An Index of treatment / by various writers ; edited by Robert Hutchison and H. Stansfield Collier.

Contributors

Hutchison, Robert, Sir, 1871-1960.
Collier, H. Stansfield
University of Leeds. Library

Publication/Creation

Bristol : J. Wright, 1907.

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INDEX OF TREATMENT

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AN

INDEX OF TREATMENT

BY

VARIOUS WRITERS

Edited by

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UNIVERSITY OF LEEDS

BRISTOL: JOHN WRIGHT AND CO.
LONDON: SIMPKIN, MARSHALL, HAMILTON, KENT & CO., LIMITED.
NEW YORK: WILLIAM WOOD & CO.

1907

JOHN WRIGHT AND CO.,
PRINTERS AND PUBLISHERS, BRISTOL

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PREFACE

THE present work is intended to provide the practitioner with a complete guide to Treatment in moderate compass, and in a form convenient for reference.

The publishers have been fortunate in securing the co-operation of a group of contributors of special experience, whose names will be a sufficient guarantee of the value of the text, and no pains have been spared to make the book a trustworthy index to the best and most modern methods of dealing with disease.

Care has been taken to avoid embarrassing the reader with a large choice of procedures, and therefore those only have been described which, in the opinion of the respective writers, are considered the simplest and most effective.

In view of the special audience to whom the book is addressed, no attempt has been made in the surgical articles to deal with the more elaborate operations which require special skill for their successful performance; on the other hand, non-operative treatment has been dealt with in detail, as well as such minor or emergency operations as any practitioner may be called upon to perform. The management of labour, whether complicated or uncomplicated, has not been regarded as falling within the legitimate scope of the book.

It is obvious that, in spite of all the care which has been bestowed upon its production, a work such as this is bound to be marked by some omissions. The editors will therefore gladly welcome any suggestion from readers which may enable these to be remedied in future, as well as details of any method of treatment which has been found specially useful in practice, and which is not described in the present edition.

THE EDITORS.

London, November, 1907.

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* These articles were almost the first to be sent in when this book was under preparation, and are probably Dr. Schorstein's last contributions to medical literature. The Editors and Publishers would like to take this opportunity of expressing their great regret at his untimely death.

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ERRATA.

Page 65.—Appendicitis (*See also* Typhlitis) read Appendicitis *and* Typhlitis.

,, 154.—Chancroid, for J. Ernest Lowe read J. Ernest *Lane*.

,, 335.—Spreading Traumatic Gangener read *Gangrene*.

,, 474.—For Ludgwig's Angina read *Ludwig's* Angina.

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AN

INDEX OF TREATMENT

ABORTION.—For the purposes of treatment abortion may be divided into (1) Threatened ; (2) Inevitable. The signs of threatened abortion are bleeding and pains, or there may be bleeding without pains. The pains are similar to those of the first stage of labour, but are less severe. If the membranes have ruptured or the os is nearly fully dilated, abortion may be regarded as inevitable. In early abortion the ovum is sometimes entirely pushed out of the uterus into the distended cervical canal before the os externum begins to dilate. In such cases likewise the abortion is inevitable.

1. **Threatened Abortion.**—In all cases absolute rest in bed is essential. No treatment is effective if this precaution be neglected. The patient should be kept strictly in the recumbent position. If there is bleeding but no pain, small doses of ergot may be given. If there are pains as well as bleeding, it is better to give small doses of opium. Extractum viburnum prunifolium in 3-gr. doses may be given in the form of a pill three times a day. If given in the form of the fluid extract it should be enclosed in capsules, as it is very disagreeable to take. The treatment should be persisted in for at least a week after the symptoms have subsided. If in spite of treatment the bleeding becomes severe, abortion must be induced.

2. **Inevitable Abortion.**—If the pains are good and the bleeding not excessive, no interference is necessary. It is most important to examine everything that comes away, to make sure that the abortion is complete. In an early abortion the ovum may be expelled entire, but at the end of the third month the fœtus often escapes first, whilst the placenta is retained in the uterus. If nothing is done the placenta may remain undelivered for a week or more, when it will probably decompose. Serious pelvic inflammation, with or without the formation of an abscess, is likely to result from such neglect. If the whole or part of the placenta be retained, it is absolutely necessary that this be removed at once. To do this is easy if an anæsthetic be given. Strict antiseptic precautions must be taken. No instruments are necessary. The placenta can be detached and removed best by the fingers of the right hand, whilst the left hand pushes the uterus down so as to enable the fingers of the internal hand to reach the fundus.

If the process of abortion is very slow, or if in the course of it the bleeding becomes excessive, it will be necessary to expedite matters. If the cervix be imperfectly dilated, the best treatment is to firmly pack the vagina with gauze and leave it in position for six hours. If the dilatation has then progressed sufficiently, the uterus may be emptied by the finger. Rapid dilatation with Hegar's dilators is sometimes, but not often, to be preferred. In inevitable abortion ergot should not be given until the uterus is emptied.

It cannot be too strongly borne in mind that, unless special indications exist, there is no more necessity to interfere in the course of a normal abortion than there is in the course of a normal labour. A certain amount of bleeding is a necessary accompaniment of every abortion, and no alarm need be felt unless it is excessive.

After an abortion the patient should be advised to lie in bed for at least a week. No douches are necessary.

W. J. Gow.

ABSCESS.—The localized collection of pus to which the term abscess has been given is in all cases treated by incision. At the same time it is necessary to recognize certain stages in the formation of the abscess which have some bearing upon treatment, and further, the steps that should be taken to provide adequate drainage and healing.

When an infective process, upon which the formation of an abscess depends, occurs in a superficial region, steps may be taken to cut short the development of the suppuration, as for example in cases of cellulitis and diffuse phlegmons. Free incisions, under such circumstances, followed as they are by the exit of the toxins and by the advent of protective and immunizing lymph to the infected area, are beneficial and advisable; but when the source of trouble lies at some distance from the surface, and where perhaps from the anatomical relations of the part it is desirable to give nature a chance either of effecting resolution of the inflammatory exudate or of determining it into a definite abscess, local applications—fomentations or hot irrigations—are to be employed.

As soon as pus has made its presence manifest, either by the phenomenon of fluctuation or by a softening or bogginess in an area of induration, no time should be lost in giving it a ready exit. All abscesses should be opened as soon as they have declared themselves; and they should be opened freely, with due respect to the anatomy of the part concerned, and in such a position that drainage of the contents is favoured.

If important structures are likely to be encountered or injured, Hilton's method should be employed: this consists in incising the tissues down to the deep fascia, and inserting a director into the most prominent part of the swelling, or where fluctuation is most obvious, until the pus flows along the groove. The opening is then enlarged with sinus forceps or Spencer Wells forceps, until a track of sufficient size has been established. When once the opening has been made, it is usually unnecessary to do more than insert a drainage tube, so that the discharge can find a ready exit. There is no great objection to the irrigation of the cavity with weak antiseptics, though it does no more than wash away the clot which has collected in the cavity. Strong antiseptics and scraping of the cavity wall are in most cases injurious, since the protective barrier of granulation tissue is damaged, fresh lymphatic spaces are opened up, and young vessels are torn across. The necrotic material which often lies against the granulation tissue wall is soon cast off, and can be gently syringed away at the daily dressing. Scraping and strong antiseptics do not facilitate its separation.

Drainage.—All abscesses require drainage, though the duration and form of this drainage vary in individual cases. The object is twofold: first, to allow the necrotic tissue, which must separate from the healthy granulations, to come away; secondly, to prevent the superficial opening closing before the deeper parts have become clean and healthy. Two chief agents are in vogue for procuring drainage, viz., strips of gauze and rubber tubes (occasionally glass); sometimes both are combined. Generally a rubber tube of fair size (for the purpose of draining an abscess of any size no tube smaller than a cigarette should be employed) is the best, but where the bleeding is profuse, or where the position of the abscess is unsuitable for tube drainage, as in ischiorectal abscess, gauze may be substituted.

In such cases care should be taken that the gauze is not tightly packed into the cavity; this prevents shrinkage and contraction, which are essential for healing. Light packing, which can readily be removed, is all that is required.

During the subsequent progress of the case, irrigations of the cavity through the tube once or twice daily are of value, the tubes being gradually shortened as the cavity closes. With regard to the irrigation, it is worth remarking that peroxide of hydrogen, though a remedy of undoubted value, and frequently employed in these cases, must be used with the utmost caution. When brought into contact with blood or proteid matter the oxygen is given off freely, and if it is injected into a cavity from which there is not a very ready exit, the gas so generated may force its way through the walls of the abscess into the cellular tissue, causing serious complications. Drainage should not be too prolonged, since the presence of a tube or strip of gauze is a source of irritation, and sinuses are often caused by a too zealous adherence to the tube over a long period. When the temperature has been normal for four or five days, and the discharge has become clean, thin, and sweet, it is time to think of withdrawing the drain. No definite rules can be laid down, but provided that the superficial opening is kept patent by a small plug, it is often very advantageous to remove the drainage early.

Rest is an important factor in the healing of abscesses. Neglect of this detail is another cause of troublesome sinuses. The part should be immobilized as far as possible. Splints, bandages, or whatever apparatus may be most suitable should be applied, and, in cases where the conditions of the part permit, gentle pressure will assist the natural process of contraction and obliteration of the cavity.

Axillary Abscess usually arises from suppuration in the cellular tissue or glands of the axilla. The abscess lies beneath the deep fascia, and should be opened by a vertical incision on the inner axillary wall in order to avoid important structures, and the pus should be reached by Hilton's method.

Submaxillary Abscess arises either from suppuration in the submaxillary lymphatic glands or as the result of a cellulitis. Cellulitis in this region is especially serious, owing to the risk of œdema of the glottis supervening. This œdema, which occurs in the aryteno-epiglottidean folds, causes occlusion of the superior aperture of the larynx, and fatal dyspnœa often follows an attempt to anæsthetize the patient. In no instance is the beneficial effect of incisions into the indurated area of a cellulitis more marked than in Ludwig's angina (q.v.). The incisions may be made either parallel with and under cover of the border of the lower jaw, or vertically in the median line; and if there is dyspnœa when the patient comes under treatment, local anæsthesia alone should be employed.

Ischiorectal Abscess occurs after infection of the fat in the ischiorectal fossa, the infection passing in from the bowel, either through a gross abrasion, such as may be produced by a foreign body, or ulcer, or by means of lymphatic communication. There are two well-recognized varieties of ischiorectal abscess: the acute form, caused in most instances by the *Bacillus coli* or other pyogenic organisms, and the tuberculous. The ordinary variety is treated by free incisions, which should extend widely across the buttock at right angles to the anus, and in most cases it is advisable to make crucial incisions over the centre of the fossa, removing subsequently all undermined skin; the finger should then be introduced and all loculi broken into. The cavity should be lightly packed with gauze and allowed to granulate from the bottom.

Cases of ischiorectal, and for the matter of that, anal abscesses, illustrate the importance of rest in order that perfect healing may be secured. The common result of these abscesses is that after they have discharged their contents, owing to the movement of the part and the bad circulation, a sinus or fistula is formed,

which necessitates a subsequent operation to effect its cure. For this reason it has been advocated that in all such cases the external sphincter should be divided, and the abscess cavity made continuous with the lumen of the anus, so that the frequent contractions of this muscle shall not interfere with the healing process.

This treatment is advisable if, at the time of active treatment, a fistulous communication with the bowel is evident, but it is unwise as a routine. If the patient is kept rigidly in bed, lying for the most part on the face or opposite side, healing may occur perfectly. Under no circumstances should he be allowed to get up until a thorough trial of rest has been made. If this treatment is combined with daily dressing and the application of lotio rubra and stimulating injections, in a fair proportion of cases the formation of a fistula may be avoided.

The treatment of the tuberculous variety is conducted on the same principles, but it is often advisable to scrape out the walls of the cavity after the pus has escaped. As a rule the simpler the operation the better in these cases, and as soon as possible the patient should be sent away to the seaside, while those remedies which are of value in combating tuberculosis elsewhere should be actively employed.

Anal Abscess may be described as a modification of the ischiorectal variety. It is much commoner, and arises from infection of the sebaceous glands and lymphoid tissue which surround the anal orifice.

The treatment should be conducted on precisely similar lines to those used in the former variety, and later, if necessary, any fistula can be dealt with.

Mammary Abscess.—There are three recognized varieties of mammary abscess: the *superficial*, which is no more than a subcutaneous collection of pus of slight extent; the *intramammary*, which results from an infection spreading into the breast, along the lymphatics or ducts, from a cracked nipple which has been neglected; and the *submammary*, usually a chronic variety dependent upon caries of the rib, the exciting organism being either the tubercle bacillus or the bacillus of typhoid fever.

Under the present heading only the intramammary form will be discussed.

During the early weeks of lactation, the breast becomes swollen, painful, and red. The abscess presents in one of the quadrants, and should be opened by incisions which radiate out from the nipple. Mere incision is, however, inadequate in these cases. Owing to the tendency of the pus to burrow into adjacent loculi, the finger should be introduced into the abscess cavity, and all secondary communications freely opened up. If there is pocketing in a downward direction, a counter opening should be made in the costomammary sulcus. Tubes should be employed for from four days to a week, and the breast should be carefully supported by means of a bandage. (See also MASTITIS.)

Palmar and Plantar Abscesses are caused by punctured wounds, or as the result of a spreading whitlow. They should be opened by free longitudinal incisions, but the position of the arterial arches should be carefully borne in mind, since hæmorrhage in wounds of this kind is troublesome and often serious. If the pus has tracked back through the interosseous spaces, a counter opening should be made on the dorsum. After incision the whole limb should be placed on a splint and kept at rest, but as soon as the temperature is normal and the wounds are healthy, careful movement of the fingers should be undertaken to diminish the stiffness, a usual sequela from the adhesions which have formed in the synovial coverings of the tendons.

Peritonsillar Abscess or **Quinsy** is the usual termination of the parenchymatous form of tonsillitis. The pus is formed outside the tonsil, and this gland is pushed towards, often across, the middle line by the exudation. The abscess cavity lies

between the tonsil and the superior constrictor, and while the tonsil has been thrust in on the one hand, the internal carotid and ascending pharyngeal arteries have been displaced outwards on the other. Pus can be detected by a feeling of softening external to the tonsil. In most cases no actual fluctuation can be felt.

Although the opening of a peritonsillar abscess is a simple proceeding, it has on many occasions been attended with serious results. In the first place, no general anæsthetic should be employed, as there is great risk of the pus running down the larynx after the abscess has been opened if the patient is anæsthetized, A 10 per cent solution of cocaine should be sprayed over the back of the throat, and the patient should sit or stand facing a good light. The mouth should be opened as widely as possible, though here the operator will experience difficulty, as the inflammation round a tonsillar abscess often prevents the patient from separating his teeth for more than a half to one inch.

The tongue should be depressed, and the fold formed by the anterior pillar of the fauces be clearly defined. The pus lies immediately behind this fold. A narrow scalpel is taken, guarded to within half an inch of the point with strapping. It is introduced on a level with the soft palate, a cut is made downwards for at least half an inch, and the knife is withdrawn. If the opening is not of sufficient size it should be enlarged with sinus forceps. The patient should be instructed to gargle his mouth repeatedly with hot alkaline solutions, and general tonics and quinine should be administered.

Before leaving the subject it will be well to enumerate some of the dangers, errors, and difficulties in performing this operation. Aneurysm of the internal carotid has been mistaken for a quinsy, and on one occasion it was incised in an out-patient department. Sarcoma of the tonsil appears very like quinsy, but inflammatory signs are absent, the temperature is normal, the glands are enlarged and not tender, and the mouth can be freely opened. The tonsil should not be incised; this mistake causes considerable pain, and the pus is missed. The internal carotid has been wounded by a careless use of the knife, and some surgeons prefer a pair of sinus forceps instead of the scalpel for the purpose of evacuating the pus, but if the above directions are followed there is little risk of this untoward accident.

Subphrenic Abscess.—(See PERITONITIS, ACUTE GENERAL.)

W. H. Clayton-Greene.

ACHORIA, or absence of the feeling of satiety, should be treated by regulating the quantity of food taken. *Robert Saundby.*

ACHYLIA (Anacid Dyspepsia).—The treatment of this condition aims at securing the passage of food as soon as possible into the bowel, where digestion can be effected. As explained elsewhere (see DYSPEPSIA), the attempt to give artificial digestive agents is not satisfactory and is superfluous. Perhaps the best thing is to give the following acid mixture after meals, in order to disinfect the gastric contents, and to stimulate the stomach to discharge its contents :—

℞	Acid. Nitrohydrochl. dil.		Succ. Taraxac.	℥j
	Tinct. Nucis Vom.	āā ♏x	Aq.	ad ℥j

Two tablespoonfuls three times a day directly after meals.

Robert Saundby.

ACNE VULGARIS.—The treatment of this disease depends on the stage which the individual case has reached. In those cases where "blackheads" are numerous and pustules few, the patient should bathe the face with warm water and apply a sulphur soap, with vigorous friction, for five or six nights a week. The acne skin is greasy, and surprisingly tolerant of irritation, and if the comedones are numerous, one may even recommend the occasional use of a sand soap, such as the famous "Monkey Brand." The friction is an important

part of the treatment, for the skin is anæmic and the cutaneous muscles have lost tone, and the hyperæmia and the massage of the muscles are both beneficial. In cases where pustules are present, the same treatment may be used less vigorously, unless the reaction is so great as to induce one to apply a soothing lotion, such as sulphur and calamine, for a few days. The pustules, and still more, the deeper abscesses, which are so commonly present in severe cases, should be opened, and their contents evacuated; but it is not necessary to apply strong antiseptics to their cavities, which usually heal up readily.

Electricity, in the form of high-frequency currents and X rays, is sometimes surprisingly successful in acne, but in other cases is most disappointing.

In about 10 per cent of the cases, or probably less, much improvement follows the administration of the sulphide of calcium, $\frac{1}{6}$ gr. thrice daily; and similar benefit also results in others from the administration of yeast, levurine, or nucleinic acid.

The diet in acne should be simple, and fats should be taken in moderation.

Norman Walker.

ACROMEGALY.—The use of pituitary extract in this condition has proved disappointing. Thyroid preparations are worth a trial, as some cases have improved to a certain extent under their use. *Robert Hutchison.*

ADDISON'S DISEASE.—Treatment must be considered under two headings: (1) Specific; (2) Symptomatic.

1. **Specific Treatment.**—It is now generally accepted that the symptoms of Addison's disease result from impairment and, eventually, complete suppression, of the functions of the suprarenal capsules, brought about by disease of the capsules themselves, or of the nerve tracts controlling their function. This suprarenal inadequacy can only be actively atoned for by the administration of its physiological equivalent. In every case, therefore, suprarenal gland substance should be administered. It must be frankly admitted that, so far, the results reported are somewhat disappointing. In some cases there has been no perceptible improvement; in others but temporary benefit has followed; while in some instances remarkably good results have been obtained. These discordances are not difficult to understand; it must be remembered that the exact lesion varies in different cases, that the diagnosis is always difficult, and that too often it is only established at a hopelessly late period of the disease. Moreover, at present we have not learned how to prepare, much less how to administer, suprarenal substance of certain standardized physiological activity. Up to the present the gland substance has usually been given by the mouth, but it is possible that its subcutaneous injection would prove more efficacious. The suprarenals of sheep have been mostly employed. Tablets of a dried extract are prepared, 1 gr. of which corresponds to 15 gr. of the gland substance. Treatment should be begun by one tablet thrice daily, and the dose steadily increased.

So far no bad results have been recorded, though several drachms of gland substance are said to have been given daily with benefit. This treatment should be persisted in, and not remitted when improvement, however well marked, takes place.

If mouth administration fails, hypodermic injection of the gland substance may be tried; the initial dose should not be more than one-third of that by mouth, and only cautiously increased.

2. **Symptomatic Treatment.**—The duration of life in Addison's disease varies from a few days to some years. These wide limits depend, to some extent, on the nature of the destructive agency at work, but probably the difficulty of diagnosis is an important factor. Only too often the cases are seen in the

last stages of the characteristic asthenia, when no treatment is of avail. When seen earlier, general treatment is of great importance. The patient must give up all active work, and be content to lead a restricted life, free from all worry and stress. Fresh air and sunshine are of great value. All muscular exertion must be moderate, and if there are any signs of faintness or syncope, he should spend most of his time in the horizontal position.

The diet should be plain, but not too restricted, and meat should be allowed ; stimulants are not to be regarded as a necessity for all cases. Sooner or later vomiting usually occurs ; the diet must then be regulated, and liquid or predigested food given ; iced champagne in small quantities is useful. Medicinally, bismuth, oxalate of cerium, and iodine may be tried.

℞ Liq. Bismuth. et Am. Cit. ℥xxx | Tinct. Cardam. Co. ℥x
Acid. Hydrocyan. dil. ℥iij | Aq. Menth. Pip. ad ℥ss
Every three hours.

℞ Cerii Oxalas gr. ij
In Pulv. j. Every four hours.

℞ Tinct. Iod. ℥j | Aq. ad ℥j
Glycerin. ℥x |
Every two hours till vomiting ceases.

Strong purgatives must always be avoided, in view of the marked tendency in these patients to troublesome and exhausting diarrhœa. Anæmia is sometimes marked, and a combination of iron, arsenic, and strychnine has been found of great benefit.

℞ Ferr. et Ammon. Cit. gr. vij | Tinct. Nucis Vom. ℥x
Liq. Arsenic. ℥iij | Aq. Chlorof. ad. ℥ss
Thrice daily in water after meals. *Lewis Smith.*

ADENOIDS. — Adenoid growths may require treatment at all ages, the youngest age at which the writer has operated being three months, and the oldest forty-two years.

In considering the diagnosis of enlarged tonsils and adenoids it should be remembered that while the two conditions usually co-exist, yet the former may be present without any hypertrophy of the lymphoid tissue of the posterior nares, while in other cases adenoids may be present without any enlargement of the faucial tonsils. The writer never makes a digital examination of the posterior nares. It is a painful proceeding and extremely terrifying to a nervous child. Moreover the information afforded by this method of examination is often incomplete, for in restless children the examining finger frequently misses the hypertrophied masses which lie in close proximity to the Eustachian tubes and produce the deafness which is one of the most distressing symptoms of the affection.

In those cases where the faucial tonsils are hypertrophied, there is no necessity to examine for adenoids ; for this examination may be made when the patient is under the anæsthetic, and if present the growths can be removed at the same time as the tonsils. When, however, the faucial tonsils are not enlarged, the diagnosis depends upon the symptoms, and it will be best to consider these as they occur in (1) *Infants*, (2) *Older children*, and (3) *Adults*.

1. **Adenoid Growths in very young infants** are not so very uncommon, and the chief symptom for which advice is sought is snuffling at the nose. Although this symptom is most commonly due to the rhinitis of congenital syphilis, yet there is no doubt that a child may be born with "snuffles" entirely due to the presence of adenoid growths. Another symptom complained of is inability to take the breast or the bottle. This is due to the fact that nasal obstruction is present, and therefore that the child cannot suck and breathe at the same time. Snoring is not such a common symptom in infants as it is in older children. Congenital laryngeal stridor is another condition which is sometimes due to adenoids. In infants the use of the post-nasal mirror is impossible, but the diagnosis can usually be made by a careful consideration of the symptoms of the patient.

2. **In older children** nasal obstruction forms a marked feature. The typical facies, with the open mouth, hanging lower jaw, thickened lower lip, and general look of stupidity, is well known. The bridge of the nose is often widened from congestion of

the soft parts, and the alæ nasi are frequently collapsed. Snoring during sleep and a peculiar thickness in articulation are often noticed. But it must be borne in mind that some children do not keep their mouth open at night, and only show the presence of adenoids by want of development and deformity of the thorax. Post-nasal catarrh is very common, and, especially when the hypertrophied masses lie in proximity to the Eustachian tubes, deafness, and in time, chronic catarrh of the middle ear supervene. It is in these cases that the use of the post-nasal mirror is so important an aid in locating the growths around the Eustachian tubes. Very often this examination may be made when the child is first seen, but sometimes the nasopharynx is so sensitive that this is impossible. Under these circumstances the writer always sends the child home for a week and gives the following prescription :—

R Pot. Brom. (according to age)	gr. v–x	Liq. Arsenic.	℥ij
		Aq. Chlorof.	ad ℥ij

Two teaspoonfuls to be taken three times a day after meals in water.

After this preparation the sensitiveness of the nasopharynx is so diminished that a satisfactory examination with the post-nasal mirror becomes possible.

Other aids in the diagnosis of adenoids in older children are the occurrence of granulations on the posterior wall of the pharynx below the soft palate, and the enlargement of the lymphatic glands along the posterior border of the sterno-mastoid muscle.

3. **In adults** who suffer from adenoids, advice is generally sought for three chief reasons :—

(*a*). *Chronic post-nasal catarrh* often occurs in cases where the adenoids have been removed in childhood and have subsequently recurred. The condition is really a hypertrophy of Luschka's tonsil, in which are found crypts from which mucopus is exuded.

(*b*). *Deafness* is also a frequent complaint. In adults it should be remembered that chronic otitis media, with indrawing of the membrana tympani may have supervened, and that therefore a cautious prognosis should be given. Still, as the presence of adenoids tends to keep up the middle-ear catarrh, they should be removed.

(*c*). *Muffling of the voice*, and a want of nasal resonance, is a symptom which becomes especially noticeable in singers. It has been said that singers should be operated upon as little as possible. When, however, it is remembered that the nasopharynx is a very important resonator of the voice, and is not a large space even when unobstructed by adenoid growths, it is clear that these should be removed and the space made as large as possible.

In considering the treatment of these cases, it has been urged that operation should be postponed until the general condition of the patient has been improved. Inasmuch as the adenoids are the exciting cause of the trouble, the writer believes that early operation is advisable, and that the improvement in the child's condition will be all the more rapid after the postnasal growths have been removed. The respiratory exercises advocated by Arbuthnot Lane are only valuable *after* the nasal obstruction has been removed.

As regards operative treatment, the first consideration is the choice of the anæsthetic. Abroad, tonsils and adenoids are removed without any anæsthetic at all, but owing to the intense nervous impression left upon sensitive children by this proceeding, the writer now always gives an anæsthetic. Of these, the ideal one is chloroform, or a mixture of two parts of chloroform and three of ether. In adults, gas and ether may be given, followed by chloroform. Gas alone, or gas and oxygen, does not give sufficient time, unless the operator be specially experienced and skilful. The use of chloride of ethyl has resulted in so many fatalities that this anæsthetic is not to be recommended. Whichever may be chosen, it should always be given by a skilled anæsthetist who acts in this capacity alone, and not as anæsthetist and general assistant combined.

The preparation of the patient for the operation is important. If a very nervous subject, the mixture of bromide of potassium and arsenic in doses suitable for the age of the patient should be given for a week beforehand. In adults the writer always gives 30 gr. of bromide of potassium in a large glass of water the night before the operation. An action of the bowels should be secured by aperients the morning before the operation, followed if necessary by an enema.

The operation is best performed in the early morning, when the stomach is

empty. Care should be taken to see that the patient, if nervous, is not wakened until just before the operation, and that no beef tea is given in the early morning.

The head should be placed low at the edge of the table and on the right side. The writer prefers this to the position formerly advocated, with the head hanging over the end of the table. The latter position leads to congestion of the veins of the neck, and consequently to greater hæmorrhage, and moreover, unless the head be firmly fixed by an assistant, it is difficult to remove the adenoid growth satisfactorily because of the mobility of the head.

Before the anæsthetic is given, a small gag should be placed between the teeth to allow of better breathing, since it should be remembered that nasal obstruction is already present. The anæsthesia should never reach the stage when the reflexes are completely lost, and before proceeding with the operation, the writer always inserts his finger, to make sure that the palatal reflex is present. It is of vital importance that the patient should be able to swallow the blood and to cough up any that accidentally enters the larynx.

There are two methods of removing adenoids which have to be described : (1) *Operation with Löwenberg's forceps*, or some modifications thereof ; (2) *Operation by means of the curette*. The writer no longer uses the curette, but relies entirely on the forceps. It is very difficult to remove the adenoids thoroughly by means of the curette, and very often only the central pad is removed. The growths tend to recur round Rosenmüller's fossæ unless completely removed from these situations, and, if left, the dangers of middle-ear complications are considerable. Moreover the writer has found that the patients experience far less pain and stiffness of the back of the neck after the operation, when this is done with the forceps only, than when the curette is used. On the other hand, it is more difficult to learn the use of the forceps than that of the curette, and the operation takes longer to perform ; but the extra time and skill required is well worth while, because it is only by use of the forceps that the adenoid growths can be completely and efficiently removed.

1. **Operation with Forceps.**—The patient having been anæsthetized, a Mason's or other suitable gag should be inserted in the left side of the mouth. In the case of adults it is always well to enquire beforehand if there are any teeth which have been crowned, so that they may be avoided, or the gag put on the other side. If no prop has been used there may be some difficulty in opening the mouth, as the patient should never be deeply under the anæsthetic. That can easily be overcome by inserting the forefinger between the jaws at the back of the last molar teeth, or by inserting the end of a tonsil guillotine and so forcing the teeth open.

The operator, standing on the right side of the patient, passes the forefinger of the left hand along the right side of the tongue over the tonsil, or below if the tonsils be large, until it reaches the posterior wall of the pharynx. He then turns it, with the dorsum of the hand on the tongue, up behind the posterior pillar of the fauces into the post-nasal space, which he examines thoroughly, if he has not previously been able to do so, by means of the post-nasal mirror. Still keeping the finger behind the soft palate, and hooking it forward, he takes the largest pair of forceps that will fit the case, and passes them closed behind his finger. He then opens them as widely as possible, and keeping them closely pressed against the posterior wall, passes them up, guided by his finger, until as large a mass of growth as possible has been included. The blades are then closed, and with a slight twist and downward pull the mass is removed. The process is repeated until all the central mass is removed. By pressing on the mucous membrane below the forceps it is easy to prevent it being removed along with the growth. He then takes a smaller pair of forceps, and turning them to either

side, thoroughly clears out any growths that may be in Rosenmüller's fossa. It sometimes happens when the growths are in very great abundance that pieces of them get pushed through into the nasal passages, and so cannot be gripped by the forceps. They can be pushed back again by passing a probe or pair of curved dressing forceps down the nose.

When there are tonsils present as well, they should be removed after the adenoids: (*a*) Because they bleed more than the adenoids, and so waste time in swabbing; and (*b*) Because the patient has had time to come more out of the anæsthetic, and will gag more, and so help to push the tonsil into the guillotine; and also if the tonsil should slip off the guillotine, it is more likely to be swallowed or spat out, and not pass into the larynx.

If the tonsils are removed last, sponging should not be required, and at any rate should always be done gently. On no account should the sponge be rammed into the back of the throat and turned round remorselessly, as if wiping out a glass lamp-chimney.

After the operation the patient should be turned over on to the right side, with the left hip and left shoulder brought well over, and the head brought to the edge of the table. Just before removing the gag the writer is in the habit of applying pure hazeline or Pond's extract by means of small pieces of sponge tightly gripped in the forceps and passed up into the post-nasal space and also pressed on to the tonsils. It acts not merely as a local hæmostatic, but as an antiseptic and local anæsthetic.

As soon as the patient is out of the anæsthetic he should be instructed not to try to blow the nose for two or three days, as the cases of suppurative otitis media that sometimes occur are generally due to blood being forced into the Eustachian tubes.

When the operation has been primarily undertaken for deafness, it sometimes happens that the depletion of the mucous membrane of the posterior nares causes marked improvement in the hearing, which is noticed as soon as the patient wakes up. But treatment with Politzer's bag should be delayed for at least three weeks after the operation. Before employing it, an alkaline spray (not a douche) should be used for a week, in order to make certain that the post-nasal space is free from any discharge.

2. **Operation with Curette.**—The operator should be provided with a guarded curette with prongs, and also with an unguarded one. The patient is in the same position, although when nitrous oxide gas only is used some operators prefer to have the patient in the sitting-up position.

The curette is passed up behind the soft palate until it impinges on the vomer. It is pressed down on the growths, and with a rapid sweep the growths are cut through and brought out attached to the prongs. The unguarded curette is then passed up and turned first to the right side and then to the left, taking care not to injure the Eustachian tube, and swept down and across to the opposite side. Even after the curette has been used by an efficient operator, it is always well to remove any little tags that may be left by means of the forceps.

After-treatment.—The patient should be kept in bed for two or three days, and in the house for two days more before being allowed out. He should also, if at all nervous, get a sleeping draught of bromide of potassium for two nights after the operation, and an aperient the second night. Should sickness persist for some time after the anæsthetic, it is a good plan to give 10 gr. of bicarbonate of sodium in a large tumbler of hot water. This is generally brought up again, and helps to get rid of the blood and mucus in the stomach. Milk should not be given for twelve hours, but weak tea and bread and butter or beef tea may safely be taken. Thirst is best controlled by giving alternate teaspoonfuls of very hot and cold water. The pain caused by the removal of tonsils is best

relieved by a mouth-wash of hazeline or Pond's extract, or very hot solution of carbolic acid (1–60), or if need be, by blowing orthoform on to the cut surface.

Breathing Exercises.—Owing to the nasal obstruction these patients have not been able to fill their lungs properly, their chests are not developed, and in some cases they have begun to be deformed. It is therefore of the utmost importance that breathing exercises, with special reference to nasal breathing, should be patiently and persistently carried out in a systematic manner until the patients have learned to breathe through the nose at all times.

In a great many cases the nares have become so narrowed that on trying to inspire quickly through the nostrils the alæ nasi are drawn in. When this happens the patient must be shown in a mirror what is being done, and made to practise expanding the nostrils during slow inspiration. From a long experience the writer has found the following exercises the most useful. They are all to be done standing up with the mouth firmly closed, so that both the inspired and expired air passes through the nose.

They are best done at bedtime and in the morning before dressing, as all tight clothing, such as corsets, braces, and tight waistcoats, render them nugatory. In fact it would be a good thing if boys learnt to wear their trousers suspended from the hips by means of a back-strap, and did not wear braces at all.

(*a*). The first set of exercises should be done against resistance. Three or four times a day the parent or nurse should stand in front of the patient and place the hands at the back of the lumbar region. The patient should then be asked to exhale deeply, so that the ribs go in. The parent's hands are then pressed strongly against the lower ribs. The patient should concentrate all his attention there, and try to push the hands outwards and backwards, and rather downwards than upwards, while taking in four short breaths through the nose.

The movement should be a backward one and confined to that part, and the chest as a whole should not be raised. After this has been accomplished, which may take from a week to a month, the hands should be placed higher up and a little more to the sides, and the exercises repeated. When this has also been successfully accomplished, the hands should be placed in the armpits, with the thumbs pressing strongly on the front of the chest. The patient should first try to separate the hands as far as possible laterally, and then endeavour to push the chest up against the thumbs. In order to prevent the muscles attached to the top of the ribs being brought into play or the shoulders being raised, the head should be allowed to hang forward.

When the patient is old enough he can do these exercises himself by making pressure with his own hands behind, and for the last exercise by putting a tape measure round the chest just above the nipple line and trying to exhale as much as possible, and then expand the chest laterally, and finally raise it. The difference between full inspiration and full expiration should be four to six inches.

(*b*). The second exercise should be done standing in front of a looking-glass. The arms should be held out horizontally on a level with the shoulders, the palms facing the mirror. In this position, while taking in as full a breath as possible, the arms should be stretched away from the body to their utmost extent. While holding the breath, and keeping the arms rigidly extended and the head quite steady, facing the mirror, the arms and shoulders should be moved round until the right arm is straight in front and the left arm behind, and then swung back again. This exercise should be repeated about six times, bringing each arm alternately in front. The rotation, if possible, should take place in the spine, the head should not be moved at all, and the hips as little as possible.

(*c*). In the third exercise the patient should stand with his back against the wall, or a door. Both arms should then be raised above the head and stretched as high as possible, while inspiring slowly through the nose. Then, keeping the back of the hands and the elbows against the wall, the arms should be flexed until the hands are on a level with the shoulders. The breath should then be slowly expelled through the nose, the head allowed to fall forward, the shoulders be brought forward, and the chest compressed so as to get rid of all the air possible. This exercise should be repeated six times night and morning.

George C. Cathcart.

AGORAPHOBIA, the dread of open spaces or the fear of crowded streets, and **Claustrophobia**, the dread of being shut up anywhere, should be treated by, as far as possible, correcting any errors of diet, giving suitable remedies for any gastritis that may be present, and diminishing the nervous excitability by

such sedatives as bromide of potassium. Ewald speaks favourably of chloral in 10-gr. doses for agoraphobia. They are often associated with neurasthenia, and are benefited by rest, change of air, and all such means as improve the general health.

Robert Saundby.

ALÆ NASI, COLLAPSE OF.—In the less severe cases, if the patient have any power of expanding the alæ, the best treatment is systematic exercise. The patient should be instructed to expand the nostrils for some minutes three or four times a day whilst standing in front of a mirror. A light resistance to the expansion should be made by gently compressing the nostrils with the finger and thumb. If these exercises are persisted in, great and permanent improvement usually results.

When, from atrophy of the muscles due to long disease, the patient finds it impossible to carry out these exercises, the alæ nasi may be dilated by inserting a small roll of cotton-wool, about the size of a pea, into the most anterior part of the vestibule. It is invisible, and is easily retained in this position, whilst it commonly yields complete relief to the nasal obstruction. Various dilators have been recommended for the same purpose, but they produce so much discomfort that the patient usually refuses to wear them. If the obstruction causes the patient much distress, and cannot be overcome by the methods already mentioned, a simple operation may be performed. A strip of mucous membrane, or of cartilage and mucous membrane, may be raised from each side of the septum and fixed in the anterior angle of the vestibule, so as permanently to expand the nostrils by acting in an exactly similar way to the pad of cotton-wool above described.

H. Lambert Lack.

ALBUMINURIA, Orthostatic, Cyclical, or Functional.—This affection, in which albumin is present in the urine whilst the patient is up and about, but disappears after rest in bed, may be regarded as one of the neuroses of childhood.

It occurs most commonly in children at the approach of puberty, but may be met with as early as the eighth year. The subjects are nervous, excitable, emotional, tearful, irritable, or passionate. They are peculiarly liable to night terrors, easily tired, lethargic and depressed; they suffer from migraine and from peculiar attacks of abdominal pain, either epigastric or in the right iliac region, which suggests appendicular colic. The bowels are often confined or relaxed. The appetite is capricious. Evidence of disturbance of the vasomotor system is afforded by sweating, flushing, or fainting attacks, tendency to redness, blueness, and coldness of the extremities, and passing erythematous eruptions. Epistaxis may occur; palpitation of the heart and tachycardia are met with sometimes, with tremors, and symptoms of Graves' disease. The kidneys may be movable, and there may be a condition of general enteroptosis. In appearance, the children are sallow, anæmic, with puffy lower eyelids and general appearance of chronic ill health. Their ancestry has been neurotic, gouty, or rheumatic. They answer to the description of children regarded as of the "uric acid diathesis," and also to that of so-called "mucous disease."

There is no evidence that the albuminuria is due to nephritis of any sort, nor that the condition ever leads to granular kidney or to any form of Bright's disease. Treatment by drugs, or by any means aiming at control of the albuminuria, is unsatisfactory, but calcium lactate has been found useful in some cases. Careful dieting, exercise, baths, and massage are generally inefficacious so far as the albuminuria is concerned, though valuable as means of improving general health.

Cyclical albuminuria is evidence of nervous instability, affecting chiefly the vasomotor system. It is best treated on general principles, which should include a simple, regular course of life, lived as much as possible in the open air,

wholesome ordinary diet, and freedom from emotional excitement and overwork at school. The subjects tend to become valetudinarians and hypochondriacs, and therefore should not be treated as invalids.

Tonics, and sometimes sedatives, are necessary, if only to satisfy anxious parents that "something is being done." *Leonard G. Guthrie.*

ALCOHOLISM.—Of the various manifestations of the alcoholic habit which we are called upon to treat, some, such as acute alcoholic poisoning and delirium tremens, are acute; others, such as dipsomania and chronic alcoholism, are chronic. Alcoholic insanity, too, is to be borne in mind, but it does not fall within the scope of the present article.

Acute Alcoholic Poisoning. Alcoholic Coma.—This results from absorption of a quantity of alcohol so excessive as to produce not merely excitement or incoherence, but actual coma. When called to such a patient, we must proceed without delay to empty the stomach. This is best accomplished by washing it out through a soft stomach-tube. Emetics like apomorphine may produce dangerous depression of the heart, and are, therefore, inferior to gastric lavage with warm water. When the stomach has been completely emptied of its alcohol, we then, before withdrawing the stomach tube, introduce half a pint of hot coffee and a dose of some saline aperient, such as 2 dr. of magnesium sulphate with 20 min. of dilute sulphuric acid in 2 oz. of peppermint water, If there be serious collapse, strychnine must be administered hypodermically. and artificial respiration may be called for if there be respiratory failure. But this is seldom necessary. We then allow the patient to sleep quietly, keeping him warmly wrapped up until he comes to himself.

Delirium Tremens.—Here, our chief endeavours are directed towards calming the patient's excitement and procuring sleep. For these purposes, he must be kept in a quiet room, with special nurses or attendants to watch him. A preliminary hot bath has an excellent sedative effect, and should be employed whenever available. Failing this, a cold pack is a good substitute, the patient being wrapped in a large sheet wrung out of cold water, and enveloped in several layers of thick blankets. He must be kept in bed, and fed with easily assimilable foods, such as hot beef-tea, milk, and strong soups. Mild cases sleep without hypnotic drugs, but in more severe ones it is necessary to give a hypnotic mixture, such as the following :—

R	Potass. Brom.	gr xxx	Tinct. Hyoscyam.	ℿxxx
	Chloral Hydr.	gr xx	Aq. Menth. Pip.	ad ℥j

Half of this dose may be repeated in a couple of hours, if the first dose is insufficient.

In cases with wild motor excitement, $\frac{1}{100}$ gr. of hyoscine hydrobromide may be administered hypodermically, and will generally calm the patient.

Mechanical restraint should be avoided as much as possible. A tactful female nurse usually succeeds in controlling the patient. She should, however, have the assistance of a strong male attendant, in case of emergencies. If the patient be violently excited and struggling to get out of bed, a good way to restrain him is by means of a folded sheet placed across his waist, between the blankets, including the patient and his bed, and tied firmly beneath the bed.

Alcohol should be avoided. If the heart fail, strychnine hypodermically, and ammonium carbonate by the mouth, should be exhibited. Careful examination of the chest should be made from day to day, lest pneumonia or other complication should arise.

When the patient has attained convalescence, he should be placed on a tonic mixture containing nux vomica, and it is well to send him off for a holiday,

in the companionship of someone who will exercise over him a judicious moral influence.

Dipsomania.—Dipsomania is a recurrent paroxysmal impulse towards violent alcoholic excess. A characteristic of the disease is that the dipsomaniac has intervals between his paroxysms, during which not only has he no particular desire for alcohol, but he may even have a distaste for the drug. Dipsomania is a congenital idiosyncrasy, and is not the result of habitual tippling. Its treatment, therefore, differs somewhat from that of chronic alcoholism.

Recognizing, then, the underlying congenital weakness, we adopt different treatment according to whether the patient happens to come under our observation in the inter-paroxysmal period, or whether an actual bout of drinking is in progress. During the non-drinking period we treat the patient as a neuropathic subject. By appropriate hygienic surroundings, physical, mental, and moral, we maintain his general health in as high a state as possible. Hypnotic suggestion is often markedly beneficial. For successful hypnotic treatment the patient's co-operation is essential ; he must be willing to be cured. Hypnotism, of course, can only be successfully applied during the inter-paroxysmal period. Deep hypnosis should be aimed at, and should be repeated every week for several weeks, and thereafter at longer intervals, so as to confirm the original suggestion. Not only must relief of the alcohol craving be suggested, but also a distaste for the drug. Total abstinence is the only safe rule for such patients.

As to the actual paroxysm of drinking, it is sometimes possible to anticipate its onset by prompt and energetic treatment. More often, however, we are called to the patient during the actual bout. He should, if possible, be removed to a special institution, where he can be continuously watched. The intestinal canal should be cleared out thoroughly by saline aperients, and the patient should be placed on a careful course of atropine and strychnine, administered hypodermically, according to the method described below for chronic alcoholism. The patient should not be informed of the nature of the remedies which are being employed. Numerous striking cures have been attained by such administration of atropine. The method, however, requires the most careful medical supervision, together with assiduous nursing.

Chronic Alcoholism.—To have a reasonable prospect of success, it is essential to have the patient removed from his own home surroundings, and to place him in entirely new environment under skilled supervision. For this purpose, the patient should be induced to enter a special hospital or sanatorium, or if this be unattainable, to place himself as a boarder with some medical man who will exercise benevolent control over him. Country surroundings are always best.

In such surroundings it is advisable in a severe case to commence without delay the special treatment by means of atropine and strychnine, originally advocated by McBride. The following is an outline of this treatment, as carried out at the Norwood Sanatorium :—

On admission, a careful and complete physical examination of the patient is made. Unless there be some contra-indication, a brisk initial purge is given. On the following day the patient is put on a tonic mixture containing liquid extract of red cinchona 15 min., tincture of capsicum 5 min., and infusion of gentian co. $\frac{1}{2}$ oz. This is given six times daily, at intervals of three hours. On the second day, hypodermic injections of strychnine and atropine are added and are administered three times a day, according to the following plan : The dose of strychnine nitrate commences with $\frac{1}{60}$ gr., and rises within three days to a maximum of $\frac{1}{20}$ gr. The dose of atropine sulphate commences at $\frac{1}{180}$ gr., gradually increased until at the end of a week the patient is getting $\frac{1}{60}$ gr. thrice daily, his pupils being dilated and his mouth dry. These doses are

maintained for a day or two, and are then gradually reduced. The reduction is less rapid in the case of the strychnine than the atropine. Commonly the dose of atropine has fallen to nil by the middle of the third week. The strychnine is maintained at its maximum for two weeks, after which it is continued in slowly diminishing doses until the end of the sixth week, when it is finally stopped.

Dr. Francis Hare, of the Norwood Sanatorium, who has had a wide experience in the treatment of these cases, writes as follows : " The object of the treatment is to attain the distinct physiological action of both drugs. Patients vary widely in susceptibility. Consequently the maximal dose of either drug may call for reduction on the one hand, or for some slight increase. At the end of the third week the capsicum is omitted from the tonic mixture, which is continued to the end of the sixth week, or it may be longer. During the first week or two of treatment, that is, until the hypodermic medication has had time to exert its full influence, the patient confines his walks to the grounds of the sanatorium. Thereafter he is free to come and go at his will, always, however, attending regularly for meals and injections."

Such is the routine treatment in a case of moderate severity. During the first day, before the hypodermic injections have commenced, the patient is allowed a small amount of alcohol if he wishes it. But on the second day this is stopped.

The object of waiting a day before commencing the atropine and strychnine treatment is to observe whether delirium tremens is threatened. If there be any sign of this, we treat it with bromide and other remedies, on the lines already described. When the delirium has passed off, we commence with the routine hypodermic treatment.

Open-air exercise without fatigue is to be recommended. Golf is particularly suitable as a pastime for such patients. A daily time-table of occupation should be laid down, and its performance insisted on. The diet must be generous, but easily assimilable. Daily warm baths are beneficial, and the bowels must be carefully regulated. Hours of meals must be regular, and also those of sleep. All these measures obviously necessitate an amount of supervision which is difficult of attainment save in a household specially arranged for the purpose.

Purves Stewart.

ALOPECIA AREATA.—Since this disease tends, in young persons at least, to spontaneous recovery, it is not always easy to say how much of the benefit which may follow a particular line of treatment is due to it. At present the pendulum of dermatological opinion has swung to the side of local treatment, though many of those who adopt it do not accept the theory of a local cause. Stimulants and antiseptics are the most popular remedies, and some favour one, some another. The writer's preference is for lactic acid, which he uses in a lotion (5–10 per cent) with castor oil and spirit. After that come, in his estimation, sulphur and salicylic acid, 5 per cent of each in an ounce of ointment; chrysarobin, 5 per cent in equal parts of glycerin and chloroform (this must, of course, be used with great care, on account of the violent erythema it sets up on the face); and corrosive spirit, $\frac{1}{2}$–1 per cent.

Cases occasionally recover after the application of high-frequency currents, as they do after any, or sometimes without any, treatment; X-rays seem a somewhat radical method of treatment, since they cause the fall of the healthy hair; but in the exposure to the rays of the iron electrode lamp Kromayer seems to have found a method of treatment of real value in cases which fail to respond to less elaborate methods.

If the patient is anæmic, or should he show any other disturbance of general health, suitable internal treatment is indicated; but the majority of cases of alopecia areata are otherwise quite well.

Norman Walker

AMENORRHŒA.—Amenorrhœa may be apparent or real. Apparent amenorrhœa, or retention of menses, is due to the absence of a free exit for the menstrual discharge. This is generally the result of the presence of a septum at the vaginal orifice, but sometimes it is due to the partial or complete absence of the vagina. The treatment in such cases is, if practicable, to let out the retained fluid and maintain a free exit for subsequent discharges. This is easily done by means of a crucial incision in cases where the retention is caused by a septum, but when the vagina is completely absent this is impossible. A permanent passage can only be maintained as such if it is lined with skin or mucous membrane. In all cases of complete, and in many cases of partial, absence of the vagina, menstruation must be put a stop to by the removal of the uterus, as it is impossible to provide for an exit for the recurring monthly discharges.

Real amenorrhœa may be congenital or acquired. In congenital cases it may be due to the absence or imperfect development of the uterus or ovaries, or both. Such cases admit of no useful treatment. Occasionally real congenital amenorrhœa is met with in women whose pelvic organs appear on clinical examination to be normal. If it persists up to the twenty-fifth year it is almost invariably permanent.

Acquired amenorrhœa, apart from pregnancy, the period of lactation, and the menopause, is generally a symptom of some abnormal condition of health. Under such circumstances the cause has to be sought for, and the general state of ill-health, of which the amenorrhœa is but one of the symptoms, must then be treated. Chlorosis is perhaps the most common disease to cause amenorrhœa. Rest, attention to the digestive organs, and subsequently the administration of iron, is the plan to be adopted. In simple amenorrhœa where there is no obvious anæmia, permanganate of potash in 2-gr. doses made up into a pill with kaolin and vaselin may be tried. Iron, however, generally does more good than any other drug.

Young women sometimes become rapidly very fat, and then often cease to menstruate. The cause of this state of affairs is not clearly understood.

Massage exercises and a regulated diet may be tried. *W. J. Gow.*

AMNESIA, VERBAL.—(See APHASIA.)

ANÆMIA.—(See also CHLOROSIS, PERNICIOUS ANÆMIA, SEPTIC ANÆMIA.)—This is a common accompaniment of many diseases (so-called "Secondary Anæmia")—in some cases so striking a feature that it appears in itself to constitute the disease (so-called "Primary Anæmia"). In either form the indications for treatment are the same, viz. :—

1. *Etiological.*—Removal, so far as is possible, of the individual factors which, either singly or, as is more commonly the case, collectively, have co-operated to cause the anæmia.

2. *Remedial.*—Correction of the effects, e.g., loss of available iron, or diminished powers of blood formation, which the operation of the causes or the mere existence of the anæmia over a lengthened period of time have brought about.

The etiological distinction between secondary and primary anæmias—that while in the former the etiology is clear, in the latter it is unknown or indefinite—is from the point of view of treatment an artificial one. As a matter of experience, even in the latter group, indications for treatment based on the existence of etiological factors are not wanting, and require even more consideration than in the group of secondary anæmias, where they are so prominent that they do not need to be looked for.

The factors in the production of anæmia which afford indications for treatment may be grouped as follows :—

I. *Physiological.*—(1) Peculiarities in structure, functions, mode of formation, and destruction of blood ; (2) Age.

II. *Pathological.*—(3) Loss of blood—the result of traumatism or disease ; (4) Hygiene (air, light, and occupation) ; (5) Digestive and nutritional disturbances, with or without accompanying toxic effects ; (6) Infections, with their toxic effects.

I.—Physiological Factors.

1. **Peculiarities in the structure,** nutritive, excretory, and circulatory **functions,** and sites and manner of **blood formation and destruction** constitute a most important factor, supplying the first and always supreme indication for treatment in all forms of anæmia, whatever their nature be. Its fluid structure, widespread distribution, and functions in nutrition and circulation expose the blood to the first brunt of injury from the many toxic influences, whether non-infective (e.g., digestive) or infective, capable of reaching it from the outside, especially through the oral, gastric, and intestinal tracts. The provisions made to protect the blood against such influences, viz., (*a*) the rich supply of *lymph cells* in the mucous membrane, especially of the digestive tract, constituting the first barrier ; (*b*) the *lymph glands*, most abundant in connection with organs supplied by mucous membranes, constituting the second barrier ; and (*c*) in connection with the *digestive tract*—the existence of a third barrier of an altogether exceptional character, *the liver*, the excretory organ of the portal blood, one of whose great functions is essentially that of purifier of the blood—all these provisions are a precise measure of the degree of injury to which the blood is exposed, in virtue of its fluid structure, its sensitive character, and its widespread circulatory function.

The indication for treatment connected with this particular etiological consideration is exemplified every day in connection with every form of anæmia, namely, the supreme importance, as the first measure in treatment, of removing so far as possible every source of possible trouble—functional, digestive, or infective—*however slight* it may apparently be, in connection with the whole alimentary tract ; and correcting by appropriate dietetic and medicinal measures any unhealthy conditions or impaired functions of the mass of active cells which not merely line this great tract, but also constitute the great first blood organ of the body. The beneficial effect of such measures is shown in everyday experience : (*a*) in connection with *chlorosis*, where the injurious influences are mainly of a non-infective (digestive) nature, and their effects are mainly functional, viz., impairment of functional activity ; (*b*) in all forms of "*secondary*" *anæmia* dependent on, or associated with, alimentary disturbances ; and perhaps most strikingly of all (*c*) in the severest forms of anæmia often loosely and, according to the writer, altogether erroneously classed together under the general title "*pernicious*," in which the injurious influences at work are always, according to his observations, of an infective nature (of a varying character afterwards to be referred to), operating with intensely aggravated effect both in impairing blood formation and increasing blood destruction, because they affect the blood in its most vulnerable part, viz., in the portal circulation.

2. **Age** is an important factor affecting the character and treatment of certain forms of anæmia. Youth is a period of relative anæmia, and this feature becomes specially marked at puberty, when, in addition to the ordinary and increasing demands of growth and adolescence, extra demands arise in connection with the onset of sexual functions and active work. Throughout this period the blood is relatively larger in quantity, and poorer in hæmoglobin, than at any other period of life ; whilst the body is also poorer in the amount of iron available for purposes of blood formation in the spleen, marrow, and other

tissues. The deficiency in this constituent is the chief feature of the anæmia of youth and adolescence, and when this is accentuated by the periodic loss of blood by menstruation, the natural tendency to anæmia is greatly increased. It is with this period of life that the commonest form of anæmia—chlorosis—is associated.

The indications for treatment connected with age are: (*a*) to supply iron in greater quantity than is contained in the food, to meet the increased demands and compensate the periodic loss; and (*b*) to recognize the unusual physical strain thrown upon so many young girls at this period of life by the often arduous duties which they at this time undertake.

The two chief indications in the treatment of chlorotic anæmia are, therefore, *iron* and *rest*. The former alone so often suffices that the importance of the latter is often overlooked or not sufficiently recognized. It is precisely this oversight that gives to severe cases of chlorosis the chronicity and apparent intractability to ordinary treatment that so often characterize them.

With advancing age—from thirty onwards—the natural tendency to chlorotic anæmia arising from want of stored iron in the body diminishes, and the greater is the likelihood that an anæmia of this type is due to other factors of a pathological character now to be considered.

II.—Pathological Factors.

3. **Loss of Blood.**—This may be due either (*a*) to injury to the vessel wall from trauma or ulceration ("*traumatic hæmorrhage*"), or (*b*) to injury to the vessel wall associated with and dependent upon disease of the blood ("*purpuric hæmorrhage.*")

(*a*) *Traumatic Hæmorrhage* is a common factor in anæmia, especially of secondary type. When associated, as it often is, with other factors, e.g., youth, digestive disturbances, etc., even the physiological loss of blood met with in menstruation may be a most potent cause of anæmia. It periodically deprives the body of an amount of iron equal to, or possibly larger than, the amount assimilated in the intervening period. The special intensity of the anæmia of young women—chlorosis—is in no little degree dependent upon such a periodic loss of iron, combined as it so often is with diminished intake of iron-containing foods.

Apart from such physiological variations, intermittent loss of blood is a potent factor in causing a severe anæmia of a chlorotic type at any time of life. As a practical point it may be said that, in adult life, the severer the anæmia and the more chlorotic its type, the greater is the necessity for considering and excluding hæmorrhage as its possible cause. The best example of such hæmorrhages are those met with in gastric ulcer, duodenal ulcer, and especially bleeding hæmorrhoids; in women, menorrhagia or metrorrhagia associated with endometritis, or with polypi or fibroids of the uterus.

The indications for treatment of traumatic anæmia are connected in the first instance with the particular site and character of the lesion occasioning the hæmorrhage—gastric, duodenal, hæmorrhoidal, uterine, vesical—as the case may be; or failing removal of the lesion itself, the checking of the hæmorrhage by suitable means.

As regards the effects of the hæmorrhage on the blood itself, the chief feature of this form of anæmia is the poverty in hæmoglobin and the corresponding degree of hydræmia which results therefrom. The chief indications arising from these characters are the necessity for iron and arsenic as hæmatinics; for rest; for hypophosphites with strychnine as general tonics; and for food as rich in iron as possible.

(*b*) *Purpuric Hæmorrhage*, dependent on or associated with diminished

coagulability of blood, is a factor in many cases of anæmia, especially of the graver (toxic) sort, and derives its importance in most cases, not from its own intensity, but from the toxic conditions with which it is associated.

In some cases, e.g., purpura hæmorrhagica, the hæmorrhages may be so numerous or extensive (e.g., epistaxis) as to be themselves the cause of a considerable degree of anæmia. But, as stated, this is exceptional. More usually the toxic features of the condition are the more prominent, and call for first attention. The anæmia is usually moderate in degree even in purpura hæmorrhagica ; it presents the characters of simple traumatic anæmia. In many mild cases there are hardly any demonstrable blood changes.

The indications for treatment that arise in connection with all purpuric conditions are, therefore, in a special degree etiological, viz., the detection (and removal, if possible) of every existing infective focus. In the writer's experience such foci are most commonly of a septic nature, and the anæmia associated with them belongs to that group which he has specially designated " Septic anæmia."

4. **Hygienic.**—Under this heading may be conveniently grouped the various factors connected with air, light, occupation, and surroundings, which play so important a part both in producing certain forms of anæmia, and still more in aggravating forms of anæmia arising from other causes.

Want of light, and bad air particularly, exercise a greater effect on the blood than on any other tissue of the body. The indications for treatment connected with this particular group of factors are obvious, i.e., a plentiful supply of fresh air, avoidance of the close atmospheres of crowded and overheated rooms, and—in particular cases—the selection, if possible, of other occupations.

As regards occupation, the amount of physical strain involved is no less important, and, as it happens, a far more common factor, than the actual character of the occupation. It is this circumstance which determines, to a degree insufficiently recognized, the peculiar incidence of anæmia in girls of the domestic servant class. The young man at the age of sixteen or seventeen takes up an occupation which, however arduous, still permits him to go to and from his work in the open air, and leaves him many hours of freedom and rest from his work. The girl of the same age, entering domestic service, has duties placed upon her from early morning till late at night, involving continuous attention and physical strain, confining her continuously within doors, and depriving her—except at stated and, in most cases, quite inadequately long intervals of time—of any opportunities of getting fresh air. This strain and undue confinement girls undergo at the very period of life when, as already seen, they are especially subject to the influence of other anæmia-producing factors.

The indication for treatment arising out of these considerations is one of the most important in the whole treatment of anæmia generally, and especially of chlorosis, i.e., the absolute necessity of *rest*. In severe cases of chlorosis three weeks' rest in bed will do more to effect improvement than any individual measure that may be adopted. In all special cases rest would greatly aid the operation of other measures.

5. **Digestive and Nutritional.**—This group of factors includes the manifold effects upon the blood of the numerous and various disturbances in digestion, assimilation, and alimentation connected with the amount and the character of the food taken ; the activity of the gastric, intestinal, and hepatic functions ; the efficiency of the various digestive processes dependent thereon ; the presence of actual pathological conditions such as catarrh and ulceration of the alimentary tract. It includes, moreover, the important influence exercised by the nervous system through the mental emotions upon the activity and efficiency of the digestive process, determining as this does the likes and dislikes of particular

classes of foods and drinks, the character of the appetite, the attention given to the regularity of meals, and the due regulation of other habits.

The effects upon the blood of the disturbances here had in view are of a definite kind. They affect chiefly the quantity and quality of the plasma and its constituents, and of the hæmoglobin. They are best exemplified in the anæmia connected with wasting diseases such as cancer, the ordinary forms of gastritis, enteritis, and diseases of the liver, and with chronic infective diseases such as tuberculosis. In no condition, perhaps, are they better exemplified than in chlorosis.

The degree of anæmia producible by disturbances in nutrition, pure and simple (apart from the operation of infective factors, presently to be considered), is comparatively slight. It affects chiefly the percentage of hæmoglobin, which is often reduced to 70, 60, 50 per cent, and even lower. The number of corpuscles, on the other hand, is comparatively slightly affected, percentages of 70, 80, 90, and even 100 being common in cancer—representing malignant disease, and in chlorosis—representing simple anæmia. In the latter condition, indeed, the number of cases in which the percentage of corpuscles is within normal limits is not much less than the number in which it is diminished. This fact is of importance from the point of view of treatment. When in such conditions the anæmia is of an exceptional degree, especially when the corpuscles are considerably reduced, the probability is that other than mere digestive and nutritive disturbances are co-operating factors—either those already considered, especially hæmorrhage, or, still more commonly, another great factor now to be considered, i.e., that of *infection*. Such infections operating within the alimentary tract are doubly effective in producing anæmia, for the reason already referred to; they not only affect the character and quantity of the food products absorbed, and disturb the processes of digestion, but in addition, the toxins which they themselves produce act on the blood in that portion of the circulation where it is most vulnerable, viz., the gastric intestinal capillaries (portal circulation).

The indications for treatment connected with this particular factor of digestion are of importance. In all cases of anæmia, of whatever nature or degree, the first point is to attend to the digestive and intestinal functions, by promoting the appetite, by careful regulation of diet and habits, and by appropriate medicinal treatment.

6. **Infective Factors** play a great part in the production of anæmia, both in aggravating the effects arising from other causes, and still more in producing independent effects.

Acute general infections such as those of fevers, or chronic infective conditions such as tuberculosis, all produce anæmia of varying degrees; but the infections here had in view are more especially those connected with the gastro-intestinal tract.

The infective factors operating within this tract may, according to the writer, be divided into three classes: (*a*) *Putrefactive*, (*b*) *Septic*, (*c*) *Specific*.

(*a*). *Putrefactive Infection*.—Under this title may be included the effects produced by the action of those organisms responsible for the putrefactive and fermentative changes which normally occur within the intestinal tract. This includes especially the *Bacillus coli*, and, in the case of children more particularly, the *Bacillus lactis aerogenes*. The intestinal disturbances in children, so commonly associated with the varying degrees of anæmia, are in many cases associated with, and probably due to, a large increase in the number of these two classes of organism, to be found not only in the intestine, but also in the stomach, sometimes almost in pure culture; still more abundantly in the duodenum, and most numerously in the ileum.

In the case of adults, the effects of putrefactive change in the production of anæmia are most commonly seen in connection with constipation. The anæmia is of the chlorotic type. Its chief feature is insufficiency of hæmoglobin.

(*b*). *Septic Infection.*—The term "septic" here employed is confined, for convenience, to the two chief pyogenic infections, staphylococcus and streptococcus. By far the most important of these is the streptococcal infection :

(i). As a cause of "oral sepsis," "septic gastritis," and "septic enteritis." The importance of septic infection as a great factor in the production of anæmia of every degree of severity cannot be too greatly emphasized. Its importance arises from the fact that it is so commonly overlooked—especially in connection with neglected septic lesions in the mouth ("oral sepsis"). As the writer has shown, this sepsis and its effects are not confined to the mouth, but extend to the stomach ("septic gastritis"), to the intestine ("septic enteritis"), and to the colon ("septic colitis").

In the case of the stomach and intestine the effects are mainly functional, and arise from varying degrees of catarrh. When severe and long-lasting they may lead to deeper-seated changes in the mucosa, e.g., sub-acute and chronic gastritis, enteritis, and colitis.

(ii). As a cause of "septic anæmia." The effects of "oral sepsis" are, however, much more severe and widespread, and affect the blood directly ; for the sepsis connected with foul gingivitis, especially when associated with deposits of tartar and suppurative inflammation round necrosed roots, is a sepsis in direct contact with open wounds, the absorption from which must be considerable ; although it may be slight in amount at any one time, its cumulative effect upon the blood, over many years, must be great.

So important are these effects that the writer has been led to designate by the special name of "*septic anæmia*" the form of bloodlessness arising from this cause.

In its slighter manifestations this anæmia is exceedingly common as a factor aggravating other forms, and if it be present its oversight gives to many apparently simple anæmias their unusual severity, and their apparent intractability to ordinary measures of treatment. In its severer forms it can give rise to a degree of anæmia equalling that of pernicious Addisonian anæmia, and hitherto generally grouped with it. It is, however, sharply distinguishable from pernicious Addisonian anæmia by its pathological, hæmatological, and clinical features, and is essentially due to deficiency of blood-formation usual in the chlorotic type.

(iii). In relation to pernicious Addisonian anæmia. Septic infection plays an important part in the development of this disease, although, however severe it may be, it is unable of itself to produce it. It is, however, a potent *antecedent* condition, creating the unhealthy conditions in the stomach and intestine which favour the contraction of the specific (hæmolytic) infection responsible for the disease, and which favour its *continuance* after its contraction. The typical mode of development of the pernicious form is an antecedent history of oral, gastric, or intestinal trouble *associated with sepsis* for some years previous to the onset of the disease, and without any special sign of anæmia. This is more or less suddenly followed by a rapidly developing and *hæmolytic* anæmia (with lemon colour, sometimes by jaundice) out of all proportion to the severity of any symptoms or lesions connected with the alimentary tract.

(*c*). *Specific Infections.*—In addition to the foregoing factors, specific infections are from time to time present in the intestinal tract, which either alone or—as is more frequently the case—aided by the above-mentioned infective factors, powerfully affect the blood, and produce anæmia of varying degree. The most severe form of anæmia, i.e., pernicious Addisonian anæmia, owes its origin,

according to the writer's observations, to such a special infection, characterized by an intense hæmolytic action on the blood, by a distinctive group of clinical features, and by a definite mode of origin.

In a proportion of cases—as large as 20 to 25 per cent—the contraction of this hæmolytic infection can be traced to exposure to the influence of severe drain poisons.

Types of Anæmia.

After the foregoing consideration of the etiological factors concerned in the production of anæmia, the treatment to be adopted may conveniently be considered in connection with three forms of anæmia representing the chief types met with :—

1. *Chlorosis*—often termed a primary form of anæmia, but in reality secondary, —the purest form of all anæmias, owing its origin to the operation of a number of factors, slight in themselves, but of a non-infective character. (See Chlorosis.)

2. "*Septic Anæmia*"—a form of anæmia hitherto not sufficiently recognized, but recently differentiated by the writer, owing its origin to the existence of sepsis in connection with the oral, gastric, and intestinal tract,—one of the commonest forms of anæmia, frequently complicating and greatly intensifying all other forms, sometimes so intense that in itself it constitutes one of the severest forms of anæmia—resembling in its intensity the severest of all, Addison's anæmia (pernicious anæmia), and hitherto generally grouped with this form of anæmia, but differing from it in its pathology, in the character of its blood changes, and in its prognosis. (See Septic Anæmia.)

3. "*Addison's Anæmia.*"—"Pernicious infective anæmia"—a form of anæmia of infective origin of specific nature, in which sepsis is a most important antecedent and concomitant factor, but has grafted on to it an intense hæmolysis, which marks it off sharply from septic anæmia ; and characterized throughout by a mode of onset, a characteristic group of clinical features, a clinical course, and a prognosis (resistance to treatment) sharply distinguishing it from septic anæmia. (See also Pernicious Anæmia.) *William Hunter.*

ANÆMIA, TROPICAL.

Climatic.—Minor degrees of anæmia are common, especially in women and children, and are to a great extent due to the sedentary life rendered necessary by the avoidance of sun and consequent restrictions on open-air life. Moderate and regular exercise at suitable times and always short of fatigue, is the best remedy. Iron is useless ; constipation must be dealt with.

Secondary.—Malaria and many other acute diseases lead to a secondary anæmia. Removal of the primary cause is essential ; arsenic, after the causes (malaria, etc.) are treated, is of more value than iron, but the combination of the two is often beneficial. Intramuscular injections of arseniate of iron are often of great value. Solutions, such as Squire's liq. ferri arsenatis solubilis, in 1 cc. doses, containing 2·5 per cent of the salt, may be given every alternate day.

Ankylostomes are the cause of the most severe form of anæmia. They are common in the natives, less so amongst Europeans. Removal of the worms is essential. Large doses of anthelmintics are necessary. Oil of male fern is sometimes used, but more often thymol. The patient should be kept on a low diet for the previous day, and a brisk saline aperient given. Thymol, 10, 15, 20, or even 30 gr., should be given in cachet or capsules, whilst fasting at daybreak, and the dose repeated twice at intervals of one hour and followed by a full dose of ol. ricini. The stools, when strained, will reveal the presence of the worms. Occasionally, symptoms of cerebral disturbance or syncope follow the

administration of thymol. This is more often the case if alcohol in any form is taken, as then the absorption of thymol is much increased.

An efficient substitute for thymol is eucalyptus oil and chloroform, given in castor oil (ol. eucalyptus 30–35 min., chloroform 40–45 min., ol. ricini 10 dr.). This should be divided into two doses, and they should be given the first thing in the morning, after the same preliminary treatment as with thymol, with an hour's interval between the doses.

The proof of complete expulsion of the worms is the absence of ova from the stools two or three weeks after the treatment. If ova are still found, the treatment must be repeated. After the complete expulsion, beyond a generous diet with careful attention to the digestive functions, little is required. Iron is useful in the later stages of recovery, but is not advisable at first. *C. W. Daniels.*

ANÆSTHETICS, Administration of.

I.—Preparation and Examination of the Patient.

Preparation.—Whenever preparation of the patient is possible, it should be arranged that no solid food should have been taken for at least four hours, and that the bowels should have been emptied by a suitable purgative, followed when necessary by a simple enema. This is not possible in some emergency cases; and in giving an anæsthetic to a patient who has not been prepared it is important that a careful watch should be kept for the first signs of vomiting, the head turned to the side, and special care taken that the vomit is cleared out of the mouth, so that none may be sucked back into the respiratory passages.

For the administration of ethyl chloride and nitrous oxide no strict preparation is necessary; but a better anæsthesia will be obtained if no food has been taken for two hours, and the bladder should be empty.

When a patient in a feeble condition is about to undergo a serious operation, it is a good plan to give a hypodermic injection of strychnine ($\frac{1}{30}$ gr.), or a rectal injection containing half an ounce of brandy.

Examination.—In examining a patient before the administration we must not be surprised to find the pulse very rapid, as this is often produced by dread of the proceedings. The presence of a systolic murmur at the apex is not of great importance, provided that there are no symptoms of want of compensation, such as breathlessness, or signs of back-pressure, as œdema in the feet, and moist sounds at the bases of the lungs. In these patients much care will be required in the choice and administration of the anæsthetic, and no closed inhaler should be used.

Particular attention should be paid to the way in which the patient breathes, and when the breathing is entirely through the mouth a dental prop placed between the teeth will ensure this air-way remaining patent throughout the administration. A cough is often due to pharyngeal irritation, especially in smokers, but the lungs should be examined for signs of bronchitis.

Artificial teeth must be removed unless very firmly fixed, and loose teeth should be noticed, as these may give trouble when it is necessary to insert a gag.

II.—Administration of General Anæsthetics.

Nitrous Oxide, or "gas," as it is more generally called, is now almost always given by means of Hewitt's apparatus. A suitable face-piece is selected, and attached to the stop-cock, while the bag is half filled with gas. The face-piece is now carefully applied to the patient's face, and a few breaths of air are allowed, to see that the valves of the apparatus are working properly, and that the face-piece is fitting accurately. The lower slot on the stop-cock is now closed, so that gas is breathed instead of air, and the signs of anæsthesia will soon be

noticed. First the colour of the face gradually becomes darker, the pupils dilate, twitching movements known as "jactitations" are noticed, generally beginning in the fingers or the smaller muscles of the face, and the peculiar "stertor" associated with nitrous oxide is heard. If the face-piece is removed as soon as the first twitchings are noticed, a period of anæsthesia lasting on the average about thirty seconds will be obtained.

By interspersing a few breaths of air with the nitrous oxide, which may easily be done by opening the lower slot of the stop-cock, a longer and quieter anæsthesia may be obtained, lasting on the average from forty to fifty seconds. When this is done the patient should not become cyanosed, and no marked jactitation or stertor should be observed. When air is given with gas the best sign of anæsthesia is the gradual increase in the depth and freedom of the respirations, with slight snoring, which is quite different from the loud stertor mentioned above. In giving air with gas in this way a little practice is necessary before the best results are obtained, and it should be remembered that children and anæmic girls require more air than robust men.

An equally satisfactory anæsthesia may be obtained by giving pure oxygen with the gas in Hewitt's special gas and oxygen apparatus.

When gas is given for a short operation, say one lasting for five minutes, it is obvious that air must be allowed, either by opening the lower slot, or by removing the face-piece from time to time. The great advantage of gas for short operations consists in its safety, the absence of any unpleasant smell or taste, the small amount of preparation of the patient which is required, and the rapid recovery, which is usually accompanied by no unpleasant after-effect. It is most frequently used in the single dose method for the extraction of teeth and other dental operations; but when given continuously for a few minutes, short operations which would otherwise be painful, and which do not demand a great depth of anæsthesia, may easily be performed. Among these are the opening and draining of abscesses, removal of nails, moving stiff joints, etc.

When an operation is being performed in the mouth it is of course impossible to keep the face-piece in position; but special forms of apparatus are in use for keeping up the supply of gas through the nose, while the mouth is kept open and free for the surgeon. The best of these is Paterson's.

Ethyl Chloride.—This anæsthetic has been extensively used during the last few years, and countless forms of apparatus have been devised for its administration. All that is really required is an ordinary face-piece, such as is used for giving gas or ether, attached to the bag of a Clover's inhaler. The ethyl chloride is sprayed into the bag, and the face-piece applied. It is a good plan to make a small hole in the metal angle-piece of the bag, just large enough to admit the nozzle of the ethyl chloride spray, and this hole may be closed with a spring, or even a wooden peg. If this is done the administration will be more pleasant for a nervous patient, as breathing may be allowed into the bag before any ethyl chloride is sprayed into it, and when regular breathing is established the drug may be added as required. For a single-dose anæsthesia, such as is required for a dental operation, 5 cc. should be enough for a man, 3 cc. for a woman, and 2 cc. or 3 cc. for a child.

Anæsthesia is obtained with almost startling rapidity, and a child who is crying loudly with fright, and struggling vigorously, after taking two or three deep breaths will be found to be profoundly anæsthetized, with a dilated pupil and no corneal reflex. The great rapidity and ease with which anæsthesia is obtained is at once an advantage to the careful administrator, and at the same time a grave source of danger to one who is careless.

The anæsthesia obtained by a single dose may easily be made to last a minute, or even longer, which is more than can be obtained with certainty with nitrous

oxide, unless administered by the nasal method. The anæsthesia, too, is profound at first, and is sometimes followed by a period of analgesia, in which teeth may be extracted while the patient is conscious of what is being done, but yet does not suffer pain. When ethyl chloride is given for the removal of tonsils or adenoids, especially when the patient is sitting up, it is most important that the anæsthesia should not be allowed to become too deep, or blood may enter the larynx, and laryngotomy be immediately required to restore the patient's breathing.

The great advantages of ethyl chloride consist in its portability, the simplicity of the apparatus required for its administration, and the ease with which anæsthesia can be obtained; but it is certainly not nearly so safe as nitrous oxide, and during the last few years many fatal cases have attended its use. It is also more likely to be followed by unpleasant after-effects, such as headache and vomiting, which are unusual after gas.

In nearly all the forms of apparatus for the administration of ethyl chloride the principle of administration is the "closed" one, that is to say, rebreathing into a bag takes place. Some anæsthetists consider that rebreathing is to be blamed for the headache, etc., and now spray the ethyl chloride on to the sponge of a Rendle's inhaler, such as is used for the administration of A.C.E. In this way more of the anæsthetic is used, as it is very volatile, but the results are said to be satisfactory, especially in the case of children.

Ether.—For the administration of ether some form of apparatus which regulates the proportion of the ether vapour should be employed. Clover's inhaler, with a large bore, as suggested by Hewitt, is one of the best forms, or the simpler inhaler designed by the writer. In giving ether by one of the inhalers the face-piece is selected and fixed to the inhaler, and a measureful (2 oz.) of ether is poured into the inhaler. The anæsthetist should then blow through the apparatus to remove the ether vapour which is in the central tube. The bag is then attached and the inhaler applied to the patient's face during expiration only, so that the bag may be distended with his breath. When the bag is about one-half or two-thirds full the inhaler is kept applied to the face, and a few breaths are allowed before the indicator is turned. The actual administration of ether is then begun by slowly turning the indicator, and so allowing more and more of the respired air to pass through the ether chamber. The comfort of the patient, and the ease with which anæsthesia is produced, depend in great measure on the very slow and gradual way in which the indicator is moved, especially during the first two or three minutes. By giving too strong a dose at first the patient will be worried, and will either cough, or hold his breath and struggle; but if the administration is begun slowly and gradually, anæsthesia may generally be obtained in a few minutes without any trouble or discomfort. For vigorous men it is sometimes necessary to turn the indicator to "Full"; but for women it is not necessary to go beyond 2½ or 3, and with children 1½ is quite sufficient. In all cases the strength of the vapour should be reduced as soon as anæsthesia is obtained.

The great advantage of ether over chloroform lies in its safety, which is of course of the first importance; but it is not so pleasant to take, it sometimes produces a considerable amount of secretion of mucus and saliva, and its after-effects, such as vomiting and the unpleasant taste it leaves, are more marked than those of chloroform.

The administration of ether is made much more pleasant by giving some nitrous oxide first. This may easily be done by filling a bag full of gas, and applying it to the ether inhaler in place of the usual small bag. The patient is allowed a few breaths of air through the valves as when gas is given alone, and the lower slot is then closed, so that the patient now breathes gas through the valves.

When half the gas has been used in this way, the upper slot is closed, and rebreathing into the bag takes place without the action of any valves. The indicator is now turned rather more quickly than when ether is given alone, and when anæsthesia is obtained the gas bag may be removed, and the smaller bag substituted. In the writer's gas and ether apparatus the gas bag contains no valves, but what is known as a three-way stop-cock. Through this the patient first takes a few breaths of air, and then, by turning the handle, rebreathing into the bag containing the gas at once takes place. This way of giving gas with a gradually increased proportion of ether is known as Clover's method.

Another method, known as Braine's, consists in placing the patient fully under the influence of nitrous oxide, that is, giving it till jactitation is noticed, and then giving a full dose of ether at once. This may be done either with a Clover inhaler with the indicator at 3 or 4, or with an Ormsby inhaler. This method requires much practice.

Chloroform is frequently given from a piece of lint; but as with this there is some chance of burning the skin, the method suggested by Lister is preferable. This consists in drawing the corner of a towel through a safety pin till a mask is formed reaching from the chin to the root of the nose. The best form of mask is Skinner's, which is a piece of flannel stretched over a light metal frame. With this there is less risk of the patient's face being burned, there is a freer admixture of air, and there is no possibility of the breathing being in any way obstructed, as sometimes happens when a piece of lint is carelessly allowed to fall over the mouth.

The administration of chloroform by either of these means is very simple, and is called the "open" method. A few minims are dropped on the lint, and the mask is held some inches above the patient's face, so that the first inspirations may contain a very weak proportion of the drug. The chloroform is added drop by drop as required, and the mask gradually approached to the face.

As with ether, too strong a vapour will cause holding of the breath, coughing, or struggling, and much care should be exercised to prevent these. The respiration should be most carefully watched, and should be kept as free and as regular as possible. When the breath is held the mask must be removed from the face to prevent too large a dose being taken with the first inspiration. The lips should be rubbed with a towel to stimulate the breathing, and when this is satisfactory the mask may gradually be restored to its former position, and more chloroform given. When the mask has been held too close to the face, or when the flannel has been saturated with the drug, the first deep inspiration after holding the breath has allowed patients to absorb a fatal dose. The part of the mask which lies over the mouth and nose should be kept just moist with the drug, and liquid chloroform must not be allowed to drop from the edges of the frame, or the skin will be burnt.

It is this reckless way of giving chloroform that has resulted in many deaths, and several forms of regulating apparatus have now been devised in which it is not possible for the patient to inspire more than a definite proportion of chloroform vapour. The Vernon Harcourt inhaler is probably the most accurate. With it a definite chloroform vapour of from ·2 to 2 per cent can be given, and by a further contrivance the strength can be increased to over 3 per cent. That the patient should really receive these percentages it is essential that the face-piece should fit perfectly accurately, and even then it is not always possible to maintain the very deep anæsthesia which is sometimes required; but it is surprising to find how easily a sufficiently deep anæsthesia may be obtained in many cases with a very small percentage.

Chloroform may also be given by means of a face-piece made of lint or flannel attached to the tube of a Junker's inhaler. A fairly constant proportion

of chloroform vapour can be presented to the patient, the strength varying with the rate and the vigour of the pumping. It may be raised to 4 per cent, which is what Lister calculated is all that is required; but if at any time a stronger vapour is needed a few drops of chloroform may be added on the face-piece.

When an operation is being performed in the mouth Junker's inhaler, with a mouth or nasal tube, is the only apparatus by which we are enabled to maintain anæsthesia, unless the surgeon performs laryngotomy, in which case the chloroform is given through the wound. The latter is the most satisfactory method for very extensive operations, as it allows of the pharynx being tightly packed with sponges, and so prevents the entrance of blood into the larynx and trachea.

The great advantage of chloroform as an anæsthetic consists in the ease with which it can be administered without any complicated apparatus, and its not unpleasant smell. It produces a quieter anæsthesia without the congestion of the air-passages and the unpleasant secretion of mucus and saliva which are so common with ether, while at the same time it more easily obtains the full relaxation of muscles which is required for some of the extensive modern operations in the abdominal cavity. Against these advantages it cannot be denied that it is a far more dangerous drug than ether, and this should always be considered in choosing an anæsthetic.

Mixtures.—Many attempts have been made to combine the good effects of chloroform and ether by giving them together in mixtures of different proportions. The most popular is still the A.C.E. mixture, consisting of one part of absolute alcohol, two parts of chloroform, and three parts of ether. It should be kept in a dark cupboard, in stoppered bottles containing four ounces.

Mixtures are now often made fresh at the time of the administration, and in this case the alcohol may be omitted, and a mixture of two parts of chloroform to three of ether, or of one part of chloroform to two of ether, may be made by measuring the liquids, pouring them into a bottle, and gently shaking them before using. It is as well to use the same mixture as far as possible.

Mixtures are especially suitable for children, and for old and weakly patients. When very little anæsthetic is required, they may be given on a Skinner's mask, but when the patient requires more, a Rendle's inhaler will be found very suitable. In the case of an adult a drachm of the mixture should be poured on the sponge, and the inhaler placed a few inches from the face. It is gradually brought nearer till it rests lightly against the face. After two, three, or four minutes, another drachm of the mixture should be poured on the sponge, and if necessary another dose at a similar interval; but it should be remembered that this anæsthetic is practically a diluted form of chloroform, and that more time should be allowed for anæsthesia to be obtained. If it is given too freely, or the air-supply to the patient is cut off too completely, the symptoms of chloroform poisoning can be obtained with any mixture of which it forms a part.

III.—The Anæsthetic State.

Whatever may be the drug employed to produce anæsthesia, and however complicated may be the apparatus, the points to be noticed in the condition of the patient are the same.

Respiration.—It is most important that the respiration should be very carefully watched during the whole of the administration. While the patient is still conscious there will be many variations both in depth and rhythm; but when consciousness has been abolished, it should become free and regular, and every effort must be made to keep it so. The great cause of obstructed breathing is the tongue, which tends to fall back and rest against the pharyngeal wall. To obviate this the head should be well turned to one side, preferably to the

right, unless the operation is being performed on the right side of the head, neck, or thorax, when it should of course be turned to the left. Pressure should be made with one or more fingers of the left hand behind the left angle of the patient's jaw, while the fingers of the right hand hook the chin forwards and upwards. By these means the tongue is carried forward, and at the same time the loose folds of mucous membrane which lie above the opening of the larynx are stretched, and so prevented from causing obstruction.

In some patients it will be found that the lower teeth become locked behind the upper ones, so that, however much force be exerted, the jaw will not move forward. In these cases an attempt should be made to open the mouth and fix the lower teeth in front of the upper ones ; but if this is not possible a small wooden prop should be placed between the teeth. It is especially important that a clear air-way should be obtained through the mouth when there is no free breathing-passage through the nose.

When the operator requires the head to be kept in the middle line, it may be found impossible to prevent the tongue from falling back, even when firm pressure is exercised behind both angles of the jaw. In this event direct traction on the tongue must be employed. The ordinary forceps bruise the tongue so much that they may cause considerable pain, lasting for two or three days ; and when the tongue must be pulled forward for some time it is better to use a simple ligature passed through its substance.

Respiration may also be obstructed by pressure on some part of the respiratory tract, as by an enlarged thyroid gland pressing on the trachea, or by fluid in the pleural or abdominal cavities. When this is the case the anæsthesia should be kept as light as possible till the pressure is relieved.

The breath is often " held " when the anæsthesia is allowed to become too light, and vomiting is imminent ; respiration will then be improved by giving more of the anæsthetic. If vomiting occur, the head should be turned to the side, and all vomited material carefully removed from the mouth before any more anæsthetic is given.

When too much air is given, a condition of " false anæsthesia " may be obtained, in which the patient breathes extremely quietly, and is apparently ready for the operation, but shows vigorous movements when the incision is made. This condition is most commonly noticed in infants.

Pulse.—While a patient is being rendered unconscious the pulse will vary considerably through the influence of excitement, but when anæsthesia has been established it should become regular, of good volume, and of moderate rate. Though it is not necessary to observe the pulse so continuously as the respiration, a careful watch should be kept on it, as it will generally give the first indication of the shock which a severe operation causes a patient by becoming faster and smaller. It should be remembered that the pulse may be made fast and small by pushing ether unduly, and so over-stimulating the circulation.

The Colour of the patient will be best observed in the lips and ears, and should never be allowed to become at all dusky. If this seems to be happening, more care must be taken to keep the air-way clear, and to remove the inhaler for longer intervals.

Corneal Reflex.—The reflex movement of the eyelids produced by touching the sensitive cornea is one of the most useful guides to the anæsthetist. As a general rule this reflex should be abolished for the skin incision, and then in many operations it may be allowed to return. For instance, the anæsthesia will generally be sufficiently deep with the reflex just present in operations on the limbs and even in many abdominal operations, when the surgeon is working on parts that are not very sensitive. Thus, for a long resection of intestine the corneal reflex may be abolished while the skin incision is made, and the parts

are placed in position ; but while the intestines are being sewn the reflex may be allowed to return, care of course being taken that no other signs of light anæsthesia, such as straining and vomiting, are allowed. However light the anæsthesia which may be sufficient for the greater part of these operations, it is generally found necessary to deepen it while the abdominal wall is being manipulated at the close of the operation, and the sutures are being inserted, as otherwise the operation may be ruined by vomiting at this critical moment.

For some operations the corneal reflex should always be retained ; among these are the removal of tonsils and adenoids, removal of the thyroid gland, operations on the brain, pleura, etc. But in some patients vomiting sets in so soon after the return of the reflex that it is necessary to keep it absent on this account, though otherwise the operation in itself does not demand deep anæsthesia. This will be more noticeable in nervous patients who secrete and swallow large quantities of saliva while they are waiting for the operation to begin, and in those who have been badly prepared. In testing the corneal reflex, care must be taken that the cornea is not abraded, and whenever it is possible the eyes should be used alternately.

It should be remembered that in infants the corneal reflex is not so reliable as in adults, and that in these little patients the absence of reflex movements of the limbs when the skin is pinched is a more certain sign of anæsthesia.

The Size of the Pupil is a useful indication of the depth of anæsthesia. When a patient becomes unconscious the pupils are generally dilated, but as the anæsthesia deepens they contract, and should be kept small throughout the operation. If the pupil becomes very large while the corneal reflex is distinctly present, it is a sign that the patient is coming round, and more anæsthetic should be given. But if no corneal reflex can be obtained, and the pupil becomes dilated, this is generally a sign of danger, and the anæsthetic should be withdrawn till the pupil contracts. A very small pupil, known as the " pin-point " pupil, is often a precursor of vomiting, especially when chloroform is being given, and when the vomiting actually takes place the pupil may suddenly dilate.

Relaxation of the Muscles.—In many operations the utmost degree of relaxation is required. It is often supposed that this can only be obtained with chloroform, but it can also be produced by ether, though sometimes not so rapidly as with chloroform. If a patient is taking ether, and the surgeon requires more relaxation, it may quickly be obtained as a rule by giving a little chloroform.

To obtain satisfactory anæsthesia all the above-mentioned guides should be watched, and one must not be used to the exclusion of the others, or disaster may result.

Condition of Danger. — Besides the obstructed respiration mentioned above, a dangerous condition may arise from three causes : (1) An overdose of the anæsthetic ; (2) The loss of a large quantity of blood ; or (3) The shock of a severe or prolonged operation ; and frequently two or more of these causes are combined.

The signs of danger may occur with startling rapidity, as in the case of syncope from an overdose of chloroform, but more commonly the onset is gradual. The breathing becomes more and more shallow, the pulse faster and smaller, the pupil large, with no contraction to light, while the corneal reflex is lost, the eyelids separate, the face becomes pale, the nose feels cold to the touch, and sweat may break out on the forehead. When failure of respiration is the principal cause of anxiety the breathing will often be noticed to become shallow, or stop altogether, while the pulse remains fairly good ; but danger may arise without the possibility of saying whether the pulse or respiration failed first.

Treatment must be prompt and thorough. The anæsthetic, of course, must be withdrawn, the mouth opened with a gag, and the tongue drawn forward and

held in position by an assistant. A finger should be passed into the pharynx to exclude the presence of any foreign body, such as vomited matter, etc. The patient should then be drawn up the table till the head is just hanging over the end, and if the mechanism of the table permits it, the whole of the body may be raised. Artificial respiration must now be begun by grasping an elbow of the patient in each hand, and compressing them firmly against the chest wall. The arms are then swept upwards and outwards at their full extent till the hands meet above the head, and they are then slowly brought down again and pressed against the chest wall as before. Great help may be given by an assistant pressing against the diaphragm through the abdominal wall at the time that the arms are brought down to the chest, and this movement will be of special use when the chest wall is rigid. It should be remembered that the success of artificial respiration depends on the thoroughness with which the movements are performed, that they should not be made more frequently than sixteen times in a minute, and should be continued for some minutes after all obvious signs of life have disappeared.

Hot cloths should be placed over the præcordium, alternately with cold ones, and strychnine ($\frac{1}{30}$ gr.) or ether (20 min.) be injected hypodermically. Brandy may be given hypodermically in a dose of 2 dr., or an ounce with a few ounces of water per rectum.

When the patient seems to be suffering principally from the effect of hæmorrhage, saline injections into the rectum or axilla, or intravenous injections should be employed.

A faradic current may be passed from the second or third intercostal space in front to the spine behind, and direct stimulation of the heart by massage has apparently saved some lives. The heart will be reached most easily by an incision through the upper part of the abdominal wall, followed when necessary by one through the diaphragm.

When infants and very little children stop breathing, they should be treated by taking both their feet in the left hand and lifting the patient up till the head just rests on the table. The right forefinger should then be placed in the mouth and used to hook the tongue forward. An assistant then performs artificial respiration by compressing the chest walls firmly, and then allowing them to resume their usual position, which their great elasticity easily enables them to do.

IV.—Recovery from Anæsthesia.

In removing a patient from the operating table to the bed, he should be disturbed no more than is absolutely necessary, as want of care in lifting and placing in bed is likely to produce vomiting. During the return to consciousness the patient should be kept in a darkened room, and as quiet as possible. He should be prevented from talking, and seeing relations and friends, as any of these causes of excitement will generally be followed by severe headache. He should be kept warm with hot-water bottles, and care must be taken that they do not produce burns. The room should be warm, and be well ventilated, so that the smell of the anæsthetic may be removed, but the patient must not be placed in a direct draught, as this has been the cause of bronchitis in patients who have inhaled ether for a considerable time. If the surgeon does not object, it is well to place the patient on one side with a pillow pushed against the back, especially if vomiting seems imminent.

No *food* should be given for four hours after the anæsthetic, or even for longer, if the patient will wait. Most of the vomiting after anæsthesia is caused by injudicious preparation, or through giving food by the mouth too soon after the recovery. After an unimportant operation some weak tea is the most suitable

liquid to begin with, and if this is taken without any discomfort a little food may be allowed in an hour.

After severe and important operations on the abdomen the after-feeding of the patient is a matter of great importance, and one which is in the hands of the surgeon, and not the anæsthetist.

Vomiting is more common after ether than after chloroform ; but after ether it generally occurs early, before consciousness returns, and after the first clearing out of mucus, with perhaps a little bile-stained fluid from the stomach, it will often not recur if nothing is given by the mouth for four hours. Vomiting after chloroform, on the other hand, often does not begin till the patient has been quite conscious for a few hours, and is then the result of taking food. Some patients are much more inclined to vomit than others, and the longer they will go without taking anything by the mouth the better chance they have of an uneventful recovery.

Vomiting should be treated by small doses of hot water, given in an earthenware spoon so that the lips may not be burned, for the water should be as hot as can be taken, and warm water is more likely to encourage it. When a small dose of water does not relieve, a tumblerful may occasionally do so. Some patients do better with sips of iced soda water or champagne, or sucking small pieces of ice.

Thirst is best treated by washing the mouth out with water containing some lemon juice, and by giving rectal injections of hot water. *Bronchitis* is generally the result of exposure, except after operations in the mouth, when it may be caused by the inhalation of septic material from the wound. It must be treated on ordinary lines. Some persons find the taste of ether diminished by sucking peppermints.

Shock.—After a severe operation the patient may be found in a state of shock, with small rapid pulse, shallow breathing, cold nose, etc., and very careful after-treatment is sometimes necessary. The foot of the bed should first be well elevated on blocks or boxes, and the limbs covered with cotton-wool and bandaged. The patient must be made as warm as possible by hot-water bottles, and the room must be kept thoroughly warm. Two ounces of brandy should be given in a pint or two of warm water, or coffee if it is available, as a rectal injection, and strychnine ($\frac{1}{30}$ gr.) be injected hypodermically. Inhalation of oxygen, with gentle artificial respiration, may be of assistance, and intravenous injection of saline fluid will be specially useful when there has been severe hæmorrhage during or before the operation. (See also SHOCK.)

V.—THE CHOICE OF AN ANÆSTHETIC.

The relative safety of the various anæsthetics should first be considered. Nitrous oxide gas has been attended by so few fatalities in proportion to the enormous number of times which it has been administered, that there can be no hesitation in describing it as the safest anæsthetic at our disposal. Many statistics have been drawn up to compare the relative safety of chloroform and ether, and the result is that ether may be reckoned to be five times as safe as chloroform, mixtures of chloroform and ether taking a place between the two drugs used separately. Ethyl chloride was at first vaunted as perfectly safe, but so many deaths have recently been recorded—and many have occurred which have not been recorded—that its exact position in this respect must be reconsidered. It is certainly much more dangerous than gas, probably more dangerous than ether, and approaches chloroform in its death-rate, even if it does not equal it.

Putting aside those short operations in the mouth, such as the removal of teeth, and considering the longer operations for which ether, chloroform, or one

of their mixtures is required, we must consider the age of the patient, his general condition and state of health, and also the nature and probable length of the proposed operation.

As regards **Age,** it may be stated that, as a general rule, ether should be given to patients over six and under sixty. For infants up to the age of three, pure chloroform is the best anæsthetic ; from three to six, a mixture of chloroform and ether ; from six to ten, ether preceded by a little mixture ; from ten onwards, ether preceded by gas up to about sixty ; and over sixty, a mixture or pure chloroform.

General Condition.—Those suffering from any acute congestion of the respiratory tract should not take ether, but must have chloroform, and ether is best avoided when there is marked degeneration of the arteries. In all cases of bad heart disease, and where an aneurysm exists, a closed inhaler should not be used. The best plan for these cases is to give a little mixture of ether and chloroform on a Skinner's mask, and when this is tolerated, the Rendle's mask with a stronger dose may be substituted, pure ether being poured on to the sponge instead of the mixture when more stimulation is considered necessary. Persons suffering from severe shock after an accident do not require much anæsthetic, and for them ether with plenty of air is the best. Patients with marked albuminuria should have chloroform.

The Operation.—For dental cases and other short operations on patients sitting in a chair, such as the removal of tonsils or adenoids, the choice lies between nitrous oxide, ethyl chloride, and gas and ether. For the majority of these cases there is no drug so satisfactory as nitrous oxide given with some air or oxygen. With it an average anæsthesia of half a minute can be expected, with a speedy, pleasant recovery. Ethyl chloride will give a longer period of anæsthesia, but it is not so safe as gas, and the recovery from it is likely to be followed by headache and vomiting, especially if a large dose has been given. Some anæsthetists prefer ethyl chloride to gas for children, as they are often very restless in the chair, and too frightened to allow the face-piece to be fitted accurately. When this is the case it is much more convenient if the operation can be done in the recumbent posture, as they so easily slip into a bad position when anæsthetized in a chair ; and then ethyl chloride will be safer, and a better anæsthesia will be obtained.

If an anæsthesia of two or three minutes is required for the extraction of difficult or numerous teeth, this may be obtained by means of gas given by the nasal method ; but as some practice is required before this can be used satisfactorily, it is better for those who give anæsthetics only occasionally to have recourse to gas and ether, which may quite safely be administered to a patient in a sitting posture.

On no account whatever should chloroform, or any mixture containing chloroform, be given for these cases ; but if gas or ether is unsuitable, or not available, and chloroform is to be given, the patient must not be allowed to sit up, but must lie on a couch or bed. Neglect of this precaution has been the most fruitful cause of deaths under chloroform.

Apart from short operations in the mouth, in which the anæsthetist's apparatus must as a rule be removed before the operator can begin, there are many small operations, such as the opening of abscesses, removing nails, or very painful dressings, for which gas may be used with great advantage. Care must be taken that the gas is not unduly pushed, so that the patient becomes cyanosed and jactitates ; but air must be given by opening the lower slot frequently for a breath or two, or the face-piece may be removed from the face. For these short cases, gas and oxygen given with Hewitt's apparatus is the best method. If gas is not available, ethyl chloride may be given ; but the longer the anæsthesia

required, the less advantage is there in choosing gas or ethyl chloride instead of ether or chloroform.

When the operation is to last more than three or four minutes, the choice of the anæsthetic should be limited to ether, chloroform, or a mixture of the two. On account of its greater safety the claims of ether should first be considered, and for the majority of operations it should be the routine anæsthetic, preceded, of course, whenever possible, by nitrous oxide. When secretion of mucus and saliva becomes excessive, or the breathing is so deep that the operator is troubled, a change can be made to chloroform or a mixture. When the operation is likely to last for more than an hour, most administrators consider that better results are obtained by changing from ether to chloroform or a mixture, after about twenty minutes.

There are occasions when ether should not be chosen : (1) When it would be unsuitable on account of the congestion it produces, as in operations on the brain, removal of the thyroid gland, operations on the eye, etc. ; (2) When it would increase the difficulties of the operator through the secretion of mucus and saliva which it often produces, as in operations on the mouth and larynx ; (3) When the ether apparatus would be in the way of the surgeon, as in operations on the face ; but here the anæsthesia may sometimes be begun with ether, and a change to chloroform made later ; (4) When a cautery is to be used near the face ; (5) When relaxation of muscular spasm, combined with light anæsthesia, is required, as in painful labour, eclampsia, and tetanus ; (6) For some abdominal operations in which a very deep anæsthesia, with perfect relaxation of muscles, is necessary, as in operations on the gall-bladder, etc.

VI.—Local Anæsthesia or Analgesia.

When the practitioner is single-handed, the administration of a general anæsthetic for an operation, however simple, should not be attempted. When the general condition of the patient is extremely serious, or the operation to be performed is trivial, the freedom from the pain may be obtained by local instead of general anæsthesia. The decision as to whether general or local anæsthesia should be employed depends on the nature of the operation, the practitioner's experience of the various methods, and the mental condition of the patient ; but in this country most people, and indeed most surgeons, prefer general anæsthesia to local.

Analgesia may be obtained in three ways : by cold, by the use of drugs, and by the " infiltration " method.

Freezing.—The skin may be frozen by means of two parts of pounded ice and one part of salt mixed together and applied to the part in a rubber bag. The skin, when frozen, becomes white and hard. Freezing may also be done with an ether spray, but the best way of producing analgesia by cold is by a spray of ethyl chloride. In using this it is important that the nozzle of the bottle should be small, so that only a fine spray falls on to the part to be frozen. This method of analgesia by cold is only suitable for simple operations, such as the opening of an abscess, and pain may be experienced when the skin thaws.

Drugs.—The drugs most commonly employed to produce local anæsthesia are cocaine hydrochlorate, or eucaine hydrochloride dissolved in water. For operations on the eye a 4 per cent cocaine solution will be sufficient, a little being dropped into the eye at intervals of two minutes, and in ten minutes the operation may be performed. Soluble tabloids are now sold which may be placed under the lid instead of a solution. For the mucous membrane of the mouth and nose, a 4 or 5 per cent solution may be used in a spray, or a small piece of cotton wool soaked in this solution may be applied to the part and left there for five minutes,

or a strong solution of 10 per cent may be painted on the part. This 10 per cent solution may also be used on the gums to prevent the pain of several dental manipulations, but local anæsthesia for extraction of teeth is unsatisfactory, for small doses are generally insufficient, and doses sufficiently large to abolish pain will often produce symptoms of poisoning. For the passage of a catheter the urethra may be made insensitive by a 2 per cent solution used in a special syringe. The skin cannot as a rule be rendered insensitive without a solution as strong as 20 per cent.

For the removal of minute tumours a few minims of a 5 or 10 per cent solution may be injected hypodermically, and this method will be of service in treating crushed fingers, when a general anæsthetic cannot be given. Some surgeons apply a rubber band to the base of the finger with the object of confining the cocaine to the part.

Some persons are very susceptible to cocaine, and soon show symptoms of poisoning. Among the most usual of these are giddiness, with great difficulty in breathing, and a feeling of oppression. The patient becomes pale, with a dilated pupil and a slow and feeble pulse. Occasionally restlessness, and irregular convulsive movements, or delirium, will be observed. Dangerous symptoms are less frequent when the patient has had food or a stimulant before the application of the cocaine, and so operations under cocaine are better performed after than before a meal. When the signs of poisoning are noticed the patient must be laid on a couch with the feet elevated. All clothing which hinders respiration must be loosened, ammonia or nitrite of amyl held to the nostrils, and occasionally artificial respiration may be required. The patient should be kept warm by hot bottles, but the windows should be opened to allow a free supply of air. As soon as he can swallow he should be given hot tea, coffee, or brandy, and should not be allowed to sit up till he is feeling quite recovered.

Eucaine is much safer than cocaine, and should be used in a 4 per cent solution in water.

Infiltration.—For small operations under local anæsthesia the infiltration method is the best. A solution should be prepared, consisting of eucaine β 1 part, sodium chloride 8 parts, to water 1,000 parts. This solution may be sterilized by boiling without affecting the eucaine. Adrenalin (1–10,000) may with advantage be added to the solution.

A syringe in good working order, and capable of holding 10 cc., should be sterilized and filled with solution. The skin having been thoroughly cleansed, the needle is inserted into the skin (not under it) and a few drops of the solution injected. A wheal will be produced, and the syringe is removed and inserted at the other side of this, and a few more drops of solution injected. This is repeated till the whole area of the skin which it is desired to render analgesic has been made œdematous with the fluid. Some of the solution is then injected hypodermically (under the skin), and into the deeper structures if the operation requires this. The incision may be made after twenty minutes, and the analgesia will last about that time ; but if the operation is prolonged, more of the solution may have to be used from time to time.

The œdema produced by infiltration considerably alters the appearance of the part, and suppuration after operations performed in this manner is not uncommon ; and the practitioner is advised to restrict its use to the removal of small tumours of the skin, at any rate till he has had some experience of the method.

Braun's syringe is the best for the purpose, and, as with the ordinary use of cocaine, it is better that the patient should have had some food not long before the operation.

It must be remembered that it is most difficult to render an inflamed area analgesic by local means, and that death from œdema of the glottis has followed infiltration of the structures round the tongue. Children are most unsuitable subjects for this method, and most nervous persons will object to it.

R. J. Probyn-Williams.

ANEURYSM, SURGICAL TREATMENT OF.—A brief consideration of two conspicuous facts in connection with the natural history of aneurysm will at once lead us to the subject of treatment. One of these is the general tendency which exists towards rupture of the sac. It emphasizes, of course, the necessity for surgical interference whenever possible. The other is that spontaneous cure can occur. The methods by which this is brought about in nature are precisely those which we endeavour to artificially reproduce by means of surgery. There is no method of treatment known to us which is not an imitation of some strictly spontaneous curative process. Nature's means of effecting a cure, and our imitations of them, may be thus enumerated and compared. They are :—

1. Spontaneous deposit of clot in the aneurysm brought about by diminished flow through the vessel, or disturbance of clot causing a block in the afferent or efferent vessel. In treatment, compression or ligature of the vessel, and manipulation for the detachment of emboli, represent these processes.

2. Suppuration and gangrene, i.e., destruction of the sac. These are imitated by excision.

3. Pressure on the artery of supply by the aneurysmal tumour. This is represented in treatment by flexion of the limb.

4. Inflammation round the sac, which spreads to it and causes thrombosis. A counterpart of this condition is obtained by means of irritating injections around the sac.

The most important because the safest and most generally applicable methods of treatment are those which bring about active or passive clotting in the aneurysm, through lessening or arresting the circulation in the vessel above, and in the tumour. Certain methods which have been employed, but are now abandoned or seldom used, may be first mentioned. They ought not to be lost sight of, for some of them may, and probably will, in the future prove to be capable of more successful application than in the past, and history has revealed, in surgery as elsewhere, a well-known tendency to repeat itself.

Injection of the Sac by Coagulating Fluids has offered most promise, but the risks of embolism, inflammation, and sloughing of the sac have been found dangers serious enough to discredit the method. Tincture of perchloride of iron injected drop by drop from a screw syringe has been most commonly used. It seems probable to me that in some form, and with proper safeguards, the method of injecting the sac has a future.

Introduction of Foreign Bodies into the Sac.—Wire, horsehair, silkworm gut, catgut, etc., have been introduced into the sac with the object of producing coagulation of its contents. In some cases the use of metallic wire and electrolysis have been combined, and a very few favourable results have been recorded. This operation should be reserved for otherwise hopeless cases.

Galvanopuncture has proved no more successful in the treatment of surgical aneurysm than in that of internal cases (for details see Dr. Drummond's note, under ANEURYSM, THORACIC, *infra*). It may be well to mention that many deaths have resulted from surgical defaults and from cellulitis in the neighbourhood of the punctures.

Parenchymatous Injection of Ergotine.—The mixture suggested is : Extract of spurred rye, one part ; rectified spirit and glycerin, of each one and a half parts. This is injected with an ordinary hypodermic syringe (10–15 minims) into the tissues surrounding the aneurysm, but not into the sac. If after two or

three injections there is no improvement, no good results are obtained by pushing the treatment further.

Manipulation.—The sac is emptied by gentle and continued pressure. Its walls are then rubbed together in order to detach some portion of the lining clot, and in the hope that the afferent or efferent vessel may be plugged by it, or that the detached clot should increase its size *in situ* by fresh deposit upon its surface. The fear of embolism has interdicted this form of treatment.

Needling of the Interior of the Sac (see ANEURYSM, THORACIC) is the most promising of all methods under present consideration, and is specially likely to prove a useful addition to methods of compression.

I.—PRESSURE TREATMENT.

Of all means, apart from operation, pressure is by far the most important in the treatment of aneurysm. The compression may be applied *directly* to the aneurysm, or *indirectly* to its vessel of supply.

Direct Pressure, by its use in unsuitable cases, has done much harm. On the other hand, it has proved most serviceable as a curative agent in cases where clotting was first brought about by indirect pressure, or by ligature above the sac, but where, nevertheless, pulsation had returned later on. Careful watching is necessary, and the pressure must not be severe enough to cause sloughing or ulceration of the skin over the sac.

The application of this method of treatment, say to a popliteal aneurysm, would be as follows : The limb is bandaged from the toes to below the knee, a well-padded splint is fixed to the front of the leg and thigh, reaching from the groin above to the ankle below, and leaving the aneurysmal tumour and popliteal space exposed to view. A thick compress, such as a well-wrung sponge, should be firmly but not tightly bandaged as a pressure pad over the swelling, and the whole limb should be elevated to at least half a right angle. The toes below should be frequently examined to determine the condition of the circulation. Pain of any severity demands removal of the bandages.

Indirect Compression.—This being the most important method of treatment apart from operation, its principles are to be remembered, and should be considered in detail.

Either by fingers or instruments the circulation can be pressure-controlled, whether on the proximal or the distal side of the majority of aneurysms.

By pressure on the proximal side control may be made complete or incomplete. The object of the former is to fill the sac with clot suddenly (the passive clot); of the latter, to allow of the gradual deposition of laminated clot (the active clot). Complete control is usually so painful as to require anæsthesia, and it may be some hours before clotting in the aneurysm occurs. If hardening of the aneurysm shows that consolidation is taking place, the case is hopeful, and with care it is likely that a cure will be brought about. So soon as consolidation has occurred, the pressure may be slightly relaxed, but it should be maintained in such a manner as to diminish the force of the blood-current for at least five hours, during which the newly-formed clot has a chance of consolidating. Even after definite hardening and arrest of the pulsation in the aneurysm, it is possible for the clot to be dissolved and washed away, and for pulsation to return. Rupture of the aneurysm has been known to occur shortly after the commencement of this treatment, and a rapid increase in the growth of the swelling is a danger signal which must not be allowed to pass unheeded.

To carry out this treatment satisfactorily relays of assistants are required. There should be one to observe the condition of the aneurysmal tumour, a second to compress the vessel, and a third ready to take the place of one or other when fatigued. A shot bag or other weight suspended over the fingers

is an aid, but the duties are nevertheless so fatiguing that it is necessary to have a change of assistants every three or four hours. The patient ought to lie comfortably, and the surface points over which pressure effectually controls the circulation should be marked out as an aid to relieving the skin from too continuous pressure on one spot.

It is impossible to predict the cases in which this treatment will succeed, or how long it may require to be continued. In a case of popliteal aneurysm under my care the patient, an intelligent man of "Spartan" type, who was shown the effect on the aneurysm of pressure above the sac, was seen a few days later because of pain in, and increased size and hardness of, the aneurysm. Examination proved that these changes were due to clotting, and a rapid and complete cure followed. His story was that he had worked during the day, and being unable to afford help, had by night while in bed kept his thumb on the femoral artery for as long as he could manage to do so, repeating the procedure again and again. On the last occasion he felt a sudden pain in the swelling, which became enlarged and hard. On the other hand, cases have not been rare where patient, assistants, and surgeon have all been tired out by consecutive days of prolonged effort, and no success has been achieved.

The chief advantages of digital over instrumental pressure are, that it can be more easily regulated, because it allows of slight changes in position of the pressure-points upon the skin, and so diminishes the risk of pressure-sore; that it is less painful; and that it gives better opportunity for avoidance of pressure on the accompanying vein. It is chiefly applicable in cases of high carotid, axillary, femoral, popliteal, and brachial aneurysms. Pressure can be kept up so long as it is borne without great inconvenience, but it is usually necessary to discontinue it at night and allow the patient to sleep. During the intervals of rest a supporting pad and bandage may be worn in order to diminish the activity of the circulation in the aneurysm; or in the case of a popliteal, or of a brachial aneurysm at the bend of the elbow, flexion of the limb secures the same result. Success may be attained by this method after months or even years of trial. In one reported case the cure of a femoral aneurysm occurred after six years of occasional intermittent pressure and support. The greatest success has followed continuous pressure and entire arrest of the circulation through the aneurysm for a limited number of hours.

Many instruments on the tourniquet principle have been employed in place of fingers to compress the artery while avoiding pressure on any accompanying vein, and allowing, usually, of the passage of a continuous weak and diminished stream through the sac. When using such instruments the limb below the aneurysm should be bandaged, and the contact point of the pressure-pad shifted from time to time to prevent damage to the skin.

Cure may be gradual, as shown by the aneurysm getting harder, and pulsation and expansion diminishing; or it may be sudden from filling up of the sac with clot. The patient requires careful and constant skilled supervision. The most courageous and obedient are apt to lose patience when restricted to one position in bed, while they are enduring pain and suffering from loss of sleep and exhaustion. The use of morphia or of some other sedative is necessary in the majority of cases, and even with these aids it may still be impossible for the patient to tolerate the treatment.

Rapid Pressure Method.—This was first applied to the abdominal aorta by Dr. William Murray, of Newcastle-on-Tyne, and with success. It has since been used for aneurysms of the limbs. A degree of pressure sufficient to arrest pulsation in the sac is brought to bear on the vessel above the aneurysm for a period varying from eight to eighteen hours. Few patients can tolerate the necessary pressure without narcotics, and if morphia does not suffice

it is necessary to use chloroform, though the anæsthesia need only be light, and can be maintained for several hours if opportunities for feeding are provided for.

Reid's Method.—The principle in this method is to produce rapid coagulation of the blood, which is made to fill the aneurysm and its vessel of supply. Taking popliteal aneurysm as an example, it is carried into effect thus: An elastic bandage is firmly applied from the toes to the lower border of the tumour; a second from a short distance above the tumour to the thigh, leaving the aneurysm and a small portion of its vessels unemptied and unsupported; then above the upper bandage an indiarubber tourniquet is fixed round the limb, firmly enough to arrest the circulation, and the bandages below are removed. The tourniquet must be kept in position for an hour, during which the limb should be pulseless. Meanwhile the aneurysm must be carefully watched, and if it enlarges, support must be given to it by pad and bandage. Before removal of the tourniquet, arrangements will be made for compression of the artery above by digital or instrumental pressure. For aneurysms higher up than in the instance we have been considering, the use of a tourniquet may not be possible; the artery above is then controlled by digital pressure. Digital pressure is also to be maintained whilst the tourniquet is removed, when the surgeon who is feeling the aneurysm dictates how much the pressure is to be relaxed. If the tumour appears to have consolidated completely, a continuous pressure on the femoral artery for three or four hours will suffice to cure it in a majority of cases, but the circulation should be lightly controlled by digital pressure, for three or four days. If some pulsation is still perceptible, the cure may be completed by direct pressure on the aneurysm, as previously described; or, if no effect has been produced, the attempt should be given up for the time, and another made after a week of rest, or some other method of attack chosen.

In the early stage of the application much pain may not be complained of, but in a short though varying time it becomes intolerable, and either morphia, or chloroform, or both, are needed. Careful watch must be kept on the pulse, as a guide to the state of the general circulation, and on the toes in order to detect the premonitions of gangrene.

Compression by Flexion of the Limb.—In aneurysms, by choice at the bend of the elbow or in the popliteal space—especially of the sacculated variety, and with thick sac wall—if moderate (not forcible) flexion of the limb produces arrest of pulsation, a cure can be brought about by maintaining that position. The same method can aid the cure in consolidation started by other means.

Selection of the Cases.—Fusiform aneurysms are never favourable cases; sacculated aneurysms, only when the mouth of the sac is not large enough to allow of active circulation in the tumour; popliteal and brachial (at bend of elbow) are the cases most suited to pressure by flexion of the limb. It is to be avoided in cases of thin-walled aneurysm, which are increasing in size. Those in the groin and axilla are seldom benefited by it, and large aneurysms in the groin have been ruptured by flexion of the hip.

Pressure on the Artery above, of such degree as to diminish but not to arrest the circulation, is most likely to succeed when the swelling is hard and the pulsation not forcible, i.e., where some clot has already been deposited in the sac, and when the patient is intelligent and placid enough to aid in the treatment.

Total Arrest of the Circulation by pressure on the artery of supply is used in cases of abdominal, inguinal, and carotid aneurysms, i.e., in situations where prolonged pressure cannot be borne, and where the artery can be effectually compressed against a bony prominence. It has also been used successfully for aneurysms of the limbs of patients unable to tolerate the more gradual method.

The elastic bandage and tourniquet method is useful in recent aneurysms which are not too rapidly increasing in size, are not too thin-walled, and where the heart is not diseased, nor the arteries exceptionally rigid.

The objections to pressure treatment are :—

1. That it is painful. Some patients cannot bear it in the most moderate degree, and all find a prolonged course so exhausting as to be almost, if not quite, intolerable.

2. That it may not cure the aneurysm. Even after months of determined effort and painful experience, a considerable proportion of patients will not be cured.

3. That after "cure" there is some tendency to relapse. It may be after a few hours or after a few weeks that pulsation returns in the aneurysm.

4. That the treatment is dangerous : (*a*) Rupture may take place soon after the treatment is commenced, or rapid extension of the swelling point to its probable occurrence ; (*b*) Gangrene of the limb below may occur, probably in some cases from pressure involving the vein as well as the artery, though it is only fair to state that gangrene is a danger common in greater or less degree to all forms of treatment.

5. Suppuration of the sac may happen in cases where the aneurysm has been suddenly "cured" by the formation of a passive clot.

6. Sepsis. All sorts of septic wound complications have followed sores produced by too active or too prolonged pressure over the vessels.

7. Subsequent operation may be made more difficult owing to the formation of pressure sores ; or because pressure may have increased the collateral circulation to such an extent as to make operation a failure ; or through the vessels being so matted to their surroundings after prolonged pressure as to make ligature a serious and difficult proceeding.

It may be said in conclusion that while these methods have all proved useful in the past, and in days when operations were dreaded by patients on account of pain, and by surgeons through fear of sepsis, their scope now has become greatly limited, and their use restricted to exceptional cases which promise to respond readily to such treatment.

II.—OPERATIVE TREATMENT.

The "Obliteration" Operation.—The design of this operation is to open and empty the sac, and to obliterate it by a series of tier sutures, leaving a sufficient channel for the circulation. Sacculated aneurysms are regarded as the most favourable cases for this procedure.

Suture of the Aneurysmal Openings into vessels, after their separation by dissection, has met with its most useful application in the case of arterio-venous aneurysm, but for both these new methods there will be a larger place in the future.

Excision of the Sac.—This, when it can be carried out, is the most generaliy applicable method of treatment. Statistics are all very strongly in favour of excision, though it must be borne in mind that the operation is more difficult than that of "ligature," and that the number of cases in which the operation has been done allows of no final judgment being passed as yet.

My last experience of excision of a popliteal aneurysm has made me less enthusiastic than I was as to the universal applicability of this method of treatment. The patient was a vigorous-looking man with a small but leaking popliteal aneurysm, which was easily dissected out. The artery above the aneurysm was so soft and brittle that a thick catgut ligature cut through it like cheese. Another was applied higher up. This held. I was so impressed by the brittleness of the vessel that special nurses were told off to watch for hæmorrhage. The third day after the operation profuse hæmorrhage occurred,

and the femoral artery was successfully tied in Hunter's canal. On the following day gangrene of the foot had set in, and amputation was performed through the thigh. The patient recovered, but lost his leg. My feeling is that with this small though leaking aneurysm, ligature of the vessel higher up and in a healthy portion would have been successful. The case recorded is of interest, as it emphasizes the old view, which has latterly been ignored, and even denied, that the vessels in the neighbourhood of the sac are occasionally so brittle and diseased that there is danger in applying a ligature to them.

Nevertheless statistics show the safety of the operation. It is also proved that there is less chance of gangrene following it than is the case with an operation by ligature ; that the cure is certain ; and that no after troubles, such as arise from the presence of a shrunken sac, are possible. The most brilliant application of this method of attack is to be found in the treatment of ruptured diffuse aneurysms of the limbs where amputation is the only alternative. By turning out the escaped blood and finding and excising the aneurysm, many of these serious cases can be brought to a successful issue. With these advantages excision can claim for the present to be the operation of choice.

Ligature of the Artery of Supply.—This may be (1) *Proximal*, immediately above the aneurysm, or some distance above it ; or (2) *Distal*, below the aneurysm.

1. *Proximal Ligature.*—Unless in exceptional cases, the nearer a ligature can be applied above the aneurysm the better, so that the obstruction in the aneurysm and that in the vessel effected by the ligature may combine. The immediate effect of the ligature is to arrest pulsation in the sac, which shrinks and should become solid. The diminished circulation in the limb below demands treatment by warm wrapping, elevation, artificial maintenance of heat, and prolonged, frequently-repeated upward rubbing, in order to aid the venous circulation. Following ligature there may be :—

(*a*) Recurrence of pulsation. In the course of a few days after successful ligature, pulsation may recur in the aneurysm, but as a rule it disappears in a few days more, of its own accord, or with slight aid. Bandaging the elevated limb and compression of the aneurysmal swelling may first be tried. Then digital pressure upon, or ligature of, those collateral branches which have influence upon its pulsation ; or ligature of the artery distal to the sac, may be resorted to. If a fair trial of these means fail, excision of the sac is indicated.

(*b*). Gangrene. If the limb continue to be shrunken, pallid, and cold, definite gangrene is to be expected before the end of the first week. If the gangrene is dry, the whole extremity may, after thorough cleansing, be wrapped in antiseptic wadding, and the appearance of a line of demarcation awaited. If the gangrene is moist, the sooner the limb can be amputated above the aneurysm the better.

(*c*) Suppuration in the sac. The ordinary evidences of pus formation in the sac indicate the same treatment as for suppuration elsewhere. The sac should be freely opened, its contents evacuated, and its interior packed. If inflammation has not extended from the sac into the surrounding tissues so as to make excision impossible, this will be the best treatment. Amputation will offer the best chance if secondary hæmorrhage after suppuration should occur.

2. *Distal Ligature.*—The only condition in which this has been employed with encouraging success has been in aneurysms of the lower part of the common carotid artery.

Aneurysmal Varix and Arterio-venous Aneurysm.

The dangers and difficulties of operation in such cases, where large vessels are involved and where the circulation is difficult to control, must be fully realized ; yet the dangers and discomforts resulting from the lesions may be

so serious that the risks of operation have to be faced. In cases of aneurysmal varix, palliation may be obtained by the use of an elastic bandage, and occasionally a pad over the orifice of communication can be so effectually applied as to remove all the distressing symptoms. When, however, a tumour is present, operation is a necessity, for the aneurysmal swelling is progressive and will eventually rupture. The operation usually implies separating the artery and vein, and tying both vessels above and below the opening. After separation it may be possible to close the opening in each by carefully applied sutures, and this is the best surgery.

Aneurysms of the Upper Extremity.

Axillary Aneurysms.—On account of their rapid growth, the serious pressure symptoms they occasion, and their liability to rupture, active treatment is essential. There are three methods of attack, from which a choice must be made: (1) *Pressure;* (2) *Ligature of the Artery above the Aneurysm;* (3) *Excision of the Sac.*

1. *Pressure* is so painful as to necessitate the use of an anæsthetic, and relays of assistants are required in order to hasten the result. The method of application is as follows: The spot above the clavicle on the third part of the subclavian artery, pressure on which completely arrests the circulation in the aneurysm and in the vessels below, is to be noted and marked. Then an elastic bandage is applied firmly to the limb from below up to the axilla, but not over the aneurysm. By pressure on the third part of the subclavian the circulation in the aneurysm must be totally arrested, and the elastic bandage pressure should be maintained for one hour, after which digital pressure should be continued for three hours more, and then gradually relaxed.

In fat or unusually muscular subjects it may be impossible to control the circulation with the skin undivided. It would be possible and proper in such a case to make the pressure through a wound over the vessel. It is almost superfluous to add that such a wound could only be safely made under perfect surgical conditions, and that those who compress the vessel would necessarily wear sterile indiarubber gloves.

2. *Ligature of the Artery above the Aneurysm.*—If the aneurysm involves the lower part of the artery it will be possible to ligature the artery above it, but as a rule, even under these circumstances, the operation of choice will be by ligature of the third part of the subclavian, as the dangers and difficulties of the latter operation, when in the hands of a skilled surgeon, are now comparatively small, and the after-results fairly good.

3. *Excision of the Sac.*—This is still regarded as a last resource by the majority of surgeons, but evidence is accumulating in its favour. It should be the method of choice in dealing with large, rapidly increasing aneurysms which are causing œdema and paralysis of the limb.

Brachial Aneurysm.—Compression here is easily performed, and should be fairly tried. For cases at the bend of the elbow flexion is the method of choice. For those due to traumatism and embolism excision is the only satisfactory treatment.

Aneurysm of a Palmar Vessel.—Compression of the aneurysm and of its arteries of supply, along with elevation of the limb, may first be tried. A splint is to be applied over the extensor surface of the hand and forearm, and pressure pads adjusted over the radial and ulnar arteries and over the tumour. The hand and arm are then slung at a right angle. If this does not succeed, it will be necessary to ligature the radial and ulnar and to compress with pads the interosseous and median arteries, and to elevate the limb. Excision in the palm is difficult, and may occasion irreparable damage to the usefulness of the hand.

ANEURYSMS OF THE LOWER EXTREMITY.

In this region popliteal aneurysms are the most common. They outnumber those of the femoral artery in the proportion of four to one. Below the popliteal, aneurysms are rare.

Femoral Aneurysm.—Compression treatment by means of elastic bandaging may be tried before operation is resorted to. The elastic bandages are applied firmly below the aneurysm, lightly upon it, and so tightly over the vessel above it as to serve the purpose of a tourniquet. The bandaging below ensures the distension of the aneurysm with blood, and the gentle pressure directly applied to its surface affords support. The tourniquet bandage above arrests the circulation in the aneurysm and in the vessels below. When the upper or tourniquet bandage is fixed, the lower can be removed, as it has then fulfilled its purpose (that of filling the sac with blood). The tourniquet bandage is to be kept applied for an hour and a half, and while it is removed, and for two or three days after, digital pressure is to be substituted for it. For several days after this again, elevation of the limb and a supporting pad over the aneurysm are used as aids towards making the cure true and permanent.

If pressure treatment fail, then ligature of the artery above the aneurysm, or excision of the sac, must be resorted to. Of these alternatives, excision of the sac has given the best results ; it is, moreover, the only method of treatment applicable to cases of arterio-venous aneurysm in this region.

Popliteal Aneurysm.—Pressure and flexion of the knee are methods of treatment frequently successful, and comparatively free from danger. They are therefore deserving of fair recognition. Pressure may be digital, and effected continuously by relays of assistants, until consolidation has occurred, an anæsthetic being used if required ; or it may be intermittent, and applied every alternate hour for two or three days, as the patient can tolerate it. When continuous compression is resorted to, the femoral artery should be completely occluded by pressure against the ramus of the pubis until consolidation has taken place. Then the circulation is to be controlled by gentler pressure, whether digital or instrumental, for a few days longer. Or the pressure may be made by means of elastic bandages applied firmly from the foot to the aneurysm, lightly over its surface, and tightly enough above it to arrest the circulation. The lower bandage is then removed, and the upper (the tourniquet bandage) kept on for one hour. Before its removal the artery above must be controlled by digital pressure, and this must be continued for two or three days if consolidation has taken place. If it has not, the attempted cure should be temporarily abandoned, to be repeated after a few days of rest ; or some other method of treatment should be chosen in its place. At least 50 per cent of popliteal aneurysms can be cured by pressure.

Ligature of the femoral artery at the apex of Scarpa's triangle is the easiest of the ligature operations for popliteal aneurysm, and it has yielded good results, about 80 per cent of cures having been effected by its means. It seems probable that ligature of the femoral artery in Hunter's canal, or of the popliteal above the aneurysm, might give results even better than these.

Excision of the sac is necessary if the aneurysm is not cured by one or other of the ligature operations above mentioned, or if, after cure, it is the cause of painful contraction symptoms. Excision is, moreover, the only alternative to amputation when the sac has ruptured. It has not yet been proved that it is the best operation for ordinary cases.

Gluteal Aneurysm.—It is to be remembered that a gluteal aneurysm, owing to its progressive tendency, always demands active surgical treatment. The most successful method of attack as yet reported has been by the injection of a

solution of perchloride of iron (20 per cent) into the sac. This does not seem to have been followed by serious consequences. The injection (50 minims) is introduced at several places, a few drops at each, whilst the sac is compressed laterally. Rest should be enforced for ten days afterwards.

Incision of the sac, arrest of hæmorrhage by finger pressure, and, after the necessary dissection, ligature of the vessel above and below the aneurysm, is an operative procedure which has been successfully carried out. It would, however, be safer to ligature the internal iliac artery.

Aneurysms of the Leg and Foot.—These are encountered but rarely. The most satisfactory treatment is by excision of the sac.

ANEURYSMS OF THE NECK.

Aneurysm of the Common Carotid Artery.—When the aneurysm is at its most common site, i.e., at the bifurcation of the artery, the surgical methods of treatment available are: (1) *Digital Pressure;* (2) *Needling the Sac;* (3) *Ligature of the Artery below the Sac;* (4) *Excision of the Sac;* (5) *The Obliteration Operation.* Before one or other of the above operative procedures is selected, the medical measures described in connection with thoracic aneurysm should have been given a fair trial, since they have at least arrested the progress of the aneurysm for a time. Surgical interference should only be resorted to when threatening signs are present.

1. *Pressure.*—Digital pressure on the vessels below the aneurysm and against the soft parts covering the spine is the best form of surgical treatment, but can seldom be brought to a complete conclusion, nor indeed tolerated in most cases for any protracted period of time. Daily repetitions are necessary, and should be continued for as long as they can be borne. The development of cerebral symptoms, such as loss of consciousness, convulsions or paralysis, may necessitate abandonment of the procedure. The pressure method of treatment is most likely to be successful with young subjects, and in cases of traumatic aneurysm.

2. *Needling of the Sac* may be used either in addition to the above method (pressure) or as an independent procedure.

3. *Ligature of the Artery below the Sac* has been associated with a high rate of mortality, chiefly in consequence of disturbances in the cerebral circulation, and apart from this has in some cases not cured the aneurysm. It is therefore at the present time an operation not in favour.

4. *Excision of the Sac* is probably less dangerous than ligature of the artery below, and if it can be accomplished the cure of the aneurysm is certain. On these grounds recent surgical opinion is in favour of the operation. It is chiefly indicated in cases of traumatic aneurysm of young people. Before either proximal ligature or excision is undertaken, the circulation in the other carotid artery should be tested.

5. *The Matas Operation*, i.e., obliteration of the sac by suture, may here find a field for usefulness, and in favourable cases exclude all other forms of treatment.

Aneurysms of the External and Internal Carotid Arteries.—These are treated by ligature of the vessel below the aneurysm, or, if this is not possible, by ligature of the common carotid.

Aneurysm of the Innominate Artery.—Needling and electrolysis have both been used with success. The operation of choice, providing that both common carotids are pervious, is that of simultaneous ligature of the right common carotid and subclavian arteries. It has been followed by good results.

Aneurysm of the Subclavian Artery.—

Of the 1st part.—The treatment is the same as that for innominate aneurysm.

Of the 2nd part.—After failure of medical treatment and of "needling," which

should have a fair trial, simultaneous ligature of the common carotid and subclavian arteries beyond the aneurysm is indicated.

Of the 3rd part.—Direct compression and proximal compression have both been tried, and with some success. Proximal ligature of the first, second, or third part of the subclavian artery may be done ; or ligature of the innominate and common carotid arteries ; or amputation at the shoulder with high ligature of the artery. All of these operations have failed to cure the aneurysm, and the mortality has been appalling. Excision of the sac has given the best results.

Aneurysm of the Vertebral Artery.—In the only reported case the aneurysm occurred at the lower part of the artery, and the vertebral was tied close to the subclavian and divided. A cure resulted.

Arterio-venous Aneurysm of the Carotid and Jugular Vessels.—Digital compression of the carotid artery below the sac should be fairly tried first. Operative treatment is not to be lightly undertaken, both on account of its inherent danger and in view of the known natural history of these cases. In many of them the swelling remains stationary, and the disturbed cerebral and cephalic circulation ceases to cause the trouble it had originally produced. Severe pressure symptoms and rapid growth are the indications for operation. The artery and vein are to be ligatured above and below the opening, and the sac incised and packed.

Subclavian Arterio-venous Aneurysm.—Treatment is the same as for the previous variety.

ABDOMINAL ANEURYSMS.

It is to be remembered that in dealing with these cases medical treatment ought first to be given a fair trial. In this connection it is of interest that two cases of cure after the administration of calcium chloride have been recorded.

Pressure on the vessel above the aneurysm may be applied by means of an abdominal tourniquet, and when the aneurysm is not too highly situated may prove successful. The pressure must not be applied for too long a stretch, but is to be repeated from time to time, a due watch being kept meanwhile over the patient's general condition.

Introduction of Wire into the Aneurysm seems to have been the only other method of treatment which has been attended by any success.

Aneurysms of the Visceral Branches of the Aorta, with the exception of the renal artery, have not yet been brought into the domain of practical surgery.

Aneurysms of the Renal Artery have been successfully extirpated along with the kidney on more than one occasion.

The other vessels, in view of recent improvements in blood-vessel surgery, such as the Matas method of treatment for aneurysm, end-to-end or lateral anastomosis of vessels and transplantation of vessel grafts, cannot fail to come under surgical treatment in the near future.

Inguinal Aneurysms.—The term is applied to aneurysms of the iliac arteries, though the femoral may be involved. Digital pressure on the artery above may be tried first, and its action may be assisted by compression of the tumour. If pressure treatment fails after a fair but short trial, the artery should be *ligatured* above the aneurysm. For ruptured aneurysm and after failure of the above methods, excision of the sac is called for. *Rutherford Morison.*

ANEURYSM, THORACIC.—An intimate knowledge of the literature of this subject, together with practical experience of a large number of cases (amounting to several hundreds), compel me to confirm the general opinion that the results of the treatment of aneurysm are eminently unsatisfactory. Nevertheless there is much to be done, and all experienced in the matter will admit that the patient may be benefited in many ways by treatment. Proof of this position

is to be found in the records of any large hospital where cases are frequent. Patients introduced into the wards suffering from pain, dyspnœa, distressing cough, etc., leave in a state of comparative comfort, to return again in a few weeks, or perhaps months, in much the same condition as at first. Once more they obtain relief, and so the cycle continues, it may be, for several years. It would be a mistake to deny that even cure may occur, but this result is so rare as to be reckoned little more than a possibility.

TREATMENT.—This is directed to the relief of the symptoms, principally pain, dyspnœa, cough, and dysphagia ; and in securing this relief we aim also at the reduction in size of the sac, a thickening of its walls, and coagulation of the contents.

It must not be forgotten that some of the symptoms are not necessarily the direct result of the aneurysm, and may depend upon valvular lesion, heart-muscle weakness, or excessive blood-pressure—points that require our closest attention in selecting a plan of treatment. Fortunately, however, drugs and methods adapted to the relief of the aneurysmal symptoms are also suitable, at least in many instances, for treatment of the concomitant heart and circulatory conditions. Iodide of potassium, for example, is an excellent heart tonic ; and we cannot do much better in reducing blood-pressure than insist upon rest, and a lowering diet.

Freedom from worry and excitement is in all cases highly important ; but the fortunate fact that our patients are, as a rule, of a calm and cheerful disposition, though it simplifies the management of a case in some ways, renders it more difficult in others, inasmuch as a patient seldom realizes the gravity of the situation, and is often only with difficulty persuaded to obey instructions.

Rest.—It would perhaps be impossible to over-estimate the value of rest, but the question will naturally arise, Should every case of aneurysm of the arch of the aorta be compelled to rest ? And if exceptions be allowed, what are they ?

Practically speaking, all cases are benefited by rest, but for some few absolute rest is perhaps not essential, this minority consisting of those whose only symptoms are nocturnal pain and consequent sleeplessness. These may be allowed to sit up, and may even take gentle exercise with advantage ; but all alike must be impressed with the necessity of avoiding the exertion of sustained effort. In other words, it is highly important to restrict movements in all cases of thoracic aneurysm.

Diet.—The diet should be carefully selected both as to quantity and quality, and this even in cases in which it is not proposed to carry out the Tufnell plan of treatment. A mixed diet may be allowed, taking care to avoid an excess of animal food ; indeed some patients are greatly benefited by a course of milk and farinaceous food alone, and this recommendation is offered notwithstanding the opinion held by many practitioners that the diet should be as dry as possible and highly nitrogenous.

In this connection it may be said that the treatment associated with the name of Tufnell, namely, starvation diet and absolute rest, is worth a trial in some cases, though the patient seldom submits to it for any length of time without protest, nor can it be urged that the results are encouraging enough to warrant coercion. The diet, as is well known, consists of a morning meal of 2 oz. bread-and-butter, with 2 oz. milk or cocoa ; a meal at mid-day of 3 or 4 oz. meat, with 2 or 3 oz. potatoes or bread and 3 or 4 oz. water ; and an evening meal of 2 oz. bread-and-butter and 2 oz. milk or tea. Some cases do badly under this plan, and care must be taken to select suitable ones, for the broken-down syphilitic patient, or the man with aortic regurgitation and failing compensation, should not be subjected to the risk. A modified Tufnell diet, however, in conjunction

with rest and iodide of potassium, constitutes the plan of treatment on which our best reliance is to be placed.

Drugs.—The most useful drug in the treatment of aneurysm is undoubtedly iodide of potassium, which is generally supposed to have been first employed for this purpose by Bouillaud. In conjunction with rest and diet, as a means of relieving pain, it leaves little to be desired. It relieves all varieties of the pain associated with aneurysm, but especially for the true aneurysmal pain which is worse at night and is relieved by change of posture, it is almost a specific. The dose should be large, but 15 to 20 gr. three or four times a day is generally sufficient, though in some cases relief is only obtained by the use of a considerably larger daily amount, and some authorities recommend as much as 1 dr. for a dose. Occasionally the pulse is accelerated by the use of iodide, but this is of little importance, and does not interfere with the beneficial action of the remedy.

As a rule a few days elapse before any improvement is noticeable, and some patients are unable to bear the necessary dose. When this happens it is well to withdraw the iodide of potassium and substitute the strontium salt in its place. It is unnecessary here to discuss the action of this salt further than to say that it seems to relieve pain, lower blood-pressure, act favourably on heart muscle, aid formation of clot, reduce the size of the sac, and thicken its walls.

The treatment should be persevered in for six or eight weeks at a time, and rest and diet certainly increase the usefulness of the remedy.

Operative Measures.—The results of distal ligature in the treatment of aortic aneurysm have not been encouraging, though the cases recorded by Heath, Barwell, and others, as treated by this method, would seem to suggest that we are not justified in excluding our surgical friends from some say in the matter.

Extreme dyspnœa, amounting at times to threatened suffocation, generally associated with congestion and blueness of the head and neck, may be benefited by venesection; and chloroform has often given relief. The operation of laryngotomy is intensely disappointing in its results, for the simple reason that the obstruction is generally below the larynx and rarely due to bilateral abductor paralysis. In two cases, when death seemed imminent from suffocation, and tracheotomy was performed without relief as the trachea was compressed at the bifurcation, the threatened danger was averted by inhalation of nitrite of amyl; but the relief was, of course, only temporary.

Electrolysis.—Galvano-puncture or electrolysis was recommended many years ago for the treatment of thoracic aneurysm. It consists of the introduction into the sac of two insulated needles, bare at the points, by which means a galvanic current is passed through its contents. The object of this proceeding is, of course, to induce coagulation of the blood in the sac about the positive needle, and care must be taken that the points are not allowed to touch. Indeed it would seem to be unnecessary to introduce more than the needle connected with the positive pole, for the circuit can be closed by the application of the negative pole through the medium of a large surface rheophore to the skin close to the sac. In the few cases I have treated by galvano-puncture the resul were not satisfactory enough to encourage further attempts, and this would seem to accord with the general experience. A reference to the literature of this part of the subject will, I think, convince the reader that most of the cases in which benefit has been claimed from this plan of treatment would probably have done as well with some other less heroic means; and in not a few it has hastened a fatal termination.

Another form of treatment having the same object, and associated with the names of Moore and Loreta, is the introduction into the sac of foreign material, such as wire, silk, horse-hair, or catgut. Personally, I have no experience

of this plan, and am not favourably impressed by the published results. The electrolytic method in conjunction with the introduction of fine iron or gold wire has also been tried, and in a few cases successful results have been claimed.

Internal Irritation of the Walls.—In 1890 Macewen advocated a plan for inducing the formation of white thrombi in the sac of an aneurysm by irritating the internal surface with the point of a needle. I subjoin Macewen's description of his method: "Before performing the operation the skin over the aneurysm ought to be carefully cleansed and rendered aseptic. The aseptic pin ought then to penetrate the sac and pass through its cavity, until it comes in contact with the opposite side. It ought to touch and no more. Then one of two methods may be employed: either to move the pin over the surface of the inner wall so as to irritate its surface, or to allow the impulse of the blood-current playing on the very thin pin to effect the same object. If the wall penetrated by the pin on introduction be dense, the former method will be preferable, as the force of the blood-current produces such a feeble action on the thin pin as to be insufficient to move it to and fro whilst it is firmly grasped by the dense wall. After acting thus for ten minutes at one part, the point of the pin, without being removed from the sac, ought to be shifted to another spot, and so on until the greater portion of the internal surface opposite the point of entrance has been touched; this ought to be done in a methodical manner. A single insertion of the pin through the aneurysmal sac into its interior may be sufficient to enable the point of the instrument to come into contact with the greater part of its internal surface, but in some cases puncture from various sides of the external wall may be necessary so as to reach portions of the tumour which cannot be attacked from the first puncture" (*Lancet*, Nov. 22, 1890). The period for which the pin has been kept in the sac has varied between a few minutes and many hours, but forty-eight hours is given as the limit of safety.

Only a limited trial has apparently been made of this plan of treatment in cases of thoracic aneurysm, and I confess I have been deterred by the fear of displacing clot that might already line the sac. All practical physicians also recognize the enormous difficulty presented at times in distinguishing between sacculated and fusiform aneurysms.

A somewhat similar procedure was introduced in Paris in 1888, when Dr. Constantin Paul advocated the introduction of a number of long and very fine needles into the sac, to be left there for a few minutes with a view of setting up a slight degree of adhesive inflammation—the operation to be repeated in a few days at another part of the sac. Paul contended that this results in thickening of the walls, and possibly this plan would commend itself to some in preference to Macewen's; but it is obvious that both are more suitable for aneurysms of smaller vessels than for those of the aorta.

Injection of Gelatin.—Based upon the observations of Dastre in 1895, that the injection of a solution of gelatin into the veins of a dog favoured coagulation of the blood, Lancereaux, about nine years ago, proposed the employment of a similar solution in the treatment of aneurysm. Since then many cases have been treated by gelatin injection, and some with surprising results. In his earlier cases, Lancereaux employed a 2 per cent sterilized solution of purified white gelatin, of which he used 4 or 5 oz. (introducing the needle deeply into the subcutaneous structures, buttock, axilla, etc.); but later he reduced the strength to 1 per cent, and advocated the injection of 9 or 10 oz. of the solution, repeating the operation every three or four days until eighteen or twenty injections were made. In some of my own cases I have employed as strong a solution as 4 per cent, of which 1 oz. or rather more was injected, and repeated every three or four days, according to the state of the patient; but the weaker solution is probably safer and seems to do as well.

This plan of treatment appears to be most useful in cases in which a false sac has become established outside the bony structure of the chest, with threatened perforation ; but it is evident that the treatment must be subjected to a much more extended trial at the hands of skilled observers, and under conditions free from risk, before a definite decision can be arrived at as to its general utility. Undoubtedly in some cases the injection of a gelatin solution does induce coagulation of the blood in the sac. In one very striking case of my own there was a pulsating sac the size of a large orange, pointing to right of sternum above the fourth ribs, and covered by shining skin of purple colour. Five injections were made into axillæ and beneath adjacent pectoral muscles at intervals of two or three days ; after the first, a distinct change was noticed in the contents of the sac ; after the fifth it ceased to pulsate, and became as hard as a cricket ball, being also reduced in size. But another of my patients developed tetanus after the ninth injection, which was the more unfortunate as otherwise the case seemed to be doing well.

In fact it should be recognized that in this agent we clearly have a remedy that is powerful for good or evil. It may perhaps come to be regarded as a medicinal factor in the treatment of aneurysm, second only in importance to iodide of potassium ; but at present the gelatin treatment is attended by considerable risk, and very few practitioners who have given the plan an extended trial have succeeded in avoiding some untoward result. The chief danger seems to lie in the fact that commercial gelatin is apt to contain the tetanus bacillus, and the difficulties in sterilizing the solution are very great, as the properties of gelatin are destroyed when the temperature is raised beyond a certain point. It is hoped, however, that this difficulty may soon be overcome, so that the treatment may be undertaken in suitable cases without undue risk to the patient.

Narcotics.—When pain defies rest, diet, and iodide of potassium, it may be relieved by morphia ; and without doubt the hypodermic syringe is the best method for its administration.

The troublesome symptom of irritating cough may, in some cases, be aggravated by iodide on account of its tendency to increase bronchial secretion. These are nearly always cases of aneurysm of the transverse arch, in which the sac presses upon the lower part of the trachea. As a rule the iodide, with rest, will give relief by reducing pressure ; but where the sac is intimately incorporated with the trachea, and the secretion is copious and expelled with difficulty, the drug may fail. Here small doses of morphia, with soothing inhalations such as menthol, conium, or Friar's balsam, may afford relief ; but the administration of the sedative must be watched with care on account of the respiratory difficulty.

David Drummond.

ANGEIOMATA.—These tumours require treatment when (1) They are obvious disfigurements ; (2) They are increasing in size ; (3) They have become inflamed or ulcerated, with the associated risk of hæmorrhage. If a nævus is small, is not upon an exposed area of the body, and is not increasing in size, no treatment is required. Some of them disappear spontaneously.

The aim of all treatment is to remove them so as to leave only the slightest trace of their former presence, and this is best attained by means of excision. In most instances this can be done. In certain situations, such as the scalp, it is imperative, since destruction of the nævus *in situ* without removal will leave an area that will always be devoid of hair. The simplest procedure is to enclose a fusiform area in which the nævus is situated by two incisions, which must be just free from the margin of the tumour all round. One apex of the enclosed area is seized by toothed forceps, and the tumour can then be peeled off rapidly

by traction, aided by a few touches of a scalpel. By this means the free hæmorrhage that is frequently regarded as the necessary accompaniment to the removal of a nævus is almost entirely avoided—a consideration of the utmost importance when such a tumour requires removal from the scalp of an infant.

This procedure must be modified for the treatment of nævi occurring in certain situations, such as the orbit, the nose and mouth, the lips, the external genitalia, and the circum-anal region. A nævus in the orbit which has given rise to proptosis must be removed by piecemeal dissection with two pairs of dissecting forceps through an incision in the eyelid. By this method all injury to the rest of the structures in the orbit is avoided, since the nævus tissue shells out easily. A combination of methods must be employed for the removal of a large cavernous nævus from the lips, which frequently appear as large pendulous shapeless masses. Make a small vertical incision into the lip, and through the opening thrust the fine needles of a galvano-cautery into the centre of the tumour. The needles must not be heated until they have been introduced: otherwise the edges of the incision will be charred. Having burnt away some of the nævoid tissue, allow the needles to cool, and then withdraw them. Stitch up the incision with fine silkworm-gut sutures. By a frequent repetition of these measures the whole of the nævus can be destroyed with very slight disfigurement to the lip. If the growth encroaches upon the surface of the gums, palate, or mucous membrane of the nose, the free edge must be immediately destroyed by cauterization to prevent it spreading to regions inaccessible to treatment. For a nævus in the genitalia or circum-anal region, a combination method of excision and cautery or electrolysis is the most valuable.

When, from consideration of the situation and size of the nævus, excision or any of the foregoing combined methods appear to be impracticable, other means of treatment must be adopted. A large number have been devised, but only two of them can be considered of real value—cauterization and electrolysis. The former is the more rapid way; the latter leaves less ultimate scarring. Both can be carried out by means of fine needles attached either through a resistance board to a main or to a storage battery. For electrolysis a current of 10–20 ma. is sufficient and safe. Either the negative or positive needle, or both, may be inserted into the tumour. The negative needle has the advantage of destroying the tissue more rapidly than the positive, and the evolution of hydrogen can be used to gauge the amount of destruction that has been done at each operation. There is no such indication when the positive pole is used, and although this is said to yield a firmer thrombus, it has the additional disadvantage of staining the tissues brown by a deposit of iron from the needle. Blanching of the tissues by hydrogen must not be induced to an extent likely to cause sloughing at the surface, since a deep permanent scar will be the result. For fine capillary nævi on the face, a few pricks by the negative pole are generally sufficient to avoid all disfigurement.

When a nævus has been destroyed by these methods and the resulting fibrous tissue has been allowed to shrink, a further improvement can frequently be effected by excision of the fibrous mass. It is hardly necessary to add that all these operations must be carried out under conditions of the most scrupulous surgical cleanliness. (See also ELECTROTHERAPEUTICS.) *George E. Waugh.*

ANGEIONEUROTIC ŒDEMA.—(See URTICARIA.)

ANGINA LUDOVICI.—Ludwig's angina is a condition of cellulitis of the floor of the mouth and the adjacent tissues of the neck, due to invasion by virulent streptococci from the mouth. The subjects of this disease are often broken down in health, and a small ulcer may be present in the floor of the

mouth through which the infection occurs. After a few hours the floor becomes swollen, hard, and brawny, so that the tongue is raised and forced upwards against the palate, interfering with speech and deglutition ; the tissues between the chin and the hyoid bone become swollen and indurated, and the skin dusky red. The œdema may spread to the glottis, producing urgent dyspnœa. There is at first marked fever, but it soon assumes an asthenic type, and the patient passes into the typhoid state. Death often occurs in a few days.

The treatment must be prompt and energetic. Free incisions through the skin and deep fascia must be made all over the œdematous area, and the tissues opened out with finger and director so as to afford very free drainage. It is better not to make incisions inside the mouth ; if they seem to be necessary they should not extend deeper than the mucous membrane. Injections of anti-streptococcus serum should be given as soon as possible, and the patient's strength supported by quinine, ammonia, and stimulants. If dyspnœa occurs the larynx should be scarified ; if this is not practicable or does not give relief, tracheotomy must be performed, using a Hahn's or Trendelenburg's tube to prevent septic matter entering the air passages. *Edmund W. Roughton.*

ANGINA PECTORIS.—Treatment may be divided into two parts : (1) The direct treatment of the paroxysm ; and (2) Treatment in the interparoxysmal periods.

In the great majority of cases that prove directly fatal, angina pectoris is known to be associated with disease of the coronary arteries in one form or another. The disease, however, regarding it as a clinical entity, may be met with apart from any lesion of the coronaries : this much must be admitted. In rare cases of mitral stenosis it is so met with : death in these cases does not result from the angina (in the writer's experience), but from the ordinary disturbance of the circulation wrought by the valve lesion. Moreover, in the disease associated with coronary changes, it sometimes happens that the angina pectoris subsides, while the symptoms and signs of cardiac muscle failure develop, and run their ordinary course to a lethal termination. Many cases of angina pectoris, *but not all*, are associated, moreover, with habitual high, or fairly high arterial tension. This condition becomes intensified during the paroxysm, whether as cause or effect has been matter of controversy. It is found that remedies which dilate the arterioles, and so lower blood-pressure, at the same time relieve the pain of angina. It is not necessary, however, that the blood-pressure should be high in order that the paroxysm may be relieved by vaso-dilators—probably the condition of the heart and the relationship of its contractile power to the burden imposed on it has to be considered in such cases, and vaso-dilators will still lighten the burden of the heart in the presence of quite low tension. However this may be, the *trial* of vasodilators must not be limited to cases associated with high arterial tension.

1. **Treatment of the Paroxysm.**—When a patient has had a paroxysm of angina pectoris, it is usual to commence the treatment of the paroxysm with the inhalation of nitrite of amyl, and such inhalation often gives an indication of the effects likely to be obtained from the vasodilator class of drugs. It is best to give the patient, who is found to obtain relief from amyl inhalation, a box of small glass phials containing it, each wrapped up in linen. When he feels the onset of an attack he takes out one of these so-called " capsules," breaks it between his finger and thumb, and holds it to his nostrils for inhalation.

A considerable number of nitrites are in use for internal, and more or less regular use : liq. ethyl nitritis, sodii nitris, liq. nitroglycerini or trinitrini or glonoini, or tabellæ nitroglycerini (chocolate excipient), or tabloids of erythrol-tetranitrate. Erythroltetranitrate is believed to keep up its effects for a

longer time than the others, and tabloids are made containing respectively three strengths: $\frac{1}{4}$, $\frac{1}{2}$, and 1 gr. Even in the case of the last the difficulty of maintaining the action of the drug is great. It is often advisable to anticipate paroxysms that occur in the night by giving a full dose of a vasodilator at bedtime. Alcohol is essentially a vasodilator, and its good effects in the paroxysm of angina pectoris were long ago recognized. A glass, or less, of whisky or brandy taken in hot water at bedtime, will often ward off a nocturnal seizure.

Diffusible stimulants—spts. ammon. arom.; spts. ætheris; spts. chloroformi, etc.—singly or in combination, are generally useful in the paroxysm, and often promote that much desired effect, the eructation of "wind," which seems often to end the attack, whether the result be *propter hoc* or merely *post hoc*.

In the classic case of Dr. Arnold, of Rugby, it is related that Dr. Bucknill gave brandy and laudanum to the patient, and a better combination at the time could hardly be devised—the brandy as a vasodilator, the laudanum as an anodyne. To-day, with a deeper—if still imperfect—insight into the disease, we give nitrites in place of alcohol, and a hypodermic injection of morphine in place of laudanum by the mouth. Moreover, in order to mitigate the disagreeable after-effects of morphine that occur in many subjects, we combine the drug with atropine, which, like strychnine, is a respiratory stimulant. The hypodermic injection of the morphine is an immense improvement, inasmuch as it obviates the tendency that might arise to too frequent application of the remedy by the patient himself, and the stomach and intestines are very much less disturbed by it than when morphine in any form is taken by the mouth. There are some patients, however, who suffer from severe sickness and inability to take nourishment, when morphine has been given even hypodermically, and guarded, as it were, by atropine. Fortunately, such cases are very rare, for their treatment is one of the greatest difficulty when nitrites fail to relieve, and indeed, nitrites seldom continue to effect complete relief to the end of a case. No general rule can be given, but by experiment—altering the proportion of atropine and diminishing the morphine—a dose of the two alkaloids may be arrived at that will give great relief without the production of sickness. In all cases of the disease, when it becomes necessary to give morphine, the dose should be very small at first, and it is the invariable practice of the writer to combine it with atropine. It is easy and safe to increase the dose gradually, when once the individual tolerance of the drug is known. To give even $\frac{1}{4}$ gr. of morphine without any knowledge of the idiosyncrasy of the patient, and especially without knowing if he be the subject of seriously diseased kidneys, is always a risk. Much bronchitis, again, with a tendency to accumulation of secretion in the tubes, is quite as strong a contra-indication to the use of morphine as Bright's disease. Beginning with infinitesimal doses, and combining the morphine with atropine, it is usually possible so to administer the drug that its beneficial effects are exerted without safety being compromised.

Very exceptionally, it may be necessary to have resort to the inhalation of chloroform, and there is good evidence of the occasional value of the treatment. When morphine has already been given with only partial success, inhalation of a very small quantity of chloroform may accomplish complete relief for a considerable period, promoting the action of the morphine.

2. **Treatment in the Inter-paroxysmal Periods.**—It is all important, in the first place, that the patient should lead a regular, quiet life, and that he should specially avoid circumstances likely to expose him to *physical exertion* and *mental emotion*. The rush up a short stair to catch a train at a railway station, or the fleeting loss of his temper, may cost the subject of angina pectoris his life.

The dietary of the subject of angina pectoris perhaps comes next in importance to tranquillity of life. The evil effects of tympanitic distension of the abdomen

cannot be denied ; it is admitted by nearly all sufferers from the disease. It is known that starchy food is the great promoter of tympanites, and practical experience and experiment will soon convince any one of the fact. Flesh-food, again, favours the contractile vigour of the heart-muscle along with the musculature of the body generally, and the heart-muscle is apt to be ill-nourished in the disease. No fear need be entertained, on the other hand, that excess of flesh-food will induce "excess of uric acid" and all that faulty metabolism which such a state connotes, *provided carbohydrates are at the same time cut down to a minimum.* The writer, on the other hand, has no fear of letting the patient have with his flesh food, which taken alone seems to lack the property of affording the feeling of repletion, *green* vegetables, thoroughly cooked, and best squeezed through a sieve. No doubt satiety and lethargy are experienced by the carnivora after feeding, but they, as a rule, have one meal in twenty-four hours, which must needs be a large one. Let the reader, however, contrast the belly development of the lithe carnivora with that of the slow, though it may be powerful, herbivora. Though any large quantity of fat in the diet of the subject of angina pectoris is to be deprecated, it is probable that the patient, whose carbohydrate food is cut down to a minimum, may be allowed a fair amount thereof, should his inclination lie in that direction. To simplify the digestive processes, the writer recommends that breakfast should be made the bread or carbohydrate meal of the day. The bread is best taken in the form of thin crisp toast, buttered cold, its crispness promoting mastication and thorough mixing with saliva. *China* tea should be used, or weak coffee ; cream may be allowed therewith. Fruit is probably best taken with or after breakfast, and its inclusion in the dietary is wholly beneficial. The mid-day meal should consist of some sort of flesh food plainly cooked, with green vegetables, as already recommended. One kind or another of green vegetable is to be obtained all the year round, but occasionally such a vegetable as turnip (with 5 per cent of carbohydrate in the form of pectose) may be allowed, for the patient after a time longs for an occasional change. Carrots, on the other hand, cannot be allowed, owing to the large amount of carbohydrate they contain (10 per cent of sugar).

The evening meal, again, may be begun with a *small* quantity of *consommé*—for such promotes digestion—no rich heavy soup on any account. Flesh food follows, and fish, joint, or bird may be allowed. No large number of courses, however, is to be recommended. A custard, or junket and cream, should be permitted only when *one* flesh-course has been taken. The less fluid drunk with the meal the better, and on no account should long draughts be taken. It is the writer's experience that when carbohydrates are reduced to a minimum, patients have no desire to drink much.

For the sufferer from angina pectoris, it is certainly important to rest after a meal. Great risk may be incurred by neglect of this rule, and this risk is so much the greater if the meal has been a "mixed" one, like the luncheon and dinner of ordinary society. In the case of the poor, no less care must be taken with regard to the dietary, and the difficulties to be overcome are much greater ; but with a knowledge of the composition and price of different food-stuffs they can be overcome. Excessive bread-eating, inasmuch as bread is a cheap food, offers the greatest difficulty in the case of the poor : on the other hand, the small quantity of flesh-food usually obtained by them is perhaps a saving fact in their case.

The *Medicinal Treatment during the Inter-paroxysmal Period* should be directed against constipation, dyspepsia (essentially treated by dietetics), insomnia, and other disorders calculated to promote a seizure of angina. An excellent mixture for the relief of constipation and dyspepsia is 20 gr. of compound rhubarb powder

suspended in an ounce of peppermint water, taken three times daily. As regards pure insomnia, chloral is often useful, unless there be great feebleness of the heart. It acts on the arterioles as a vasodilator, and also as a depressor of the vigour of the heart-muscle. Chloralamide is safer, and whenever there is an element of dyspnœa or threatening of angina associated with the insomnia, a hypodermic of morphine and atropine is best. Arsenic has long been in use in the treatment of angina pectoris. It is usefully given in the form of liq. arsenici hydrochloricus, combined with liq. strychninæ, 4 or 5 min. of each in ½ or 1 oz. of water taken after meals. When there is any tendency to nocturnal attacks, a tabloid of erythroltetranitrate, ½ or 1 gr., may be taken each night at bed-time in anticipation of an attack.

Iodide of potassium is often recommended in arterial degeneration, but probably to be efficient the drug must be employed earlier than is usually the case. While the writer has perhaps too low an estimate of the value of the drug, a course of it is always safe, and may prove beneficial between the paroxysms of angina pectoris. Its tendency is to lower arterial tension. Its use might seem specially indicated in cases of syphilitic aortitis associated with angina pectoris and narrowing of the coronary orifices. The writer has repeatedly used it in such cases, but has never witnessed what may be termed a "specific" result. As far as the relief or removal of symptoms goes, he has never seen any result approaching in success that commonly witnessed in cases of intrathoracic aneurysm from the administration of the drug. *Graham Steell.*

ANKYLOSTOMA.—(See INTESTINAL PARASITES.)

ANOREXIA NERVOSA should be treated by isolation, and forcible feeding with or without the stomach tube, which is not often necessary, as the patient will generally swallow if fed with a spoon, and when isolated from anxious friends soon eats normally. These cases do well under Weir Mitchell treatment, but may relapse when they return to their homes. *Robert Saundby.*

ANOSMIA.—The treatment of anosmia depends entirely upon the cause. It may be (1) *Obstructive*, that is, due to any form of nasal obstruction which prevents the access of the olfactory particles to the olfactory area; (2) *Essential*, viz., an affection of the olfactory mucous membrane or nerve-endings; and (3) *Central*, that is, disease or injury of the brain or of the olfactory nerve or nerve centre. In the first form the treatment consists in the removal of the cause. If this can be effected, recovery may take place, although the sense of smell has been in complete abeyance for years. The most common cause of this form of anosmia is nasal polypus or œdema of the middle turbinate. The chief causes of essential anosmia are poisons, such as cocaine, morphia, and tobacco, and the toxins of influenza and syphilis. The treatment consists in the elimination of the cause. In syphilitic cases iodide of potassium must be given; in influenza the most hopeful treatment is the internal administration of large doses of strychnine and quinine; arsenic may also be tried. Good feeding and change of air are also beneficial. In central anosmia due to lesions of the brain, little can be done, but if the loss of smell be due to neurasthenia or hysteria, appropriate general treatment will often effect a cure.

H. Lambert Lack.

ANTHRAX.—In the external form the pustule must be excised, all affected tissue being removed as completely as possible. The resulting raw surface should be swabbed with carbolic acid (1–10). A few minims of a 1–20 solution of carbolic acid, in equal parts of water and ether, should be injected in six or seven places round and beneath the wound. A compress of the same solution should be applied, and over it an ice-bag (J. H. Bell). Instead of carbolic acid,

potassa fusa, or chloride of zinc paste, may be applied to the wound. Ipecacuanha powder, externally (after excision) and internally, has been strongly recommended by Dr. Muskett and the late Mr. Davies-Colley. In addition to local treatment, 20 to 60 cc. of Sclavo's serum should be injected hypodermically, and repeated if necessary. This serum is stated to be both antimicrobic and antitoxic. Such favourable reports have been published concerning it, that it should certainly be given a trial in all forms of the disease. (See also BACTERIOTHERAPEUTICS, and FEVERS, ACUTE INFECTIOUS).

E. W. Goodall.

ANTRUM, SUPPURATION IN.—(See NOSE, ACCESSORY SINUSES OF.)

ANTRUM, TUMOURS OF.—(See JAWS, TUMOURS OF.)

ANUS, Surgical Diseases of.

Anal Abscess. (See ABSCESS).

Epithelioma of the Anus.—(See also RECTUM, CANCER of).—Wide and extensive removal of the growth at the earliest opportunity is the only treatment. The sphincters must be unhesitatingly sacrificed, and it is best to perform a preliminary colotomy, so as to give the patient control over the evacuations and prevent contamination of the large wound which must result from removal of the growth. The patient should be discouraged from any attempts to treat the growth by X rays or radium, though there is no objection to trying such treatment for external ulceration if operative treatment has failed.

Anal Papillomata (Warts).—The commonest forms of anal warts are the condylomata which occur round the anus as a manifestation of secondary syphilis. These as a rule require no special treatment beyond that necessary for the constitutional malady. There is, however, a rare form of anal papilloma which is not syphilitic; the tumours hang in bunches like grapes, and are often very numerous. There is in such cases sometimes an antecedent history of secondary syphilis, but the condition is not affected by antisyphilitic treatment; excision of the growths is the only remedy.

Fissure of Anus.—By this we understand an ulcer just within the grasp of the external sphincter, and which calls for treatment on account of the extreme pain which it causes, and because it may result in a fistula. The only certain method of curing a fissure is to incise its base and divide the underlying fibres of the external sphincter. Palliative treatment with ointments, etc., is only successful in very slight cases; the time required for healing is often considerable, and the results are often unsatisfactory. Incision is followed by immediate and complete cure if properly carried out.

OPERATION.—The external parts are cleansed as well as possible, and the patient is anæsthetized. A straight cut is then made with a knife from the uppermost limits of the fissure straight through its base and well out on to the skin. The incision must be deep enough to divide all the base of the fissure and the outer fibres of the external sphincter muscle. Any bleeding that occurs is easily stopped by pressure. A small piece of wool is placed in the cut and a bandage applied. If the fissure is complicated, as it often is, by a small polypus or external pile, this is cut off with scissors at the same time. The wound should be dressed daily and the patient kept lying down till the wound is quite healed.

If a general anæsthetic is contra-indicated, the incision can easily be made under local anæsthesia. For this purpose some of the following solution should be injected with a fine hypodermic needle beneath the base of the fissure before making the incision.

℞ β-Eucaine Hydroch. (4 p.c.) 9 parts | Sol. Adrenalin (1–1000) 1 part

A cure can sometimes be effected by simply stretching the sphincter, but this must be done under a general anæsthetic, and it is unreliable; or in very slight

cases the patient may be kept in bed and the bowels kept acting loosely with an aperient, and in addition some such ointment as the following may be squeezed into the anus :—

R	Bismuth. Subnitrat.	gr. cxx	Vaselin. pur.		℥j
	Cocain. Hydrochlor.	gr. viij			

This should be in a collapsible tube with a bone nozzle, or used with an ointment introducer. Operation, however, is the best treatment, and the quickest in the end. Fissures should never be neglected, as they often cause fistulæ.

Fistula in Ano.—There is no treatment other than by an operation. When a fistula has been detected it should be operated upon as soon as possible; a much more severe one may have to be performed if it is neglected. Fistulæ are often divided into blind internal, blind external, and complete, but the treatment is the same in each case.

Operation.—This consists in freely laying open the fistula by a grooved director and knife, and then laying open all the side tracks, if there are any. If a single pocket or track is missed, the operation is almost certain to be a failure, and it is here that the difficulty of successfully operating for fistula arises. The sphincter should never be divided in more than one place, and care should be taken not to cut the muscle fibres on the slant. Small straight fistulæ should be cut out. Large and tortuous fistulæ must be laid freely open and all granulation tissue scraped away. The wound is then packed with gauze or wool and allowed to heal up from the bottom. Daily dressings are necessary, and healing is much accelerated by baths.

Contrary to what is often supposed to be the case, the operation for fistula requires special skill and considerable experience if a cure is to be obtained. This is well known to those surgeons who make a speciality of rectal surgery, for nearly half the patients presenting themselves for treatment have previously been operated upon, many of them several times.

(See also Colotomy and Pruritus Ani.) *J. Lockhart Mummery.*

AORTIC VALVULAR DISEASE.—(See Heart.)

AORTITIS.—(See Arteriosclerosis.)

APHASIA (in Hemiplegia.)—Right-sided hemiplegia is nearly always associated with some defect of speech, except in left-handed people. In some cases the defect is transitory, in others permanent. If transitory, it is because either the speech centres and their connections on the left side of the brain are temporarily damaged, but not destroyed, or because those on the right side take on the function of those on the left. If permanent, it is probable that not only the speech centres on the left side, and their inter-connections or commissures, are destroyed, but the path through the corpus callosum between them and the right-sided centres is broken.

It is impossible in a given case to say whether or not the callosal fibres are interrupted, and therefore each case should have the benefit of the doubt, and treatment will aim entirely at *re-education* of the right-sided speech centres, when those on the left side have been injured.

The varieties of speech defects in hemiplegia are numerous and complicated. Only the simple and uncombined forms can be considered here, with reference to treatment.

Aphasia may be (*a*) *Motor*, (*b*) *Sensory*.

(*a*) In purely **Motor Aphasia** the patient understands spoken and written or printed words and sentences, but mispronounces and cannot articulate, or he utters "dead propositions" or set phrases such as "dear, dear!" whenever he

speaks. He is conscious of this defect. He may be able to write spontaneously or at dictation, and to copy—after practice—with his left hand. The treatment consists in endeavouring to teach him to articulate on the oral system, as practised in the deaf and dumb.

(*b*) **Sensory Aphasia** may be *Auditory* or *Visual.*

In *Auditory Aphasia* there is "word deafness." The patient cannot understand spoken words, although he hears them. He can copy, but cannot write at dictation. He may be able to speak, but uses wrong words without knowing it, in contradistinction to the motor aphasia.

The treatment consists in endeavouring to rouse the *Visual* memory of words and objects when audition of their names and sounds conveys no meaning. Thus, a spoken word should be written or shown in print, and an object or picture of it displayed, whilst mentioning its name to the patient.

Word Blindness.—Here the patient may be able to write spontaneously or at dictation, even with eyes shut, but does not understand written or printed words, nor can he copy. He cannot read aloud (Alexia). *Treatment* consists in teaching him to trace written or printed letters with his finger in the air, or to use the "Braille" raised-letter system as employed for the blind.

The combination of "word blindness" and "word deafness" constitutes "mind blindness," in which the unfortunate patient recognizes neither persons, objects, nor words.

Here it is only possible to attempt to educate the sense of touch, a method which proved of signal success in the cases of Laura Bridgman and Helen Keller, who were deaf, dumb, and blind.

Verbal Amnesia is usually associated with some word deafness and motor aphasia. In its simplest form the patient cannot recall words or the names of objects. He can copy and understand written and spoken language, but cannot write spontaneously. He may be able to write a single word at dictation. He can repeat words and names of things at dictation, but immediately forgets them. He should be encouraged to repeat strings of words and names over and over again, his vocabulary being daily enlarged.

Agraphia.—In all cases of right-sided hemiplegia the patient should be encouraged to write with his left hand, and indeed to use his left hand as much as possible, for working and other purposes, in order to stimulate the right side of the brain. When motor aphasia is present, however, attempts to write are often impossible until the patient has recovered some powers of articulate speech.

When word and letter blindness are not present, the curious errors, such as repetition of syllables and substitution of consonants, which render writing unintelligible, may be overcome by practice of copying.

In all cases of aphasia the principle of treatment is to observe first the main defect, and then to devise appropriate exercises to remedy it. Such exercises should be of the simplest nature at first, and each should be mastered before more complex ones are attempted.

Exercises should never be practised long enough to cause fatigue, and should be repeated frequently, for short periods, during the day. *Leonard G. Guthrie.*

APOPLEXY.—(From Cerebral Hæmorrhage, or Occlusion of Cerebral Vessels.) (See also COMA and HEMIPLEGIA).—Apoplexy implies loss of consciousness, of sensation, and of voluntary movement occurring, more or less suddenly, in consequence of rupture or occlusion of cerebral vessels. Both cerebral hæmorrhage and occlusion of vessels may take place without loss of consciousness, but in this paper only cases in which unconsciousness attends or supervenes on either condition will be considered as apoplexy.

Deep and instantaneous coma is rarely the result of an intracerebral vascular

lesion. When it occurs, the lesion is usually so extensive as to render treatment hopeless.

Most cases of apoplexy may be divided into two stages, which it is important to recognize, as each requires treatment appropriate to its cause :—

1. *The Initial Shock.*—Collapse or syncope, with loss of consciousness, often preceded by sudden vertigo, pain in head, and vomiting. To this stage the term " cerebral surprise " has been applied. It is usually followed by a rally or return to consciousness, succeeded more or less gradually by :—

2. *The stage of Apoplectic Coma.*

Diagnosis is always a matter of probability rather than of certainty. Guidance is afforded by knowledge of the various causes, by the patient's age, and the condition of his heart, vessels, circulation, and kidneys, and by his history. Hæmorrhage may be suspected in the middle-aged and elderly ; occlusion of vessels in the old and young. Hard arteries are not proof of hæmorrhage, but high arterial tension is in favour of it. Chronic Bright's disease is the most frequent cause of hæmorrhage. In young adults, not subjects of chronic interstitial nephritis, thrombosis or embolism is more probably the cause than hæmorrhage. Embolism is most likely in cases of mitral stenosis, or in cases calculated to promote intracardiac thrombosis. In young adults, too, in whom no other cause can be detected, thrombosis due to syphilis may be divined.

Some help is afforded by the mode of onset. " Cerebral surprise," or initial shock, is most commonly the result of sudden hæmorrhage or occlusion of a large vessel by embolism.

In thrombosis, premonitory symptoms, such as headache, mental confusion, giddiness, weakness, or paræsthesia of limbs, are fairly common. It should be remembered that hæmorrhage not infrequently takes place into areas previously softened by the effects of thrombosis.

Post-epileptic coma may be indistinguishable from apoplexy except by eliciting a history of former epileptic fits. Narcotic coma can only be distinguished from apoplexy by circumstantial evidence. Hæmorrhage into the pons varolii strongly simulates opium poisoning. In the former the temperature is usually high ; in the latter it is low. Diabetic and uræmic coma must be thought of, but are hardly likely to be confounded with apoplexy, when the patient's history is known. Albuminuria is in favour of hæmorrhage.

Finally, cerebral hæmorrhage is not confined to stout, plethoric, short-necked, quick-tempered, gouty individuals, who indulge in gross feeding and alcohol. It may also occur in meagre, debilitated ascetics.

I.—APOPLEXY FROM CEREBRAL HÆMORRHAGE.

Causes of Cerebral Hæmorrhage.—Healthy vessels do not burst. The factors concerned in producing cerebral hæmorrhage are :—

1. Disease of vessel walls, which renders them weak or brittle. Such disease may be atheromatous, syphilitic, inflammatory (from septic infarct), or degenerative, associated with chronic interstitial nephritis or senile decay.

Chronic interstitial nephritis is found in from 60 to 70 per cent of fatal cases of cerebral hæmorrhage. This may be the cause in children, adults, and elderly people. Miliary aneurysms may give rise to hæmorrhage.

2. The second factor is a powerfully acting heart (hypertrophied), with general increase of arterial tension, causing increased supply of arterial blood to the brain.

3. Obstruction of cerebral *venous* circulation, occasioned by any violent exertion, or by semi-asphyxia arising during sleep. These conditions may put a bursting strain on weakened vessels.

The commonest site of hæmorrhage is in the neighbourhood of the internal capsule supplied by lenticulo-optic and striate branches of the middle cerebral artery. Hæmorrhage easily makes its way thence into the ventricles of the brain. The next most frequent site is the pons varolii.

Treatment.—The treatment of intracerebral hæmorrhage naturally falls

under two headings: (1) To arrest bleeding from the ruptured vessel; (2) To relieve pressure-symptoms produced by the extravasation. In both, treatment must be based on physiological and pathological data, and also on the symptoms present.

1. To Arrest Hæmorrhage.

Bleeding from a ruptured intracerebral artery cannot be directly controlled. The vessel cannot be compressed or tied. Probably, arrest of hæmorrhage would never take place before the patient died were it not for pressure of the extravasated blood upon the ruptured vessel, and sealing of the aperture by spread of coagulation. It is only possible to favour coagulation by lowering the flow of blood through the perforated artery.

Effects of Shock or Syncope.—The initial shock or collapse caused by giving way of an intracerebral vessel will tend to stay the hæmorrhage by reducing arterial blood supply. Hence strenuous efforts to rouse the patient and to restore consciousness under this condition are inadvisable. The hæmorrhage may recur with the return of consciousness.

Initial shock from hæmorrhage is unlikely to be fatal unless the rent in the ruptured vessel be large. Masterly inactivity is the best policy. Injections of strychnia, digitalis, ether, and brandy, should be avoided.

Absolute rest in recumbent position, with head and shoulders slightly raised, should be secured. The room should be cleared, if crowded, and kept airy; the patient's collar should be taken off. Life may be usually sustained by warmth; hot flannels may be applied to the præcordia, hot bricks or bottles to the feet, and between the thighs.

Brandy, almost invariably, will have been poured down the patient's throat in more than sufficient quantity before the doctor arrives. When otherwise, a few drops may be placed on the tongue or used to chafe the lips. To avoid the imputation of doing nothing, anxious relatives and bystanders may be despatched on various quests for hot water, bricks, blankets, bottles, pillows, rugs, and sal-volatile.

Rest and warmth are the best means of retaining life, without endangering it by starting hæmorrhage afresh.

Whenever possible, the patient should be kept for at least twelve hours in the place where the seizure has occurred. When removal home or to a hospital is unavoidable, it should be effected in an ambulance, not in a four-wheeled cab. When a bulky man is seized by apoplexy in a dining room, it is safer to improvise a couch for him there than to convey him to a bedroom upstairs. Unfortunately, as soon as he regains consciousness, he usually insists on walking upstairs or going home at once. Recurrent hæmorrhage follows in consequence. Many lives have been thus sacrificed.

Syncope probably checks hæmorrhage and allows time for coagulation to occur. Unless it is so profound as to endanger life, it should not be energetically treated. With reaction from syncope, hæmorrhage may be renewed with symptoms of so-called ingravescent apoplexy. The patient becomes increasingly drowsy until comatose. Localizing signs, such as hemiplegia, make their appearance.

The methods designed to stay recurrent hæmorrhage are:—

(i) *Arterial Depletion.*—The indications for arteriotomy of the temporal artery were long considered to be a forcible, rapid, or slowly heaving heart, with a full, bounding, incompressible pulse.

Undoubtedly a powerfully acting heart, together with a condition of general high arterial tension all over the body, will increase the force and rapidity of the blood-flow through the ruptured artery in the brain. Hence it seemed the

obvious course to let out blood from over-filled arteries. Temporary benefit from cutting the temporal artery was often remarkable. The patient quickly recovered consciousness, even whilst the blood was flowing, but speedily lost it again, because he fainted. If he died, some said he was bled too much, and others not enough. The former conjecture was probably correct.

On pathological grounds it is difficult to see how arteriotomy could be beneficial. The general high tension which prevails in most cases of cerebral hæmorrhage is due, not to absolute but to relative plethora, consequent on general vasomotor constriction. Abstraction of a large quantity of arterial blood under these conditions might certainly relieve cardiac labour, but only momentarily, for, given continuance of vasomotor constriction, high tension must soon recur, and in a patient rendered weaker than before by loss of arterial blood. Arterial blood is life. It cannot be profitable to lose it. In the case of venous blood it may be otherwise. If, as stated, high arterial tension and blood pressure depend upon narrowing of the calibre of arteries and arterioles in general, the most reasonable course would be to *increase the calibre of the blood-vessels* rather than to *diminish their contents*. The result would be to flood the body in general with arterial blood, and so deplete the cerebral arterial supply; for the cerebral vessels have no acting vasomotor system, and therefore when the general arterial system is contracted the cerebral arterial supply is increased.

Crude methods of "determining blood" to the surface and extremities so as to diminish the supply to the brain have always formed part of the stock treatment of cerebral hæmorrhage. Sinapisms, rubefacients, hot irons, Burgundy pitch plasters to the calves and soles of the feet, blisters to the nape of the neck and to the shaven scalp—"universo capiti"—were styled counter-irritants, but were really barbaric means of withdrawing blood from the brain to distal parts. Their net result could only irritate. Celsus summed them up as "means which often only delay death when it seems at hand, and meanwhile prove troublesome to life." Less antiquated methods which have once been used are, "Junod's boot," in which air is partially exhausted around the limbs; and the application of constricting bandages to their proximal parts. Local measures of the kind can only be of infinitesimal value.

The use of a hot-air cradle over the lower limbs is perhaps reasonable in theory, but has the disadvantages of raising the temperature generally, and quickening the pulse. If used, the temperature of the air-bath should not exceed 180° F. or thereabouts.

Nitrite of amyl and nitroglycerin produce flushing, throbbing of vessels, headache, with dilatation of vessels, fall of general arterial pressure, and *greatly diminished cerebral circulation* (Hill). Hence, when vasomotor constriction is producing high arterial blood-pressure and increased cerebral circulation, the use of nitrites would seem to answer all purposes required, without the disadvantage attending arteriotomy. The objection which may be raised against nitrites is that by their direct action on the blood they may increase asphyxia, which, after all, is the chief danger to be apprehended in cerebral hæmorrhage. Their utility in cases of generalized arteriosclerosis in decrepit elderly subjects is doubtful, but in youngish patients whose vessels are on the whole sound, though in a condition of generalized constriction, nitrites may prove valuable.

Inutility of other drugs as Hæmostatic Agents.—Such drugs as ergot, adrenalin, digitalis, and strychnia, which raise arterial blood-pressure by causing contraction of arterioles, cannot be recommended in cerebral hæmorrhage. The main object of treatment is to keep arterial blood-pressure low. In the majority of cases the pressure is already too high. The above-named drugs can only increase it if the contractile elements of the vessels are in working

order. Chloride of calcium has been suggested owing to its action in increasing the coagulability of the blood. If it could be employed for some days before the occurrence of the hæmorrhage, no doubt it might be beneficial. To use it afterwards would seem to be as reasonable as to attempt to stop a leak in a water-pipe by putting plaster of Paris in the cistern.

(ii) *Direct Compression of the Carotid Artery.*—If one can be certain that bleeding has occurred from an intracerebral branch of the carotid, e.g., middle cerebral, and not from a branch of the postcerebral or basilar, compression of the common carotid is a logical procedure. Ligature of the vessel is an operation too formidable to need consideration.

Finally, hæmostasis may be favoured by keeping the head and shoulders slightly raised and the feet dependent. Application of an ice-bag or Leiter's tubes to the head may perhaps be beneficial.

2. To Relieve the Pressure Symptoms.

The Second or Pressure Stage of Cerebral Hæmorrhage.—The symptoms are coma, with stertorous, laboured, irregular respiration, lividity or congestion of face, turgescent throbbing cervical veins, glistening conjunctivæ, pupils dilated or contracted, nystagmoid movements of eyeballs, and sometimes convulsions. Respiration gradually fails, may become of Cheyne-Stokes variety, or gasps occur at increasing intervals, until the last breath is drawn. The pulse at first may be full and bounding, quick or slow. Later, arterial blood-pressure falls as signs of pulmonary obstruction appear, and the air passages become choked with bronchial secretion. The pulse then becomes small, weak, and irregular, the right side of the heart dilates, becomes engorged, and blocks the entry into it of venous blood. As a rule the heart continues to beat after respiration has ceased. Death is due to asphyxia.

The symptoms are those of acute cerebral anæmia. They are produced by compression of cerebral vessels by the extravasated blood. Anæmia thus caused, affects the bulbar respiratory centres, and so gives rise to asphyxia and gradual respiratory failure.

Asphyxia in apoplectic coma is also partly due to mechanical obstruction to air-entry into the lungs. This is indicated by the familiar stertor, and is caused by paralysis of tongue, palate, and cheeks, and by weakness of respiratory muscles and accumulation of mucus in the bronchi. Such mechanical asphyxia impedes the return of cerebral venous blood to the heart, and thus causes cerebral venous congestion, which aggravates intracerebral pressure already occasioned by the hæmorrhage.

Venous congestion and anæmia produce similar effects; both starve the respiratory centre of oxygen.

Treatment should aim at (i) Relief of direct pressure on the brain by the existing clot; and (ii) Prevention or counteraction of secondary pressure (venous congestion) occasioned by mechanical asphyxia.

(i) *Methods of treating Cerebral Compression caused by Hæmorrhage.*—In traumatic cases, when the bleeding is from a meningeal vessel, and upon the surface of the brain, the obvious course is to trephine, close the bleeding vessel, and turn out the clot. The method in such cases has been strikingly successful. This is inapplicable in cases of spontaneous intracerebral hæmorrhage. In such cases palliative trephining has been suggested, with a view to lessening intracranial pressure; but Hill has shown that removal of a small circle of bone gives no relief; for the brain simply presses up against the trephine hole and closes it like a valve. Removal of a large portion of a cranial bone might relieve by allowing compensatory expansion of the volume of the brain; but so formidable a procedure is quite unjustifiable in practically all cases of intracerebral hæmorrhage. Moreover, the result, in all likelihood, would be to create fresh hæmorrhage.

No treatment can obviate the results of direct compression of cerebral vessels by a clot in the interior of the brain. We can only try to prevent increase of the pressure which already exists.

(ii) *Asphyxia*, due to mechanical obstruction of respiration, may be combated by drawing forward the tongue and chin, placing the patient on his side, so that

secretion may trickle out of the mouth instead of passing down the trachea. He should lie on the paralyzed rather than on the non-paralyzed side, in order to allow the latter some scope for action. When the bronchi are becoming choked with mucus, injection of atropine may check the secretion. Atropine, moreover, may be useful in stimulating the respiratory centre and in lowering arterial tension.

Venous Depletion, indirect and direct.—Purgation by calomel or croton oil answers the purpose of indirect depletion, and may in clear cases of cerebral hæmorrhage be recommended. *Venesection* fell into disrepute in apoplexy because it was carried to excess, and used indiscriminately for all cases of unconsciousness, whether due to hæmorrhage, occlusion of cerebral vessels, or simple syncope. The indications for venesection are, however, fairly clear, and if correctly observed it is difficult to believe that abstraction of a few ounces of venous blood can be otherwise than beneficial in cases of cerebral hæmorrhage in the second stage. The condition which venesection may relieve, is venous congestion of the brain, intensified by obstruction of exit of the blood from the right heart, such obstruction being the result of asphyxia.

When the left heart labours in vain to overcome resistance afforded by high arterial tension in front, backward pressure is induced in the right heart, which becomes engorged and unable to empty itself. Backward pressure spreads to the jugular, and thence to the cerebral veins ; a condition which aggravates pressure already produced by the intracerebral clot. The condition can only be rationally treated by temporarily aiding the right heart and removing the intravenous cerebral pressure by tapping a vein.

The condition which warrants venesection is manifested by a full, tense pulse, a labouring heart, with failure and acute distension of the right auricle and ventricle, and engorgement of the cervical veins. Venesection is contra-indicated by a weak, small, fluttering pulse, with failure of a chronically (not acutely) dilated heart in debilitated, aged subjects.

When coma is profound and lasting, and the hæmorrhage extensive, venesection is unlikely to afford even temporary benefit ; but when venous engorgement and distension of heart and veins have been largely brought about by mechanical obstruction of respiration, venesection, together with means to secure free entry of air into the lungs, may tide the patient over the immediate danger of death from asphyxia. Venesection may in fact relieve an acutely distended heart in those circumstances, as it undoubtedly does in cases of distension due to purely intrathoracic causes of obstruction.

Methods of Venesection.—Although it would seem most rational to draw blood from the external jugular vein, with a view to relieving at once both heart and brain, it is safer, easier, and perhaps as efficacious, to open a vein at the bend of the elbow, in the usual manner.

The opening in the vein should be free, and not more than 8 or 10 oz. of blood should be withdrawn, as speedily as possible. The operation should never be repeated. When it is found impossible to overcome the prejudice of the patient's friends against bleeding, the application of two or three leeches to each mastoid process may be recommended ; or dry cups may be employed extensively over the chest. Dry cupping is painless, and causes but little disturbance to the patient.

Diuretics are probably of little value, but distension of the bladder should be looked for, and relieved by catheterization, even when there is incontinence of urine.

Finally, to avoid entry of food into the larynx, an unconscious patient should be fed by nasal tube. The danger of bed-sores and burns by hot bottles should be anticipated.

II.—APOPLEXY FROM OCCLUSION OF CEREBRAL VESSELS.

Causes: (1) Embolism; (2) Thrombosis.

Embolism arises from

(*a*) Detachment of fibrin from a diseased cardiac valve — most commonly the mitral (mitral stenosis); more rarely the aortic valves, or an aneurysm at the base of the heart, or disease of the pulmonary veins, may be the source of embolism.

(*b*) In cases of prostrating illness, e.g., enteric fever and diphtheria, coagulation may take place in the cardiac cavities, especially the left auricle, whence thrombi may be swept into the cerebral circulation.

An embolus large enough to block a cerebral vessel of considerable size can only come from the left heart, or from its vessels.

Thrombosis.—The causes are

(*a*) Diseases of the vessels, which are the same as those which give rise to hæmorrhage.

(*b*) Morbid blood conditions which increase coagulability, e.g., chlorosis, diabetes, and perhaps gout.

(*c*) Prostrating illness, e.g., typhoid, diphtheria, exhausting confinement and lactation, hæmorrhage.

(*d*) Feeble circulation in elderly or debilitated subjects.

TREATMENT.—In hæmorrhage, as we have seen, the main desiderata are a quietly working heart and low arterial tension, in order to favour stagnation and hasten coagulation at the site of the injury.

In occlusion by thrombosis of a cerebral artery, one desires to stimulate the heart, raise arterial tension, and accelerate the circulation, in order to lessen the tendency to further coagulation.

Initial Shock or Syncope produced by Occlusion of Cerebral Vessels.—Although probably beneficial in hæmorrhage, syncope must be the reverse in cases of vascular thrombosis, and it is therefore important to revive the patient as speedily as may be.

Warmth is essential. Bags of hot water should be applied to the præcordia, heat being the best of cardiac stimulants. The patient should be recumbent; the head and shoulders low, but not too low, lest return of venous blood from the brain be impeded. The foot of the bed should be a little elevated. As soon as consciousness returns, the head and shoulders may be slightly raised and the end of the bed lowered.

Stimulants must be given, but not too freely. Physiological considerations must be subservient to pathological conditions present. For in thrombosis due to local atheroma, excessive stimulation may rupture the weakened vessel, and cause hæmorrhage into an area of brain already softened, and thus make matters worse. Such hæmorrhage is by no means uncommon. Again, in cases of embolism from detachment of fibrin from a diseased cardiac valve, vigorous stimulation may dislodge another embolus.

A single dose of ether and ammonia, or a tablespoonful of brandy, may be given at once; smelling salts or burnt feathers may be held under the nostrils. Such measures will be sufficient to cause a rally, without undue vascular excitement.

Purgatives.—The common custom of giving, indiscriminately and at once, croton oil or a large dose of calomel to all patients who are found unconscious and hemiplegic, cannot be too strongly deprecated. Infinite harm may be done by drastic purgation in cases of thrombosis. The patient is weakened thereby, and his blood rendered more coagulable than before. It is a safe rule to avoid drastic purgatives in all cases of apoplexy in early stages, except, perhaps, when the diagnosis of hæmorrhage in robust, plethoric, heavy drinking and large eating individuals, is clear.

When consciousness returns in cases of vascular occlusion, a dose of castor oil, followed if necessary by a simple enema, is quite sufficient to secure evacuation of the bowels.

To Prevent the Spread of Coagulation.—Arterial tension may be raised, cardiac force increased, and circulation quickened, by cardiovascular stimulants. The indications for their use must depend upon the actual condition of the cardiovascular system. For instance, such drugs as strychnia, digitalis, and ergot may, by causing extreme vascular constriction, seriously embarrass a weakened and dilated heart. Except in cases in which extensive degeneration of the walls of arteries and arterioles precludes the possibility of their reacting physiologically to drugs, cardiac stimulants should be combined with vascular dilators, such as nitroglycerin.

Nitrite of amyl and nitroglycerin alone are contra-indicated in thrombosis of cerebral arteries, owing to their action in depleting cerebral vessels by lowering systemic arterial pressure. But this effect may be counteracted by giving digitalis, or, better still, strychnia simultaneously. With this object, nitroglycerin in one-drop doses of the 1 per cent solution may be given with 2 or 3 min. of liq. strychninæ. On the other hand, it must be remembered that neither vasomotor dilators nor constrictors can have much action on vessels whose walls are extensively atheromatous and rigid. After death in such cases one may find the brain substance softened to fluidity, and the vessels suspended in it like branches of dried seaweed. Treatment in these conditions is obviously futile.

Powerful cardiac stimulants can only, as said before, tend to burst atheromatous and thrombosed vessels, by increasing cardiac force and rapidity. Strychnia, strophanthus, digitalis, and perhaps ergot, may be given when thrombosis seems to be the result of general enfeeblement, cardiac weakness without disease, and morbid blood conditions.

Thrombosis due to Syphilitic Endo- and Peri-arteritis.—No cases seem to be more promising for the success of treatment, and yet are more disappointing, than these. The hemiplegia which results is often permanent, and antisyphilitic treatment is useless. This is doubtless because, if blood supply is cut off from an area of the brain for any length of time, the brain tissue dies. However, in a certain proportion of cases the circulation is not entirely cut off—the nutrition of the brain is merely impaired, and may be restored. Therefore, in all cases the patient should be subjected to mercurial treatment. Inunction with mercurial ointment until slight salivation occurs is the best course. The innumerable preparations of mercury for subcutaneous or intramuscular injection are yet on their trial. Many of them seem not to be absorbed after injection, and practically all are painful. The iodides may be given in small doses (7–8 gr.) three times daily, but large doses should be avoided, on account of their tendency to promote coagulation.

Treatment of Coma following Vascular Occlusion.—Deep coma is less common in cases of occlusion of cerebral vessels than in those of hæmorrhage ; but when a large vessel is plugged, it may occur with resolution of limbs and interference with respiration as profound as in hæmorrhage. The symptoms are in fact the same as those of pressure by intracranial hæmorrhage, and considering that diminution of cranial contents rather than increase must be the result of blockage of a large vessel, it is difficult to explain their occurrence.

The investigations of Mott, Horsley, and others, however, have shown that pressure symptoms are due to anæmia of the bulb, a condition produced as much by hæmorrhage as by cutting off of the cerebral arterial blood-supply, or by intracerebral venous congestion. Deep coma following occlusion of cerebral arteries is therefore due both to anæmia and to venous congestion, which must necessarily be the consequence of arterial blockage.

When, therefore, signs of respiratory embarrassment with venous engorgement and cardiac dilatation are present, the treatment does not differ from that of

the same condition occurring in consequence of cerebral hæmorrhage. The danger of *mechanical asphyxia* from obstruction of entry of air into the lungs should be averted by attending to the patient's position, as in cases of hæmorrhage.

When suffocation from accumulation of bronchial secretion threatens, atropine, $\frac{1}{100}$ gr. with strychnia, may be injected hypodermically, with a view to checking the secretion of mucus and stimulating respiration.

Calomel may now be given in order to relieve abdominal venous plethora. Pulmonary congestion should be treated, and the right heart relieved by dry cupping. Cerebral venous congestion may be lessened by leeching the mastoid processes. Direct abstraction of blood in these cases is regarded as inadmissible; yet venous congestion, unless relieved, will in all probability prove fatal. Venous blood is useless to the brain for the purpose of nutrition. One is therefore justified in these circumstances in attempting to relieve immediate necessities by withdrawing a few ounces of venous blood.

After-treatment of Thrombosis.—The distressing headache due to inflammatory reaction which follows thrombosis, may be alleviated by leeching the mastoid processes. No more than two leeches should be applied. Phenazone with citrate of caffeine may also be administered, for relief of headache and pyrexia, and an ice-cap may be affixed to the head. Diuretics, such as spirit of nitrous ether in ½-dr. doses, are also useful.

Convulsions or delirium are not uncommon during the reactionary stage, and if they do not yield to the measures mentioned above, bromides in moderate doses (½ dr.) may be given, with digitalis.

The majority of subjects of thrombosis are debilitated and worn out. They require nutritious and easily assimilated food, but care should be taken not to overload digestive powers. Bland fluids, such as barley-water, may be freely supplied, in order to lessen viscosity of the blood. Alcohol may be needed when the heart and pulse are weak and fluttering, but should be withheld, if possible, during the reactionary or febrile stage.

The greatest care should be exercised in prevention of bed-sores. The bowels should be regulated without active purgation, and retention or incontinence of urine appropriately treated. Tranquillity of mind and body are essential, for any cardiac disturbance may be followed by reactionary failure and extension of thrombosis.

Treatment of Embolism.—Treatment can neither dislodge nor dissolve an embolus. One can only hope to prevent the passage of other emboli into the cerebral circulation, and to lessen the thrombosis which succeeds embolism and makes the blockage more complete.

Complete rest is demanded in all cases. When a particle of fibrin has been detached from a diseased cardiac valve it is necessary to strengthen and steady the action of the heart; for irregularity and feebleness of the heart tend to increase the deposition of fibrin upon the valves, and excited cardiac action causes fibrin to be washed off into the circulation. Belladonna, strophanthus, and digitalis are the best remedies.

Embolism is most likely to occur in young subjects of heart disease, whose arterial walls are sound, and so the precautions which must be observed in cases of hæmorrhage and widespread atheroma need not, with regard to the drugs mentioned, as a rule, be considered in cases of embolism.

In cases arising from detachment of a clot which has formed in the auricle—a condition associated with exhausting illness such as enteric fever or diphtheria, or with loss of blood after parturition or profound anæmia—cardiac tonics are needed, and attempts should be made to lessen coagulability of the blood. With the latter object, transfusion of saline solution, rectal, subcutaneous,

or intravenous, may be practised. When embolism is associated with septic inflammation in the pelvis, or elsewhere, treatment of course must be chiefly of such local conditions. The possibility of the formation of a cerebral abscess in such cases should not be overlooked.

* * * *

In conclusion, it must be added, that in most cases of apoplexy we have to deal with damaged hearts, kidneys, vessels, and morbid conditions of the blood. The treatment of such pathological states on purely physiological grounds is fallacious. As Hippocrates said, "Grave apoplexy is impossible, and mild is not easy, to cure." Recovery in a large proportion of mild cases is spontaneous, and more or less complete. Active treatment is therefore unnecessary and may be dangerous. In grave cases, treatment may be useless, yet that is no reason why it should be withheld when the symptoms and physical signs suggest rational measures for their relief. *Leonard G. Guthrie.*

APPENDICITIS. ~~(See also~~ and TYPHLITIS.) It is only within the last few years that the laws regulating the line of treatment for appendicitis have been in any way codified. There has been endless discussion on various points, the fundamental one being whether operative treatment should be carried out, and if so, the best time for performing the operation.

There is a certain group of cases, however, in which the treatment at the present time is practically unanimously agreed upon. I refer to the very acute attacks in which general peritonitis rapidly supervenes; the sooner these cases are opened and dealt with as described in the article on general peritonitis, the better. The details of the operative treatment really belong to the domain of special abdominal surgery; a few points, however, are dealt with in the article just mentioned. (See PERITONITIS.)

As soon as the practitioner has made the diagnosis of appendicitis, he is at once confronted with the problem concerned with the necessity of operative treatment. Only quite recently the question would have been formulated in the following way, "What are the reasons to justify one in advising operation in any given case?" At the present moment I think we are justified in wording this question inversely, and asking, "What reasons are there to justify the decision not to operate, or for delaying operation, in any given case?" This different wording of the question has come about owing to the great advance made by surgery in the treatment of acute inflammatory conditions of the appendix. Fortunately the public has been brought to regard the matter very much in the same light as the profession. People realize the great risks that are run by trusting to expectant treatment, and knowing the treacherous character of the attacks, they are quite able to approach the present position of the matter, especially if put in the form I have suggested, namely, What reasons are there that would justify a decision not to operate?

I will endeavour to arrange in groups the cases that the practitioner may be confronted with when first called to the patient.

1. *Cases seen at their Commencement.*—I put these first because they are the most responsible cases that the practitioner has to deal with. When the patient has not been seen by the doctor until a day or two after the commencement of symptoms, there is always a feeling on his part, and quite an excusable one, that if he had seen the case at its commencement, he would have been in a better position to decide upon the question of operation. This, however, is scarcely the correct way of stating the issue. In such cases time has often solved the practitioner's difficulty: it is the patient who often suffers by the delay in calling professional advice. Many authorities, especially in America, have for several years refused to admit any difficulty in deciding the

line of action in this group of cases ; their contention is that operation should be performed immediately, however early the patient is seen, provided the diagnosis of appendicitis can be reasonably made. The only treatment in their opinion is immediate abdominal section, followed by any operative procedures necessary for dealing with the condition found. It is difficult to take up any logical position antagonistic to this method of treatment. It is almost certainly true that if the patient is going to recover from an acute attack of appendicitis, an operation for removal of the appendix does not add to the risk of death to any material degree. Of course there *is* an extra risk in removing the appendix when it is in a state of acute inflammation, but in the hands of experienced surgeons this risk is a small one. On the other hand, we are able by this definite rule to save a large number of patients who must die if operation is not performed, or who must run an increased risk if operation is delayed. It is quite easy for men of great experience, skill, and judgment, to be wrong in the prognosis of these attacks. On the whole, therefore, I think we must agree that, when a case is seen at its early stage, operation is advisable unless there is some special reason which, in the opinion of the practitioner, renders operation in any particular case rather more risky than carefully managed expectant treatment.

2. *Average Cases.*—In the majority of cases the practitioner is called a day or two after the commencement of an attack, finding the position somewhat as follows : Acute abdominal pain with some sickness, commenced forty-eight hours previously ; for some hours the patient felt very ill and complained especially of griping pain in the abdomen ; with hot fomentations to the abdomen, and perhaps brandy taken internally, some improvement followed, and the doctor is not called owing to this lull in the attack. At the end of twenty-four hours, however, the patient complains of more pain, especially in the right iliac fossa, and after some hesitation the doctor is called in, usually at the end of the second day, or during the third. On examination he finds a tender swelling in the right iliac fossa ; the temperature 100 or 101, with little or no general abdominal pain, and practically no vomiting ; pulse of good tension, rather bounding ; abdominal respiration decidedly diminished. Such a case as this does not cause much alarm, especially as the symptoms seem to be improving, and indeed are improving, because the cases of this group remain local in their activity, and the aggressive symptoms progressively disappear between the fourth and the sixth day. Of course these attacks may recur, and at any recurrence the symptoms may suddenly present an acute and formidable aspect, placing the case in a much more serious group. This kind of case,where the practitioner is able to satisfy himself that the main attack is over on the occasion of his first visit, is the most satisfactory of all. He is able with considerable confidence to state that the case is not a serious one, and does not require immediate operative treatment. As soon as the patient is practically free from the symptoms, however, the question arises as to the removal of the appendix in order to render another attack impossible—a matter that will be referred to again.

3. *The Abscess Group.*—There are a certain number of cases somewhat similar to those of the preceding group in their general history, but the symptoms, instead of gradually subsiding towards recovery, remain. The temperature often increases to 102–3 or even higher ; the lump in the right iliac fossa, it is true may become less tender, but it does not disappear, and at the end of five to six days or earlier, a definite abscess is there. The treatment is obvious : the pus must be got rid of.

4. *Relapsing Cases.*—There are a certain number of cases in which the symptoms apparently clear up, and the practitioner may think that all danger is over, but about the fifth or sixth day an attack of pain which may be slight

or severe, an increase of temperature, and the ordinary symptoms of septic invasion, develop. This exacerbation indicates that the appendix is so far diseased that natural recovery is impossible, and it is a most important class of case to recognize. Very often the patient derives a certain amount of immunity from antitoxins absorbed during the early days of the inflammatory disturbance, and his condition does not appear so serious as it really is. With care it is not difficult to identify these cases. A sudden and unexpected increase in the cardinal symptoms occurring after an apparent improvement is a most significant indication. As a rule these relapses appear between the fifth and eighth day, and as soon as it is recognized, operation should be performed without a moment's delay.

5. *The time of Election for Operation.*—At one time there used to be a good deal of discussion on this point. There was a tendency to regard the decision to operate and the time for operation as quite different problems. As a matter of fact, at the present time these questions merge naturally one into the other. Whenever in an acute appendicitis it is advisable to operate, the operation should be performed without delay. The only exception to this rule is a patient who is obviously getting over an attack when he is first seen by the doctor, and it is decided to allow him to recover as already discussed in group (2). At one time it was largely held that in an ordinary attack of appendicitis it was better to delay the operation until after the fifth day, because by that time the local disturbance would be more localized, there would be less risk of opening up the general peritoneal cavity, etc. The improved methods of technique have shown that removal of the appendix, often when acutely inflamed, is a far less serious undertaking than it was a few years ago : so much so, that most surgeons think that even in an ordinary appendix abscess it is advisable not only to evacuate the pus, but to find the appendix and remove it. The risk of lighting up general peritonitis, etc., is as a rule quite small, and the patient is safer when the diseased appendix is removed than when the pus only is evacuated. The question of the time of operation therefore practically comes to this :—

(*a*) In all cases that are to be operated upon during the acute stage, the operation should be performed as soon as possible after the diagnosis has been made and the decision to operate arrived at.

(*b*) In those cases where it is obvious at the time of the practitioner's visit that the patient has a mild attack from which he is rapidly recovering, removal of the appendix is more safely carried out when the patient is convalescent ; in my opinion about a week or ten days after the temperature is normal, and after all other symptoms have disappeared. That there is any particular day during an attack of appendicitis when there is a minimum risk in operating is quite untenable.

Surgical Treatment.—The details of treatment of a case of appendicitis are most important, success or failure depending largely upon the carefulness and judgment with which the various points are dealt with. They may be best considered under the following headings :—

1. *The Pre-operative Treatment.*—One of the great difficulties a surgeon meets with when called in to see a case of appendicitis is to find out the exact condition of the patient when some form of narcotic has been used. It is surprising how small a dose of morphia or opium will improve the condition of a patient, not only as regards the subjective sensations, but also as regards the physical condition. As soon as the pain caused by the peritoneal inflammation is a little relieved, the whole of the reflex phenomena begin to abate, and we often find, after a quarter of a grain of morphia hypodermically, a marked improvement in the patient, lasting several hours, or even for a day. I think we may lay down

a definite rule that *no narcotic should be given to a patient suspected of appendicitis until the question of operation has been definitely decided.* Apart from the administration of anodynes, the patient receives great comfort from hot applications to the abdomen, especially applied to the right iliac fossa, and at the same time it is advisable to give an enema slowly, preferably by gravitation. In addition to this it is advisable to try and flush out the system, either by intra-cellular infusion or rectal injection of normal saline solution. In mild cases three-quarters of a pint of warm saline given every hour per rectum is very useful; in the more acute I prefer intracellular infusion, regulating the apparatus so that from a pint to a quart is absorbed every hour. In the London Hospital my patients are given intracellular infusions as a routine practice as soon as possible after they enter the ward. Not only is the immediate improvement definite, but there is no doubt that the ultimate result is most beneficial: the patient is nearly always able to withstand the operation better. It is remarkable how a patient passing but little urine, in the course of an hour or so after absorbing saline solution passes a large quantity and feels better in himself. If there is much collapse, care should be taken to get the patient thoroughly warmed with hot bottles, etc., and the foot of the bed should be raised. If there is difficulty in getting the bowels to act by ordinary enemata, especially if there has been some constipation before the attack, a drachm of tincture of valerian to a pint of water, or the same quantity of turpentine, will often be beneficial. The question of administration of aperients in cases without operation has been much discussed. Some few years ago a period commenced when active purgation succeeded the traditional treatment of opium and fomentations to keep the bowels quiet. Now again most authorities are in favour of giving the bowels rest, after any accumulation in the sigmoid flexure or rectum has been got rid of by enemata. When the symptoms are obviously clearing up, in an average case from the fifth to the tenth day, enemata of soap and water, etc., with small and repeated doses of saline or calomel, can be given with safety and benefit to the patient.

2. *The Operation.*—It is scarcely within the province of this article to deal with the details of the operation itself. In cases of general peritonitis associated with the appendicitis, the treatment will be considered in the article on general peritonitis. (See PERITONITIS, ACUTE GENERAL.)

As regards the treatment of local appendicitis, in all cases any abscess should, of course, be incised and drained. If the operator has not great experience in abdominal surgery, it is not advisable to proceed to remove the appendix unless it is quite an easy matter. The safest plan is to be satisfied that there is free drainage of pus, making quite sure that there is direct and free discharge from the bottom of the abscess cavity. If one is experienced in abdominal surgery, I believe it is best in practically all cases, after evacuating the pus, to proceed to the removal of the inflamed appendix. In many cases, after the abscess has been opened, trouble is caused by the diseased appendix causing burrowing of pus, etc., to the tissues around, or by septic process extending to the general peritoneal cavity.

3. *Post-operative Treatment.*—Here, of course, it is most important to attend carefully to minute details of drainage, etc. Apart from these there is the very important subject of abdominal distension which is so liable to occur after these operations. In my experience, Tait's method, the routine administration of small doses, say a drachm each of sodium sulphate and magnesium sulphate, every three hours, is advisable. There is no doubt that the intestine is better able to empty itself with the aid of these salines. In addition, one may give strychnine internally or hypodermically. In cases where the toxic symptoms are marked, injection of normal saline solution should be recommenced, either intra-cellular or per rectum.

Henry Percy Dean.

ARHYTHMIA.—(See HEART, IRREGULARITY OF.)

ARTERIOSCLEROSIS* is not a clinical but a pathological name. The arterial tree, as a whole or in parts, may undergo injury or deterioration in the course of more than one series of morbid events ; moreover, however closely in their superficial, or even in their histological aspects, the diseased vessels in the advanced stages may resemble each other, it is probable that the intimate process of damage or decay is similarly various. If, towards the end of their life, they all abut upon a common form of decay, there may be nevertheless, and probably there are, several processes of initiation, each with its own primary pathological features.

In this article we have no direct concern with the histology of the subject ; yet, as the kinds of disease leading to such damage or decay of the arteries are several, each must have its own way, and its own means of therapeutical aid. I know of no such discrimination of the kinds of arterial disease but my own ; I must therefore use my own divisions, which are as follows :—

1. Arteriosclerosis, the effect of persistently high blood-pressure (hyperpiesis).

2. Arteriosclerosis, the effect of certain infections, such as syphilis, typhoid fever, lead, diabetes, etc. In many of these the blood-pressure is not necessarily, or usually, much increased, if at all ; in others, such as lead, it is raised throughout.

3. Arteriosclerosis, the effect of senile involutionary changes ; in this form, again, the arterial pressures do not exceed the quasi-normal increase general in later life. But the first process may supervene upon the third, temporarily or persistently, and not infrequently does so.

It is evident that these several processes, if justly contrasted, must arise in different ways, and be counteracted by means as different.

In the first variety, the hyperpietic, the increase of peripheral resistance upon which the rise of pressure depends is of obscure origin. The immediate cause is increased friction, which must depend either on a narrowing of the arteries themselves, or on an increase of viscosity of the blood ; or of course upon a combination of these factors. Russell-Opitz and his collaborators have shown that the viscosity of the blood varies considerably ; on the other hand, we know that the arteries may contract persistently over areas large enough to maintain a considerable rise in the general pressure. In health, such wide constrictions are neutralized by a dilatation of the vessels of the splanchnic area ; but we may suppose that the splanchnic may itself be the area of constriction, or, what seems less probable, that the compensatory mechanism is liable to get out of gear. The proximate cause of this arterial constriction may come from without, or may be a product of distempered metabolism ; and that there is such a poison of this origin, a poison akin to that of gout, which acts upon the vasomoter centre, or widely upon the vessels themselves, is a doctrine with many supporters.

Although my text is arteriosclerosis, and hyperpiesis in children does not lead directly to this injury, yet our outlook on the matter would be imperfect did I not allude at least to transient manifestations of excessive blood-pressure in them. If the duration of the disorder be too short to induce static disease in young vessels, nevertheless we are probably dealing with a process essentially the same. Indeed, even in children, frequent or persistent morbid excess of pressure produces some static change, though it is not permanent. The artery may thicken, but, after some uncertain time, it returns to its normal state ; the transient thickening probably consists only in a hypertrophy of the media, which, when no longer wanted, disappears. Children thus affected are usually more or less pasty-faced, dark under the eyes, sickly, headachy, and sluggish

* Without Bright's Disease.

in mind and body. Their tongues are sticky and dirty, the breath is foul, the bowels irregular, and the epigastrium and abdomen tumid. Often, by manipulating the epigastrium, squelches, if not true splashes, can be elicited. In these cases the rules of treatment, empirical as they are, are promptly efficacious. The diet must be restricted, particularly in respect of fats, sugars, meat, and strong broths. Even milk may be given too liberally in these cases, especially in its natural state ; for a child of ten years of age thus disordered, one pint of milk, prepared in this way or that, is quite sufficient for the twenty-four hours. The quantities of food must indeed be moderated in all directions, for the mother is too apt to stuff the child, or the school-boy to stuff himself. During the ailment, three or four rusks and a cup of milk is enough for breakfast ; a little light broth, with a biscuit, may be given in the forenoon, and at dinner some plain white fish, or chicken, with but little potato, and a light pudding. Full plates of farinaceous puddings are to be forbidden, as being flatulent, and clogging to the digestion. Light steamed bread puddings, a little blancmange, or the like, are to be preferred. Tea to be as breakfast, rusks or dry toast being preferred to thick slices of bread. Butter is to be given in scanty quantity, jam not at all. Some milk food will make a sufficient supper. The temperature in these cases sometimes rises a little in an irregular way ; if so, the food should be even more sparing for the time, and but little of it solid. If feverish, the patient must stop in bed ; but otherwise he is better about and, in fine weather, allowed to go out of doors for gentle exercise.

Of medicines, mercury is the chief. It may be administered as calomel or grey powder. As we are in the habit of using grey powder for children, this is the form of which I have most experience. Under the use of frequent fractional doses, the secretions improve, the breath sweetens, the actions of the bowels become more normal, and the stools less offensive. As children are very tolerant of mercury, we may rely on this drug for a considerable time ; say, for a child of ten, a quarter of a grain of grey powder thrice daily, and this in repeated courses of four or five days at a time. The mouth must be closely watched, and kept very clean. If the drug produces two motions a day, we need not hold our hand ; but if mucus becomes evident in them, the remedy may be reduced to twice, or once a day, or suspended for a while. As the tongue cleans and the other symptoms are mitigated, a bitter mixture may be administered. Children dislike bitters, but they are efficacious ; and if pleasantly flavoured with chloroform and the like will be taken by well-disciplined children readily enough. They should be taken before the meals. The diet may now be cautiously enlarged ; but fats, and even starches, are to be given with a sparing hand. These children are often of nervous stock, and their ailments may be coloured by whims and ill humours ; still, the disorder must substantially be one of the *primæ viæ*. When thoroughly clear of the disorder, it is helpful to give these patients cod-liver oil ; during the colder months of the year this fat is so well digested by the young that it may displace with advantage some of the other "rich" elements of the dietary. Under this kind of management —a method which is so familiar that I need not describe it in more detail— the full sustained pulse and obtrusive artery gradually subside. When the vessel returns to its normal tenuity I cannot say, as one loses sight of the patient before this quite comes about ; but when, at some later date, an opportunity arises for a re-examination, it will be found, if the amendment has been maintained, that the walls of the vessels have returned to their normal condition. Whether these children are more apt than others to fall into the hyperpietic disorders of later life, I am not yet able to say.

In hyperpiesis of the adult, the symptoms are of like character, and probably of like nature. Unfortunately, hyperpiesis often establishes itself in

the adult without betraying its presence, so apt is the bodily system in adjusting itself to abnormal conditions. Indeed, it seems that high pressure in the cerebral vessels may give rise, for a time, to a sense of wellbeing. Almost as I write these lines I discovered, in a man of sixty years of age, who reported himself as in excellent health, save for a skin eruption which had brought him to the physician, an arterial pressure of 190 mm. Hg. His radial artery was already a little thickened, and the left heart enlarged in a moderate degree. In such a case it is usually still possible to restore the health more or less completely, when the heart will return to the normal ; but it is not a pleasant task to spring upon a man, who had regarded himself as healthy, the duty of a long, close, and troublesome medical treatment, and much irksome management of his diet and habits. Yet, to continue in this disorder for a few years would lead to death by apoplexy (as it did, I was told, in my patient's father), or by failure of the heart to contend with the abnormal pressures ; if, indeed, life be not cut short sooner, as in such subjects it is apt to be, by an intercurrent pneumonia.

This patient will get rid of his plethora if he will pay the price ; his arteries are not perhaps much worse than hypertrophied, his heart, so far, is contending successfully with the stress, and there is no trace of Bright's disease. But at a somewhat later stage the outlook will not be so cheerful ; the circulation—heart and vessels—will get a permanently abnormal set, and a restoration of the normal balance of parts will be no longer practicable. In such a state, to reduce the arterial pressure to the normal level disturbs the artificial balance without re-establishing the original one, and the patient becomes weaker and less comfortable. Thus, after a time, treatment becomes a compromise, yet the compromise may be sufficient to prevent an apoplexy, and to husband the resources of the heart for some considerable time.

Happily, in these cases the heart is usually of good quality ; its coronary circulation, until it is embarrassed by atheroma, is at high pressure ; and even in advanced atheroma, if the progress of the disease be gradual, the nourishment of the heart, stretched and strained as it may be, is kept up, somehow or other, with an inexplicable steadfastness. Such patients are often kept more or less completely at rest for " a weak heart." Now these " weak " hearts are often staggering under an arterial systolic pressure of no less than 200–240 mm. Hg. ! Our treatment of " weakness " of this kind cannot be that of a heart failing intrinsically under ordinary or low pressures. Enlarged, such hearts certainly are, and at length a mitral leak may appear ; but even in spite of these disadvantages, they often hold on heroically. With great discrimination, and at certain moments, the physician may need such cardiac stimulants as digitalis or strophanthus ; but his first duty is not to spur the heart on, but to relieve it of its enormous burden. If a recovery of the normal adjustment be past hope, much can still be done to bring about a more equable balance.

In early and late stages of high pressure, the method of cure must be the same in principle. In most instances, at any rate, the rise of arterial pressure is due to excess of food, positive or relative. The subjects of this plethora, large eaters as they may be, may not be fat, nor ruddy ; often they are so, but not rarely they are lean and pallid. In others, the intake is not more than many persons can dispose of easily—individuals vary widely in their capacity for disposing of excess of food—but it is more than the capacity of a certain bodily habit. Many of these persons, in both categories, if they do not present a personal history of gout, yet come of gouty stock, and are wont to regard themselves as gouty. Moreover, treatment directed against the supposed gouty habit often answers to expectation. If the man be fat, he must gradually reduce his intake till he brings himself back to the normal weight of his earlier years—say to his

weight at forty years of age. To bring the food down gradually, even to half the quantity habitual to the individual, has in many cases the happiest results. And, although I am not of opinion that alcohol alone leads to atheroma, yet I am sure that, in conjunction with other causes—as with lead poisoning, for instance—it has a strong contributory influence. I think the same may be said, with less assurance, of tobacco. Alcohol therefore must be reduced to nominal amounts ; it is better to cut it out altogether. Tobacco may be used in strict moderation, unless there be signs of harm from it, such as cardiac irregularity. As regards the chief classes of food—the nitrogenous, the starchy, and the fats—I am of opinion that restriction should be carried farther in respect of the nitrogenous than of the other kinds, and of these, especially in respect of the foods containing purins. In many persons, the main point is the restriction of the whole quantity of intake, yet others are so little able to convert, normally and completely, even moderate quantities of food, that an abstemious diet fails to avert or to dissipate a morbid rise of pressure. Some of these patients are indeed of sedentary habits, such as elderly ladies or closet students, in whom ordinary quantities of food are relatively excessive, and the excretory functions sluggish. Sedentary mental work in towns seems, unfortunately, to create a sort of false appetite, although Chittenden's researches suggest that mental work makes a remarkably small demand on food. Briefly then, the customary intake of food is in most people excessive, in many persons very excessive ; and in hyperpiesis our first business is to bring the intake down to the real needs of the body, a standard often to be regulated by the scales. In spare persons who are not free feeders, we must be guided by the progress of the case, and by our clinical observation. As in eating, so in the swallowing of liquids, many persons are prone to excess. Thirst, like the appetite for food, acquires strength by indulgence, and thirsty people, by adding unnecessarily to the bulk of the blood, make excessive demands upon the capacity of the heart.

To turn now to the fate of the food ; we assume by the abiding high pressure that metabolism is imperfect, perverse, or its organs overstressed. Although it is an error to suppose that an annual six weeks' " cure " can take the place of a systematic, patient, and persistent method, yet from spa treatment very striking results are to be obtained. A course of waters taken under the eye of a resident physician, at Harrogate for instance, Carlsbad, Marienbad, or Homburg, is for the time very efficacious. Carlsbad is the severer course ; Homburg is suitable for mild cases, and for patients who must be gently handled. A course of waters, with the customary concurrent precautions, can, however, with a certain decision of purpose, be carried out at home, and repeated from time to time, as the symptoms, and the functions of bowel and kidney may indicate. Of single drugs in these states, none is to be compared to mercury, especially —for those who tolerate it well—calomel ; for others, blue pill. The calomel is to be given in fractional doses, say $\frac{1}{4}$ gr., once or twice daily for five days, a course to be repeated four or five times. In the intervals, small and frequent doses of podophyllin—$\frac{1}{10}$ to $\frac{1}{4}$ gr. thrice daily—may be prescribed, or euonymin, or iridin. From day to day some notion of the effects may be guessed at by the finger, but the blood-pressure should be measured at least once a week.

Of venesection for hyperpiesis I know nothing, and am ashamed to confess it. In these cases, which they recognized by the hard pulse, our forefathers took blood freely and periodically, and I believe with great benefit.

Vasodilator drugs have some, but not a predominant, part to play when the pressures are acute and urgent. Of them sodium nitrite is effectual, but it is not very easy to prescribe, and it is so variable in standard, that at one time a small dose is almost too prompt in its effects, at another, a dose three times as large appears inert. Where symptoms seem to call upon all our resources,

we may prescribe this drug with a few grains of nitrate of potassium, and eight or ten of the hippurate of sodium recommended by Dr. George Oliver; potassium iodide is incompatible with it. But it is rather by mercurial alteratives—the good effect of which is so well and quickly felt as often to provoke exclamations of gratitude from these patients—saline laxatives, and a modified diet, that we shall succeed in alleviating the heavy stress on the whole arterial tree.

Diaphoretic methods, at first sight likely to be useful to such patients, are, in my experience, disappointing. For them I have tried hot-air baths, such as the "Turkish," hopefully, carefully, and perseveringly; but they neither give relief to the patient (often indeed they cause discomfort), nor establish any abiding reductions of blood-pressure. Now I do not use them, nor any other baths. The Nauheim methods are not generally required in these cases in which the heart is good enough if it can have fair play; nevertheless there may be instances in which, after reducing the mean blood-pressures, baths and exercises, and digitalis may assist us in helping the heart back to more normal diameters. We must recognize the unwelcome truth that, when the patient has begun to suffer from dyspnœa, and the heart is dilated to the degree of mitral regurgitation, the heart has undergone defeat; a substantial and permanent restoration of cardio-arterial balance is not then to be hoped for. Reduction of pressure by heart-failure is not indeed to be desired. Something may yet be done, but too many leaves have been torn out of the book. Diuretics have their value especially when—as is often the case—the urine is of high specific gravity, scanty, and lateritious. But the class of patients now under discussion do not present the nausea, headache, epistaxis, and other symptoms of renal inefficiency. Polyuria is a frequent feature in all cases of high arterial pressures.

It is in the first stages of the malady, in sound subjects, when the abnormal pressures are not of long standing and the consequent ill effects upon the heart and vessels are incipient, or even yet to come, that periods even of from five to ten years may elapse without permanent strain. In the curable stage, unless the peripheral resistance be unusually high and obstinate, there are better methods for the restoration of the circulation than artificial baths and exercises; namely, natural exercises. In such cases, caught early—and we should now be catching them earlier and earlier—patients may be encouraged cautiously to take more and more exercise. When the heart, relieved of stress, has pulled itself together, and the blood-pressure is running at not more than 140–150 mm. systolic pressure, gentle games may be permitted, especially such as do not require sudden efforts. Gentle cycling on the level, quiet walking, even up gentle inclines, golf, and so forth, are useful. The efforts of tennis, even of the lawn variety, are too sudden. It is of enormous advantage if we can throw open the vast muscular areas to the blood currents, and thus lower resistance and wash away impurities. If all goes well, for patients disposed to recurrent hyperpiesis, but in whom the arteries betray as yet no definite signs of injury, there is no medicine like regulated hill-climbing. The precautions to be demanded in the initiation of this method are chiefly in the first few minutes of the excursion. When a healthy man essays to climb a hill, he will find that, during the first two or three minutes, the radial artery maintains its calibre; and so probably do the chief arterial areas in the body. During this period, the exertion must raise the pressure, embarrass the breathing, and throw additional stress upon the heart. But then, not gradually but rather suddenly, the radial artery dilates, perhaps to twice its size; this signifies, no doubt, the opening of other large arterial areas, and therewith pressures fall, and the respiration becomes easy; we get, as the phrase goes, our "second wind." During this initial period, no caution can be too great; but after this relief,

the walker can slowly proceed without distress. How far this searching but efficient method may be applicable to a particular case, must depend on the discrimination of the physician. From the age, let us say, of forty-five in every person, the arterial pressure should be measured every four or five years, and oftener if it be found above the mean for the period of life, or if morning depression of spirits, sleeplessness, constipation, biliousness, or other vague feelings of disorder, suggest that the exchanges of the body are something short of perfection. Such counsels are the more incumbent upon him who comes of a family in which gout or apoplexy has appeared.

For cases too far advanced for natural exercises, and for the initiatory stages of milder cases, massage is very useful, more useful, I think, than artificial exercises. If not done rudely, but with a gentle, patient manipulation, the muscular areas are opened, and stagnant humours expelled. Probably the flow of lymph is favoured and accelerated.

Of the effect of the high-frequency current in reducing excessive arterial pressures I have little definite knowledge. I have tried it in three or four cases —or rather have had it tried for me—and am disposed to think it had some effect in this direction. However, until blood-pressures are more accurately and systematically measured by therapeutists, their reports cannot be relied upon.

In respect of climate in hyperpiesis, I have nothing to say which will not be supplied by the common sense of the reader. In the involutionary form of arteriosclerosis, a mild and equable climate is a more important factor.

Not a few cases of early stages of hyperpiesis are falsely diagnosed as "neurasthenia"; but a close examination of the heart, and a measurement of the arterial pressures, should dismiss them to their proper category.

When, at last, the heart is worn out by the intolerable stresses under which it has been permitted to suffer, when it leaks at its valves, yields in its walls, and gives up the unequal strife, the treatment falls into the line of like events arising from primary diseases of the heart, and is described elsewhere in this work.

Toxic Arteriosclerosis.—It would be impossible to enter upon the infinite methods of treatment of the various infections which may issue in arteriosclerosis. The arteriosclerosis of syphilis is more likely to supervene in cases in which the first stages of the cure were neglected or perfunctory; and no doubt the same is true of other distempers for which, however, too often, we have no direct antidote. The cure must then be indirect; the patient must, if possible, be restrained from the full use of body and mind until, presumably, the elimination is complete. In these cases, or in most of them, the blood-pressures are not raised, and we have not this guide to estimate the degree of amendment. In those toxic cases, such as lead, in which the pressure is raised, the sphygmometer is of course of much service. The same considerations apply to the arteriosclerosis of diabetes, or of lardaceous disease, in which, again, there is no rise of pressure.

Involutionary Arteriosclerosis.—Although, in this change, hyperpiesis is not a factor, nor indeed of very frequent supervention, it is important to beware of its appearance. It is unnecessary to insist upon the peril of rises of arterial pressure in subjects whose vessels are already decaying under ordinary pressures. Of the causes of involutionary arteriosclerosis we are in ignorance. It may be that, as Prof. Osler says, bad tubing was put in when the machine was made; and it is probably, like hyperpiesis, hereditary. It has nothing to do with gluttony, nor, so far as I know, has it any necessary dependence upon toxins of external origin, though some of the cases may be ultimate stages of toxic conditions. In elderly persons, as has been said, arterial pressures generally rise, say some

20 mm. Hg. ; and if, for some unknown reason, the media deteriorates, the normal or quasi-normal pressure soon becomes relatively excessive, and accelerates the evil. In involutionary arteriosclerosis we must prevent or remove attacks of hyperpiesis, from which these patients are no more immune than other people. By therapeutical tests the discrimination is not difficult, and in involutionary cases, intercurrent plethora is as readily dissipated as it is in primary hyperpiesis. If, sometimes, the elements of excessive pressure and of internal decay cannot readily be discriminated, in practice the cases may nearly always be classified as of one or the other kind. So far from originating in overfeeding, involutionary arteriosclerosis often occurs in hardworked and underfed persons. It is very common in workhouses, and is prevalent among the agricultural labourers, who labour hard, have not the means of excess, and are much exposed to vicissitudes of weather. In the treatment of arteriosclerosis there is some element more than mere senility to contend with, could we but detect the injurious factors ; unless in microscopic degrees, it is no necessary accompaniment of old age, common feature of it as it is. I find no evidence that care and anxiety produce involutionary arteriosclerosis. As in the poor, so this affection arises commonly in persons of easy and happy circumstances. Renal disease is not essentially, nor even frequently, associated with it ; and on the average it is of later incidence. Grotesquely distorted and extensively calcified as the arteries become in the involutionary form, treatment seems as yet very far from systematic, and so it must be so long as its causes are unknown. Nor are the ultimate consequences those of the hyperpietic form. Such patients do not die of apoplexy, not, that is, in its sanguineous form. In the involutionary disease, the arteries become less and less pervious, and the peripheral parts, as they lose irrigation, fail more and more ; but these events rather deprive the sufferer of the value of life than of life itself. Like the rest of the organs, the heart is disposed rather to an atrophy than a hypertrophy, and is less apt to burst the vessels. Thus involutionary arteriosclerotics often survive to great and even to extreme old age. Treatment then, in these cases, has to concern itself rather with nutrition than with depletion. By providing for the best assimilation of the best foods, by the addition from time to time of ferruginous and other tonics, by gentle exercises in fresh air, by mild winter climate, and by the relaxation of work and care, the tendency to this degeneration is to be counteracted ; that is, by a restorative strategy as patient and insidious as the morbid proclivities themselves.

To sum up: involutionary arteriosclerosis is incurable. The toxic forms of arteriosclerosis seem to undergo some mitigation in time, perhaps to pass more or less away ; at any rate, syphilis apart, they do not ultimately do much direct harm ; or, as life goes on, they may lose themselves in the involutionary form ; it is in the hyperpietic form that treatment is directly and obviously efficacious. If the hyperpiesis be discovered before it has impressed itself indelibly on the vessels, we may wholly drive it away, or by no very irksome watchfulness dispel it again and again ; if we do not detect it till a later stage, we may still control it for good, or at worst postpone or avert its extremer perils.

Acute and Chronic Thoracic Aortitis.—Of the treatment of chronic aortitis, or atheroma, there is not much to say besides that of the general diseases of which it is a part. Indeed, it is rarely directly cognizable until it has attained such dimensions as to be more or less irremediable. The chronic aortitis of syphilis, for instance, when it reveals itself to the clinical observer, usually has issued in aneurysm or large anfractuous dilatation. In this stage, it is difficult to convince oneself that specific remedies have still much efficiency.

In acute and subacute thoracic aortitis, more clinical facts are available,

and there is more to be done. The disease, especially in the subacute degree, is rather more frequent than is generally supposed. The diagnosis is not difficult, if the attention be awake to the crucial symptoms. It is most frequent in rheumatic fever, syphilis, and influenza. This is not the place to detail symptoms; but I may briefly say that acute aortitis is attended by incessant angina pectoris, ruthlessly returning again and again, for days or weeks; the chronic disease is more common, and to the wary observer betrays itself in a like form, though much attenuated in degree. A peculiarly wearing and depressing pain, seated about the middle or upper sternum, and occasionally passing down the arms, a pain aggravated by exertion, by food, by emotion, by whatsoever excites the circulation, dogs the patient for weeks, or months; and if not subdued by medical intervention the disease is very apt to invade the aortic valve also, and to set up regurgitation.

The first condition is rest, as absolute as possible. As perpetual bed, for weeks and weeks, depresses both animal and mental spirits, it is a great advantage to order the rest, after sanatorium methods, in the open air. Gentle massage should be tried before the patient is definitely released from the couch. Thus, the appetite and general metabolism are encouraged. Besides the vigilant use of alteratives, gentle laxatives, and other means of securing continuous clean running of the circulation, vasodilator drugs must be used continually so long as any effort is attended with local discomfort. Erythrol-tetranitrate or nitrite of sodium may be used in appropriate doses. Exacerbations of the pain are often attended by some rise of temperature for a day or two, especially in cases of rheumatic fever, indicating the inflammation at work within; but, beyond the rest, this slight fever does not need special treatment. All cares of life and business must be resolutely excluded. Digitalis, and other drugs reinforcing or accelerating the circulation, must be avoided. Meals must be light and unstimulating, and, if frequent, very moderate in quantity. Iodide of potassium is to be administered during all the illness; 5 gr. three times a day is sufficient, unless there be evidence of syphilis, in which case it may appear desirable to push this drug from time to time in considerably larger doses. In rheumatic cases, of course, the salicylates will be needed.

T. Clifford Allbutt.

ARTHRITIS DEFORMANS.—(See RHEUMATOID ARTHRITIS.)

ARTHRITIS, SUPPURATIVE.—When once a joint cavity has become full of pus, the first principles of treatment are free incisions into the joint, and drainage. These incisions must be made at points most *accessible and convenient*: accessible, so that important structures around the joint are not injured; convenient, so that drainage is favoured. In the knee joint, for example, convenience is sacrificed to accessibility, since while drainage through the popliteal space is very efficient, there would be great danger of injuring important structures, and the joint would have to be flexed to keep a tube in position. It is sometimes possible and advisable to pass a tube through the joint to the popliteal space; the posterior opening must be made at the side of the vessels.

After the pus has been evacuated, the joint cavity should be irrigated with a weak antiseptic, peroxide of hydrogen being the best for the purpose. Some authorities recommend the application of pure carbolic acid, followed by absolute alcohol, to the synovial membrane, after a free exposure of the joint. We cannot recommend such drastic treatment. After operation the limb is to be fixed on a splint or by some suitable apparatus in a position that will be best for the patient should ankylosis ensue, i.e., the foot at right angles to the leg in cases of disease of the ankle joint.

If the case does well, the tubes must be removed at the earliest possible

moment, in mild cases within forty-eight hours, and as soon as it is clear that the acute inflammatory phenomena have subsided, massage and passive movements may be undertaken. We would point out that, contrary to what is often stated, a considerable amount of movement may be regained in these cases, if an operation is performed early, and if drainage is not prolonged. At the same time, this treatment requires the greatest care and discrimination, and if movement is followed by pain, swelling, and rise of temperature, it must be stopped.

In more severe cases it will be necessary to retain the tubes for a longer period, and if the joint has been extensively destroyed there is little hope of any result beyond ankylosis. In the worst cases, where the bones are damaged and constitutional symptoms are severe, or where previous drainage has failed, excision or amputation will be required.

Excellent results have been obtained by the use of Bier's method of passive congestion (q.v.) in cases of suppurative arthritis. *W. H. Clayton-Greene.*

ASCITES.—(See CIRRHOSIS OF LIVER.)

ASPHYXIA.—Asphyxia results from many causes. Familiar examples include obstruction of main air-way (strangling, tumours, foreign bodies, diphtheria), drowning, gas-poisoning, intoxication of respiratory centre (morphia, chloral, chloroform poisoning). In all, the principles of treatment are identical. Clear the air-passages, provide adequate oxygen, ventilate the lungs, stimulate the respiratory centre. In actual practice, asphyxial cases are always emergencies ; every second is of value, and such aids as electrical batteries or oxygen gas are rarely at hand. Hence, treatment resolves itself into properly performed artificial respiration ; by this means the blood is driven from the lungs into the left side of the heart, and thence into the aorta, while at the same time the lungs are ventilated. Artificial respiration can only be learned by actual demonstration. Synchronously with the movements of artificial respiration, the tongue should be jerked forward ; this is believed to aid in reflex excitation of the respiratory centre in the medulla. Such subsidiary aids as application of heat, hypodermic injections of strychnine, or the application of electrical stimulation, may be useful, if available. After resuscitation, the patient must be kept in bed for some days ; the tendency of such cases to develop pneumonia and the like, must not be forgotten. *Lewis Smith.*

ASTHENOPIA.—The symptoms of pain in or about the eyes, or headaches following the use of the eyes, the running together of print when reading, should lead to a careful examination of the eyes. Organic disease, either of the media or fundus, must first be excluded. (*N.B.*—The conjunctiva should be looked at critically for signs of any chronic inflammation, especially of follicular conjunctivitis, and astringents ordered if necessary.)

1. The refraction should be tested, and the correction for any hypermetropia myopia, or astigmatism given. If the headaches are experienced both in distant and near vision, the correction of any hypermetropia of astigmatism should be worn constantly. Myopes may prefer their distance correction for general use, but if they have asthenopic symptoms they are usually more comfortable either with no glasses or an under-correction for close work.

2. The external muscles should be tested for *insufficiency* with the Maddox rod. If there is *exophoria*, a prism with the base inwards is often of great assistance for close work. With *hyperphoria*, a vertical prism slightly under-correcting the defect may give invaluable help. It must be remembered however that only a small proportion of the muscle defects which are found give rise to symptoms, and therefore it is only these which call for correction. It is a good rule, where glasses have not previously been worn, to order at first the

lenses correcting the refraction error alone, and to add the prisms at a later date if the asthenopic symptoms have not been alleviated.

3. The general health of the patient is a very important factor, and should be carefully looked into and treated, especially in regard to anæmia, constipation, and neurasthenia.

4. The conditions of work must also be attended to. See that the head is kept in a proper, upright position ; that the work is held well away, not nearer than 14 inches ; that there is good illumination coming from the left side ; and that when reading, good print is used.

W. Tindall Lister.

ASTHMA, BRONCHIAL.—Asthma arising as the result of heart or renal disease will be dealt with under those headings. Idiopathic or bronchial asthma will be considered here.

It has been abundantly shown, by experiment, that bronchial asthma can be produced by spasm of the bronchial tubes, though there are still many who believe that in some cases the symptoms are produced by a rapidly oncoming œdema of the bronchial mucous membrane, a sort of urticaria of the bronchial tubes. Moreover, it is evident that, although everyone possesses the mechanism for the production of asthma, only a few suffer from the spasm ; and that, therefore, there must be an underlying sensitiveness to stimuli capable of acting on this mechanism in the asthmatic.

Treatment has consequently turned upon :—

(1) *The attack or spasm* (or œdema) ; (2) *The underlying tendency ;* (3) *The removal of the cause.*

1. **The Treatment of the Spasm.**—To give a complete list of all the remedies which have been reported as successful in the treatment of this complaint would be confusing. There is probably no condition in which so many drugs have been used ; and it must be said, at the outset, that a remedy which is immediately successful in one case may have no effect in another, and further, may prove quite useless in the same case at another time.

Morphia we should place first, as of most value for the rapid relief of the distressing dyspnœa, and its effect is often increased by the addition of atropine. These should be given together in the form of a hypodermic injection (morphia $\frac{1}{6}$–$\frac{1}{3}$ gr., atropine $\frac{1}{120}$–$\frac{1}{60}$ gr.).

Caution.—Morphia should not be given if there is considerable bronchitis, or in old people, and on no account where there is kidney disease. The danger of the formation of the " habit " must be borne in mind, and for that reason it is important not to leave the treatment in the hands of the patient ; and if the case is one where the attacks are of very frequent recurrence, and the necessary dose has to be increased, it would be wise to seek a less risky means of relief.

Inhalations and fumigations have been largely used. Chloroform is often very efficacious, but the relief is generally very transient. Much the same may be said of ether. These are remedies which should never be left in the patient's own hands. Nitrite of amyl, in some cases, gives temporary relief (it is well to remember that less headache will follow its use if it is inhaled through the mouth instead of through the nose). Much more generally useful and more lasting in their effects are the inhalations of certain fumigations. Tobacco is successful in some cases (when not used habitually). Nitre paper is perhaps one of the commonest remedies, and often gives early relief ; it must be used freely so as to make the air of the room dense with its fumes. Many papers are used which contain, in addition to nitre, numerous other drugs, such as the iodide and chlorate of potash, and powdered digitalis, stramonium, and lobelia leaves.

" Himrod's Cure " is a well-known powder, very useful in many cases. Its success has given rise to various imitations. Its chief ingredients are probably

lobelia, nitre, green tea, and stramonium. Cigarettes are also made containing various of the above-mentioned drugs, and arsenical cigarettes are found to give relief in some instances. With these remedies the dose has frequently to be increased; and they often leave bad headache behind. Asthma is a pulmonary neurosis, closely allied to other neuroses, frequently met with in families in which other members suffer from migraine and allied affections. It is, therefore, not surprising to find many remedies which are of service in the treatment of migraine equally so in cases of asthma. Thus, strong tea (or Guarana tea), coffee, or, better, citrate of caffeine, phenacetin, antipyrin, and antifebrin, will, one or other of them, sometimes act like a charm. Of this class of remedies it must be said that they frequently lose their power, and it will often be found that when they do relieve the spasm, their use is attended by great sleeplessness: in some cases, sleeplessness alternates with asthma, and is a most difficult symptom to combat. Alcohol must be mentioned as a remedy, because it is often so quickly efficacious. The objections to its use are obvious, especially if the attacks are frequent.

Lastly, the induction of vomiting, or at least nausea, is often attended by instantaneous relief of the spasm. Sometimes the relief may be due to the emptying of an overloaded stomach, which has acted as a cause. Some patients will bring on vomiting by tickling the back of their throat, or it may be produced by an ordinary emetic.

2. **For the Underlying Tendency.**—The actual attack having passed off, it becomes necessary to lessen the frequency of its return, by reducing the sensitiveness of the mechanism to outward stimuli. Many of the remedies mentioned under this heading will be found useful even during the attack, but their chief aim is directed towards permanently curing the patient, or at any rate lengthening the period of freedom from attack. The two drugs which are found most generally useful are iodide of potash and arsenic. They can be given separately or together, but in any case a prolonged course is advisable. Some patients, who are very intolerant of the iodide, will stand arsenic well, and the prescription of bismuth with the latter will often prevent the gastric irritation so frequently seen as a consequence of its administration. Opium, belladonna, and lobelia are also of service as preventives, and are generally given in combination with arsenic and potassium iodide. Several cases have been permanently cured by the application of electricity to the neck; it is supposed that the current blocks the vagi, and so prevents the conveyance of irritating stimuli. What has been called the pneumatic treatment, elaborately carried out at Reichenhall and Meran, certainly materially benefits a large number of chronic cases. Briefly, the treatment consists in alternately inspiring compressed air and expiring into rarefied air. It is of little use in the acute condition, but where, as the result of repeated attacks, bronchial catarrh and emphysema have resulted, it is most useful.

Of all the preventive treatments so far mentioned, undoubtedly the greatest reliance should be placed on a prolonged course of arsenic and iodide.

3. **Removal of Cause.**—There is, perhaps, no disease in which the removal of the cause is so immediately attended by the subsidence of all symptoms. One admits the difficulty, in many cases, of fixing on the true etiological factor; also that, in others, any of several causes may be sufficient to start an attack; nevertheless one is convinced that, in the majority of cases, a definite cause, or causes, can be found, and the removal be attended by the most beneficial results. In one it may be a chill, the slightest bronchial catarrh being accompanied by asthma; in another it may be an overloaded stomach or bowel, or some other source of peripheral irritation, such as worms, teething, or skin troubles. Asthmatic attacks are seen in gouty people when they are

most gouty, and so forth. But of all causes, those which are found in, or come through, the nose and throat, are the most likely to give rise to attacks. It therefore becomes essential that the curative treatment of asthma should commence with a careful search for the cause. The nose, mouth, and throat should be examined for adenoids, rhinitis, enlarged tonsils, delayed and painful teething. Careful notes should be kept by the patient, or friends, as to the circumstances which give rise to the trouble, so that, by a process of exclusion, the true cause may happily be discovered. These causes are very various, the smell of birds, cats, dogs, horses, certain flowers, fumes, dust, etc., having all at one time or another been shown to initiate an attack.

General and Climatic Treatment.—Asthmatics are generally very susceptible to climatic influences. Many are always free in large towns, others only in country districts or at the seaside. Curiously enough, a sufferer will sometimes be quite free from his trouble for some time after first moving into a fresh district, and subsequently the attacks will return, or the reverse may be the case. As a rule such patients are freer from trouble when in large towns. Moderate altitudes are often beneficial; but care must be taken not to send patients, in whom long-continued asthma has given rise to emphysema and cardiac dilatation, to mountain resorts. Indeed, where bronchial catarrh and emphysema have resulted, these call for greater consideration than the asthma, and such cases do well to winter in warm, sunny, seaside places; an equable, moist climate being the best.

From what has been said, it will have been gathered that the diet often needs careful consideration; dyspepsia must be treated and constipation avoided.

The following prescriptions are suitable for the treatment of such cases:—

FUMIGATION FOR THE ATTACK.

℞ Pulv. Bellad. Fol. | Pulv. Stramon. Fol.
Pulv. Hyoscyam. Fol. | Pulv. Potass. Nitrat. āā p. æq.

M. Half a teaspoonful to be burnt for each fumigation.
(*Vict. Park Hosp. Pharm.*)

℞ Stramon. Fol. ℥iv | Lobelia ℥jss
Green Tea ℥iv

Mix and pour on the mixture enough saturated solution of nitre to wet it. Dry it and keep in closely stoppered bottle. (*Plant*).

℞ Datura Tatula ℥ij | Pulv. Pot. Nitr. ℥ij
Stramon. Fol. ℥ij | Ol. Eucalypti ℥ss
Cannab. Ind. ℥ij

Mix thoroughly. (*Woodward*).

ANTI-ASTHMATIC MIXTURE.

℞ Pot. Iodid. ℥ij | Tr. Hyoscyam. ℥iv
Liq. Fowleri ℥j | Aq. Chlorof. ad ℥viii
Vin. Ipec. ℥iv

M. ft. Mist. A tablespoonful in water three times a day after food. (*Whitla*).

MIXTURE FOR ASTHMATIC PAROXYSM.

℞ Tinct. Lobel. Æther. ♏xv | Sp. Ammon. Arom. ♏xx
Potass. Iodid. gr v | Syr. Tolu. ℥j
Potass. Bromid. gr iv | Aq. Camph. ad ℥j

ANTI-ASTHMATIC PILL.

℞ Sod. Arsenat. gr ⅓ | Ext. Bellad. gr. ¼
Ext. Nucis Vom. gr j | Ext. Gentian. ad gr iij

M. ft pil. One pill twice daily after food.
W. J. Hadley.

ATHEROMA.—(See ARTERIOSCLEROSIS.)

BACILLURIA.—A great number of micro-organisms are found in the urine under different conditions, and it would seem probable that, in most instances, if not in all, where organisms gain access to the blood-stream they also are excreted in the urine. Hence, organisms are found in the urine in a great number of diseases besides mere local affections of the urinary tract. In infective diseases like enteric fever, the specific microbe is excreted in the urine for prolonged periods, and may even be found in considerable numbers when convalescence is re-established. Specific organisms are also found in the urine when the seat of the lesion is in some distant organ, as for example in cases of phthisis. In this malady, the bacillus of tubercle is not uncommonly present in the urine, and hence its presence here is not necessarily evidence of local urinary tuberculosis.

But, in addition to these well-known forms of bacilluria, there is another, where the urine may contain very large numbers of organisms without the existence of any gross organic disease in other organs of the body. In this form of bacilluria, the organisms may be present in sufficient amount to cause decomposition of the urine, and may give rise even to cystitis. The urine frequently undergoes decomposition of such a character as to give rise to extremely offensive bodies, with a fishy odour, apparently due to the formation of methylamin. It is probable that this form of bacilluria owes its origin to decomposition in the intestine, and it is undoubted that the *Bacillus coli communis* is not uncommonly excreted in the urine in abundance, and reaches it through the blood-stream.

Bacilluria requires to be treated by urinary antiseptics, and especially with urotropin, not only in those cases where it gives rise to urinary decomposition and cystitis, but also in those instances, as for example in enteric fever and tuberculosis, where the organisms are present in the urine, often in abundance, without causing urinary decomposition and cystitis. *J. Rose Bradford.*

BACKWARDNESS.—(See MENTAL DEFICIENCY IN CHILDREN.)

BACTERIOTHERAPEUTICS.

INTRODUCTION.—One of the most remarkable developments of modern medicine has centred on the question of the immunity and recovery from infections produced by pathogenic microbes, and we now possess for diseases of this class a number of remedies, the skilful exhibition of which demands special knowledge. Before dealing in detail with these remedies, however, it is necessary to consider briefly the data upon which their application as therapeutic agents is based, which is all the more necessary, as bacteriology is a subject progressing by such leaps and bounds that the busy practitioner finds it increasingly difficult to keep abreast with even the great advances, to say nothing of the host of minutiæ which are thrust on the medical world day by day.

In the first place it has been demonstrated beyond a doubt that many diseases are directly or indirectly caused by the entry into the body of living pathogenic bacteria. Each infection is caused by a definite virus; the given infection is produced only by that virus, and the virus always produces the same infection and no other. This is expressed briefly by saying that the infectious agents are *specific*. Thus, we know that diphtheria is produced by Loeffler's bacillus. The source of any given case of diphtheria is a pre-existing case of the disease. The bacillus may make its way from the throat of one individual directly to that of another, or it may pass to some inanimate object, which in turn disseminates it, or it may pass from the throat of a person suffering from diphtheria to an individual who may not actually contract the disease, from absence of the necessary disposition, but who can transmit it to a predisposed person, in whom the disease develops. In any case diphtheria is always caused by Loeffler's bacillus, and without this factor there is no diphtheria.

The establishment of the doctrine of specificity among infectious bacteria has been of fundamental importance, for its practical outcome is the elaboration of a rational therapy, which is narrowing itself down to a specific therapy, remedies being sought which lead to the exclusive destruction of the specific microbe which has been proved to be the cause of the given infection.

When a pathogenic microbe enters the body of man, complicated phenomena ensue, the whole process having been conventionally looked upon in the nature of a conflict. Two aspects of the case have to be considered, viz., the behaviour of the microbe on the one hand, and of the infected individual, otherwise spoken of as the " host," on the other. Offensive weapons brought into action by the microbe enable it to pass a phase of its existence in the host, which, however, retaliates with various defensive mechanisms, by means of which it seeks to protect its cellular members against disease or destruction.

Speaking generally, the clinical phenomena of infectious diseases are brought about by poisons (*toxins*) elaborated by the bacteria. In some cases these toxins are excreted by the bacteria (*exotoxins*) and pass into the fluids or tissues of the body, while the microbe which produced them may be located in some trivial or even undiscovered lesion. Diseases of this class are practically pure intoxications, and examples occur in the cases of tetanus, botulismus, and, to a less extent, diphtheria. In most of the other known infections the poison (*endotoxin*) is closely associated with the microbic protoplasm, and it is believed that any signs of intoxication in such cases are due to the escape of the poisons after dissolution of the microbe has taken place. At any rate, from bacterial cultivations other than those mentioned above, it has hitherto been found impossible to obtain by filtration the specific toxins which on inoculation give rise to the specific clinical characters of the infection produced by the living virus. Apparently, the differentiation of exotoxins and endotoxins is fundamental in regard to the methods of bacteriotherapy.

It cannot be doubted that some sort of defensive mechanism is called into action by the infected host, when one reflects that many infections end in recovery. Without some form of resistance, man, exposed as he is to multitudinous chances of infection, would be rapidly exterminated. The degree, however, to which this defence is developed is the subject of extraordinary variations, not only in regard to different infectious agents, but to the same agents in different individuals. In some cases the resistance is sufficient, in others again, totally inadequate, the prognosis of infections depending largely on the knowledge which medicine has accumulated for ages in regard to the degree to which man is capable of resisting the action of certain pathogenic bacteria.

The mechanism of defence consists in the production of protective substances, which, entering the blood-stream, are carried in this channel throughout the body. Where these substances are actually formed is not known with certainty, but they can be demonstrated in the blood, and the inability of infectious bacteria to multiply continuously in the body is referable to these substances. In other words, there is an immunity which may be congenital or acquired. The degree of immunity is variable. It may be the subject of temporary variations, which are mostly of complicated origin. Under the term " acquired disposition," these variations meet with a great amount of attention from the practitioner.

Until recent years the entire range of practical medicine, with its gigantic pharmacopœias, consisted in the use of means to lower the degree of susceptibility, or in other words, to increase the resistance of a particular individual for pathogenic bacteria in general. If this is done *before* an infection has actually occurred, one speaks of " prophylaxis "; if done afterwards, one speaks of " cure." These remedies differ, however, in their essence from those in which a *specific* prophylaxis or cure is induced against one particular kind of microbe, and it is exclusively with the latter that this article has to deal.

For this specific immunization it is important to distinguish two varieties :—

1. Immunization against the living microbes themselves.
2. Immunization against microbic toxins.

Specific immunity may be acquired in a variety of ways, but as these are described in all books on bacteriology it will be sufficient merely to mention them here. They are :—

1. Artificial inoculation with the living virus in a virulent condition. This was the basis of the practice of variolation.
2. Artificial inoculation with the living virus in an attenuated state. This great discovery, made by Jenner and amplified by Pasteur, is used in a large proportion of mankind to induce a prophylaxis against variola. It is the basis of Pasteur's hydrophobia prophylaxis. It is used on a large scale in protecting animals against anthrax.
3. Inoculation with the infectious agents which have been killed by some agency (heat, chemicals, etc.). This is the basis of many of the modern methods of specific prophylaxis which have been applied to man, and is spoken of as protection by the inoculation of " vaccins." As examples may be mentioned Haffkine's cholera and plague

vaccins, Wright's typhoid vaccin, Wright's therapeutic vaccins against infections due to *Staphylococcus*, *Bacillus coli*, *Proteus vulgaris*, and Koch's new tuberculin T.R.

4. Inoculation of extracts of bacteria, especially bacterial endotoxins, e.g., Koch's old tuberculin T.O.

5. Inoculation with bacterial exotoxins.

In the case of diphtheria and tetanus, which, as we have seen, are typical intoxications, Behring found that the *blood serum* of animals, inoculated with the toxins of the microbes which produce these diseases, possesses marked prophylactic and even curative properties, the substance in the serum which brings about this effect being spoken of as "antitoxin" on account of its antidotal properties. Now the immunity conveyed by such antitoxic serum differs in a marked degree from that produced by the five methods above-mentioned, in so far that its onset is extraordinarily rapid, but its duration is transient. Ehrlich has described it as a "passive immunity," in contradistinction to the "active immunity" induced by the inoculation of the actual virus or its poisons. To the five previous methods we must therefore add :—

6. Inoculation of the blood-serum of an animal actively immunized.

Taking into consideration the fact that passive immunity is rapid in its onset, still another method (7) has been suggested, where the passive and active immunizations are combined—the passive preceding the active in point of time, e.g., in immunization against the plague bacillus, by antiplague serum and plague vaccin.

All the bacteriotherapeutic remedies in use at the present time are referable to one or other of these groups, and they are isopathic in their character and entirely different from the ordinary allopathic medicaments. These isopathic remedies aim only at combating the *materies morbi*, and have nothing to do with the direct relief of symptoms, however unpleasant these may be.

Nature and Causes of Acquired Immunity.—It has already been mentioned that immunity is due to the presence in the blood of substances which, from their action, may be spoken of as protective. In an acquired immunity, such substances are created by the individual in response to an infection. The exact manner of their production is involved in obscurity, but it is known that before a bacterial intoxication can take place, the poison must enter into chemical union with some cellular element in the body, the cell involved varying considerably in the different infections and intoxications. From the property of these poisons to turn towards the cells, Wright has proposed collectively to call them "tropins." The union of the tropin with the protoplasm calls forth as a reply from the host, the development of substances directed against the tropins. In the widest sense of the word these are protective, and are spoken of as "antitropins."

The mode of action of bacteria being varied, it is not surprising to learn that there are different kinds of antitropins, and from their remarkable properties these have assumed great importance from a therapeutic standpoint. The first antitropins to be discovered were antitoxins, which act by neutralizing the poisonous effects of bacterial exotoxins. The best-known bacterial antitoxins are those of diphtheria and tetanus, and are spoken of as antidiphtheritic and antitetanic sera, or more frequently as diphtheria and tetanus antitoxins. *Bacillus botulinus* also gives rise to a true antitoxin, but its use in medicine is unimportant on account of the rarity of outbreaks of botulismus. Other antitoxins (not of bacterial origin) are antivenene (the serum of horses inoculated with snake venom), and possibly "pollantin," a serum obtained from animals inoculated with pollen toxin. This neutralizes the toxic effects produced by pollen in subjects disposed to hay fever.

Behring's discovery of diphtheria antitoxin at first led experimenters to the belief that similar antitoxins could be prepared against the micro-organisms producing suppuration, pneumonia, cholera, typhoid, plague, glanders, anthrax, gonorrhœa, tubercle, dysentery, etc. The general result of ten years' experimentation has been to show, however, that the sera of animals inoculated with the microbes of the above-mentioned diseases are either entirely inactive, or possess at most prophylactic and but slight curative properties. At any rate it may be said, without fear of contradiction, that such sera are not comparable in their beneficial action to the true antitoxins. The reason of this has caused a great deal of enquiry. In the case of cholera and typhoid infections, Pfeiffer showed that although no antitoxic properties could be demonstrated in the blood of animals in which typhoid and cholera bacilli had been injected, the sera nevertheless possessed certain *anti-bacterial* properties which led to dissolution or *lysis* of these bacteria. Such an anti-bacterial serum is, however, much more complicated than antitoxic serum, in so far that its dissolving or lysogenic power depends on the united action of two substances, one of which—the complement—is present in normal blood, in a quantity which is not capable of being materially increased. The other substance —the amboceptor—which is developed in the inoculated individual, and may be in large amount, is ineffective, as it is incapable of acting destructively by itself. Clinical experience has determined that such bacteriolytic sera are disappointing in their action in cases which present any severity; and although several such sera are on the market, the manufacturers candidly state that they are "still in the experimental stage," where

for some time they seem likely to remain. In recent years experimenters have gradually tended to come away from serotherapeutic remedies—apart from the true antitoxins—and on a large scale (cholera, plague, enteric fever) a return has been made to the older Jenner-Pasteur method of active immunization, with attenuated virus, as a prophylactic but not as a cure.

Although Pfeiffer's bacteriolytic action has been assumed for infections other than typhoid and cholera, in which he proved it to exist, it cannot with certainty be demonstrated, and there still remain a number of infectious microbes—and these some of the commonest (pneumococcus, streptococcus, staphylococcus, gonococcus, tubercle bacillus) the inoculation of which into animals does not lead to the serum becoming bactericidal. If, for example, a horse is inoculated with cultures of staphylococcus, the serum of the animal is in itself incapable of killing the coccus. To what, then, is the recovery from such infections due ?

For years Metchnikoff has taught that immunity is brought about by *phagocytosis*, a relatively simple conception, according to which certain cells of the body actively attack the invading micro-organisms and destroy them by a process of intracellular digestion. This conception is histogenic in character, as opposed to the humorigenic theory of immunity developed by Behring, Ehrlich, and Pfeiffer. It is believed by Metchnikoff that the principal cells concerned in the phagocytic act, originate in the great blood-forming depôts—the myeloid and lymphatic tissues. The exact relation of the phagocytic and humoral theories has been the subject of much investigation, without unanimity having been reached between the upholders of the rival views. Recently in this country, A. E. Wright and Douglas have shown, in a series of convincing experiments, that in phagocytosis, so-called, the blood *fluids* play a cardinal rôle, in so far that they prepare the microbes for subsequent ingestion by the phagocytes. The work of Wright and Douglas, which has been confirmed from many sides, would seem to demonstrate a third and important method of defence, in which the destructive action on the microbe is brought about by a combination of the fluids (plasma) and the cells of the body. The substances in the blood-fluids which prepare the bacteria for phagocytosis are called by Wright "opsonins" (*ὀψωνω*—I prepare a feast). In several of the infections in which a bacteriolytic action of the serum has been assumed, without actual proof, Wright and Douglas have shown that the defence is really phagocytic, and so far as is known the phagocytosis is preceded by an opsonic action of the blood-plasma or serum. We know at the present time, then, three important types of bacterial antitropins, viz., antitoxins, lysins, opsonins. Wright has worked out a method by which a quantitative measurement of the opsonic content of the serum can be made—a point of great importance when the question of the treatment of bacterial infections by bacteriotherapeutic methods has to be considered. The technique described by Wright is a modification of that originally suggested by Leishman, and consists essentially in the enumeration of the bacteria engulfed by a number of phagocytes. For this purpose one requires : (1) Blood serum ; (2) Blood leucocytes ; (3) Emulsion of a given bacterial culture.

1. Blood is drawn from the finger, in a small glass capsule with a bent limb. After coagulation has set in, the serum separates out. A few drops of blood suffice for the test.

2. Blood corpuscles are obtained, by allowing blood to flow from the finger into a glass capsule containing sodium citrate solution (1 per cent sodium citrate dissolved in ·85 per cent solution of sodium chloride). When the blood has entered the citrate solution (which merely acts as a decalcifying substance) the capsule is sealed in the flame, and it is then suspended in a centrifugal machine, the corpuscles (red and white) being carried to the bottom of the tube by centrifugal action. The capsule is then cut through by means of a file or a bone pliers, the citrated plasma is pipetted off, and the thick deposit of corpuscles subjected to a process of washing in saline solution (·85 per cent) so as to remove all traces of plasma. After a final centrifugalization, the clear salt solution is removed, and the corpuscles are ready for use.

3. The emulsion of the particular microbe, the opsonic power of the serum against which has to be tested, is prepared by making a suspension in saline solution. In the cases of masses of bacteria, as in cultures of tubercle bacillus, the suspension is best made by rubbing up the culture with the saline in an agate mortar. The serum, corpuscles, and emulsion having been prepared, a series of capillary pipettes are taken in hand. A mark is made on the stem of the capillary about ½–¾ inch from the distal end, and by means of a teat, certain volumes of serum, emulsion, and corpuscles are aspirated into the tube. The mixture should be gently ejected on to a glass slide and aspirated back into the capillary again, this act being repeated several times so as to ensure thorough mixing of the different elements. The distal end of the pipette is then sealed, and it is placed in an incubator at 37° C. for fifteen to twenty minutes (exact time must be kept in comparative experiments). The contents of the pipette are then blown on to a slide on which the final count has to be made. The slide is first prepared by roughening its surface with very fine emery paper (No. 000), so that the blood film may be uniformly

spread out. After the film has been made, it is fixed and stained. For most micro-organisms Leishman's stain is used; in the case of tubercle preparations the usual acid-fast method, with a slight modification (fuchsin, 2 per cent H_2SO_4, methylene blue). The film is best made by placing the drop of blood and bacteria from the pipette at the end of a slide, and then spreading it out by means of a second slide applied about three-quarters across the first, so that a free edge to the film is obtained. In this free edge large numbers of leucocytes abound. Under the microscope the free edge is found, and in every leucocyte encountered, the number of ingested bacteria is counted. After some thirty-five to fifty leucocytes have been examined in this way, the average number of bacteria ingested *per cell* is noted, and the result is compared with that of a normal serum. As a rule the result is stated as the "opsonic index," which is obtained by dividing the number of bacteria taken up per leucocyte in the presence of any given serum by the number taken up per leucocyte in the presence of the serum of a normal individual, which is considered as unity. Thus staphylococci per leucocyte in the presence of a serum from an individual the subject of boils numbered ten, while staphylococci per leucocyte in the presence of normal serum numbered twenty.

20 : 10 :: 1 = opsonic index ·5

As a great deal has recently been written on the value of Wright's methods from a curative point of view, it is necessary to consider for a moment the value of the "opsonic index." The phagocytic power is represented as an index, and not as an absolute number, because it is not possible, in two separate tests, with microbic emulsions of differing densities, to obtain comparative results. As used at the present time, the test of any given serum must be controlled by the results obtained with the serum of a normal individual under the same conditions of emulsion and leucocytes. Contrary to the opinion of Metchnikoff, it has been shown that where the phagocytic power of different bloods is compared, the variable factor is the blood serum and not the leucocytes.

Variations in the Opsonic content of the Serum.—If comparative results are to be obtained by different investigators, it is important to know what variations, if any, occur in a series of individuals presumably healthy, or at any rate not affected with the particular microbe against which the opsonic power of the serum has to be determined. In a series of nearly 200 normal people whose sera were tested against tubercle bacilli, the average index was ·96, the variations ranging from ·8–1·2, so that, as tested by Wright's method, the sera of healthy people do not differ among each other to any considerable extent as far as tubercle bacilli are concerned.

Opsonic Index in Disease.—In the course of an infection the opsonic index may be depressed or exalted, and a similar state of affairs obtains when a bacterial vaccine is introduced into the body for prophylactic or curative purposes. The course taken by the opsonins—and the same applies to antitoxins and lysins—follows a general law, which has been described by Wright as the law of the *ebb, flow, reflow, and subsequent maintained high tide of immunity.*

One of the most important clauses in this law is the ebb, or "negative phase," which ensues when a bacterium, or its products, enters the body. Here there is a diminution in the antitropic content of the serum. In this negative phase the susceptibility of the individual to infection is increased, although profound differences exist when different individuals are subjected to the same dose of one and the same bacterial vaccin. In individuals already infected by a microbe, minute doses of the homologous vaccin produce, at first at any rate, very definite negative phases. From a practical standpoint the study of the depth and duration of the negative phase is a matter of the greatest moment.

After a time the negative phase is succeeded by a positive phase, or "flow," in which there is an increase in the antitropic content of the serum due to the entry of newly-formed antitropins into the blood. From the nature of these bodies one must suppose that the resistance of the individual is increased, and clinical observation frequently bears this out in a striking manner.

In a shorter or longer time the "reflow" sets in, the antitropic content diminishing to a certain extent, but still keeping above the level reached before the introduction of the vaccine. This is the "maintained high tide."

These phases can be seen satisfactorily only where determinations of the antitropic content are made at frequent intervals, and it must be remembered that variations in the different components of the immunity curve occur with reference to different subjects, doses, and vaccines. The most successful results of inoculation as a therapeutic remedy, are achieved by closely following the development of the immunity curve, and this is all the more true where repeated doses of a vaccin are required to obtain the desired end. The art of immunization consists in developing the optimal conditions for maximal antitropic formation, and, as far as is known at the present time, this can only be known by estimating from time to time the antitropic content of the serum.

Prophylaxis and Cure.—As we have already seen, a fundamental distinction has to be made between *active* and *passive* immunization. Following Jenner, the pioneers of

bacteriology, notably Pasteur, sought to induce a prophylaxis by active immunization brought about by the infectious agents themselves, especially in attenuated form. To Koch, however, belongs the credit of having attempted to *cure* an infection with a specific remedy, viz., tuberculin in tuberculosis. As is well known, the régime of treatment originally laid down has proved to be a failure, and it was thought that the serotherapeutic principle of passive immunization enunciated by Behring in the cases of diphtheria and tetanus was the real solution of the problem of the cure of infections, and manifestly, if this were so it would be a tremendous practical advance, as it is the *cure* of an infection which the practitioner of medicine has in the main to deal with. As has been hinted above, however, sera which have been prepared against bacterial poisons other than those of diphtheria and tetanus have been disappointing in the hands of clinicians, or at any rate the results have been inconclusive. In recent years a return to the older method of active immunization has taken place, chiefly at the hands of Wright, but with this great difference, that he has applied bacterial vaccines as *curative*, and not merely as prophylactic, agents. Although he has achieved excellent results with several infections, it must be admitted that this new departure in therapeutics throws a great onus of responsibility on the shoulders of the advancing practitioner, who, if he wishes to keep abreast of the times, has to assume the rôle of an active immunizator. Hitherto he has been content to introduce into the body of man substances (therapeutic sera) prepared by others, and prepared of great strength only after years of labour and endless anxieties. Now he must quit the post of an onlooker and become an active agent himself in determining the best means of elevating his patient's immunity ; and let it not be forgotten that, in the majority of cases, he is face to face with infections which in the natural course of events do not leave a lasting immunity behind them. Experience has shown that in these active immunization processes by bacterial vaccins, the practitioner has in his hands a potent factor for good or evil according as he has grasped the fundamental principles of active immunization. From a practical point of view it must be remembered that the machinery of immunization and the elaboration of protective substances by the host can be stimulated or inhibited by the infecting agent. By judicious inoculation of a bacterial vaccin, the worn-out and inefficient machinery may be renewed, provided that suitable doses have been given at properly interspaced periods.

Bacterial Vaccines—their Standardization.—Bacterial vaccines used as therapeutic and prophylactic agents are mostly killed cultures, or products from them. The concentration of these vaccines must be determined, so that some idea may be obtained what quantity or what strength of material is being injected. For microbes like the pyogenic cocci, *Bacillus typhosus*, etc., Wright has suggested the determination of the actual number of bacteria in a given emulsion. This can readily be done by mixing a volume of normal blood (obtained from a prick in the finger) with a volume of the bacterial emulsion After mixing, a film is prepared, fixed, and stained. In a number of microscopic fields the relation of the red blood-corpuscles to the bacteria is determined. The number of bacteria is then easily calculated from the fact that normal human blood contains 5,000 million red corpuscles per cc. This method of Wright's is sufficiently accurate for all practical purposes.

The proper number of bacteria which should be inoculated varies in different cases, and with different vaccines. The limits of safety have been determined by Wright for several vaccines, e.g., in staphylococcic lesions quantities like 100–2500 million cocci may be injected without fear of even local complications.

In the case of tuberculosis, the most suitable method of dosage is by weighing the culture, the dose being estimated in fractions of a milligram.

Classification of Bacteriotherapeutic agents.—In actual practice, all these remedies, prophylactic and curative, are divisible into two great classes according as they are active (vaccins in the widest sense of the word) or passive immunizers (therapeutic sera). For the purpose of easy identification they may be arranged, as far as human medicine is concerned, as follows.

I.—Active Immunization.

1. *Prophylactic Remedies* :—

a. Immunization by attenuated living virus, e.g., Jennerian vaccination against variola ; Pasteur's protection against rabies by emulsions of nervous system containing attenuated virus.

b. Immunization by infectious agents killed by heat, etc., e.g., Haffkine's cholera vaccin ; Haffkine's plague vaccin ; Wright's typhoid vaccin ; Wright's staphylococcus vaccin ; Koch's tuberculin T.R.

c. Immunization with bacterial products (tropins and toxins), e.g., Koch's old tuberculin T.O.

2. *Curative Remedies* :—

Koch's tuberculins, old and new, T.O. and T.R. ; Wright's pneumococcus, staphylococcus, and coli vaccins.

II.—Passive Immunization (serum of animals actively immunized).

Prophylactic and Curative Remedies :—

a. Specific antitoxic sera, e.g., diphtheria antitoxin ; tetanus antitoxin ; dysentery antitoxin ; antivenene ; jequiritol serum ; "pollantin" ?

b. Specific bactericidal sera, e.g., antityphoid serum ; anticholera serum ; anti-dysentery serum (Shiga).

c. Sera in which bactericidal action is assumed but not proved, e.g., antistreptococcus serum (mono- and polyvalent) (Moser's serum ; Menzer's serum) ; antipneumococcus serum (mono- and polyvalent) (Pane's serum ; Römer's serum) ; anti-plague serum (partially antitoxic ?) ; anti-anthrax serum of Sclavo.-Sobernheim.

III.—Combined Active and Passive Immunization.

E.g., Plague serum and plague vaccine (jequiritol serum and jequiritol—Römer).

Injection of Bacteriotherapeutic Remedies.—*Subcutaneous Injection.*—The various bacteriotherapeutic agents are usually injected subcutaneously, the favourite sites being in the flanks, or between the shoulder blades. Where the quantity of fluid is considerable, as in the case of several of the therapeutic sera, the flank is the best site, as large quantities of fluid can be introduced here without material discomfort. Where the quantity of fluid is small (tuberculin), injection between the shoulder blades is convenient. Injections into the subcutaneous tissue of the forearm or buttock are in general to be avoided.

The skin should be washed with soap and water, and then with some antiseptic lotion, such as 5 per cent carbolic acid or 3 per cent lysol. The hands of the operator must also, needless to say, be clean. A good fold of skin is picked up and compressed slightly, the needle being inserted into the compressed area, and the fluid is then slowly injected. The puncture may be sealed up with collodion.

Syringes.—The question of the syringe is often a trouble. The best are undoubtedly those made entirely of glass, although, as the capacity increases, the price of such instruments is also very considerable. With care, however, these all-glass syringes are longer lived than those of glass with metal, rubber or asbestos parts. The operator should provide himself with two syringes, one having a capacity of, say, 2 cc., the other 10 cc. Excellent "all glass" syringes are made by Messrs. Burroughs, Wellcome & Co., and other suppliers of antitoxin. For the last ten years the writer has used syringes made by Luer.* It is preferable to have the needles made of iridium-platinum, as they last much longer.

The syringe, separated into its parts, should be boiled in water containing 1 per cent sodium carbonate, for 3 to 5 minutes. In Luer's instrument this can be done in the box which carries the instrument, the spirit for boiling the water being poured into the lid. In private practice and in out-of-the-way places it is not always easy to disinfect the syringe quickly. Wright† has suggested an excellent method which the writer has frequently used. It consists in sterilizing with olive oil at a temperature of 160° to 180° C., and it is sufficient to fill the syringe twice with hot oil at this temperature. The temperature may be obtained either by a thermometer, or if this is not at hand by a piece of ordinary bread crumb. The bread crumb becomes *brown* and crisp as soon as the temperature of 160° to 180° C. is reached. The olive oil may be heated in a spoon over a spirit lamp or the gas. The oil method prevents rusting of the needles, but it cannot be used for sterilizing indiarubber tubing. The syringe should be thoroughly cleaned before being put away.

Intravenous Inoculation.—In severe cases of infection it may be advisable

* Maison Luer, 6, Rue Antoine Dubois, Paris.

† Wright, Lancet, Jan. 8, 1898.

to introduce curative sera intravenously, in order that the relatively slow absorption which takes place from the subcutaneous tissue may be avoided and the remedy quickly brought into the circulation. The median basilic vein is the most convenient site. In the child it may be necessary to give a general anæsthetic, although cocaine anæsthesia is usually sufficient. Various methods have been described of making incisions, etc., but the writer has found no difficulty by operating as follows :—A bandage is placed round the upper arm, an assistant applying pressure over the cephalic and basilic veins. The area at the bend of the elbow is then thoroughly disinfected with soap and water, alcohol and ether, and 5 per cent carbolic acid, the arm being thoroughly extended. By the time this is done the veins stand out prominently. The disinfected area is covered over with a piece of gauze soaked in antiseptic. The syringe having been boiled (oil is unsuitable in this case), the serum, which has been previously warmed (37° C.), is aspirated into the barrel but not quite filling it. The needle is first introduced subcutaneously over the distended vein, which is penetrated a little higher than the skin wound. A backward movement of the piston (as in drawing blood from the vein) is made, and if everything is right, blood will flow into the syringe and come in contact with the antitoxic serum. If this is satisfactory the serum can then be safely introduced, care being taken that, towards the end, no bubbles of air pass in. If the syringe has to be refilled, it should be disconnected, leaving the needle in the vein, and after the syringe is applied again the same manipulation is made. When the operation is completed, the needle is quickly withdrawn, the bandage released from the upper arm, and a pad of lint applied to the puncture. The writer has never seen complications following this technique in scores of cases. In very fat people there may be some difficulty in getting into the vein at once, but if after some difficulty an entry cannot be effected, it is better to try afresh on the opposite side. The right median basilic vein appears to the writer to be easier to operate on than the left.

Complications following the Introduction of Curative Sera.—"Serum Disease." The most frequent complications which may ensue from inoculation of sera are cutaneous rashes of various kinds, pains in the joints, etc. These are, however, dealt with in the article on the treatment of diphtheria. Von Pirquet and Schick have recently described (1905) what they term "serum disease." This is a condition set up by the introduction into the body of an alien serum, especially where given in repeated doses. According to their frequency, the chief symptoms of the "disease" are fever (up to 40° C.), exanthemata of polymorphic character, swelling of the glands, leukopenia, joint swellings, œdema, and albuminuria. After the first injection of serum these symptoms may appear, after an incubation period of 8 to 12 days. Where repeated injections are given, the incubation period may be so shortened that symptoms come on in about twenty-four hours. Von Pirquet and Schick attribute the "disease" to the concurrence between the proteids of the serum and anti-bodies which are developed from these proteids. It has been suggested that the hypersensitive condition (*Anaphylaxie* of French writers) which may follow the introduction of bacterial vaccins, is also referable to the production of anti-bodies dissolving the bacterial protoplasm, so that one appears to get a cumulative action.

Diphtheria. — *Diphtheria Antitoxin* (*Antidiphtheritic Serum*). Diphtheria antitoxin may be taken as the type of the genuine antitoxic serum possessing marked prophylactic and curative properties. For its production horses are exclusively used, and the manner in which the immunization is brought about is briefly as follows :—

Certain toxigenic races of *Bacillus diphtheriæ* are chosen, so that the yield of toxin may be as large as possible. The cultures are grown in alkaline bouillon for a number

of days, and are then filtered through a Berkefeld or Chamberland *bougie*, the toxin obtained in this way being finally conserved by the addition of toluol. The strength of the toxin is obtained by measuring its lethal effect on guinea-pigs. The horses which are to act as serum producers must be free from all disease, especially infectious diseases like glanders, for which they should be tested with mallein. Having passed these tests, the immunization is commenced with the subcutaneous inoculation of small quantities of a toxin of known strength. The effects of the inoculation are local swelling, fever, loss of appetite, and malaise, which, however, soon pass off. In the course of a few days a larger dose of toxin is injected, and so on till the animal is capable of withstanding immense doses without ill effect. At various times during this process small samples of blood are drawn from the jugular vein, in order that the progress in antitoxin formation may be known.

When the serum contains a quantity of antitoxin which is deemed suitable for clinical purposes, a venesection is made, and several litres of blood are withdrawn into sterile flasks, where it is allowed to coagulate, the serum which separates being diphtheria antitoxin so-called. In most cases the serum is protected against possible contamination by the addition of carbolic acid (0·2–0·3 per cent) or tricresol, and in some cases it is also filtered through a Berkefeld or other bacterial filter. Before it is finally put up in bottles or phials, it is tested for sterility, absence of toxicity, and for its antitoxic strength. At the present time most manufacturers send it out in hermetically sealed glass phials.

Standardization of Diphtheria Antitoxin.—Diphtheria antitoxin is the most accurately standardized of all the bacteriotherapeutic remedies, and its strength is estimated on a system of units devised by Ehrlich. Since 1894, the testing of all antidiphtheritic sera made in Germany has been under State control in the Institute for Experimental Therapy in Frankfort, and only this tested antitoxin may be sold. In most other countries, including England, there is no State control, each manufacturer testing the value of his own antitoxic serum. In the early days of antitoxin production several English sera in the market were not accurately tested, but at the present time they are of good strength, and no doubt contain all the antitoxic units which they are said to do.

Antitoxin Unit.—A great deal of erroneous information is contained in books in regard to the value of the antitoxin unit. Its evolution has been somewhat complex, but it is important that it should be understood. Without going deeply into technicalities, the unit has arisen in this way: when it was found that antitoxin varied in strength, it became necessary to adopt some standard of measurement whereby the relative strength of different antitoxins could be compared. Behring and Ehrlich designated as one unit the quantity of antitoxin (i.e., diphtheria serum) which completely neutralized the toxic action of 100 times the minimal lethal dose of diphtheria toxin on a guinea-pig weighing 250 grams. The actual testing was carried out in this way: that to 10 minimal lethal doses of toxin, varying quantities of serum were added, and the mixtures were injected into guinea-pigs. The quantity of serum which neutralized the 10-fold toxin dose was $\frac{1}{10}$ of 1 unit.

This simple method however was soon found to be unsuitable, as different toxins which were equally poisonous required different quantities of serum to neutralize their lethal effects. In other words, there is no relation between the absolute toxicity and the combining power of the toxin and antitoxin. Ehrlich found that the cause of this was that the toxin undergoes certain changes, whereby its toxicity diminishes, while its antitoxin-combining property remains constant. For this reason the use of toxin had to be abandoned as a standard, and antitoxin was taken in its stead, and the first antitoxin standard, while derived from the older toxin standard, was to a certain extent arbitrary. Since 1896 the antitoxin standard has, however, been maintained with wonderful accuracy, considering the nature of the substances in question. A large quantity of a given standard serum was kept under conditions which prevented deterioration, and a unit of serum, while originally sufficient to neutralize 100 lethal doses of toxin, is in reality a more or less arbitrary standard kept in the Frankfort Institute. This

standard serum is supplied from time to time to manufacturers in other countries, and they use it for standardizing their toxin, using this standardized toxin to test the antitoxic value of the sera which they themselves manufacture. Outside Germany, therefore, a diphtheritic antitoxic unit may be defined as the quantity of serum which neutralizes a certain quantity of toxin, which quantity is neutralized by Ehrlich's unit.

Strength of Diphtheria Antitoxin.—The dosage of antitoxin is reckoned entirely on Ehrlich's system of units. With increased knowledge of the best methods of immunization of horses, the antitoxic value of the sera in the market has risen considerably in recent years, reaching figures up to 1200 units per cc. The higher strengths (500 units and upwards) are more difficult to prepare, and in consequence are more expensive. The diminution in the quantity of serum to be injected is, however, a very important advantage, as in very severe cases a large number of units can be injected in a relatively small bulk of serum.

The manufacture of diphtheria antitoxin has reached a high standard of excellence at the present time, and considering the anxiety, responsibility, and trouble in its preparation, its cost is reasonably low. Without making invidious comparisons, the diphtheria antitoxins prepared by the following institutes and commercial firms may be regarded as trustworthy :—

1. Lister Institute, London (Agents : Allen & Hanburys). Diphtheria serum in liquid form, in phials, each

Containing 2000 units (price 2/6). Dried Serum in tubes, 4000 units (5/-)
Extra potent Serum in tubes, 4000 units (10/-).

2. Burroughs & Wellcome supply diphtheria antitoxin at the rate of 2/9 for 2000 units ; likewise sera of higher potency, as follows :—Phials containing

2000 units in 2 cc. ..	5/6	6000 units in 6 cc. ..	16/-
4000 ,, 4 ,, ..	11/-	8000 ,, 8 ,, ..	22/-
5000 ,, 5 ,, ..	13/6	10000 ,, 10 ,, ..	27/-

3. Parke, Davis & Co. supply antitoxin in two grades : "X" (or standard serum) up to 400 units per cc., and "XX" (special serum) from 400 to 1200 units per cc. Their different quantities and prices are arranged as follows :—

	X	XX		X	XX
No. 1, containing 500 units	1/-	—	No. 5, containing 3000 units	4/6	8/-
,, 2 ,, 1000 ,,	1/10	—	,, 6 ,, 4000 ,,	—	9/6
,, 3 ,, 1500 ,,	2/6	—	,, 7 ,, 5000 ,,	—	12/6
,, 4 ,, 2000 ,,	3/2	6/2	,, 8 ,, 6000 ,,	—	15/-

Of German firms with agencies in this country, three supply well-known antitoxins of great uniformity, and all tested in Frankfort :—

1. Meister Lucius & Brüning, of Höchst (51, St. Mary Axe, London) supply sera in three forms.

No. 1 (green label)	600 units, price	1/7
,, 2 (white ,,)	1000 ,, ,,	2/4
,, 3 (red ,,)	1500 ,, ,,	3/5

They also supply extra potent sera (marked as such on the label) in the following strengths :—

Phial No.	O.D. (yellow label)	containing 1 cc.	500-fold =	500 units.
,,	II. D. (white ,,)	,, 2 cc.	,, =	1000 ,,
,,	III. D (red ,,)	,, 3 cc.	,, =	1500 ,,
,,	IV. D. (violet ,,)	,, 4 cc.	,, =	2000 ,,
,,	VI. D (blue ,,)	,, 6 cc.	,, =	3000 ,,
,,	VI. E. (,, ,,)	,, 5 cc.	,, =	3000 ,,

2. Schering's antitoxin (A. & M. Zimmermann, 3, Lloyd's Avenue, London, E.C.). The Schering firm have six qualities of antitoxin, viz. :—

I. (yellow label)	Phial of 1 cc. = 500 units	..	1/-
II. (white ,,)	,, 2 cc. = 1000 ,,	..	2/-
III. (red ,,)	,, 3 cc. = 1500 ,,	..	2/11
IV. (violet ,,)	,, 4 cc. = 2000 ,,	..	3/9
V. (,, ,,)	,, 5 cc. = 2500 ,,	..	4/6½
VI. (blue ,,)	,, 6 cc. = 3000 ,,	..	5/3½

3. Merck, of Darmstadt (16, Jewry Street, London, E.C.) also supplies excellent serum, mostly of 500 times normal strength, and supplied in doses of 600, 1500, and 3000 units.

Dosage of Antitoxin.—Manufacturers of antitoxin recommend very different doses, and it is well known that even to-day considerable diversity of opinion prevails among physicians as to the number of units required. The opinions and wide experience of Dr. Goodall on this subject will be found in his article, together with the effects which take place on the diphtheritic process, and the complications which may ensue. (See DIPHTHERIA.)

Administration.—The serum is usually inoculated subcutaneously, suitable sites being the flanks or between the shoulder blades. Antiseptic precautions should be observed throughout. In very severe cases intravenous inoculation may have to be practised, the method by which this can be safely carried out having been already described.

Keeping Properties of Diphtheria Antitoxin.—Every one admits that the durability of diphtheria antitoxin is remarkable. A slight cloudiness, with a tendency to the formation of a deposit, may occur, although this is not evidence that the serum has deteriorated. Kept in a cool place and away from light, its potency remains for a year at least. Miller, who has recently investigated this important subject bacteriologically, in the case of sera manufactured by Parke, Davis & Co., has shown that, with the excess of units usually allowed by manufacturers, antidiphtheritic serum retains its therapeutic activity for a much longer time than is generally supposed. The high grade sera appear to deteriorate more quickly than the weaker strengths, and Miller's conclusion is that the "ordinary packages of serum, containing as they do the excess allowed by the manufacturers, retain their full therapeutic value for months or even years after their time limit as stamped on the label has expired."

Antibacterial Diphtheria Serum.—As we have seen, diphtheria antitoxin is a product derived from the inoculation with the soluble diphtheria toxin only, the bodies of the bacilli being discarded. There is a good deal of evidence that the local diphtheritic lesion is referable, in part at any rate, to the bacilli themselves, which are not destroyed by diphtheria antitoxin. Wassermann has recently attempted to prepare a new form of diphtheria serum which would act on the bacilli themselves. He extracted the bacillary bodies with a 1 per cent solution of ethylene diamine, obtaining after centrifugalization a clear fluid containing both endo- and exotoxins. This fluid, injected into horses, gives rise to an agglutinin in the serum which acts on the bacilli. The exact nature of the bodies in this antibacterial serum is still a matter of doubt, but possibly they are of the nature of opsonins which would act on the diphtheria bacilli in the throat and render them a more easy prey to the phagocytes. Recently, a serum on Wassermann's lines has been prepared in the Lister Institute, and can be used locally in the form of pastilles, which are allowed to dissolve slowly in the mouth. Whether it will have the desired effect, and aid in the destruction of the bacilli in the throat, remains to be seen.

Tetanus.—(*Antitetanic Serum*). The only bacteriotherapeutic remedy used in connection with tetanus is tetanus antitoxin. Its mode of preparation

is identical with that of diphtheria antitoxin, the tetanus toxin being obtained by filtration from anaerobic cultivations of the *Bacillus tetani*. On account of the susceptibility of the horse, immunization by tetanus toxin is often difficult, and must be slowly carried out. In the highly immunized animal, immense doses of tetanus toxin can be tolerated, and the serum shows a high degree of antitoxic strength. Notwithstanding this fact, opinions are still divided as to the therapeutic value of the antitoxin in cases of tetanus in man. Experimentally, the prophylactic and curative properties of the antitoxin are undoubted, although, in judging the latter, the following factors have to be taken into account, as Behring and Knorr have shown:—(1) The dose of the toxin; (2) The dose of the serum; and (3) The time which elapses between the introduction of the toxin and the application of the serum.

Having determined first of all the quantity of serum which, if introduced twenty-four hours before the minimal lethal dose of toxin, would protect against the latter, Behring found that 100 serum doses would protect against 100 toxin doses under the same conditions. If, however, instead of twenty-four hours previously, the serum is injected only fifteen minutes before the 100 toxin doses, the quantity of serum required is 400 to 1000 times as much as in the first case, and if the 100 lethal doses of toxin are injected first, 10,000 times the quantity of serum will be required. These experiments are of great interest in considering the question of treating tetanus in man by antitetanic serum, for in the vast majority of cases the practitioner has to deal with the disease when the symptoms have already manifested themselves. The poison has permeated the nervous system, and, as Meyer and Ransom have recently shown, the antitoxin is practically powerless to cope with it even when injected in large quantities intravenously. It was suggested some time ago that the antitoxin should be injected intracranially, the basis of such a suggestion being the observations of Roux and Borrel that it is possible, by inoculating the serum directly into the brain, to save the life of a highly susceptible animal like the guinea-pig, even after tetanic symptoms have been developed. This suggestion has been applied in a number of human cases, but the results have not been encouraging. Although, therefore, there is little hope of the antitoxin being able to neutralize the toxin which has already become anchored in the nervous system, antitoxin should be administered in all cases, as it may still be able to neutralize any toxin which is passing into the circulation from the local bacillary focus where it is manufactured. A relatively small dose of antitoxin is probably sufficient for this purpose. As a prophylactic the serum should be administered in cases of wounds where infection with tetanic bacilli is probable.

Tetanus Antitoxins.—Antitetanic sera are manufactured in this country and abroad, the best known brands being prepared by the following:—

1. Lister Institute. The serum is sold in liquid and solid form. Three phials, each containing 10 cc. of serum cost 12s., and the instructions recommend that 100 cc. should at once be administered subcutaneously as a curative dose, being repeated on the two following days. A final injection should be given, even in favourable cases, 10 to 13 days after the first injection. The cost of such treatment works out at £8 for antitoxin alone. Dried antitoxin is also supplied at the rate of 4s. per gram (equal to 10 cc. of liquid serum).

The Lister Institute also supplies an antitoxin (devoid of antiseptic) for intracerebral inoculation, and it is recommended that 2 to 3 cc. should be injected. In applying for this, the purpose for which it is intended should be stated. As a prophylactic 20 cc. is considered sufficient.

2. Burroughs, Wellcome & Co. also supply tetanus antitoxin in liquid (10 cc. for 3s. 4d.) and solid form (4s. per gram.). They state that the curative dose

may vary from 10 to 100 cc. in one dose or more. As a prophylactic in the treatment of wounds 10 cc. is said to be sufficient.

3. Parke, Davis & Co. sell antitoxin in liquid and solid form at the same rate. The strength of the tetanus antitoxin prepared by the above firms is not stated. No doubt, however, some system of standardization is carried out.

4. Probably the strongest and certainly the most accurately standardized are the antitetanic sera manufactured by Meister Lucius & Brüning at Höchst, and Behring's tetanus curative serum prepared by Siebert and Ziegenbein at Marburg, a. d. Lahn. In these sera the strength is estimated on a system of units (Behring). Originally the standard was a definite serum in the possession of Behring and Knorr, and called a normal serum = 1. Later, a unit system was introduced, the starting-point being a toxin of which 1 cc. was capable of killing 4,000,000 grams of living mice in 4 to 5 days. The quantity of serum capable of neutralizing 10 times this dose of poison was described as an antitoxic unit, and the strength of the serum is reckoned according to the number of units it contains per cc. Meister Lucius & Brüning supply 100 units at 8s. and 20 units at 2s.

Siebert and Ziegenbein's antitoxin, made under the control of Behring, costs 15s. per 100 units and 3s. per 20 units.

The curative dose for man is 100 units when the antitoxin is introduced as soon as the diagnosis of tetanus is established. For prophylaxis a dose of 20 units is considered sufficient.

It is recommended that the serum should be inoculated at the site of the entry of the virus, if that site is discoverable, otherwise subcutaneously into the subclavicular region. The serum may also be applied in the dried state to the local lesion. In any case, the serum treatment should be undertaken without a moment's delay.

Tuberculosis.—*Tuberculin.* A considerable number of preparations exist under the name Tuberculin, e.g.,

Tuberculin T.O. (Koch's old Tuberculin, 1890).
Tuberculin T.R. (Koch's new Tuberculin, 1897).
Tuberculocidin (Klebs' Tuberculin).
Oxytuberculin (Hirschfelder).
Tuberculin of Denys.
Tuberculol of Landmann.
Tuberculin of Beraneck.

The most important of these are the two preparations of Koch, the foundation for the use of which was Koch's observation that small quantities of dead tubercle bacilli produce death in animals which had already been rendered tuberculous. By reducing the quantity of dead tubercle bacilli to very minute proportions, Koch was able in a certain number of cases to bring the tuberculosis to a standstill. He found, however, that the dead bacilli remained for long periods at the point of the inoculation, and ultimately gave rise to abscesses. Whatever amelioration of the tuberculous process had taken place, must have been due to substances which passed out of the bacillary bodies, and this gave the suggestion that such substances might be prepared from the bacilli and injected in a form capable of rapid absorption. In this way originated tuberculin, now described as "old tuberculin" or tuberculin T.O.

This was prepared from glycerin bouillon cultures of T.B. 4 to 6 weeks old. These were sterilized at 100° C. for 1 hour, then evaporated in vacuo to $\frac{1}{10}$ of their bulk, and finally the bacillary bodies were filtered off. Tuberculin prepared in this way is a yellowish clear liquid which, on account of its high percentage of glycerin, remains unaltered for years, provided that it is not exposed to light.

When this tuberculin was injected in small doses into tuberculous human

beings, the manifestations witnessed were both pyrogenic and phlogogenic, the latter consisting of inflammation, leucocytic emigration, and necrosis of the tuberculous foci visible to the naked eye. Koch originally regarded the local necrosis as an essential element in the cure of tuberculosis ; the rise of temperature was looked upon as specific, in so far that it occurred only in tuberculous individuals. The exact nature of this so-called tuberculin reaction is not yet thoroughly understood, but it is in some way connected with the T.B. in the body, as the reaction does not occur in healthy individuals. Koch hoped that the tuberculin would prove a therapeutic agent, and as such it was tried, and after some successes and many failures, especially in pulmonary tuberculosis, it was practically abandoned. Apparently, however, Koch was convinced that it possessed certain curative virtues, as he proceeded to improve the tuberculin, finally issuing in 1897 his so-called " new tuberculin " or tuberculin T.R.

This tuberculin T.R. is the unchanged protoplasm of fresh virulent tubercle bacilli, and it is manufactured as follows :—The living virulent cultures are first dried in vacuo, and then comminuted to an impalpable dust by machinery. The dust is then treated with saline solution, and the mixture thoroughly centrifugalized. In this way an opalescent fluid T.O. (O = *oberste ; angl.* uppermost) and a deposit T.R. are obtained. The deposit is then worked up with successive quantities of water, and is named T.R. (R = *rest ; angl.* residue). Most recently Koch (1901) has used a mixture of T.O. and T.R. under the name " Koch's new tuberculin-bacillary emulsion."

Tuberculin T.O. possesses properties similar to old tuberculin, while T.R. acts differently. In his employment of tuberculin Koch may be looked upon as the founder of therapeutic as opposed to prophylactic inoculation.

Old Tuberculin : its Use.—At the present day, old tuberculin is used almost exclusively as a diagnostic agent for tuberculosis, and this chiefly in the case of the domestic animals. There are, however, many who also advocate its use as a diagnostic for man likewise, although this application has not been employed to any great extent in this country. In the fifteen years which have elapsed since tuberculin was first introduced, a great deal has been learned, not the least important being the fact that the failure of tuberculin was largely due to the exhibition of doses much in excess of what was necessary, or even safe. The chief stigma against it has been a widely current belief that the introduction of tuberculin into a tuberculous individual causes dissemination of the morbid process by setting the bacilli free, and no doubt this frequently took place in the early days of its administration. With increased knowledge, however, the danger of dissemination scarcely exists at the present time. Thus, an experienced physician like Moeller has recently asserted (1905) that in 20,000 inoculations which he had made he had never seen dissemination as a sequela when the tuberculin was used as a diagnostic agent, even in pulmonary tuberculosis. Koch and others have spoken in a similar strain.

In using tuberculin in the diagnosis of tuberculosis, Koch recommended that the temperature should be noted for a day or two prior to the inoculation, and the tuberculin should not be given if the temperature was above normal.

For those in fair health he recommended 1 mgram. (1 cc. of a dilution of 1–1000). Provided no rise of temperature ensued, he proceeded in two days to 5–10 mgrams. If a rise of even ½° C. took place, the original dose was to be repeated.

Moeller, from an unusually large experience in pulmonary tuberculosis, lays down the following rules (1905), emphasizing the importance of individualization in regard to dosage, and pointing out such contra-indications as fever, recent hæmoptysis, hysteria, and epilepsy. The object to be attained is the certain diagnosis of tuberculosis, with as little risk and reaction as possible. With this

in view, Moeller begins as a rule with $\frac{1}{10}$ to $\frac{2}{10}$ mgram., obtaining this quantity by dilution thus :—

A	·1 cc. tuberculin	+9·9 cc. of ·5 per cent carbolic acid,			1 cc=·01 gram tuberculin.
B	1 cc. of A dilution	+9 cc.	,,	,,	,, =·001 gram. (1 mgram.)
C	1 cc. of B	+9 cc.	,,	,,	,, =·1 mgram.
D	1 cc. of B	+4 cc.	,,	,,	,, =·2 mgram.
E	1 cc. of B	+2 cc.	,,	,,	,, =·3 mgram.

The inoculation is best made between the shoulder blades (arm is to be avoided), and before the inoculation the temperature should be taken every two hours on three successive days. Injection should be made between 7 and 8 o'clock in the evening, so that the reaction which occurs on the following day may be closely watched. A rise of ·5° C. is to be regarded as a reaction. If no reaction has occurred with $\frac{1}{10}$ mgram, but a rise of, say, ·3° C. or ·4° C., Moeller proceeds to $\frac{2}{10}$ mgram. at the end of two or three days. If there is *no* rise of temperature after the first dose, then $\frac{5}{10}$ mgram, and failing a reaction 1 mgram, up to 10 mgrams (highest dose). For a child the maximum dose is 5 mgrams.

If no rise of ·5° C. occur after 10 mgrams. in an adult, or 5 mgrams. in a child, the reaction is negative.

During the reaction the patient should be kept in bed on a light diet.

These rules, which apply to tuberculin diagnosis of pulmonary tuberculosis, are also applicable to tuberculous processes in other parts of the body.

Moeller thinks that certain deductions can be drawn from the tubercular reaction, in so far that small doses produce the characteristic effect chiefly in patients in whom the disease (in the lung) is beginning. Where the process is chronic it requires the bigger doses to produce a reaction. The fact that those recently affected react with minute doses, is of great importance practically, as early diagnosis of the disease is vital.

Tuberculin is also used as a therapeutic agent, although most experienced observers consider that a certain selection of the cases is necessary.

Indications for Tuberculin Treatment.—The most satisfactory cases are those suffering from uncomplicated lesions of one apex, and to a less extent where both apices are involved.

Where hæmoptysis has been frequent, one must proceed with extreme caution, the main principle being to *avoid reactions.*

Where a reaction has unavoidably ensued, the temperature must be completely normal before any attempt is made at a new injection. In favourable cases Moeller reaches 10-mgram doses in three to five weeks, but there are the greatest variations in different individuals.

Old Tuberculin can be obtained from several firms, but mainly for veterinary purposes. Tuberculin suitable for man can be procured from Meister Lucius & Brüning, their preparation having the advantage of being standardized against a standard tuberculin on a series of guinea-pigs rendered tuberculous with a definite quantity of a culture of tubercle bacilli.

New Tuberculin (Koch's Tuberculin T.R.).—This is manufactured only by Meister Lucius & Brüning, and is sold in small glass-stoppered bottles containing 10 mgram solid substance (price 8s. 6d.). Its evolution as a curative agent and its mode of preparation have been described above. Doubts have been expressed as to its sterility, but these can be easily overcome by heating the tuberculin to 70° C. for ten minutes without impairing its efficacy. In appearance T.R. tuberculin is an opalescent fluid, and it should be kept in a cool and dark place. Great care must be exerted in preparing the dilutions, not only in regard to errors of measurement, but also to ensure sterility. The manufacturers recommend the dilutions to be made with 20 per cent of glycerine (20 cc. glycerin boiled for 15 min. with 80 cc. distilled water in a flask plugged

with cotton-wool). For measurement it is necessary to use 1 cc. pipettes, graduated to $\frac{1}{10}$ths. As the doses are reckoned by weight, it is *assumed* that the bottle originally contained 10 mgrams of solid substance.

The manufacturers recommend the following method of dilution :—

With a 1 cc. pipette calibrated to $\frac{1}{10}$ths, 0·3 cc. is drawn from the bottle and mixed with 2·7 cc. 20 per cent glycerin solution, making in all 3 cc. This 10 per cent dilution contains 3 mgrams solid substance. From this 10 per cent dilution 0·1 cc. is taken and made up to 10 cc. with glycerin solution. Thus a 1 per mille dilution of the original fluid is obtained. Two divisions or $\frac{2}{10}$ cc. of a Koch or Pravaz syringe contain, therefore, $\frac{1}{5000}$ mgram of solid substance. The makers say that the dilutions will keep well for a fortnight, but the writer has used dilutions made up months previously without observing any loss of activity.

Where a number of inoculations have to be carried out, the most convenient method of diluting is the following, all the doses being brought up to a quantity of 1 cc., a quantity convenient to inoculate :—

A. By means of a 1 cc. pipette a 10 per cent solution of the original material is made, i.e., ·3 cc. of tuberculin is mixed with 2·7 per cent cc. of a 20 per cent glycerin solution (·25 per cent carbolic acid can also be used), 1 cc. of this dilution=1 mgram.

B	·1 cc. of A solution	+	9.9 cc. of glycerin solution,	=	$\frac{1}{100}$ mgram	per cc.
C	1·0 cc. of B	,,	+9 cc.	,,	= $\frac{1}{1000}$	,,
D	1·0 cc. of B	,,	+8 cc.	,,	= $\frac{1}{900}$	,,
E	1·0 cc. of B	,,	+7 cc.	,,	= $\frac{1}{800}$	,,
F	1·0 cc. of B	,,	+6 cc.	,,	= $\frac{1}{700}$	,,
G	1·0 cc. of B	,,	+5 cc.	,,	= $\frac{1}{600}$	,,
H	1·0 cc. of B	,,	+4 cc.	,,	= $\frac{1}{500}$	,, (etc.)

Quantities such as these may be filled by means of a graduated syringe into small glass capsules, which are then sealed and can be kept for considerable periods.

Use of New Tuberculin.—Koch recommended the use of progressively increasing doses, and most others following him have done the same. Beginning with doses of $\frac{1}{5000}$ mgram, he gradually raised the dose every two or three days, reaching quantities like 20 mgrams. This method was extensively tried, but the results were not very encouraging. A. E. Wright has recently revived interest in Koch's new tuberculin as a therapeutic remedy, and he has obtained good results, especially in the chronic localized forms of tubercle. By frequently determining the opsonic content of the serum, he has been able to control the doses of tuberculin in a more accurate manner than has hitherto been possible. The writer has treated a large number of cases of tuberculosis on the lines laid down by Wright, and his experience has been as follows :—

In the first place, there is no doubt that tuberculin T.R. possesses curative properties in cases of tuberculosis. It would appear that the negative or harmful results have been largely caused by the administration of quantities much in excess of what is necessary or expedient. No definite rules can be laid down as to what doses should be given, but something much less than that recommended by Koch would appear to be correct. For a time the writer began with $\frac{1}{10000}$ mgram, gradually working up to $\frac{1}{5000}$ or even higher (it will be remembered that Koch began with $\frac{1}{5000}$ mgram.), but recently he has fallen back on still smaller doses like $\frac{1}{17500}$ and $\frac{1}{15000}$ mgram. As long as the opsonic index is maintained at a high level, the dose is neither repeated nor increased. In most cases a reinoculation is required in about fourteen days, but no definite rules can be laid down, as in some patients the opsonic rise caused by the inoculation is succeeded by a fall, in some cases sooner than others.

If a negative phase is produced by a given dose, say $\frac{1}{10000}$ mgram., it is not necessary to increase the dose for the next inoculation. When a given dose has ceased to produce a negative phase, a small increase should be resorted to, such

as from $\frac{1}{10000}$ to $\frac{1}{500}$ mgram. Marked curative effect has been seen where the doses have never exceeded $\frac{1}{10000}$ mgram. The writer has noted on several occasions that the repetition of a small dose ($\frac{1}{10000}$ mgram) is followed by a condition of hypersensitiveness, and in such cases he has with advantage gone back to still smaller doses, say $\frac{1}{100000}$ mgram. The observations of Wright throw a good deal of doubt on the idea that it is necessary gradually to increase the dose in order to get more pronounced curative effects. Tuberculin, in the minute doses indicated above, is perfectly safe, and there are practically no contra-indications, although naturally not much is to be expected from this treatment in the late stages of pulmonary tuberculosis. A further advantage of these excessively minute doses is, that probably they may be safely given without determinations of the opsonic index, whereas with larger quantities, $\frac{1}{5000}$ mgram and upward, this becomes a necessity if failures are to be avoided.

It is certainly important that tuberculin treatment should be adopted, not as a last resort after everything else has failed, but as early as possible. How far the principles advocated by Wright are applicable to pulmonary tubercle is not yet determined, as here the factors are extremely complex, the dosage and interspacing of doses being, in many cases, extremely difficult.

Antitubercular Sera.—The attempts to produce curative tubercular sera in animals have been uniform failures. In most cases the serum has been prepared by inoculating horses with dead cultures of T.B. or with various toxic products isolated from such cultures. Many of these sera produce a general reaction, which is probably due to the presence of small quantities of toxic material still present in the serum.

Affections caused by Streptococci.—*Antistreptococcus Serum.* The clinical value of antistreptococcus serum is still a matter of doubt. Marmorek originally prepared it by inoculating horses with a given strain of streptococcus which had been exalted to maximal virulence by passage through rabbits. It was claimed by Marmorek that the serum of horses treated with progressively increasing doses of such a streptococcus possesses protective powers, and a number of cases were recorded in which streptococcic infections in man had been cured. Koch and Petruschky, however, threw a good deal of doubt on the protective and curative value of Marmorek's serum, and it was afterwards suggested that its failure to cure certain cases was due to the fact that these latter were probably due to cocci not identical with those which had been used for the immunization of the horse. Denys and Van de Velde then suggested the propriety of immunizing animals with different races of streptococci, the serum obtained being described as "polyvalent." Such polyvalent sera are manufactured on a large scale at the present time. From a purely experimental point of view, however, a great deal of doubt still exists in regard to the question of streptococcus organisms, and especially whether streptococci are identical in their characters or not. For the production of antistreptococcic sera some maintain that one race of the micro-organism is sufficient. Others hold that the cocci used for immunization should be obtained direct from man without passage through the bodies of animals.

Nature of the substances in Antistreptococcic Serum.—Antistreptococcic serum has been described as of the bactericidal type, the cocci being dissolved and destroyed when brought into contact with the serum. There is, however, very little evidence that this statement is correct, and some have held that the serum merely inhibits the growth of the coccus *in vitro* and possibly *in vivo*. At the present time, the question of the action of the serum, must be left undecided. The difficulties of standardizing antistreptococcic serum are so great that most manufacturers recommend doses in *quantities* (cc.), without being able to inform their purchasers what strength the serum possesses.

Results obtained.—In studying the literature of human cases treated with antistreptococcic serum, it is apparent that very discordant results have been obtained. In a certain number of cases benefit has been reported, while in many others the serum had little effect. No doubt the serum has often been used where there was no evidence of streptococci, but even where the streptococcus was demonstrated bacteriologically, the serum failed to act beneficially. In a number of such cases, the writer has failed to convince himself that the serum influenced the disease favourably. In a certain number of cases of severe streptococcic infection, a fatal issue supervened rapidly in spite of the serum. Still, it may be considered worthy of trial when other remedies have failed, although there can be no doubt that in the ten years in which antistreptococcic serum has been before the profession it has failed to establish itself as a remedy to be depended on.

The principal sera in the market are prepared by the following institutes and commercial firms.

1. Lister Institute. In the directions supplied with antistreptococcic serum as manufactured at the Lister Institute it is stated that "the remedy is still on its trial, and although numerous recoveries have been reported after the use of the serum, the number of cases is not sufficient to warrant an absolutely safe conclusion." The Lister Institute serum is polyvalent, and the dose recommended is 30 cc. (price 7s. 6d.) given at once, and repeated daily until improvement has occurred. Local injections into the primary focus are indicated.

2. Burroughs, Wellcome & Co. also supply a polyvalent serum in doses of 10 cc. (2s. 9d.). A large number of strains of cocci are used in the preparation of this serum, including organisms from erysipelas, empyema, puerperal fever, wound infections, and chorea.

3. Parke, Davis & Co. also make a polyvalent serum, supplying 30 cc. for 12s.

4. From the Pasteur Institute in Paris (Teleg. Address: "Serpasteur," Paris) a polyvalent antistreptococcus serum is issued, containing no antiseptic. The dose is 20 to 50 cc., repeated every twelve to twenty-four hours.

5. Aronson's serum (prepared by Schering, Berlin) is reputed to be the best in the market at the present time, and its strength is tested (partially at any rate) in the Institute for Experimental Therapy in Frankfort. It is described as containing two varieties of active substance.

The first of these is obtained by inoculating horses with highly virulent streptococci exalted to the highest degree by passage through animals. This moiety is tested in Frankfort, a "normal" serum being one in which 0·01 cc. protects a mouse from a severe infection with virulent cocci (10 to 100 times the minimal lethal dose). One cc. of such a serum contains 1 immunity unit. Aronson's serum as supplied contains 20 units.

The second group of antibodies contained in Aronson's serum is prepared by inoculating horses with numerous cocci which have been obtained directly from man. Hitherto it has not been found possible to estimate these antibodies quantitatively. The serum is preserved with 0·4 per cent tricresol. Three different quantities are issued, viz. :—

10	cc.	(200 units)	price 3/6
20	cc.	(400 ,,)	,, 6/3
50	cc.	(1000 ,,)	,, 14/-

In reference to his antistreptococcic serum, Aronson states that "in the test tube neither destruction nor diminution of the virulence of the streptococci is produced." The streptococci circulating in the blood of an animal protected by the serum have their virulence diminished, and are "then overcome by the body cells, chiefly the leucocytes." It is probable from this statement that antistreptococcus serum contains opsonins.

According to the severity of the case and the age of the patient, Aronson recommends 10 to 60 cc. of the serum, 20 times normal. This should be injected at once. If the fever and general condition is uninfluenced, the injection should be repeated on the two following days.

6. Tavel's serum (Berne Institute). This is polyvalent, and obtained from horses inoculated with streptococci direct from man.

Two other antistreptococci sera require a passing notice.

Moser's scarlet fever serum is a serum obtained by inoculating horses with cocci obtained from the throats of patients suffering from scarlatina. It is claimed to influence cases of scarlet fever favourably. The dose is large, viz., 30 to 180 cc.

Menzer's Serum (MERCK). Streptococci from human sources are used for the immunization of the animals. A " normal " serum is supplied, i.e., " a serum which will produce in chronic streptococcus infections in the human body a distinctly recognizable local and general reaction if 1 cc. is injected." The production of a local and general reaction indicate that the immunization of man by Menzer's serum is an active rather than a passive process, and it is probable that it contains toxic substances. It is well known that the serum of horses immunized with streptococci may remain toxic for some time, and on more than one occasion the writer has seen definite reactions (fever, changes in the infected lesion) treated with antistreptococcic sera other than that of Menzer.

Pneumococcic Infections.—*Antipneumococcic Serum* (PANE, RÖMER). In the early days of diphtheria antitoxin preparation, attempts were made to obtain a serum which would act in a similar manner in the case of pneumococcic lesions, especially pneumonia. The serum was prepared by inoculating horses, first with dead and then with living cultures, exalted to maximal virulence by passage through animals. Washbourn in this country and Pane in Italy, prepared sera in this way, and although experimentally they showed a certain—if slight—protection against fatal doses of pneumococcus culture, opinions still differ as to its therapeutic efficacy in man. In many cases the results have been negative. The subject has recently been revived by Römer, who conceived the idea of making a polyvalent serum. For this purpose the most diverse races of pneumococcus are introduced into *different* animals, the mixed sera being described as Römer's antipneumococcic serum. It has been used in pneumonia without any very marked evidence of success, but in *ulcus corneæ serpens* it appears to act well. In over 100 cases treated in the Würzburg University Hospital, Römer reports that the serum arrested incipient ulcers, and even 80 per cent of advanced ulcers were cured. Römer's serum is supplied by Merck.

Pneumococcus Vaccin (WRIGHT).—In a number of chronic pneumococcic infections Wright has obtained good results by active immunization by means of dead cultures of pneumococcus. The cultures are grown, and the number of cocci enumerated in the manner previously described. Doses of about 50–100 million cocci were used by Wright, the dose not being increased much above this figure. In some of the cases cure was rapidly obtained.

Staphylococcus Infections.—*Staphylococcus Vaccin.* In a large number of cases Wright has reported excellent results in the treatment of chronic staphylococcic lesions (boils, carbuncles, acne, sycosis, etc.) by staphylococcic vaccin. In the writer's hands the results have been equally good. Staphylococci are isolated, grown, emulsionized, and killed in the ordinary way, and the number of cocci present are determined by counting or weighing. Wright originally used one vaccin composed of a pure culture of *Staphylococcus aureus* for furunculosis and sycosis, and another containing a mixture of *Staphylococcus aureus, citreus,* and *albus* for acne. The writer has usually isolated and prepared a vaccin from the cocci of the individual case under treatment.

Wright's staphylococcus vaccin is obtainable from the Lister Institute in sealed tubes containing 1 to 2 cc., 1 cc. containing 0·25 mgram of bacterial bodies reckoned as in the dried condition, or approximately 2,500 millions of micrococci. In regard to dosage, the most recent experience goes to show that about 500 million cocci is sufficient for the purposes of cure. It may, however, be necessary to begin with 200 million. The number of inoculations necessary varies in individual cases, but even in very chronic staphylomycoses 4 or 5 doses are usually sufficient. Unless opsonic determinations of the serum are made, it is very difficult to interspace the doses correctly, but *in general*, an inoculation should succeed a previous one after an interval of about ten to fourteen days. The immediate effects of the inoculation are stiffness, and slight pain at the point of the inoculations. No complications or unpleasant sequelæ have hitherto been observed. Chronic cases are more difficult to cure than acute cases.

Anthrax.—*Anti-anthrax Serum of Sclavo.* While Pasteur's method of actively immunizing animals against anthrax has long been practised, the method has naturally not been applied to man. The production of an anti-anthrax serum has been worked out by Sclavo, Sobernheim, and others, and very favourable reports have been published as to its value in man since 1897. The process of the immunization of animals requires a long time, but ultimately large doses of living, highly virulent anthrax bacilli can be tolerated. In man, the serum has been found most useful in cases of cutaneous anthrax. It is well tolerated, and the local destructive process seems to be arrested. Recourse to the knife is avoided, and the lesion may heal without leaving a scar. The temperature usually rises after the injection of the serum. It appears, however, that the serum is useless in pulmonary anthrax, or in any case in which, at the time of the injection or shortly after, bacilli were found in the blood (Legge).

The manner of the action of Sclavo's serum on the anthrax bacillus is not understood. Sobernheim denies to it any antitoxic or bactericidal properties *in vitro*. It possibly contains opsonins in increased amount.

Sclavo's serum can be obtained from Messrs. Allen & Hanburys. 20 to 40 cc. or more should be injected subcutaneously, and the dose should be repeated in twenty-four hours, provided that no marked improvement has set in. In very bad cases, which come for treatment relatively late in the disease, intravenous inoculation may have to be resorted to.

Enteric Fever.—*Antityphoid Serum.* Some years ago antityphoid sera were tried in the treatment of enteric fever, but no unanimity of opinion was reached in regard to their efficacy. In recent years Chantemesse has reported successful results in 712 cases of enteric, with a mortality of 3·7 per cent, as compared with a case-mortality of 20·9 obtained in typhoid patients in other hospitals in Paris. His results, however, have not been confirmed by others, and the general impression seems to be that antityphoid sera are of little value. The dose of Chantemesse's serum is stated to be a fraction of a cc., which, in severe cases, may require to be diminished to "half a drop." From various considerations, Wright looks on Chantemesse's serum as a vaccin in disguise.

Typhoid Vaccin.—Following Haffkine's active immunization in cholera, Wright was the first to use a typhoid vaccin on man on a large scale. The vaccin was a killed broth culture, and the dose was determined empirically. A considerable discussion has taken place on the value of Wright's typhoid vaccin as a prophylactic against enteric fever, but most impartial observers have come to the conclusion that antityphoid inoculation has substantially diminished the incidence and death-rate of enteric fever. It is probable that, at first, the doses of typhoid vaccin were too large, and produced severe reactions. Wright's most recent practice has been to vaccinate with typhoid bacilli (from an

avirulent culture) grown in agar and sterilized by heat. The vaccinations are carried out in two stages: the first dose of 1000 million bacilli being followed in 10 days by the second of 2000 million.

Cholera.—*Anticholera Serum.* Although the injection of cholera vibrios gives rise in animals to a specific bactericidal serum, such a serum has been found to have little effect on the course of cholera in man.

Cholera Vaccin (HAFFKINE, KOLLE). Active immunization against cholera has been practised in India on man on a large scale by Haffkine, who used cultures of cholera vibrio in two strengths. Kolle subsequently introduced a more accurate method of making and standardizing the vaccin, the cultures being grown on agar emulsionized in saline solution and subsequently killed by heat at 58° C. Such a vaccin is prepared at the Lister Institute, the dose being 1 cc., followed in 10 to 12 days by another dose of the same amount.

Bacillary Dysentery.—Since the researches of Shiga in Japan, and Kruse in Germany, it is known that acute epidemic dysentery is caused by a bacillus of the colon-typhoid group. By inoculating horses with the *Bacillus dysenteriæ*, Shiga obtained a serum which had definite prophylactic properties. The serum was tried as a curative remedy in man by Shiga in Japan, and most favourable results were reported at first. In other places the serum has not been so successful. This is probably due to the fact that there are varieties of the *Bacillus dysenteriæ*, and that the serum prepared by the inoculation of the bacillus itself is purely bactericidal. Rosenthal and Todd have, however, shown that a toxin may be obtained from dysenteric cultures, and attempts have been made to prepare a combined bactericidal and antitoxic serum. Such a serum is manufactured by the Lister Institute, the horses being immunized against the dysentery bacillus and the toxic substances elaborated by it. The dose recommended is 20 cc. subcutaneously as a prophylactic, and from 20 cc. upward as a curative, according to the gravity of the attack.

Infections with Bacterium Coli Commune. — Chronic infections (cystitis) caused by *Bacterium coli* have been successfully treated by Wright and others by coli vaccin. This is a killed culture prepared in the ordinary way. The dose ranges from 20–100 million bacilli, beginning with the smaller amount and gradually rising. The inoculations should be controlled by opsonic examinations of the serum.

Plague.—*Antiplague Serum.* (*Yersin's Serum.*) Antiplague serum is prepared by inoculating horses with cultures of *Bacillus pestis.* In the hands of Yersin, Calmette, and others, the serum treatment of plague has been of benefit in the milder forms of the disease, whereas in the severer forms which have been treated in India it has practically been useless. As a prophylactic, it may be of use, although the duration of the immunity produced is transient (two to three weeks). In this country antiplague serum is manufactured at the Lister Institute, the prophylactic dose recommended being 10 cc.

Plague Vaccin (*Haffkine's Prophylactic*).—Haffkine introduced a vaccin against plague in India. His method consisted in growing the bacillus in bouillon for a month, and then killing it by heat. The dose for an adult was 2½ to 3 cc. Local swelling and redness, with severe headache and general malaise, followed the injection of this dose, and, as far as can be judged, a considerable amount of immunity was induced, which is apparently more lasting than that brought about by Yersin's serum.

A combined passive and active immunization has been suggested.

Antivenene.—Antivenene is the serum of animals (horses) which have been immunized with progressively increasing doses of snake venom. In spite of the scientific experimental proof that antivenene neutralizes the toxic effects of snake venom, some doubt still exists as to the actual therapeutic value of

antivenene in human beings who have been bitten by snakes. In the first place the strength of the antivenene is not comparable with the antitoxins of diphtheria or tetanus; and further, considerable doubt prevails on the identity or non-identity of the venoms of different snakes. Calmette, the original discoverer of antivenene, held that it was sufficient to immunize horses with one kind of venom, but Martin, Lamb, and Noguchi have shown that a relatively high degree of specificity prevails among the venoms from different genera of poisonous snakes, and thus it is that against some snake bites Calmette's antivenene has been found practically inert. Snake venom is a highly complex substance, containing poisons (neurotoxin, hæmolysin, etc.) which are entirely different in their action. Considering the circumstances under which snake-bite usually occurs, it is only in exceptional cases that the antivenene can be promptly applied. Further, relatively large doses are required. These combine to make the administration of the serum difficult, and in most countries where poisonous snakes abound, the standard methods of treatment are still the application of the ligature and the local injection of substances like potassium permanganate.

Pollantin (*Dunbar's Hay Fever Serum*).—Although not a bacteriotherapeutic remedy, Pollantin may be dealt with here, as it is an antitoxic serum. Dunbar, of Hamburg, has shown that hay fever is a disease set up, in idiosyncratic subjects, by the pollen grains of certain plants belonging especially to the graminaceæ, cyperaceæ, and compositæ. The active poison is extracted from the pollen by means of saline solution at 37° C. and then precipitated by alcohol. In predisposed subjects the susceptibility is so great that even $\frac{1}{10000}$ mgram of the toxin applied to the conjunctival sac can produce irritation within a few hours. Pollantin (a patent) is the serum of horses inoculated with pollen toxin. After a preliminary inoculation has proved that the horse is susceptible to the poison, gradually increasing quantities are injected, and the formation of the antitoxin takes place after two to three months. When a high antitoxin standard has been reached, the blood is withdrawn at least ten days after the last inoculation.

Pollantin is manufactured by Messrs. Schimmel & Co. at Miltitz (Leipzig),* and is issued in fluid form as "Pollantin liquid" (Pollantinum liquidum) and in the form of a powder as "Pollantin powder" (Pollantinum pulverisatum). Both are intended *for external use only*, and not for subcutaneous injection.

Standardization of Pollantin.—This is made from experiments on susceptible human beings, the smallest dose (*dosis toxica minima*) of a solution of pollen toxin being determined, which is just sufficient to produce a subjective and objective reaction when dropped into the conjunctival sac. To measured quantities of toxin the antitoxin is then added, and the particular mixture, which causes no irritation in the patient's eye, is designated "neutral mixture."

At first subcutaneous inoculations of pollantin were used, but it was soon found that the immunization was very transitory and only partial; this method is now being superseded by local medication only. This consists in the application of the serum to the site of the intoxication (the mucous membrane of the eye, nose, and pharynx). Liquid pollantin is preserved with carbolic acid ($\frac{1}{4}$ per cent), the dried pollantin being desiccated serum mixed with sterile milk sugar, the object of the latter being to lessen the irritation of the dried serum, while at the same time it produces a slight nasal secretion in which the serum is rapidly dissolved. Pollantin acts mainly as a prophylactic, and is of little use if applied after the catarrh is fully developed. The most recent statistics of its value refer to 792 cases, of which 61·7 per cent were treated with excellent results. In 27·9 per cent partial benefit was derived, and in 10·4 per cent no effect was manifested. There is reason to believe that many who derived no benefit from

* London agents, Messrs. Willows, Francis & Butler, Ltd., 40, Aldersgate Street, E.C.

pollantin were not suffering from genuine hay fever, but from asthma or some other trouble. To make the diagnosis of hay fever certain, Messrs. Schimmel & Co. now issue a diagnostic agent, consisting of a trituration of 2 mgram. of pollen toxin with 18 mgram. of chloride of sodium. This has to be dissolved in distilled water up to 2 cc. This 1–1000 solution is then highly diluted to 1–50,000 or 1–100,000, and brought into contact with the conjunctiva. In cases of genuine hay fever, the patient reacts at a certain degree of concentration subjectively, as well as objectively, to the pollen toxin. These symptoms can be made to disappear at once on the addition of pollantin.

Full instructions for use are supplied with pollantin, and should be rigorously followed if success is to be attained.

Römer's Jequiritol *and Jequiritol Serum.*—Many years ago infusions of the seeds of jequirity (*Abrus precatorius*) were used by De Wecker for producing conjunctival inflammations in the treatment of trachomatous pannus and other chronic processes in the conjunctiva. The method was, however, given up, as it was very difficult to control the amount of inflammation produced. This difficulty has been overcome by the introduction of jequiritol serum by Römer. Jequiritol and jequiritol serum are used as local remedies, the former to produce inflammation, which is believed to lead to the absorption of the trachomatous granules, the latter to prevent the jequiritol acting too strongly. Both the toxin and the serum are prepared by Merck.

Treatment of Malignant Tumours by Toxins of Streptococcus and Bacillus Prodigiosus (Coley's fluid).—Several years ago Coley introduced the use of bacterial toxins to cure cases of inoperable malignant tumours. The basis of this treatment is the supposed disappearance of malignant blastomata from intercurrent attacks of erysipelas. *Bacillus prodigiosus* is added to the culture of streptococcus to increase its toxic effect. Those who wish to try Coley's fluid can obtain it from the Lister Institute. The initial dose is ½ min., injected into the tumour or near it. It is supplied in phials of 2 cc. at 5s.

(See also ANTHRAX, BONE (TUBERCULOSIS OF). CHOLERA, PHTHISIS, PLAGUE, PNEUMONIA, TETANUS, TYPHOID, etc.) *William Bulloch.*

BANTI'S DISEASE.—(See SPLENIC ANÆMIA.)

BELL'S PALSY.—(See FACIAL PARALYSIS).

BERI-BERI.—The main dangers arise from cardiac dilatation or paroxysms (cardiac crises) resulting from the paralysis of the vagus.

TREATMENT.—Complete rest in the recumbent position. Nutritious food in small quantities at a time, and similar restriction in the amount of fluid given at a time, in order to avoid embarrassment of the cardiac action from dilatation of the stomach. In cardiac paroxysms, amyl nitrite, capsules of 5 min., or nitroglycerin tabloids, $\frac{1}{100}$ gr., should be used, and in extreme cases venesection may be advisable. Strychnine at this stage, hypodermically or otherwise, may be required.

The bowels must be kept freely open with saline aperients. Sodium sulphate, 1 dr. every morning, will usually suffice. Removal of the persons from the locality in which the disease was acquired is by many considered an essential.

When the more acute symptoms have subsided and the danger of sudden cardiac dilatation is over, graduated exercise may be allowed. In cases where paralysis is complete, care must be taken to avoid contraction of joints, Strychnine should be avoided, and faradization employed only when all acute symptoms, including muscular tenderness, have subsided. *C. W. Daniels.*

BIER'S METHOD.—(See PASSIVE CONGESTION.)

BILE-DUCTS, CATARRH OF.—The commonest affection of the ducts—catarrh of the mucous membrane—may be simple or suppurative. Simple catarrh may be Acute or Chronic.

Acute Catarrh (catarrhal cholangitis) is often spoken of as catarrhal jaundice, from its most striking symptom, the other evidences of it being merely absence of bile from the stools, with some distension about the gall-bladder, and nausea, flatulence, etc., arising from the cause of the catarrh rather than from the catarrh itself.

It usually occurs from extension of a catarrh from the duodenum, the result of indiscretions in diet; other causes are gout, rheumatism, secondary syphilis, influenza, and many febrile conditions; probably in all of these there is a precedent duodenal catarrh. Typhoid fever organisms may enter the duct and cause catarrh, but the frequency of this seems over-estimated.

Probably many cases of supposed catarrhal jaundice are due to inflammatory conditions of the head of the pancreas, leading to pressure on the common bile duct at its entry into the duodenum. In simple catarrhal jaundice the actual obstruction is probably by a plug of mucus at this point—the orifice of Vater.

Simple catarrhal jaundice usually passes off in five or six weeks, sometimes more quickly.

TREATMENT.—Unless very severe it is not necessary for the patient to remain in bed. The diet should be liquid for the first twenty-four hours, and gradually increased, but should remain light till complete recovery; if there be great irritability of the stomach, hot water alone should be given till it subsides. Severe pain may be treated by hot fomentations, with or without belladonna. One grain of calomel should be given at the onset; if not an actual cholagogue, it at any rate increases the bile excreted from the biliary passages.

After the first onset the bowels should be kept acting regularly by administration of Carlsbad salts or phosphate or sulphate of soda.

Attention should be directed to the cause of the catarrh; if due to syphilis, small doses of hydrarg. c. creta may be given, and the gastroduodenal catarrh present in most, if not all, cases must be treated by alkalies and bismuth; and may be benefited by giving antiseptics internally, such as carbolic acid, salol, or β-naphthol. The jaundice is often lessened by salicylates, which probably increase the secretion and render the bile more liquid, and chloride of ammonium may be given with the same object.

When improvement is setting in, it may be hastened by mineral acids and bitter infusions.

Chronic Catarrhal Cholangitis may follow on an acute attack or come on gradually from the first. It is often set up by gall-stones in the biliary passages, the jaundice in such cases being due to catarrh of the ducts rather than to the actual gall-stone; the chronic catarrh may persist after the gall-stones have been got rid of. For treatment of catarrh arising from gall-stones, see GALL-STONES.

Chronic catarrh, apart from gall-stones, may be very persistent, the jaundice and emaciation resulting from it giving the case much resemblance to that of hepatitis, or cancer, or still more, to disease of the head of the pancreas.

It should be treated by great care in diet, avoiding fatty, rich, or indigestible foods. Small doses of mercurials, iridin, or euonymin should be given at night, and alkalies and salicylates in the day. Constipation must be overcome, and walking exercise taken regularly—with most advantage before breakfast. Such patients benefit by a course of Carlsbad waters, or, if unable to go abroad, by the Harrogate waters.

Although acute and chronic catarrh of the biliary ducts occur apart from actual disease of the liver, they may also be associated with such of its affections as cancer, and the various forms of hepatitis or cirrhosis—indeed the biliary

cirrhosis of Hanot has been said to commence in an inflammatory condition of the intrahepatic branches of the bile-ducts; and although the liver disease itself may be incurable, judicious treatment may succeed in freeing the patient from the jaundice resulting from the catarrh. The drinking of hot water and administration of salicylates and alkalies, together with small doses of mercurials, should be ordered.

Suppurative Cholangitis arises from organisms entering the ducts, either through the blood-stream in the liver, or from the alimentary canal by the biliary passages; even if suppuration first occur in the larger ducts, it will soon spread into the finer duct branches within the liver. The organisms which have been found in suppurative cholangitis are many—the *B. coli*, streptococci, staphylococci, pneumococci, and the typhoid bacillus.

The most common cause is certainly a gall-stone in the biliary passages, but it may result from growths or from simple catarrh of the biliary passages, and in some cases follows acute infectious diseases. Its occurrence would be denoted by fever, rigors, enlargement and pain in the liver, and usually jaundice.

The treatment consists in free drainage of the biliary passages by operation.

Infective Cholangitis is a variety spoken of by some as special to the presence of gall-stones in the common duct, but more generally agreed to be producible by any form of obstruction which will allow infective organisms to enter the ducts. It is characterized by paroxysmal attacks of pyrexia, and has been called "intermittent hepatic fever." With these occur attacks of biliary colic, shivers, and temporary jaundice. It appears due to an obstruction in the common duct which, as a rule, allows the passage of bile, but from time to time the stoppage becomes more complete. These attacks may continue for years, on and off, and may terminate in recovery, but they may, per contra, lead to fatal toxæmia or exhaustion, and the treatment should, therefore, be operative removal of the obstruction when this is possible. *Sidney Phillips.*

BILHARZIA (Schistostomum Hæmatobium).—The position of the worms in the veins in the pelvis and abdomen prevents any radical treatment.

The symptoms due to the passage of the eggs through the mucosa can be alleviated. Rest is essential in severe cases, and over-exertion in all cases must be avoided. If the mucous membrane of the rectum is implicated, straining must be avoided, and the regular use of aperients is indicated. In hæmaturia, particularly if any cystitis is set up, boracic acid, 10 gr. three times a day, or alkaline diuretics, will be of value, such as

R	Sod. Bicarb.	gr. xv	Sp. Chlorof.	ℿ x
	Tinct. Hyoscyam.	ʒss	Inf. Buchu.	ʒj
		Every four or six hours.		

The possibility of the formation of calculus must always be remembered.

C. W. Daniels.

BILIARY FISTULA.—This is due to obstruction of the cystic or common duct, or to faulty suture of the gall-bladder to the abdominal wall in the operation of cholecystostomy. If the cystic duct is obstructed, a mucoid discharge comes away; if the common duct is obstructed, bile in large quantities discharges.

The treatment of the fistula depends on its cause: if a stone is impacted in the cystic duct, it may be possible to extract it with suitable forceps through the fistula; otherwise, if the trouble be limited to the gall-bladder and the cystic duct, cholecystectomy is the best treatment: this operation is of course inadmissible if there is any obstruction of the common duct.

Many cases are due to impaction of a stone in the common duct; occasionally the stone may be induced to pass on into the duodenum by the injection of warm olive oil and by plugging the fistulous opening; if this fails, the abdomen must

be opened, and choledochotomy or cholecystenterostomy performed ; the former operation is by far the preferable.

Fistulæ due to obstruction of the common duct by malignant growth are best left alone ; cholecystenterostomy as a palliative proceeding in cases of malignant disease is an operation involving great risk, and if successful adds little to the patient's comfort. If the obstruction of the common duct is due to simple stricture or to any other innocent condition, cholecystenterostomy should be performed.

T. Crisp English.

BIRTH PALSY.—Although these nerve lesions differ in no particular from those of similar roots in the adult, yet it will be well to discuss them apart. It is only of recent years, and owing in great measure to Kennedy's initiative, that they have been treated as nerve injuries elsewhere.

The usual lesion is Erb-Duchenne paralysis due to overstretching of the fifth cervical nerve ; other roots may be involved in severe cases, even to the whole plexus. Occasionally the paralysis is of the lower-arm type ; this occurs usually after breech presentations with the arms extended, occasionally after face presentations. It is not common to find the lesion diagnosed at birth. Often the child comes under observation owing to tenderness in the clavicular region ; in other cases it is noticed that the extremity is immobile.

In the usual type due to injury of the fifth anterior primary division, the arm is held close to the side, and the forearm is pronated and extended. When the first dorsal root is implicated, the arm is abducted, the forearm flexed, and the hand extended.

Treatment.—If seen early, the arm must be bandaged to the side and kept absolutely at rest ; as soon as all tenderness has disappeared, massage and movements must be employed. Under this treatment incomplete injuries are likely to improve, and the prognosis is favourable. With regard to operation, if at the end of three months from birth the reaction of degeneration is present in the affected muscles, the sooner operation is carried out the better. As a rule the faradic reaction is present in the muscles of a child of two months, so that three months is a safe limit. If the reaction of degeneration is present when the child comes under observation, operation should be performed. The upper cords of the plexus are easily exposed by an incision in the posterior triangle of the neck. The anterior primary divisions of five and six must be exposed, together with their junction and division, and the origin of the suprascapular nerve. The scar will usually be found in five just at its junction with six ; in some cases the upper trunk will be found damaged. In other cases the fifth anterior primary division is found torn through. The damaged portion of the nerve must be removed and the ends united in the usual way. No difficulty will be experienced in most cases in bringing the ends together. If there is tension, the shoulder should be elevated and the head inclined to the affected side. If the ends cannot be brought into apposition, or the upper end cannot be found, nerve anastomosis should be carried out. If the lesion involve the lower roots, it will be necessary in most cases to temporarily resect the clavicle.

After-treatment must be faithfully carried out ; if this is done the prognosis is good.

Before operating it is essential to discover that the paralysis is due to a peripheral cause and not to a cerebral lesion. In the latter case the muscles, though paralyzed, react to the interrupted current, and spastic changes are often present. In most of these cases the cause of the paralysis is intracranial hæmorrhage at birth, and should have been treated at the time by trephining ; in other cases it may be due to tearing away of nerve roots and hæmorrhage into the spinal cord. In either case, if seen later, nerve anastomosis offers the best chance of improvement.

James Sherren.

BLACKWATER FEVER.—No specific treatment is known. Quinine is useless, and in some instances has caused the attack. If the parasites of malaria continue to be present during the attack, quinine is necessary, but it is highly exceptional for this to be the case. The great dangers of the disease are (1) *Suppression of urine;* (2) *Death from cardiac failure*, the result of the rapidly developed extreme anæmia.

1. **Suppression of Urine** is the most common cause of death. The hæmoglobin dissolved in the blood acts as a powerful diuretic, and the albuminous materials form casts obstructing the renal tubules—hence the suppression. This rarely takes place where a constant flow of urine is maintained, so that a liberal supply of fluids is necessary from the onset of the disease. Frequent administration of water (4 ounces or more every hour, or in more frequent smaller doses) will suffice, provided there be no vomiting. If, as commonly occurs, there be vomiting, hourly enemata of warm water (6 to 8 ounces if these amounts are retained) will produce the same free flush. Large subcutaneous injections of sterilized normal saline solution (sodium chloride 0·6 per cent) are equally effective, but painful. The risk of the onset of suppression diminishes when the urine clears, but as at this time the diuretic effects of the hæmoglobin in the blood serum are removed, the rate of excretion is much diminished.

2. **Death from Cardiac Failure** becomes more probable as the anæmia advances, and is rare before the third day. Absolute rest in bed in the recumbent position is necessary. The patient must not be allowed to leave bed or even to sit up for any purpose. Alcoholic stimulants in medicinal doses are required after the second day.

A large number of drugs have been employed, some of which are injurious. Alkaline diuretics and boracic acid appear to give good results, and Sternberg's method of treating yellow fever has in the hands of Hearsay invariably proved successful (See YELLOW FEVER.)

Convalescence is rapid and usually complete. Iron, arsenic, etc., may be used in the late stages of convalescence. In the early stages they are useless. Recurrences and relapses may occur for some months after leaving Africa, and for longer periods in those in whom such attacks are induced by quinine. Return to Africa or to any highly malarious country is not advisable in a person who has had blackwater fever. *C. W. Daniels.*

BLEPHARITIS.—(See EYELIDS, DISEASES OF.)

BLOOD POISONING.—(See SEPTICÆMIA.)

BOILS.—A boil is an infective gangrene involving a small area of the cutis, in most instances starting around a hair follicle or in a sebaceous gland; in this respect it is closely allied to acne. When the infective process is more extensive and involves the deeper layers, it becomes a carbuncle. These infective conditions are liable to arise in those who suffer from diabetes or albuminuria, and it is always necessary to examine carefully for these pathological conditions in any case of extensive infection with boils. Apart from these constitutional diseases, patients who suffer from boils usually show a very low resistance to the staphylococcus, a point to be specially considered in connection with the treatment.

TREATMENT.—*Local Treatment* consists chiefly in applying an antiseptic dressing after careful purification of the surrounding skin. In many cases the boil aborts or becomes blind; that is to say, the inflammatory process subsides without suppuration. The general method of covering a boil with a poultice or fomentation is to be condemned, since it tends to disseminate the infection and to cause a fresh crop to erupt.

When once a boil has made its appearance as a conical, red, tender swelling, an excellent form of treatment is to cut out and apply a small piece of Unna's plaster rather larger than the boil, with a small opening in the middle, which should be over the centre of the inflamed area. The boil must be carefully protected from pressure or irritation, either by a pad of gauze or lint, or by means of a small celluloid shield.

Another method of treatment applicable to those boils which have come to a head, is to snip off the projecting point and to apply pure carbolic with the end of a match to the centre of the area.

Gallois treats cases as follows: A solution is made up of iodine (1 dr.) and acetone (2½ dr.); a probe surrounded with cotton wool is dipped into this iodacetone and applied to the boils, giving them the appearance of so many "beauty spots." A piece of absorbent material large enough to cover the whole region is soaked in boric acid glycerin (glycerin 6 oz., boric acid 5 dr.), and this is applied as a dressing over the whole area. The dressing is renewed once or twice a day, according to the amount of discharge. To succeed in this treatment, M. Gallois insists that antiseptic precautions should be observed.

In cases where there is considerable induration and pain, relief will be afforded by a free incision into the brawny mass.

General Treatment consists in free purgation and the administration of tonics—iron, arsenic and quinine. The sulphide and the iodide of calcium have been used with much success.

Vaccin Treatment.—The condition of furunculosis, or the general development of boils, being due to a lowered resistance to a staphylococcal infection, Wright has treated patients by means of a staphylococcal "vaccin," the object being to increase the opsonic index, and so the general resistance to this micro-organism. The results of this method fully justify its wide application.

W. H Clayton-Greene.

BONE, INFLAMMATIONS OF.—Inflammation of bone may be acute or chronic. The acute cases are almost invariably due to the invasion of the bone by pyogenic organisms, while the chronic ones are due generally to syphilis and tubercle; less commonly to the *Staphylococcus aureus* and *albus*. The typhoid bacillus is occasionally responsible for cases of chronic and subacute inflammation.

The staphylococci are the principal causal agents in the production of acute inflammations; less frequently the *Streptococcus pyogenes*, and rarely the pneumococcus. A mixed infection of staphylococcus and streptococcus has been found to be especially virulent. Variations in the virulence of the invading organisms, and in the resistance of the host, account for the widely different clinical pictures presented by these cases. The stress of the invasion may fall on the deeper-growing layers of the periosteum, on the bone marrow, or both the marrow and periosteum may be involved simultaneously.

Usually the disease starts at the growing end of the diaphysis of a long bone of a child or adolescent, in the majority of cases selecting the more fertile of the two extremities. These variations in the incidence of the disease are responsible for the many names under which the invasion of bone by pyogenic organisms is known. The terms "acute infective periostitis" and "osteomyelitis" indicate the part of the bone principally involved. Acute diaphysitis reminds the surgeon of the site of the original infection. In infants, the epiphysis may be the seat of the process, and, as in this case the joint is invariably infected, the condition is often known under the name of "acute arthritis of infants." The old name, "acute necrosis," indicates the almost invariable effect on the bone of the more virulent forms.

Lately, the view has been expressed by many surgical writers, particularly in France, that acute and subacute invasions of bone by attenuated cultures of

pyogenic organisms may terminate in resolution, or may be responsible for an exudation which differs materially from pus. These views of the pathology of such conditions find expression in the terms "growth fever," and albuminous or serous periostitis or osteomyelitis.

The treatment of cases of acute microbic invasions of bone has to be considered under two heads: (1) The treatment of the acute condition; (2) The treatment of certain sequelæ and complications.

Growth Fever usually occurs between the ages of 7 and 15; it may be provoked by fatigue, slight injury, or cold. It affects the more actively growing extremities of the long bones, i.e., the lower end of the femur, the upper end of the tibia, the upper end of the humerus, and the lower ends of the radius and ulna.

The chief characteristics of the condition are areas of deep tenderness near a joint, and rapid growth of the limb; perhaps, also, there may be accompanying malaise and slight fever. The condition is an uncommon one, and its chief interest lies in the diagnosis, as it is frequently mistaken for early tuberculous disease of the neighbouring joint. A few days' rest in bed will usually clear the matter up, as the minor affection quickly subsides with rest, and it may be found later that there has been considerable growth of the affected limb. This may be the explanation of the inequality of the lower extremities which is so often found in adolescents, and which may be first noticed after a slight febrile attack.

The treatment consists in rest, with tonics and fresh air. Care must be taken that no weight or strain is placed on the bone so long as there is tenderness. Salicylate of soda will relieve the pain when the latter is marked.

Acute Infective Periostitis and **Osteomyelitis.**—These cases belong to the class of surgical emergencies. Their treatment is by immediate operation. An incision should be made down to the bone, over the area of maximum tenderness, the periosteum incised, and the pus, if any, liberated. In almost all cases the medullary canal should be opened, either by a trephine or a gouge, and if pus be found, a spacious gutter should be cut in the bone, exposing the interior of the medullary canal, until a healthy area is reached.

The question of the necessity of exploring the medulla will always arise, and should be answered in the affirmative in all but a very few cases. The incision should be planned to avoid important structures, particularly nerves, but at the same time should be made as near to the point of maximum tenderness as is possible. The frequency with which the disease originates at the growing end of the diaphysis, almost invariably selecting the more fertile of the two extremities, is a useful guide to the surgeon in planning his incisions. Counter openings should be made for drainage, and this must be free. For this reason tubes appear to be more useful than gauze or worsted. The use of powerful antiseptics in these cases is still a moot point among surgeons, some preferring to paint the infected area with pure carbolic acid, while others, eschewing the use of antiseptics entirely, irrigate the wound with sterilized saline solution. The latter procedure certainly has the support of modern research, which has shown us that chemical substances inhibit phagocytosis, the most important part of that reactive process whereby the organism resists microbic invasion. In those cases where the pus is offensive, swabbing the infected area with peroxide of hydrogen appears to be of benefit. In many cases it is obvious, at the time of the operation, that a large portion of the diaphysis is dead, and in a few cases of bipolar diaphysitis, where the process has simultaneously involved both extremities of the shaft, the diaphysis has been found practically loose in an abscess cavity. It is rarely, however, wise to remove the dead bone at this stage, because it is practically impossible to foretell the exact limit of the necrosis, and therefore either too much or too little bone might be removed. This particularly applies to cases in which, at this stage of the disease, it would appear that a certain length of the shaft is dead throughout its whole extent; yet the

sequel of the case shows that the necrosis is limited to a thin cylinder of compact bone, and that the cancellous bone inside this cylinder, though infected, is still capable of recovery. At this stage, therefore, the surgeon's endeavour should be to provide adequate drainage, particularly of the medullary cavity. Convalescence is necessarily slow, with continual suppuration, while the involucrum, or shell of new bone, is being formed and the sequestrum is separating. With careful dressing to avoid contamination by other organisms, the suppuration can be reduced to a minimum, and the discharge from the sinuses is practically clear. Such a case will run a painless and afebrile course.

The limb must be carefully splinted, lest fracture of the newly-formed shaft should occur. The patient should, however, be allowed out of doors, on a couch or spinal chair, as both sunlight and fresh air are important factors in maintaining the general health, and in thus aiding the processes by which the sequestrum is separated. It must be borne in mind that the separation of the sequestrum belongs to the vital process of repair, and is inhibited by sepsis and excessive suppuration. Surgical cleanliness is therefore imperative, to prevent the ingress of new microbes ; but the surgeon of to-day has, in addition, a useful weapon in the shape of inoculation of vaccins, which increase the patient's resistance to staphylococci. The dose of the vaccin and the time of the inoculations must be determined by a study of the patient's "opsonic index" in relation to the staphylococcus ; and it is usually better to prepare the vaccin from a cultivation of the patient's own pus.

The few cases in which it does not appear necessary to drain the interior of the bone are those where a considerable subperiosteal abscess has formed with only slight constitutional disturbance. Such cases, however, require careful watching, and, if the temperature does not subside after simple incision and drainage of the abscess, a second operation must immediately be undertaken, to explore and drain the interior of the bone.

Removal of the Sequestrum.—The selection of the best time to remove the dead bone requires careful consideration. It is usually better to wait until the sequestrum is loose, or its limits are so clearly defined as to enable the surgeon to remove the entire sequestrum, and at the same time not to encroach unnecessarily on the surrounding bone. Time should also be given for the formation of an involucrum of new bone sufficiently strong to withstand the pull of the muscles, and to sustain the weight of the limb. This shell of new bone appears to be moulded on the old and dead shaft. This fact constitutes an important reason for waiting before removing the sequestrum in the case of the femur and humerus, because neither of these has a companion bone to act as a splint and to maintain the shape of the limb while the new bone is consolidating.

Röntgen rays may occasionally prove of signal utility in locating the sequestrum and demonstrating its size and shape. In a recent case the newly-formed bone is more pervious to the rays than the sequestrum, and therefore the latter appears as a dark shadow surrounded by a lighter shadow representing the involucrum.

The incision in the operation of sequestrotomy must be an adequate one, and must be planned to avoid important nerves, e.g., the musculospiral above the elbow. It should, in most cases, bear a close relation to the existing sinuses. Some surgeons raise a flap of the soft parts in order to obtain a sufficient exposure of the bone. The new bone must be chiselled or gouged away, and the sequestrum thoroughly exposed. The granulation-lined cavity in which the dead bone has lain is carefully scraped and cleansed, and its interior systematically searched for minute fragments of dead bone. In order to facilitate the thorough search for outlying pockets of the main cavity, the limb should first have been rendered bloodless by raising it and applying an Esmarch's tourniquet above. After thoroughly cleansing the wound with sterile saline solution, the bone cavity is

plugged, a tight dressing applied, and the tourniquet removed. The bone cavity must be packed daily with sterile gauze, and allowed to granulate up from the bottom. The process is a tedious one, and attempts have been made to shorten it by filling in the cavity with pieces of bone recently taken from another animal, such as the humerus of a young dog. The success of this measure depends entirely upon the degree of asepsis of the wound at the time of grafting. As a rule, if all the sequestra have been removed, and only healthy bone remains, the cavity granulates up with surprising rapidity, and it can only occasionally happen that bone-grafting is necessary.

The question of Amputation will arise at two periods.

(1) During the original acute attack. It is, however, questionable whether an amputation will save a patient who is poisoned, at the onset of the attack, to an extent sufficient to suggest the need of such a drastic measure. Such a patient is probably suffering from an acute septicæmia, and an operation of such severity merely depresses him still further, without very materially decreasing the toxæmia, which is due to a general infection of the circulating fluids and of important viscera. The case differs somewhat when there is, in addition to the bone disease, suppuration in the neighbouring joint. In this case it is possible that the majority of the toxins are being manufactured in the infected area, and are being absorbed into the general circulation through the medium of the synovial membrane, which possesses a special capacity for absorption. Amputation rids the patient of this absorbent area, and therefore early operation is imperative in a case of infective osteomyelitis of marked virulence, in which there is also suppurative arthritis of the neighbouring joint. An exception to this general rule must be made in the case of acute arthritis of infants, in which form of the disease incision and drainage would probably show a lower mortality than amputation ; but, in these cases, whatever be the treatment, the mortality is exceedingly high.

(2) The second period at which the question of amputation has to be discussed is after the acute attack has subsided. It may then be evident that the patient, worn out with prolonged suppuration, is suffering from chronic toxæmia, as shown by hectic fever and evidences of lardaceous disease. Attempts have probably been made to remove the dead bone, but these efforts have only been partially successful, owing to the delayed separation of the sequestrum. This delay is due to the inhibition of the processes of repair by sepsis. Secondary hæmorrhage, or septic thrombosis, may have occurred, owing to the implication of the coats of an adjacent vein. Under such unhappy conditions, amputation is often the only treatment which will save life, but the question of its employment must be decided with reference to each particular case.

Since the more thorough appreciation of surgical cleanliness, such cases have become very much less common, and should become even more rare, now that we have the means of increasing the patient's own powers of resistance to the infecting micro-organism.

The treatment of **Acute Infective Osteomyelitis of the Cranial Bones** when, as occasionally happens, it gives rise to œdema of the scalp and to intracranial suppuration (the condition known as "Pott's puffy tumour") must be conducted on the above lines. In this case, however, a disc of bone should be invariably removed, to secure drainage of the interior of the skull.

Chronic Osteomyelitis and Periostitis may occasionally be due to pyogenic organisms. The clinical forms under which this may occur are : (1) One form of abscess of bone ; (2) Quiet necrosis ; (3) Necrosis with suppuration ; (4) Albuminous or serous periostitis, due to subacute infection by an attenuated culture of *Staphylococcus aureus* or *albus*.

The chief interest in these cases lies usually in the question of diagnosis, as

they are often mistaken, on the one hand for growths of bone, and on the other for tubercle or syphilis.

The treatment is incision, the removal of any sequestrum, and drainage. It is particularly in these chronic cases that the inoculation of a specific vaccin is of value.

V. Warren Low.

BONE, TUBERCULOUS DISEASE OF.—

Either the periosteum or the marrow of bone may be the seat of a tuberculous infection giving rise to a tuberculous periostitis or osteomyelitis. The infecting organisms reach the bone through the circulation, the most common primary focus being, in children, an infected bronchial or mesenteric gland. Tuberculous osteomyelitis particularly affects the cancellous tissue of the short bones, and the extremities of the long bones; e.g., the bodies of the vertebræ, the tarsus, carpus, and phalanges, and the articular extremities of the bones of the limbs. The last variety is generally considered in connection with tuberculous disease of joints. Tuberculous osteomyelitis is the form more often met with in children and adolescents.

Tuberculous periostitis affects most commonly the ribs, sternum, and cranial bones. It is also the more usual form of tuberculous disease of the vertebral column met with in adults. The shafts of the long bones are only rarely affected, and then usually those bones which are subcutaneous, e.g., tibia, ulna, and clavicle. Tuberculous periostitis and osteomyelitis frequently co-exist, and either form may give rise to the other. They are, however, more likely to remain distinct in tuberculosis than in the more acute pyogenic affections of bone. The term tuberculous osteitis is usually employed to cover both forms.

In both cases the onset is insidious and the progress of the disease slow. Frequently attention is only drawn to the bone disease through the medium of some secondary condition arising from it. Instances of these are: affections of the joints; deep-seated cold abscesses of the soft parts (which possess a peculiar tendency to migrate to a considerable distance from the original focus of disease); and lastly, as a result of abscesses opening externally, sinuses.

Except in the case of the superficial bones—as the phalanges, tarsus, and carpus—the presence of tuberculous osteitis could only be inferred from indirect evidence until quite recently. Tuberculous disease of certain joints, deformity or rigidity of some part of the spinal column, or the presence of a psoas or iliac abscess, are generally accepted as definite, though indirect, evidence of the presence of tuberculous osteitis. In a few cases, the earliest manifestations of the disease are indefinite malaise, easily induced fatigue, and a slight evening rise of temperature, together with vague pains, which have gradually localized themselves to the vicinity of the bone affected. By means of Wright's method of estimating the tuberculo-opsonic index, it is now possible to diagnose the invasion of tubercle during this early stage, and before any considerable gross changes have occurred locally. Consequently, in the future, accurate and specific treatment will be undertaken earlier, with proportionately more successful results. The X rays are also a useful means of diagnosis.

The general treatment for tubercle of bone, as for localized tubercle elsewhere, must be directed towards two objects, viz., preventing the spread of the disease locally, and its dissemination generally; and increasing the patient's power of resistance to the disease. This latter property has been found to reside chiefly in the circulating fluids, in the shape of certain protective or bactericidal substances, of which the agglutinins, bacteriolysins, and opsonins are examples. It is therefore essential to increase the quantity of these substances present in the blood, and also to augment the circulation through the affected area, in order to flush the diseased tissues with a maximum quantity of lymph charged with protective substances.

It often happens that the diseased area is practically shut off from the action of the circulating fluids, owing to its being surrounded by inert material, granulation tissue, or pus, which has practically been deprived of all protective substances. The mechanical removal of this material is therefore an important and essential part of the treatment.

With these principles in view, the details of treatment vary somewhat with the bone affected.

In all cases the most important measure to prevent extension or dissemination of the disease is physiological rest. The diseased bone must be relieved of all

strain, whether produced by the weight of the body or by muscular action. Disease of the vertebral column requires the supine position. Careful splinting, to include the joints above and below the affected bone, is required when a limb is the seat of the disease.

The next most important factor in preventing extension or dissemination of the tuberculous focus is freedom from contamination by pyogenic organisms. This point has chiefly to be considered under the head of operative procedure, but it has also to be taken into account at all stages of the disease, as it is particularly important that a migratory tuberculous abscess should not become contaminated either by opening on the surface of the body, or, as occasionally happens, by coming in contact with a viscus, e.g., the kidney or bowel.

It has been abundantly shown, both clinically and experimentally, that tuberculous infections of bones and joints are more prone to become disseminated in the blood-stream, and to extend more rapidly locally, when there is contamination with pyogenic organisms. This fact was probably responsible for a prejudice that existed among experienced practitioners twenty years ago against opening tuberculous joints. This measure was stated to increase the risks of generalized tubercle. Increased resistance of the patient's tissues and circulating fluid to the tuberculous invasion can be obtained by (1) Open-air treatment ; (2) Inoculation of small doses of Koch's tuberculin.

The value of fresh air and sunshine in the treatment of scrofulous glands and joints was realized at an earlier period than the importance of the same agencies in the treatment of pulmonary tubercle ; and yet, at the present time, liberal provision is made for the open-air treatment of pulmonary tubercle, but very little has been done to secure equal advantages for patients suffering from what is known as surgical tuberculosis. Properly organized open-air treatment is, however, of the greatest value in these cases of osseous tuberculosis, and should be combined with absolute rest of the affected bone. It must always be borne in mind that these patients should not be treated together with sufferers from pulmonary disease, because the former are liable to pulmonary infection in a greater degree than are healthy persons.

The question of feeding is an important one, the essentials being a plentiful supply of easily assimilable food, and the absence of any fresh infecting material. For this reason, the milk supply should be above suspicion, and the dietary should contain sufficiency of animal fats in an appetizing and easily digestible form. Cod-liver oil is invaluable in these cases, and is usually prescribed with iron or maltine ; the latter combination being the more palatable.

The treatment of localized tubercle by the inoculation of small doses of Koch's new tuberculin has now been firmly established. The doses are smaller than those at first employed ; $\frac{1}{2000} - \frac{1}{1000}$ mgram. is the amount usually given, but the surgeon must be guided as regards both the amount of the dose and the frequency of its administration in each particular case by careful estimation of the tuberculo-opsonic index. Tubercle of bone, being a good example of localized tubercle, is well suited for inoculation treatment, and by means of it excellent results have been obtained.

" Open-air treatment " and inoculation are alike directed to increasing the amount of protective substances in the patient's blood and lymph. In order to bring the maximum quantity of these protective substances into contact with the diseased tissues, it is essential to increase the circulation through the infected area. This object is achieved by various forms of mild local stimulation, such as application of Scott's dressing, or painting with iodine. Fomentations have the advantage of being anodyne, and at the same time they are a cleanly means of stimulating the local circulation. If pain is a prominent symptom, the parts may first be painted with glycerin of belladonna. If a sinus be present, or the

skin be infected, the material employed in fomentation should be impregnated with boracic acid. Of recent years, Bier's method of treatment by producing local congestion has been extensively used in this country, and its employment has been attended with a considerable measure of success. This method is only applicable to cases of local tuberculosis in limbs, and consists in constricting the limb by means of a light elastic bandage—e.g., a Martin's bandage. The constricting force should be sufficient to block the venous return without interfering with the arterial supply. The constriction should be applied for periods varying from fifteen to thirty minutes, and can be repeated daily. (See PASSIVE CONGESTION.)

With the earlier diagnosis of tuberculous osteitis, and with the therapeutic measures outlined above, which endeavour to imitate the natural processes of cure of the disease, the necessity for operation ought to become increasingly less. There will still, however, remain a number of cases in which the mechanical removal of a sequestrum, or the liberation of pus, will be necessary in order to permit access of the circulating blood and lymph to the diseased tissues. Such operations must be performed under the most stringent asepsis, and this must be maintained during the after-treatment. For this reason, it is important to avoid, as far as possible, the use of drainage—always a prolific source of wound infection. The sequestrum should be removed, or the pus liberated ; the cavity carefully wiped out with sterile gauze, and the wound closed. It is possible, in the case of an abscess, that this operation may have to be repeated ; but the result of two or even three such operations is preferable to the older method of incision and drainage. No useful purpose is served by the use of such chemicals as iodoform, sulphur, zinc chloride, or pure carbolic acid in the abscess or bone cavity. Such substances inhibit the natural processes of cure, while the patient's own lymph, with which the parts are flushed after the removal of the pus, is the most suitable bactericidal agent for his own case. In order to avoid infection of the surface wound by the abscess cavity, the deeper structures should be sewn up first with catgut stitches.

The formation of a sinus is always a serious complication in a case of tuberculous osteitis. It invariably means a double infection, and we have to deal with a pyogenic as well as a tuberculous invasion. Operations in such cases are not aseptic, and there is always a risk of an extension locally, or even of a general dissemination, following any operative interference. General treatment, including rest, and exposure to fresh air and sunshine, must be persevered in ; while local measures, such as boric acid fomentations and Bier's "compression," must be directed to increasing the lymph circulation through the infected area. Inoculation is necessary to raise the power of resistance both to tubercle and to the special pyogenic organism which has been found to be most prevalent in the sinus. This is generally a stapyhlococcus. The presence of a sequestrum, as shown by the probe or by the X rays, or as suggested by the persistence of the sinus in spite of treatment, will require operation.

In such a case, the operation should take place at a time when the indices, both for tubercle and for the pyogenic organisms, are high. The operation itself should take the form of a deliberate search for a necrosed area of bone, and should not consist of the vague scraping procedure so often employed on these occasions. It is unfortunately impracticable, as a rule, to close the wound entirely, and therefore drainage is necessary, with the usual result of another sinus. This second sinus may, however, close after prolonged treatment, but, until it does so its presence is always a source of danger to the patient. Indeed, it cannot be too strongly emphasized that the most important point in the treatment of tuberculous osteitis is the prevention of sinus-formation.

A case of uncomplicated tuberculous osteitis is seldom fatal ; nor is amputation

often necessary when the disease affects a limb. Such cases are invariably due to secondary infection with other organisms, and call for the principles of treatment set forth in the article on pyogenic diseases of bone. (See BONE, INFLAMMATIONS OF.)

The treatment of tuberculous osteitis may be summarized by the following examples :—

Should the disease affect the trochanter of the femur, with a cold abscess in the thigh :—

1. Rest on a couch or bed with a Liston's or Thomas's hip splint.
2. Exposure to open air and sunshine.
3. A diet including plenty of milk and of animal fats.
4. Inoculation with small doses of Koch's new tuberculin—the doses to be regulated by the estimation of the tuberculo-opsonic index.
5. The abscess should be opened under careful aseptic precautions, any sequestrum should be removed and the cavity carefully wiped out and closed with a few catgut stitches, the skin being sewn up separately.

A case of tuberculous osteitis of one of the phalanges in a child would require, as before, open-air treatment, and splinting, with fomentation. Bier's compression is particularly useful in these cases. Therapeutic inoculation should also be employed, when the circumstances of the case allow it. If there be evidence of pus-formation, or if the X rays show the presence of a sequestrum, an incision must be made, the pus liberated or the sequestrum removed, and the skin carefully sewn up again. It is rarely necessary to remove the finger, and the majority of cases recover, though occasionally the resulting finger is shortened and stiff, and the patient prefers to have it removed. It is better, in spite of this possibility, to defer amputation in such a case until the disease is cured, as it is impossible to foretell what the result will be in any individual case, and the most unpromising ones have healed, leaving a useful limb.

The details of treatment of a case of tuberculous osteitis with sinus formation have been already dwelt upon. (See also JOINTS, TUBERCULOUS DISEASE OF THE ; PHTHISIS, and BACTERIOTHERAPEUTICS). *V. Warren Low.*

BONE, TUMOURS OF.—Osteomata may be compact or cancellous. The former occur in connection with the cranial bones, and are sessile tumours composed of dense compact tissue of the consistence of ivory. Their removal is rarely within the range of practical surgery. Should, however, the position and circumstances of such a tumour demand an operation, the surgeon must not forget that the bone forming the tumour is extremely hard, so that, unless the incision for its removal can be carried entirely outside the tumour, and in healthy bone, it is necessary to make use of mechanical saws and drills of fine temper, and worked by an easily controlled motor.

Cancellous or spongy osteomata are usually pedunculated tumours, and grow in the vicinity of the epiphyseal lines of the long bones. They are often symmetrical. Their removal, when necessary, is an easy matter ; the soft cancellous bone at the neck of the tumour is easily cut with a chisel or bone forceps, and the tumour shelled out from the adjacent soft parts. Strict asepsis is necessary, as these tumours grow in the close vicinity of joints. By their removal, also, the cancellous tissue of the bone to which they are attached is opened.

Subungual exostosis is an irregular outgrowth of bone which occasionally occurs on the ungual phalanx of the great toe, pushing up and deforming the nail. It is probably inflammatory in its nature, and arises from the pressure of unsuitable boots. Its removal is effected with a sharp spoon, after the nail

has been removed. Recurrence is probable unless properly shaped boots are worn.

Chondromata occur in connection with bone, and may occasionally require removal. They are often multiple and symmetrical, and occur most frequently in connection with the phalanges and metatarsal or metacarpal bones. They are definitely encapsuled, and can, as a rule, be easily shelled out of their capsule. In the majority of cases this simple measure is successful.

Myelomata.—Within the last few years, pathologists have differentiated between myeloid sarcomata of bone and pure myelomata, and have removed the latter from the category of malignant tumours. These tumours consist almost entirely of large multinuclear cells, and grow in the medullary cavity of the shafts of long bones, immediately adjacent to the epiphyseal cartilage. They occur most frequently in the upper end of the tibia, the lower end of the radius, the upper end of the humerus, and the lower end of the femur. They have also occurred in the upper end of the fibula, in the clavicle, in the patella, and in the mandible. The diagnosis between a myeloma and a myeloid sarcoma can only be made by the careful examination of properly prepared microscopic sections, and this should be carried out by an expert pathologist in conjunction with the surgeon. The portion of growth required by the pathologist must be removed by a formal operation, and the incision carefully closed.

When the diagnosis has been firmly established, a myeloma may be dealt with by enucleation, or by resection of part of the bone. The former operation is more suitable where the tumour is completely contained within a cavity in the bone, and can be easily separated from the wall of the cavity. Enucleation is also a more suitable operation where resection is impracticable, as in the lower end of the femur and upper end of the tibia. In the case of the radius, ulna, clavicle, and fibula, resection of part of the bone should be performed. It cannot be too strongly insisted upon that, in the case of the humerus and femur, where the diagnosis is in any doubt, it would be safer to amputate at once.

Endotheliomata may occasionally implicate, by their extension, the cranial bones, and also the mandible. In connection with these tumours, it must be remembered that they appear to possess only a local malignancy, and this not always of a particularly marked type. Consequently, operations for their removal may be undertaken such as would scarcely be justifiable were the tumour a sarcoma ; as even in cases where apparently portions of the tumour have been left behind, recurrence has been delayed, in some instances indefinitely, and the patient's condition has therefore been considerably relieved.

Sarcomata of bone may be central or periosteal. Both varieties occur more frequently at the extremities of the long bones than at the centre of the shafts. The bones of the lower extremities are more frequently affected than those of the upper.

Periosteal sarcomata are commonly composed of round cells, and are the most malignant of bone tumours. They grow with great rapidity and, at a very early stage, give rise to secondary growths, usually in the lungs. This particularly applies to the round-celled sarcomata of the humerus and femur. In some periosteal sarcomata there is a tendency to the formation of fibrous tissue, cartilage, or bone ; and these tissues may predominate over the cellular elements of the growth. Such sarcomata are less rapidly fatal than those of the soft cellular type. Central sarcomata may contain a certain proportion of myeloid cells, and have been regarded as being less malignant than periosteal growths ; but, now that the myelomata have been separated from the sarcomata, it is doubtful whether central growths, as such, can be regarded as any less malignant than periosteal growths. The malignancy of any particular tumour should be measured by its behaviour and rate of growth, and by the character

of its cellular elements, rather than by its mere anatomical position. For this reason it is important that a carefully prepared microscopic section of each growth should be taken before amputation, not only in order to confirm the diagnosis of sarcoma, but also to guide the surgeon as to the site of the amputation, by the presumable degree of malignancy of the particular tumour. The treatment of all cases of sarcoma of the bones of the extremities should be amputation of the limb well above the tumour. Wherever possible, the amputation should be by skin flaps with circular division of muscles. In nearly all cases, the affected bone should be removed, so that the site of the amputation is usually at the joint above the tumour. In the case of a round-celled sarcoma of the tibia, it should be through the lower third of the femur.

A few exceptions to the general rule that the affected bone should be removed may be quoted. In the case of a sarcoma of the lower end of the tibia or fibula, in which an adult tissue, as cartilage or fibrous tissue, predominates over the cellular elements, amputation may be performed through the upper third of the leg.

In the case of a round-celled sarcoma of the femur, unless the diagnosis has been made within a few weeks of its earliest appearance, the prognosis is so extremely bad that it has been a question whether the patient should be subjected to such a severe operation as an amputation at the hip joint, since even this offers only a small prospect of ultimate cure. The palliative measure of a subtrochanteric amputation has therefore been suggested, since it presents fewer immediate risks, and will at the same time save the patient the miseries that attend a fungating and septic growth. But on the other hand an amputation at the hip-joint does slightly improve the prognosis in these cases, and the immediate dangers of the operation may be lessened by careful provision against shock and against loss of blood by carefully tying the main vessels at the commencement of the operation. The writer is therefore of opinion that the major operation should be performed in all cases of sarcoma of the femur. Only skin flaps should be employed, and the muscles should be cut as short as is practicable.

In the case of a sarcoma of the humerus, Paul Berger's amputation of the upper extremity appears to give a lower mortality than amputation at the shoulder joint. As sarcoma usually affects the head, or the upper third, of this bone, Berger's operation is in every way the more suitable one. Unfortunately, the prognosis, in respect of recurrence, is extremely bad in these cases.

Sarcomata, either central or subperiosteal, occur in the clavicle, scapula, jaw-bones, and occasionally in the ribs, and may be amenable to surgical treatment, if discovered early enough to justify excision of the affected bone. Sarcomata of the cranial bones, vertebræ, and pelvis are rarely fit cases for operation.

V. Warren Low.

BRADYCARDIA.—Bradycardia, or abnormally diminished frequency of the heart-beat, is produced by different causes, some of which are similar to, if not identical with, the factors mentioned as producing arhythmia. (See HEART, IRREGULARITY OF). The condition may be a constitutional peculiarity, in which case the myocardium is probably primarily at fault. Apart from such an idiosyncrasy, bradycardia is the result of one or other of three distinct causes.

1. Inhibitory influences, produced by irritation of the vago-accessory fibres, may have their origin directly either in an increase of intracranial pressure, affecting the centre, or by any interference with the trunk of the nerves, and also reflexly, from many distant causes of irritation.

2. Bradycardia is also produced by toxic agents. These may act through the nervous system, calling into play the inhibitory mechanism, and possibly

diminishing the augmentor apparatus, or they may act upon the heart muscle, thus interfering with rhythmicity, excitability, conductivity, or contractility. As types of such agents, the poison of tobacco may be mentioned, and the toxin of influenza.

3. Bradycardia may further be the result of structural changes in the heart muscle, by which one or more of its special functions may be depressed. In one group of cases, the production, reception, or conveyance of, or response to, the stimulus may be interfered with in such a way that the whole heart beats at a lessened rate. Much more commonly, however, the auricles are unaltered as regards these different functions, and the conduction of the stimulus fails at Gaskell's bridge—that is, the auriculo-ventricular bundle, described first by Gaskell, which passes from the auricular to the ventricular septum. When the auricular impulse is interfered with at this point, there may be incomplete or total heart-block, i.e., a certain number of auricular impulses may pass through, and the ventricles respond to them, or no impulses are allowed to get through, and the ventricles have an independent rhythm. Bradycardia may be divided into certain different groups. It may be persistent, or it may be intermittent; under the latter type falls the interesting complex of symptoms now known as the Stokes-Adams syndrome.

There may be an entire latency of all symptoms, so that the patient is unaware of the infrequency of the pulse until attention is specially directed to it. Usually, however, there is some breathlessness on exertion, and there may be some faintness, even on changing the recumbent for the upright position. Occasionally there is actual pain of an anginous character. In the case of paroxysmal bradycardia, the cerebral symptoms may be syncopal, apoplectiform, or epileptic. Sometimes during the paroxysms the breathing is of the Cheyne-Stokes variety. The pulse is usually of high pressure, although this is by no means a constant condition, and the arteries are often in a state of sclerosis. especially in the types found amongst elderly people. In those due to microbic agencies, the pressure is often extremely low, and the vessels are perfectly healthy. The rate of the pulse is permanently low in the persistent varieties, an average of thirty beats per minute being the most common figure. In the intermittent forms the pulse-rate sinks to a much lower level, reaching twenty, fifteen, and even below ten pulsations per minute. It is interesting to note that in those elderly cases which have begun as instances of intermittent, and have developed into permanent bradycardia, the pulse-rate, when the condition has become persistent, is never so low as during the original attacks. The phenomena revealed on examination of the heart present wide divergencies according as the bradycardia is produced by nervous influences or toxic agents on the one hand, or structural changes on the other. In the former group the whole heart, as a general rule, participates in the diminished frequency of pulsation, and there is no discrepancy between the movements of the veins of the neck and those of the apex of the heart or the arteries. In the toxic group, and especially in the variety caused by microbic agencies, there is commonly some cardiac enlargement, with murmurs of escape at the great venous orifices; but in the cases which are purely of nervous origin there may be no physical signs connected with the heart, except weakness of pulsation along with the infrequency. In senile forms, including, for the most part, the variety of intermittent bradycardia with Stokes-Adams attacks, there is usually a discrepancy between the movements of the veins and of the apex and arteries. The veins of the neck reveal two or three auricular pulsations for each ventricular beat, or there may be a complete divorce between them. Simultaneous tracings from the jugular veins and the apex of the heart illustrate this beautifully. In such cases, there is commonly hypertrophic dilatation of the heart, and a systolic aortic murmur is frequently followed by a loud booming aortic second sound. Murmurs of escape at the mitral and tricuspid orifices are frequently heard. In the long pause between the second sound and the following first sound or systolic murmur, as the case may be, it is very common to hear a soft low sound produced by the pulsation of the auricles. Two, or even three such sounds may be heard. There may be results of disturbance of different functions of the body, but these have no necessary connection with the affection, and need not be discussed.

Treatment.—In the management of bradycardia, as in that of arhythmia, the first aim must be to ascertain the cause of the condition. The same general regulations as for arhythmia (see Heart, Irregularity of) require to be applied in the case of bradycardia, to the extent necessary for each case.

Rest, exercise, diet, and occupation must be regulated in accordance with the exigencies of each patient. In the instances of diminished pulse-frequency caused by nerve influences, the use of belladonna or atropine is often followed by excellent results. These drugs have no influence over cases of heart-block, but, when the diminished frequency is due to nervous impulses inhibiting the rhythmicity of the auricles, belladonna and its alkaloid are effective in accelerating the rate. In some cases, atropine and strychnine may be combined and administered hypodermically, $\frac{1}{100}$ gr. of the former and $\frac{1}{30}$ gr. of the latter, twice a day. For this type of bradycardia, bromine is also of service. It may be administered as one of the bromides or as hydrobromic acid, three or four times a day. In the cases produced by toxic agents, the first indication is to use every measure which can remove the poisonous substance from the tissues. Aperients, baths, and massage are very helpful to this end. There is usually a natural period to the symptoms induced by microbic agents, and it suffices to support the patient during the interval which must elapse before the poison has been thrown off. For most of these poisons strychnine is more or less an antidote, and it acts best when given subcutaneously. In the case of gouty bradycardia, the combination of colchicum with alkalies, recommended for arhythmia, will here again be found of signal utility. When tobacco, tea, or alcohol has induced bradycardia, the treatment consists in absolutely prohibiting the further use of the noxious agent, and the employment of baths, exercises, and strychnine. When bradycardia is the result of increased pressure due to arterial spasm, the nitrites must be employed, with or without strophanthus, according to the condition of the cardiac muscle. When there are distinct structural changes, the use of iodine, either as one of the iodides or hydriodic acid, will be imperatively necessary. If the heart is feeble, they may be usefully combined with digitalis or strophanthus ; and when arterial spasm is associated with sclerosis, as is often the case, nitrite of sodium may be given along with iodide of sodium :—

℞ Sod. Nitrit. gr xij | Aq. Menth. Pip. ad ℥vj
Sod. Iodid. ℥ij |

A dessertspoonful in water three times a day after meals.

In some cases, combinations of the iodides and arsenic are beneficial. The formula which has acted well in my own hands is the following :—

℞ Sod. Iodid. | Aq. ad ℥ij
Liq. Sod. Arsenat. āā ℥ij |

A teaspoonful in water three times a day after meals.

It must be admitted that, in a large proportion of cases of bradycardia, every measure fails to influence the rate of the heart in the slightest degree.

G. A. Gibson.

BRAIN, COMPRESSION OF.—In all cases of head injury of any severity, constant watchfulness must be maintained for the onset of signs of compression, for it is the early recognition of this condition, followed by the early removal of the compressing agent, that makes a favourable result possible. It is beyond the scope of this article to enter upon a description of the signs and symptoms of compression of the brain, but the treatment adopted depends so closely upon the cause that the etiology must be considered.

The causes of compression of the brain after injury may be classified as follows : (1) Depressed fracture ; (2) Foreign bodies ; (3) Intracranial hæmorrhage—(*a*) Extradural, (*b*) Intradural ; (4) Inflammatory effusions—(*a*) Meningitis, (*b*) Abscess.

It may be said briefly that :—

1. Signs of compression following immediately upon the receipt of an injury to the head are due to a depressed fracture or the presence of a foreign body.

2. Signs of compression rapidly developing after the receipt of an injury, without any return of consciousness, and becoming progressively more marked, are due to intradural extravasation of blood.

3. Signs of compression showing themselves from one to six hours after an injury, but preceded by an interval of return of consciousness from the original concussion, gradually progressing and leading to coma within twenty-four hours, indicate extradural extravasation of blood—in the great majority of cases due to rupture of the middle meningeal artery.

4. Signs of compression accompanied by fever, and perhaps rigors, coming on three days or more after an injury, indicate inflammatory effusions, whether meningitis or abscess.

In the treatment of compression the obvious indication is to relieve the pressure by operation, and the methods employed will depend upon which of the above-mentioned causes is at work. (See SKULL, HÆMORRHAGE, etc.) The general treatment to be adopted may, however, be touched upon here. The patient is kept quiet in a darkened room, and an ice-bag may be applied to the head. The bowels are opened by the administration of a drop of croton oil in a little mucilage placed on the back of the tongue, followed by enemata. The urine is drawn off twice a day by catheterization. The patient is fed upon liquids by means of a nasal tube passed into the stomach. Stimulants must not be administered. There is a danger of the patient suffocating through the rolling back of the tongue. This may be avoided, as a rule, by placing the patient on his side; should it occur, the tongue is pulled forwards with forceps.

Death occurs from respiratory failure, the heart continuing to beat for some time after the breathing has stopped. Artificial respiration is therefore called for at times to keep the patient alive while an operation is being performed for the relief of the pressure, the breathing, when this has been done, continuing spontaneously.

S. Maynard Smith.

BRAIN, CONCUSSION OF.—It is usual for the purposes of description to divide concussion into three stages: (1) *Collapse;* (2) *Reaction;* (3) *Convalescence;* but it must be recognized that the severity of the condition may vary greatly. Thus there may be merely a momentary loss of consciousness, the patient feeling giddy and confused. In cases of severe injury, on the other hand, death may ensue in a few minutes. In the majority of cases, however, which come under the care of the surgeon, the three stages mentioned are sufficiently well marked.

Stage of Collapse.—Whilst employing measures to restore the patient from his condition of collapse, it is of the utmost importance to avoid over-stimulation. It is impossible to say at this stage whether there be any laceration of the brain tissue or rupture of intracranial vessels. Undue stimulation will result in the starting of hæmorrhage from these ruptured vessels, or, by causing hyperæmia of the brain, will predispose to the occurrence of inflammatory affections or of spreading œdema. The patient should immediately be put to bed between warm blankets, hot bottles placed around his lower extremities and trunk, and the surface of the body be gently rubbed with warm flannels. If the collapse be great, a rectal injection of a pint of warm saline solution should be given. In rare cases it may be necessary to resort to the administration of brandy either per rectum or hypodermically, but the dangers of stimulation must be carefully borne in mind. If the unconsciousness be long maintained, nutrient enemata will be needed, or fluid nourishment may be given by means of a nasal tube.

Stage of Reaction. — The onset of reaction is often marked by vomiting;

the pulse, at the same time, improves, the respirations become deeper, and consciousness returns. When this occurs a purge (calomel gr. 5) should be administered, followed if necessary by an enema. The diet should for a few days consist of "slops"; stimulants of all kinds must be avoided; and the utmost care should be taken to avoid all disturbing influences. Thus, the room should be darkened, the blinds being drawn and the lights shaded. The attendants should be warned to avoid noise in moving about the room, in attending to the fire, and in opening and closing the door. Should the reaction be considerable—as indicated by a raised temperature, continued mental disturbance, and severe headache—the head should be shaved and Leiter's tubes applied, whilst free purgation should be persisted in.

Convalescence.—Sufficiently prolonged rest from work and the avoidance of worry and mental excitement are the chief indications. *S. Maynard Smith.*

BRAIN, LACERATION OF.—More or less laceration of the brain and its membranes is a frequent accompaniment of head injuries. If there be a compound fracture of the skull and the dura mater be torn, the lacerated area is in direct communication with the exterior, and the grave dangers of septic inflammation are added to those directly dependent upon the laceration. It may be said that unless there be a depressed fracture of the skull, or unless the violence be localized to a small area, the laceration is most marked at a point diametrically opposite to the point struck (*contre-coup* laceration). Thus it is not unusual to find convulsions and paralyses on the *right* side of the body when it is the *right* side of the head which has been struck, since as a result of the blow there has been a *contre-coup* laceration of the *left* motor area.

Treatment.—It is obvious that in all cases of contusion or laceration of the brain the primary symptoms will be those of Concussion (q.v.). There are, however, several special symptoms which may arise in the course of the case and which call for special treatment. These are as follows:—

1. If there be a wound the utmost care is taken in its disinfection, as described under the heading of Scalp Wounds. Depressed fragments of bone and foreign bodies are removed, prolapsed brain tissue is cut away, and if possible the torn dura is brought together with catgut sutures, a small drainage tube being left in.

2. If signs of compression, preceded or accompanied by early convulsions or paralyses, ensue, the cause is likely to be hæmorrhage into or upon the surface of the brain. The treatment is given under Hæmorrhage, Intracranial.

3. The peculiar train of symptoms known as "cerebral irritation" coming on early after an injury is due to a laceration of the frontal lobe. For treatment, see Cerebral Irritation.

4. Convulsions occurring at a later period—usually from the third to the fifth day—indicate inflammatory processes or a spreading œdema originating at and extending from the lacerated area. If the patient be young and the pulse full and hard, venesection to the amount of 10 or 12 oz. may be performed, and full doses of bromides given. If, in spite of this, the convulsions become more general, and the unconsciousness becomes more profound, the lacerated area should be exposed, the dura opened, and the clots removed. If the brain appears swollen and œdematous, a free incision into its substance holds out the best hope of success.

S. Maynard Smith.

BREAST, INFLAMMATION OF.—(See Mastitis.)

BREAST, NEURALGIA OF.—Pain may, of course, form one of the symptoms of any affection of the breast, but in speaking of mammary neuralgia one refers to those cases in which pain is the outstanding feature of the case, the local

changes being slight or absent. This condition is very commonly met with in practice amongst female patients.

The causes are diverse, and usually unobtrusive; they may be divided into: (1) Local causes; (2) Pelvic affections; (3) Impaired general health. Local and general causes are often combined, and inseparably connected with both is the dread of cancer to which pain in the breast usually gives rise.

TREATMENT.—Before commencing treatment, it is essential to get a clear idea of the cause of the pain. Cure can rarely be brought about by merely covering up the breast with plasters or by the application of anodynes.

A very careful search must first be made for slight local lesions, and especially for small patches of localized mastitis. The condition of the pelvic organs must be inquired into, and treatment in this direction be instituted if necessary.

As has already been stated, it will be found that the fear of cancer is at the root of the trouble in the greater number of cases, and reassurance on this point will go far to cure the neuralgia. In fact, many of these patients come to us, not because the pain is a serious trouble, but in order to find out whether they have cancer. When we can honestly reassure them, as is often the case, the pains will usually vanish. If we are confident that there is no local disease, it is well to be emphatic, for any doubt or hesitation on our part will lead to infinitely greater doubt in the patient's mind, and to exaggeration of the pain and worry.

Any local changes in the breasts will demand local treatment, and, on the other hand, it may be pointed out that, in the absence of local changes, it will often be unwise to order local applications, for these will tend to keep the patient's attention to the region, and usually fail to give relief. Where there is mastitis, mercurial ointment and the internal administration of sodium iodide should be used. Should this treatment fail in patients over thirty, it will be wisest to excise the affected area freely. Small fibro-adenomata and cysts should be at once removed, and this step will almost always relieve the neuralgia.

When the general health is at fault, and is responsible for the neuralgia, the indications for treatment are clear. The most useful drugs are iron, quinine, and purgatives. Anæmia and insomnia must be promptly treated. In the neurasthenic cases, rest, general massage, and high feeding, or a change of surroundings, will be advisable; the most effective form of local treatment in these cases is galvanism. *T. Crisp English*

BREAST TUMOURS.

1. **Fibro-adenomata.**—Very small tumours, causing no trouble, may be left alone unless the patient desires their removal. Otherwise removal should always be recommended, for the following reasons: (1) These tumours are almost always a source of worry and anxiety to the patient; (2) If she marries, they usually grow rapidly and give trouble during pregnancy and lactation; (3) In a small number of cases they ultimately assume a malignant character; (4) The diagnosis can never be absolutely certain, and tumours supposed to be fibro-adenomata occasionally prove to be early sarcomata or carcinomata, even in young subjects.

No external application of any kind has the slightest influence on the growth of a fibro-adenoma; liniments, iodine, X rays and other "absorbent" remedies do nothing but harm.

The operation, although apparently a simple one, requires careful attention to detail. A full anæsthetic should be given; some recommend the use of a local anæsthetic, but this frequently leads to failure or to a hasty operation, for few women will bear an operation on the breast without a general anæsthetic. The *incision* should be a small one, and should be situated as low in the breast

and as near its periphery as possible; an inconspicuous scar will thus be left; in some cases a little flap with its convexity downwards may be used in order to get the main part of the scar lower. Many recommend that the capsule of the tumour should be incised and the growth "shelled out." Personally, I feel that it is better practice to remove the capsule with the tumour, for cases are met with in which the tumours have recurred locally after being "shelled out;" in these cases a small lobule of the tumour has been left behind. Further, it occasionally happens that on microscopical examination the growth is unexpectedly found to be malignant; the fact that the tumour has been excised thoroughly will then be an advantage in any case; the complete operation should be strongly advised at once, but it may happen that the patient refuses a second operation, or insists upon waiting for a recurrence. After removal of the tumour, all bleeding points are carefully secured, and the cavity is closed by passing silkworm gut sutures deeply; a drain of a few strands of silkworm gut is employed for 48 hours. Unless the wound be closed carefully, a hæmatoma usually forms, and will probably interfere with the union of the wound.

2. **Cysts.**—Cysts occurring in the breast may be grouped under the following headings: (*a*) Simple serous cysts; (*b*) Multiple cystic disease, including involution cysts; (*c*) Cysts connected with tumours; (*d*) Galactocele; (*e*) Hydatids.

(*a*) *Simple Serous Cysts* may occur in the breast apart from the presence of a tumour or intracystic growth.

TREATMENT.—These cysts may sometimes be cured by withdrawal of the fluid and the injection of two or three drops of pure carbolic acid; the acid excites inflammation and the cyst refills with fluid, which becomes absorbed in a few days, leaving the cyst obliterated. This method is not to be recommended; the result is uncertain, and moreover many of these cysts, which appear simple, are connected with tumour formation, which can only be recognized by incision; for instance, there may be a large cyst and a small, early carcinomatous growth. Tapping and injection should only be employed when the patient absolutely refuses the further operation.

The best treatment is excision; the resulting cavity in the breast tissue must be obliterated as far as possible by passing sutures of silkworm gut deeply, otherwise a troublesome hæmatoma is liable to develop; a small drainage tube should be inserted and left in for twenty-four hours.

In operating upon these cases it is well to remember that other smaller cysts may be found; in fact, that the condition is really multiple cystic disease; or cystic growth may be present. It is advisable, therefore, to obtain the patient's consent to remove as much of the breast tissue as may seem advisable.

(*b*) *Multiple Cystic Disease* is usually the result of chronic lobular mastitis, and the treatment depends on the same principles as that of chronic mastitis. Each case must be considered separately; in some the cysts may be dealt with one by one as they arise, by injection and tapping, or by excision; in others, excision of a portion of the breast is indicated; in many, it is wiser to remove the whole breast.

(*c*) *Cysts connected with Tumour Formation* (intracystic growths). If the growths are papillary and are not to any degree implicating the cyst wall, simple excision of the cyst should be performed; if the growths infiltrate the cyst wall, the treatment is that of malignant disease of the breast; if there is doubt, it is wise to excise a wide area of mammary tissue with the cyst. If the cyst is connected with a fibro-adenoma or a malignant tumour, the treatment is that of the tumour.

(*d*) *Galactoceles* are cysts containing altered milk, which originate in lactation and are due to partial obstruction of one of the larger ducts.

Treatment.—Nothing as a rule should be done until lactation has ceased. The cyst should then be excised, and the cavity left obliterated as far as possible by deep suturing; drainage for forty-eight hours should be employed.

Other methods, such as tapping and injection, free incision and stuffing with gauze, etc., are unsatisfactory, and should not be employed. A suppurating galactocele is treated as an ordinary mammary abscess.

(*e*) *Hydatid Cysts* are rare, and should be freely excised.

3. **Malignant Tumours.**—The only treatment for malignant disease of the breast is early and thorough operation, provided that there is a reasonable prospect of removal of the disease. Under certain conditions, palliative treatment only is possible. However small and early the growth, operation must not be delayed, for with each week of delay the prospect of cure diminishes. One would also point out emphatically that however small the growth, the extent and thoroughness of the operation should never be diminished, for it is in these early cases that a permanent cure may be obtained.

Radical Operations.—The term "radical operation" is used for those operations in which an attempt is made to procure a radical cure by the removal of the whole of the disease; in former days this expression would scarcely have been admissible in view of the large number of cases in which recurrence took place. The experience of recent years, however, is clearly proving that after the proper performance of the modern complete operations, local recurrence only ensues in a small proportion of the cases, and that a large number of patients escape from any further manifestations of the disease.

The *rationale* of radical operations for mammary cancer is based mainly on two considerations: (1) The anatomy of the lymphatic system in this region; and (2) A study of the areas in which the disease reappears after incomplete operations. Before discussing the indications and contra-indications for the radical operation, brief reference must be made to its extent and nature. The following structures are removed in one continuous mass: the whole of the mammary gland and a large portion of the overlying skin; both pectoral muscles, excepting the clavicular fibres of the pectoralis major; the whole lymphatic area, including the fascia and fat from the epigastric region below to the clavicle above and to the commencement of the brachial artery laterally. The incision extends from just above the insertion of the pectoralis major, includes a large ellipse of skin, and terminates in the epigastrium midway between the costal margin and the umbilicus.

This is obviously an extensive and very complete operation, but the results fully justify it. One would point out strongly that it is not a formidable operation; there are some who object to it on the grounds that it involves great shock, great risk, and that it is unnecessary. The last argument is scarcely a serious one when we consider the nature of the disease with which we are dealing. The other arguments do not hold good in practice.

I have performed this operation during the last three years in all cases in which there was a reasonable prospect of eradicating the disease, and can testify to the comparative ease with which it can be carried out. The usual duration of the operation is from 40–50 minutes: there is rarely marked shock or collapse afterwards if the hæmorrhage be kept at a minimum, and the patient is able to get about at the end of a week or ten days; with proper after-treatment the movements of the arm are scarcely impaired. Finally the prospects of the patients are infinitely better than if any of the less extensive operations had been performed.

Indications for Operation.—In many cases it is at once clear that operation is the right and proper course; in others it is equally clear that any operation would be futile or even harmful; but there are a great many borderland or

doubtful cases, in which every aspect must be carefully considered before a decision is reached.

The best subjects for operation are middle-aged, comparatively thin women, with sound viscera, who have small growths in the outer quadrant of the breast, with slight or no palpable enlargement of the axillary glands. Bad subjects are those who are young and have large breasts, those who are stout and plethoric, the alcoholics, diabetics, bronchitics, those with feeble hearts or diseased kidneys, those who are elderly and have little power of resistance.

The following local conditions exclude any attempt at radical operation: (1) Fixation of the growth to the thorax; (2) Extensive involvement of the skin, either in the form of a brawny induration or of multiple widely-scattered nodules; (3) Implication of the axillary vessels or nerves.

Enlargement of the supraclavicular glands is usually held as an indication that the disease has gained too strong a grip upon the patient, and that operation for palliative purposes only is possible. Some surgeons have practised operations in such cases, and have reported a few successful results. One would say, therefore, that in the majority of cases this complication renders any extensive operation useless, but that in certain cases, with very slight involvement of these glands, extirpation may be attempted.

Atrophic Scirrhus should always be operated upon, if there is any reasonable prospect of completely removing the disease, unless the patient be very old or very feeble. It is true that such cases may go on for a very long time without serious trouble, but ultimately most of them die of internal deposits; on the other hand, if operation be done thoroughly, there is an exceptionally good chance that a permanent cure may result.

Visceral Deposits of course negative any possibility of cure; very careful search should be made for these before advising operation, for they are easily overlooked when showing themselves as vague "rheumatic" pains about the limbs or spine, slight pleural effusions, etc.

Diabetes, Cirrhosis, and Renal Disease are formidable complications. The advice of a physician should at once be taken, and if diabetes be present, a quantitative examination of the sugar in the urine be made. The question resolves itself into one of the successful performance of an operation under unusual difficulties, and in this respect we are now in a much improved condition. Sepsis, which formerly represented the main danger of diabetes, should nowadays be an almost negligible factor, whilst the precautions which prevent or diminish shock are better known. In diabetics it is advisable to devote a short time to careful dietetic treatment before operation. The increased risk involved by the presence of these complications must be explained to the patient or to her friends, but considering that without operation we are leaving her to die, and to die probably sooner owing to the complication, operation will usually be desired in spite of the increased risk.

In old subjects, say patients over seventy, the question presents very special difficulties. To begin with, a large proportion of these patients will obstinately refuse any operation, even before such treatment has been mentioned, on the ground that they are too old and could not stand any operation. In such cases one can only point out emphatically that no decision should be made until the facts of the case have been carefully explained and thought over by the patient and her friends for two or three days. The first point is to estimate the patient's practical age, for many of them will be found to be for surgical purposes much younger or older than the actual age given. For this purpose a thorough examination must be made, special attention being paid to the heart, lungs, arteries, and urine. Secondly, a rough estimate must be made of the rate at which the tumour is growing and the length of time which is likely

to elapse before it causes the patient's death if no operation be performed. Accuracy in a matter of this kind is obviously impossible, but with care and experience an approximate result may be obtained. Generally speaking, of course, these growths are very slow in old subjects, and the older the patient the slower the growth; in fact, in some it is obvious that the patients are far more likely to die from other causes before the growth is sufficiently advanced to cause them much trouble or to kill them. Thus most cases of the atrophic variety of scirrhus in patients over 70 are best left alone. Thirdly, we have to consider the risk, and this will depend on the general condition of the patient and the difficulty and duration of the operation. In the greater number of cases it will be advisable to limit the duration of the operation to twenty minutes or half an hour.

Pregnancy forms a very serious complication in cancer of the breast. In considering the question of operation, two main facts present themselves—the rapidity with which mammary cancer grows during pregnancy and lactation, and the risk of abortion after the necessarily extensive operation. There are some who advise against operation owing to fear of disturbance of the pregnancy. But the indications are perfectly clear. To leave the patient means rapid increase, and probably fungation, of the growth, and early death; moreover, there is still a liability to miscarriage or non-survival of the child. On the other hand, miscarriage after removal of the breast occurs in certainly less than half of the cases. Pregnancy should therefore never be considered as an argument against operation when the growth is removable, but should be taken as demanding early and thorough operation.

The question of treatment in cases of *bilateral carcinoma* may at first sight suggest difficulties, but may easily be decided in the following way: Each breast is considered by itself, and a decision made as to whether operation would be advised for the disease in that particular breast, if the other breast were not affected. If one can answer in the affirmative as regards each breast individually, then operation for both sides should be recommended. If operation is decided upon, then the question arises as to whether both sides should be dealt with at the same time, or by two operations. Under ordinary circumstances one would prefer to allow an interval of a fortnight or so to elapse between removal of the breasts, but several factors must be considered. There are some subjects whose physical powers would be dangerously taxed by two extensive operations in a short time; there are some who could not face the prospect of two separate operations; and there are those disappointing cases, which all surgeons encounter, in which the patient consents to two operations, but after the first refuses to allow the second to be performed. On the other hand, there are practical or placid women who have the moral courage, as well as the physical powers, to face two separate operations. If the breasts be removed at the same time, all the resources of surgical organization are called for; the work must be done as quickly as possible, though thoroughly, and above all things hæmorrhage must be reduced to a minimum. The best plan is to have a skilled assistant, who can ligature vessels and sew up the wound after removal of the first breast, whilst the surgeon proceeds to removal of the other. The time occupied in suturing the wounds can be reduced considerably by the use of Michel's sutures.

Palliative Operations.—A great many cases of mammary carcinoma which come under notice are unfortunately obviously beyond the possibility of any radical cure; but in many of these cases a palliative operation may give much relief. These operations are performed to prolong life, to give relief to pain, to prevent fungation, and to make the patient more comfortable and happy during the time that remains to her.

Removal of the breast as a palliative operation is called for mainly in comparatively young subjects with large, rapidly growing tumours; such tumours often cause much pain, and are a source of great distress to the patient; and when fungation occurs this distress is greatly increased, and the sepsis which almost invariably follows rapidly shortens the patient's life.

The nature of the operation depends on the distribution of that portion of the disease which is causing trouble. In most cases a simple removal of the breast and the most enlarged glands in the axilla is the operation for choice; any elaborate clearing of the axilla is usually inadvisable. In some cases, however, when pressure upon the axillary nerves by enlarged glands is likely, the axilla should be cleared up to the clavicle as in the "complete" operation. I would strongly insist on one point: in all palliative operations, the skin flaps should be so cut that they can be united without difficulty, the wound healing by first intention. Unless this can be done I should advise against any operation, for I believe that more harm than good is done by leaving a large raw surface. The very object of the operation, palliation, is usually defeated by inability to completely close the wound; the long convalescence means much distress and disappointment to the patient, and growth often shows itself in the granulating wound, which then of course never closes.

Recurrent disease should be dealt with at once unless obviously irremovable. The most favourable recurrences are superficial nodules in the neighbourhood of the scar; if these are widely excised, no further recurrence usually occurs in that particular region. Large masses of recurrence adherent to the chest wall can seldom be dealt with successfully, and for these cases the X-Rays should be carefully tried.

Non-operative Treatment.—There is at the present time no remedy which can replace or give any excuse for delay in operation. Should the disease be obviously beyond operative treatment, nothing can produce any permanent effect on the progress of the disease.

The curious vagaries of cancer account for the supposed success of certain remedies, such as "violet leaves," "cinnamon bark," and "trypsin." If these remedies are given at a time when the tumour is about to undergo one of these curious pathological improvements, they gain the credit of having worked a marvellous cure.

Strong caustics are painful, dangerous, and excite suppuration. Electricity sometimes relieves pain, and encourages the patient, but is otherwise useless. X-Rays are undoubtedly useful in certain cases; they usually relieve pain, and can cause the disappearance of superficial nodules, and the temporary healing of superficial ulceration. There is probably no case in which they have effected a cure, and they have practically no effect on subcutaneous disease covered by healthy skin. Dermatitis may be caused if the rays are not skilfully applied; occasionally their use excites a sudden inflammatory condition and rapid increase of the growth.

The injection of Coley's fluid has produced a few undoubted cures in cases of inoperable sarcoma; in the great majority it fails, and its use is attended with marked constitutional disturbance and definite risk. For inoperable sarcoma this treatment may be considered, but in cases of carcinoma its use is scarcely justifiable under present conditions.

Oophorectomy for irremovable mammary cancer has now received extensive trial, and the results are disappointing. There has probably been no case of true cure, but marked temporary improvement is said to have occurred in about 25 per cent of the cases which have been publicly reported. The best results have been obtained in patients between forty-five and fifty years of age; after

fifty no good appears to follow the operation. The mortality amongst the published cases is about 6 per cent.

The facts may be summed up as follows: In about 20 to 30 per cent of the cases definite relief and improvement appear to follow the operation; the probability of cure is remote; the mortality of the operation under these circumstances is about 6 per cent; chronic growths in patients between forty-five and fifty give the best results.

Medical Treatment of Inoperable Carcinoma.—Much may be done to relieve those suffering from inoperable cancer. The medical man must use his discretion as to the amount of encouragement and hope that he gives the patient.

Pain will usually necessitate the use of morphia; bromides, veronal, sulphonal, give a certain amount of relief in the earlier stages, but morphia usually becomes necessary. If so, it should be given in sufficiently large doses to completely relieve the pain, and steadily increasing doses will be necessary, and are well borne.

The most important point in the local treatment is asepsis; for if the growth ulcerates and becomes septic, the patient's life is considerably shortened. Antiseptic dressings are regularly applied, and occasionally the ulcerating surface should be painted over with 1–5 carbolic acid. If the surface should become very foul, hydrogen peroxide is the best application. If the growth should cause much pain, one of the following applications recommended by Sheild should be used: (1) Citric acid, 2 dr. to 8 oz. of water; (2) Warm poultices of fresh conium leaves; (3) Freshly prepared succus conii and equal parts of lanolin; (4) Cocaine ointments.

Hæmorrhage from an ulcerating surface should be treated with adrenalin solution, or hamamelis lotion, and firm pressure.

Lymphatic Œdema of the Arm.—This is one of the most distressing results of mammary carcinoma; it is often associated with severe pain, due to the involvement of nerves by growth in the subclavian triangle or high in the axilla. Relief is usually afforded by massage and firm bandaging; if flexion at the elbow is not interfered with, a sling should be worn. In some cases thyroid extract causes marked diminution in the œdema of the arm, appearing to act as a lymphagogue. In cases of very severe pain, the possibility of relief by operation arises. The pain may sometimes be cured by removal of glands pressing on the nerves; it may be relieved by division of the nerve trunks, a comparatively simple proceeding, which, however, leaves a paralyzed and still œdematous arm.

In cases of agonizing pain, in which life is scarcely tolerable, removal of the whole fore-quarter may be considered. In suitable cases this gives great relief; it is of course a severe operation, but is not very often called for.

Doubtful Tumours.—The use of a grooved needle or small trochar for the diagnosis of doubtful swellings of the breast is to be most strongly condemned; it is both painful and alarming to the patient, and may be very misleading to the surgeon. It is used as a rule to discover whether there is fluid in the swelling; but in thick-walled cysts it frequently fails to enter the cyst, and leaves one with the impression that the swelling is solid, whilst if fluid is drawn off it tells us nothing of the nature of the cyst; the cyst may contain intracystic growths or may be connected with a small malignant growth. In the case of solid tumours also the grooved needle gives us no information of any kind, and it seems probable that the puncture of a malignant growth may stir it to increased activity. The grooved needle is in fact one of the most dangerous instruments ever invented. Exploratory incision should be the routine treatment for all doubtful swellings; delay is not permissible, for experience shows that the greater number of "doubtful swellings" prove to be malignant. In

nearly all cases, the nature of the tumour becomes at once apparent upon incision, but in some the microscopical evidence must be awaited. Where it is desirable to proceed to the full operation at once if the growth proves malignant, arrangements can be made to receive an immediate report from the pathologist; thus, in a case upon which I operated recently, the microscopical report was received in eight minutes after the removal of a portion of the growth, and the radical operation was proceeded with at once: the aid of a skilled pathologist is necessary. *T. Crisp English.*

BREASTS, HYPERTROPHY OF THE.—True hypertrophy of the breasts is uncommon, commences generally at puberty, and usually affects both breasts.

TREATMENT.—In a small proportion of the cases, arrest or diminution of the condition may be brought about by the continued application of firm pressure, and the internal administration of iodides. In most cases the hypertrophy is progressive in spite of medical treatment, and removal of the breasts, which are functionless, becomes necessary. There are no special difficulties about these operations if they are carefully planned and the hæmorrhage is efficiently dealt with. *T. Crisp English.*

BRIGHT'S DISEASE.—(See NEPHRITIS.)

BRONCHIECTASIS.—Before studying the treatment of this affection it is necessary to understand its varieties and etiology, and also the results or complications which may supervene; for it is these that need attention rather than the actual condition, which admits of little if any amelioration, and which if robbed of these consequences, is compatible with a fairly healthy, useful, and active life.

1. A congenital form occurs (very rare). It is always unilateral, and the other lung hypertrophies, so taking on the work of both.

2. The form due to more or less extensive fibrosis of lung, consequent upon interstitial or unresolved pneumonia or bronchopneumonia, pleurisy, or empyema. This, too, is often unilateral, the other lung hypertrophies, and the patients are often in good health but for attacks of bronchial catarrh, or some of the complications mentioned below.

3. The form occurring with chronic bronchitis and emphysema, or in chronic cases of pulmonary tubercle. Here the treatment is chiefly that of the affection causing it, plus that of complications as stated.

4. The form due to the impaction of a foreign body in a bronchus, or to pressure of an aneurysm, or other tumour, upon one of the tubes. The tubes beyond the obstruction, softened and inflamed by the retained, often decomposed, and fœtid secretion, dilate, and complications are more likely to occur than in any other form.

5. Acute dilatation occurring as the result of excessively frequent and prolonged paroxysms of coughing, usually in the course of pertussis. Treatment of the cough and accompanying bronchitis with general tonics we have seen result, apparently, in the complete disappearance of this condition.

It will be seen that in many instances the appropriate treatment will be directed towards the disease causing bronchial dilatation, or in the course of which it occurs; whilst in others only general tonic and hygienic measures are needed. It is the consequences which are most to be dreaded. They are:—

1. Hæmorrhage—(occurred in 14 out of 35 cases—Fowler).

2. Bronchitis, very liable to recur, often runs a febrile course, and is not uncommonly accompanied by patches of pneumonia.

3. Retention, with decomposition of sputum, which is most to be feared, as it may give rise to:—

(i). Fœtid bronchitis.
(ii). Ulceration of tubes.
(iii). Gangrene of lung.
(iv). Septic absorption, with secondary abscesses (brain).

Hæmorrhage is not generally profuse, and the usual treatment for hæmoptysis (q.v.) is applicable in such cases. The recurrent bronchitis needs special care, because of the damaged state of the lung, and the likelihood of the attacks running on to a pneumonia, or becoming fœtid ; otherwise their treatment does not differ from ordinary cases. The chief aim is to prevent the retention and decomposition of sputa, and correct the fœtid and septic nature of the secretions. The following points are important :—

Encourage the emptying of the dilated tubes, by mechanical means if natural efforts of coughing are ineffectual. This can be done by inverting the patient, getting him to assume the genu-pectoral position, or lean well over the edge of the bed, so that his head nearly touches the floor. In children, emetics are often useful to help in the expulsion of the accumulated secretions, or firm rubbings and pressure of the chest with the hands. These methods are directed towards prevention of decomposition, but are equally important where fœtor is present. In such a case we must add the use of antiseptics. These may be given by the mouth, inhaled, or introduced by intratracheal injections, or they have even been injected directly into the cavity of the dilated tube through the chest wall with a hypodermic syringe.

Internally, the best remedy is creosote (2 to 3 min. given in capsule twice a day) or guaiacol (5 to 6 min. twice daily).

For inhalations, the formulæ given below will be found useful. But by far the most successful way of getting the secretions sweet is by the inhalation of creosote, vaporized by heat. For this purpose the patient is put into a small chamber, rendered as air-tight as possible, and a metal dish full of ordinary commercial creosote is placed on a tripod under which a small spirit lamp is arranged. The vapour comes off in dense, whitish fumes. These fumes are very irritating, so that the eyes of the patient must be protected by watch-glasses and strapping, and his nostrils plugged with cotton-wool, whilst he is instructed to breathe through his mouth. Salivation, profuse coughing, and expectoration result ; usually patients are not able to stand a longer sitting than from ten to twenty or twenty-five minutes, which should be repeated daily. We know of no more efficacious means of reducing the fœtor of the expectoration.

Intratracheal injections are usually composed of : menthol 10 per cent, guaiacol 2 per cent, olive oil 88 per cent, and about a drachm of this mixture is introduced, by means of a tube and syringe, into the trachea twice daily. Care must be taken, during the injection, that the patient is lying on the side into which it is wished that the remedy should go, in order that it may gravitate into that bronchus.

Lastly, it is necessary to mention that some very chronic bronchiectatic cavities have been treated by incision and drainage. The results are not encouraging. The cavity cannot contract and become obliterated, and thus a permanent sinus usually results.

Inhalation for Fœtid Bronchitis.

℞ Acid. Carbol. ʒss | Tinct. Opii Camph. ʒiij

One teaspoonful to be freely inhaled from half a pint of hot water. (*Davis*).

Compound Iodoform Inhalation.

℞ Iodoform gr j | Chloroform ♏ij
Ol. Eucalypti ♏x | Sp. Rect. ♏x

10–15 drops to be inhaled from the sponge of a respirator. (*Vict. Park Hosp. Pharm.*)

CREOSOTE INHALATION.

℞ Creosote | Alcohol Absolut. āā pt. æq.

10–15 drops to be inhaled from the sponge of a respirator.

(*Vict. Park Hosp. Pharm.*)

W. J. Hadley.

BRONCHITIS, ACUTE.—The patient's room should be kept at a temperature of 65° F.; the air moistened either simply with a steam-kettle, or some aromatics may be added to the water, such as eucalyptus, tinct. benzoin co., or phenol, about 1 dr. to the pint. The bowels should be well opened, and some diaphoretic, with either antimony or aconite, given, such as the following:—

℞	Vin. Antimon.	℥ x	Syr. Tolu.	ʒss
	Sp. Æth. Nitrosi	℥ xv	Aq. Camph.	ad ʒj
	Liq. Ammon. Acet.	ʒij		

Every four hours.

Patients vary much in the manner in which they bear antimony, but the tendency at present is to undervalue it. Old people, as a rule, do not take it well. Aconite, in my experience, is best given alone, in a little water, tincture of aconite 1 min. every hour for six or eight doses; its effect can be watched and the diaphoretics given separately. The perspiration can be increased by hot baths or some form of portable vapour bath, several types of which are now easily available. This, followed by a hot-water bath, will sometimes cut short an attack. The patient should take freely of warm fluid food. The question of alcohol must be decided in each individual case.

More commonly used to relieve an acute bronchitis is ipecacuanha, which may be combined with small doses of carbonate of ammonia and hyoscyamus.

℞	Ammon. Carbonat.	gr iij	Tinct. Hyoscyam.	℥ xx
	Vin. Ipecac.	℥ v	Aq. Camph.	ad ʒj
	Sp. Chlorof.	℥ x		

Every four hours.

Warmth to the chest, in the shape of a fine Shetland-wool jacket or coarser knitted-wool vest, is serviceable; so is stimulation with a moderately strong liniment, e.g., liniment. tereb. acet. Poultices, except on rare occasions, are unnecessary, and in some ways do harm, both by their weight, and by the patient's liability to fresh cold while they are being changed. Occasionally. however, they give great relief. Bran, though lighter than linseed, does not retain heat so well.

Counter-irritation, by means of mustard leaves, is often of service. The ordinary mustard leaf may be cut into two or four pieces, and if too irritating, may be covered in with silk before application to the chest. Strong counter irritants such as linimentum crotonis are seldom needed.

If the attack is of a more severe nature, ammonium carbonate, belladonna, and strychnine should be used, and if necessary in large doses, either separately or in combination, e.g.:—

℞	Ammon. Carbon.	gr v–xx	Inf. Caryophyl.	ad ʒj
	Tinct. Cardam. Co.	ʒss		

Every four hours.

The taste of the ammonium carbonate is not fully covered, and it is not pleasant, but the medicine may be diluted by the addition of water. The value of large doses of this drug in severe acute bronchitis is not sufficiently recognized.

Strychnine may be given in the medicine taken, or hypodermically. When possible, the latter method is preferable, as one can better gauge its effect, and increase it apart from the other drugs used. In severe cases it should be pushed

to the physiological limit. A dose of $\frac{1}{60}$ gr. hypodermically may be used as often as seems necessary, and gradually increased to $\frac{1}{20}$ gr. if it succeeds in stimulating respiration and pulse.

Belladonna may be given either as tinct. bellad., or liq. atrop. sulphat., e.g. :—

℞	Liq. Atrop. Sulph.	♏ j	Aq. Chlorof.	ad ℥ j
	Sp. Anisi	♏ v		

Every four hours.

for six doses, and then less often, carefully watching the effect on respiration and pulse, as well as its action on brain, pupils, and throat.

Sometimes the belladonna may be combined with potassium iodide, e.g. :—

℞	Tinct. Bellad.	♏ x	Potass. Bicarb.	gr xv
	Potass. Iod.	gr iij	Aq. Camph.	ad ℥ j
	Ammon. Carb.	gr iij		

Four times daily. *Gustave Schorstein.*

BRONCHITIS, CHRONIC.—The patients at first have cough only during the winter, but in time the cough persists throughout almost the whole year. They gradually develop more or less emphysema.

Preventive Measures.—They feel the cold much, and should always dress in light, warm woollen clothes, not heavy enough to induce perspiration to any large extent when they walk. They should be especially careful in passing from warm rooms to cold air, and should avoid crowded rooms and foul air. A respirator, objectionable though it be in appearance, is often useful.

They should be cautious in undressing and dressing in cold bedrooms, and if possible, bedroom and bed should be warmed. The use of cold lavatories is an obvious danger. With careful attention to details the number of attacks in winter may be much diminished.

For those who can afford it, many places on the south coast, the French or Italian Riviera, Sicily, Algiers, and Egypt, offer climates in winter which render the likelihood of an attack much smaller than at home. But it must always be remembered that even for those whose means allow of travel, the comforts of home often far outweigh everything else. Many of those sent abroad thoroughly dislike the change, and I have rarely seen bronchitics more uncomfortable than in a badly-warmed hotel on the Riviera on a cold winter day.

A patient suffering from chronic bronchitis has from time to time acute attacks superadded. These must be treated as described under ACUTE BRONCHITIS. As the acute condition passes off, the patient reverts to the state of chronic cough, with more or less easy and abundant sputa. The objects to aim at are, to help the patient to get rid of secretion, to stimulate the respiratory centre, to strengthen the right ventricle for its extra work, and, if needful, to procure sleep.

The most useful form of prescription in an ordinary case of chronic bronchitis with moderate secretion is some such combination as :—

℞	Tinct. Nucis Vom.	♏ v	Tinct. Scillæ	♏ xx
	Ammon. Carb.	gr v	Inf. Seneg.	℥ j

Three or four times a day.

It is not very palatable, and other vehicles than senega can be used, such as infusion of serpentary, cloves, etc. But empirically senega seems to afford most relief. The nux vomica stimulates the respiratory centre and helps cough, and thus enables the patient both to get rid of secretion and to sleep. Of all hypnotics used in chronic bronchitis, nux vomica is the best : it has the disadvantage that in some patients, old men, it induces irritability of the bladder, and where there is much atheroma of arteries may increase arterial tension

beyond safety limit. In such cases belladonna may be substituted and used freely up to 15 to 30 min. thrice daily, watch being kept on its effect on brain, if any signs of delirium appear, on the pupils, and on dryness of throat.

The value of squill is that, beside its effect as a stimulant expectorant, it also acts very much as digitalis does on the heart. In all chronic bronchitics the right heart begins to fail sooner or later, and one or other of the cardiac stimulants is indicated. A suitable combination is :—

℞	Syr. Scillæ	ʒss	Aq. Chlorof.	ad ʒj
	Acid. Hydrobrom. dil.	♏xxx		

Three times daily.

Small doses of digitalis or strophanthus tincture may be added if needed.

In some cases, the sputa are difficult and sticky ; in these it is well to give some potassium iodide for a while, e.g. :—

℞	Potass. Iod.		Syr. Aurant.	ʒss
	Ammon. Carb.	āā gr iij	Inf. Gent. Co.	ad ʒj
	Potass. Bicarb.	gr x		

Three times daily.

Where the sputa are excessive in quantity, sometimes the resins are useful, e.g. :

℞	Vin. Ipec.	♏v	Mucilag. Acac.	♏xxx
	Tinct. Benzoin. Co.	♏xx	Aq. Anisi	ad ʒj
	Syr. Prun. Virgin.	♏xxx		

Three times daily.

If the sputa are both excessive and very watery :—

℞	Vin. Ipec.	♏v	Syr. Tolu.	♏xv
	Tinct. Camph. Co.	♏xxx	Mist. Ammoniaci	ad ʒss

Three times daily.

Or,

℞	Syr. Pic. Liquid. (B.P.C.)		Syr. Prun. Virgin.	♏xxx
	Syr. Codein.	āā ♏xx	Infus. Cascarillæ	ad ʒj

Three times daily.

If the right heart fail considerably, œdema and congestion of the lungs are superadded to the bronchitis, and as the right ventricle dilates, all the signs of cardiac failure in various degree appear : cyanosis, dyspnœa, scanty urine, œdema of legs, etc. Sometimes free venesection helps, 15 to 20 oz. of blood being drawn from the median basilic vein. The special indication for this is cyanosis, with a thready, small pulse, and dilated but still forceful cardiac impulse. The last is difficult to judge, and must often be guessed, owing to the emphysema accompanying the bronchitis. The relief given in such cases by bleeding is often marked ; and a patient who has once felt the ease that follows, will ask at a later stage to have it repeated. In private practice, however much caution should be exercised before advising this measure ; it is unpopular among the general public, and if it is not successful, the practitioner may incur undeserved blame. Dry cupping will sometimes help in cardiac failure, but slowly, and not very efficiently.

Of drugs, digitalis, strophanthus, caffeine, strychnine, ammonia, and ether are the most useful.

℞	Sp. Ammon. Arom.		Tinct. Aurant.	♏x
	Sp. Æther.	āā ♏xxx	Aq. Camph.	ad ʒj

Occasionally.

To this may be added full doses of the special cardiac stimulants until the full physiological effect is obtained, or until it becomes obvious that they are

doing no good, when they should be discontinued. Sometimes a patient is made even more uncomfortable by them. Digitalis is often badly borne, and in such cases strychnine, strophanthus, and caffeine are available. Strophanthus is still, in spite of excellent work towards standardization, an uncertain drug, and it should always be used in small quantities at first, 3 to 4 min. of the tincture, to gauge its effect, and then increased gradually.

If the kidneys are sound, as far as can be made out (urine of good specific gravity, not below 1015, good colour, and not much albumin), the combination of mercury with digitalis in pill is good.

℞	Pulv. Digit.		Pil. Hydrarg.	gr j
	Pulv. Scillæ	āā gr j	Ext. Hyoscyam.	q.s.
		Ft. pil.	Twice daily.	

or Baillie's pill, viz. :—

℞	Pil. Hydrarg.	gr ij	Pulv. Scillæ	gr j
	Pulv. Digit.	gr ss		

But if there is much chronic interstitial nephritis and hard arteries, as is common enough in chronic bronchitis, mercury is best avoided. It is, under these conditions, often the cause of extreme salivation and stomatitis, even when given in small doses, and adds to the patient's discomfort.

For hypodermic injection, digitalinum (pulverisatum purum germanicum), which is a mixture of glucosides, $\frac{1}{60}$ gr., or caffeine sodio-salicylate 3 gr., are effective (the latter is the better of the two), or strychnine $\frac{1}{60}$–$\frac{1}{30}$ gr.

Oxygen.—The results of the use of oxygen in bronchitis with cyanosis and failing heart are very variable. In extreme cases it is always worth a trial. It should be given for about twenty minutes at a time, and its effect watched. The less elaborate the apparatus the better, as many patients are much alarmed by the size of bag, etc. It is advisable to let the gas pass through a twisted metal coil placed in a can of hot water, between the cylinder and patient. The extreme coldness of the gas as it issues from the cylinder may easily be harmful.

Treatment of Cough.—The essential point always to keep in view is whether the cough is useful or useless. To stop a cough which is emptying the bronchi of pus is a mistake; to stop a cough due to irritation of lung or bronchial mucosa, without discharge, is clearly desirable.

The greater proportion of cough in chronic bronchitis disappears *pari passu* with the success of the general treatment, and nothing more is needed than some simple lozenge, of which there are many. The trochiscus glycyrrhizæ of Brompton Hospital is a favourite :—

℞	Ext. Glycyrrhiz.	gr iij	Troch. Acac.	gr x
	Ol. Anis.	♏ss		

For those who object to the aniseed, this can be omitted. The official lozenges, trochiscus gummi rubri (1 gr.), and trochiscus ipecacuanhæ ($\frac{1}{4}$ gr.), are both useful, and many variants can easily be devised and obtained.

The most serviceable general linctus is the St. Bartholomew's Hospital formula :—

℞	Tinct. Camph. Co.		Syr. Tolu.	āā ♏xx
	Oxymel Scill.			
		One teaspoonful occasionally.		

Honey is an excellent ingredient in cough mixture, well-known, but not now much used. The following is pleasant :—

℞	Mel. purificat.	℥ss	Tinct. Scill.	♏v
	Vin. Ipec.	♏v	Syr. Prun. Virgin.	♏xxx
			Mist. Amygd.	ad ℥ss
		Occasionally.		

If the cough is useless, more sedative preparations are necessary, and should be employed with care, e.g. :—

℞ Heroin Hydrochlor. gr $\frac{1}{8}$ | Tinct. Prun. Virg. ℥x
Terp. Hydrat. (P.G.) gr j | Glycerin. ad ʒj
Occasionally.

℞ Syr. Codein. | Succi Limon. ℥xviii
Glycerin. āā ℥xx | Æth. Chlor. ℥ij
Occasionally.

℞ Morph. Hydrochlor. gr $\frac{1}{16}$ | Aq. Lauroceras. ℥viii
Sp. Chlorof. ℥iv | Syr. Limon. ℥xxx
Glycerin. ad ʒj
Occasionally.

For the morning cough, a dose of the following with a cup of warm milk or tea, taken before getting out of bed, is helpful :—

℞ Sod. Bicarb. gr x | Æth. Chlor. ℥v
Sod. Chlorid. gr iij | Aq. Anis. ad ℥j

A wineglassful of Ems water (Krähnchen) in half-a-tumblerful of warm milk serves the same purpose.

For long-continued cough with slight expectoration, a course of pil. ipecac. c. scill. gr. 3, bis die, will sometimes help ; and to the pill may be added, if the arterial tension is high, and there is no chronic kidney lesion, $\frac{1}{3}$ gr. of hydrarg. subchlor.

This long-continued cough is also helped occasionally by inhalation of ammonium chloride vapour, for which several forms of apparatus are to be obtained. The ammonium chloride may also be taken by mouth, its unpleasant taste being the chief objection.

℞ Ammon. Chlor. gr xx | Aq. ad ℥j
Ext. Glycyrrhiz. Liq. ʒj |
Three times daily;

or if the taste be not much disliked, 20 gr. may be dissolved in 3 oz. of water, and sipped slowly, when cough is troublesome.

Cough may be much relieved by *inhalations*. One of the best is tinct. benzoin co. 1 dr. to a pint of water at a temperature of 140° F. in a suitable apparatus.

Useful variants of this are :—

℞ Ol. Eucalyp. | Tinct. Benzoin. Co. āā ℥xx
Ol. Pini Sylvest. |

℞ Creosote ℥v | Aq. ad ʒj
Magnes. Carb. gr v |

Or,

℞ Acid. Carbol. gr x | Aq. ad ʒj

One drachm of any of these three preparations to be mixed with a pint of warm water (140° F.), and the vapour inhaled.

The patient may also use an oro-nasal respirator, one of the simplest of which is Dr. Burney Yeo's, made of perforated zinc ; a great variety of solutions may be used. The following are a few typical prescriptions :—

℞ Sp. Menthol | Sp. Chlorof. āā pt. æq.

℞ Ol. Pini | Sp. Chlorof. āā pt. æq.

℞ Thymol ʒj | Tinct. Benzoin. Co. ʒiij
Ol. Eucalypt. ʒij | Sp. Chlorof. ad ʒj
20 drops to be used occasionally on an oro-nasal inhaler.

Similar solutions may be used as a fine spray, in one of the many forms of nebulizer or atomizer. Sometimes it is well to make liquid paraffin (under one of its many names) the basis of the solution for nebulæ.

Insomnia.—The sleeplessness of chronic bronchitis often disappears under general treatment, without special hypnotics. In a very bad attack it is necessary for the patient to keep awake in order by voluntary effort to assist the exhausted respiratory centre.

If strychnine (probably the best hypnotic in chronic bronchitis), digitalis, carbonate of ammonia, and belladonna have failed to induce sleep, recourse must be had to other drugs.

Alcohol.—The best brandy or whisky obtainable should be used. Many of the cheaper spirits given in large doses are poisonous. The great advantage of brandy or whisky as a hypnotic is that it is quickly eliminated, and it is not cumulative in its action. Starting with small doses, ½ to 1 oz., about an hour before the time at which the patient usually goes to sleep, the quantity may be gradually increased. Its effect varies much in different patients, and it is only by trial that its value can be estimated.

If it (*a*) Produces sleep, and lessens restlessness; (*b*) Lessens frequency of respirations; (*c*) Lessens frequency of pulse; (*d*) Lowers temperature; (*e*) Makes the tongue less dry—it may be safely continued.

At present, for many reasons, the tide is running strongly against the use of alcohol; but in suitable cases it is beyond doubt, in my opinion, valuable and effective.

The Bromides.—These must be used in full doses to have any chance of success.

℞	Sod. Brom.	āā gr xx	Tinct. Hyoscyam.		℥xx
	Ammon. Brom.		Aq. Camph.		ad ℥j

If this draught fail within one and a half hours, it should be repeated. Some such combination, which can be varied in many ways, is safe, and often answers.

Paraldehyde, in doses of 1 to 2 dr., induces quiet sleep, and has very little unpleasant after effects, but its taste and smell are intolerable to many patients. The adjuvants usually added do not get rid of this disadvantage entirely.

Two formulæ are:—

℞	Paraldehyd.	℥j	Ext. Glyc. Liq.		℥ss
	Syr. Aurant.	℥xv	Aq.		ad ℥ij
		M. Ft. haustus.			

Or,

℞	Paraldehyd.	℥j	Ext. Glyc. Liq.		℥j
	Ol. Amygd. Ess. (sine Acid. Hydrocyan.)	℥iss	Syrup.		℥ss
			Aq.		ad ℥ij
		M. Ft. haustus.			(*Martindale.*)

Sulphonal, 10–20 gr., *Veronal*, 3–7 gr., in tablets or cachet, are both worth trying.

Opium.—The well-recognized disadvantages of opium or morphia in chronic bronchitis are, that while, with very few exceptions, they may be relied on to produce sleep, (*a*) They are cumulative, and not easily eliminated; (*b*) They depress and lull the respiratory centre at a time when its activity is most essential; (*c*) They upset the digestive process. These dangers are real, but may be much exaggerated, and should not paralyze the practitioner in face of persistent insomnia. A few hours' steady sleep is often the turning-point in a bad case of bronchitis.

The simplest combination, the old-fashioned pulv. ipecac. co., may be given in doses of 10–20 gr., and with the addition of some alcohol, answers still better.

Morphia may be given hypodermically, and guarded with small doses of atropine, which lessen the effect on the respiratory centre.

℞ Morphin. Hydrochlor. gr ¼–½ | Atropin. Sulph. gr $\frac{1}{100}$
Ft. injectio hypodermica.

One rarely sees any trouble from these doses.

Or the morphia and atropine may be combined in pill form, with some aloes, a favourite prescription of Dr. Milner Fothergill.

℞ Morphin. Hydrochlor. gr ¼–½ | Pil. Aloes et Myrrh gr ij
Atropin. Sulph. gr $\frac{1}{60}$–$\frac{1}{30}$ |
M. Ft. pil. One or two daily.

The atropine, besides its effect on the respiratory centre, diminishes the tendency to sweating.

There are cases when everything fails, but in the majority, with care, safe sleep may be induced.

Diet and Convalescence.—With regard to the treatment by diet, and during the stages of convalescence, there is nothing to be said which will not suggest itself to the common sense of every practitioner. *Gustave Schorstein.*

BRONCHOPNEUMONIA, CATARRHAL.—(See also BRONCHITIS, and PNEUMONIA.) With the differential diagnosis between this affection and the croupous form we shall not deal.

It is, however, necessary to emphasize the following points :—

1. That catarrhal pneumonia is almost invariably associated with—practically is an extension from—bronchitis.

2. There is usually as much disseminated collapse as there is patchy consolidation of lung.

3. It is frequently seen in connection with diseases characterized by pulmonary catarrh, such as measles, pertussis, etc., and also in debilitated, rachitic, and unhealthy children.

4. It is more often followed by imperfect resolution, resulting in permanent damage to the lung.

As regards treatment, it must be remembered that, the affection being as it were a combination of bronchitis and pneumonia, many of the methods applicable in these two conditions are frequently useful here. It may be impossible to say where bronchitis ends and pneumonia begins, and the treatment is simply that of acute bronchitis ; whilst in other cases, the usually discrete, consolidated areas spread and coalesce until the condition is one of extensive pneumonia, complicated by a more or less diffuse bronchitis. We will, however, take an ordinary case. The indications for treatment will be : —

1. To relieve the evident difficulty of breathing, by liquefying and expelling the tenacious bronchial secretion ; that is, treating the bronchitis.

2. To prevent extension of pneumonia and collapse.

3. To support the general strength and cardiac action.

1. *To Remove Excretion.*—In adults, expectorants, such as the carbonate and chloride of ammonium, squills, and copious hot alkaline drinks, or the inhalation of steam, are most useful. In children, steam inhalation will be most reliable, and it is generally necessary in their case to cause vomiting in order to get a proper emptying of the bronchial tubes. Ten to 20 gr. of powdered ipecacuanha (or 1 dr. of the tincture) may be used from time to time ; but its depressing effect must be carefully watched, and it cannot often be repeated. Cupric sulphate is a very reliable and rapid emetic, and has not the depressing effect of ipecacuanha on the heart. In all cases it must be remembered that

expectoration, vomiting, or absorption, must get rid of secretion as fast as it is made, or the tubes will become more and more blocked, with all that that means in dyspnœa, cyanosis, etc. It is useless, and even harmful, to promote a copious, watery secretion, without the patient having the power, or being stimulated, to get rid of it. There is not the necessity, so marked in the croupous form, for avoiding unnecessary movement; and, especially in children, frequent examinations of the chest, changes of position, brisk rubbing, and squeezing of the chest wall, are most helpful means of stimulating expectoration.

2. *To Limit Extension of Consolidation and Collapse.*—Active local measures, such as leeching, cupping, etc., often so useful in the croupous form, are not attended by such good results in these cases. In the majority all that is necessary is to keep the patient very warm by the application of a cotton-wool jacket. Where the signs in the lungs are widespread, accompanied by great dyspnœa, retraction of ribs, and cyanosis, active interference is necessary. Collapse goes hand in hand with consolidation in such cases; the symptoms (dyspnœa, etc.) are due as much to one as to the other, and our treatment must be directed to open up collapsed air-cells quite as much as to prevent a few more small areas of consolidation. Application of cold to the chest has been recommended for this purpose, and may take the form of ice cloths, ice packs. cold bath, or douching. It has the twofold effect of lowering temperature, and causing deeper respiratory movements calculated to inflate collapsed areas. Such methods are often attended by rapid and most beneficial results. It must, however, be laid down most strongly that such treatment is not unattended by risk of general collapse and heart failure, the patient becoming pallid and cold, with a small pulse. The good effects are seen in lowered temperature, deeper and easier breathing, and improving colour (less cyanosis). We think even better results are seen from an almost opposite line of treatment, viz., the hot mustard bath, accompanied by vigorous rubbing and squeezing of the chest while the child is in the bath. The water should be as hot as can be borne by the nurse's hand, and a good tablespoonful of mustard added; the child should be immersed to the shoulders for one to three minutes, vigorously rubbed, rapidly dried, and again covered in cotton-wool and blanket; the whole thing to be done before a good fire. Usually the respirations are much easier and deeper, and this effect can be increased by dashing cold water on the face and neck while the child is in the hot bath.

3. *To Maintain Strength and Cardiac Action.*—The fever is not so high, nor is the toxæmia so great, as in the croupous form, and the imminent danger of cardiac failure, in *that* form, is replaced, in this, by a failure of respiration, begotten of choked bronchial tubes and collapsed lung; though, of course, such a condition tends to cause cardiac failure eventually.

For the maintenance of the general strength food is of the greatest importance; it should be given frequently in liquid form, in small quantities, and is better given hot so as to stimulate secretion.

As a stimulant we prefer strychnine, because of its action on the respiratory centre as well as on the heart. Oxygen is rarely of much use, as it cannot get beyond the choked tubes. Digitalis is often helpful, as also ether and caffeine. The same remark must be made as in speaking of stimulating drugs in croupous pneumonia, that in many cases they must be given under the skin to do any good at all.

Alcoholic stimulants are sometimes needed, and when used should be given in hot milk and water (10–20 drops every three hours will be enough for an infant). In some cases, where there is gastric intolerance, it is better to give stimulant and nourishment by the bowel for a time.

The after treatment of bronchopneumonia is, without doubt, of far greater

importance than in the croupous form. The collapsed and inflamed condition of the lungs, and the frequently unhealthy and debilitated state of the general health of the little patients causes resolution to be slow and often imperfect; and one sees more permanently damaged, fibroid, and contracted lungs, as the result of bronchopneumonia, than from any other cause. In adults the risk of the supervention of pulmonary tubercle must be borne in mind. It is, therefore, important, in order to obtain as full and early a recovery of the lungs as may be, to get such cases into absolutely pure air as soon as possible, and to teach them systematic gymnastic and deep-breathing exercises. General tonic treatment, with abundance of good food, is also important.

RESPIRATORY STIMULANT IN BRONCHOPNEUMONIA.

℞	Strychnine	gr ¼	Ext. Cinch. Liq.	℥iij
	Acid. Hydrochl. Dil.	℥j	Aq.	ad ℥iv
	Sp. Chlorof.	℥ss		

M. Ft. mist. For a child five years old, ℥j (= 1/12 gr. strych.) in water every three or four hours (*Burney Yeo*).

W. J. Hadley.

BULIMIA.—This condition should be treated by first removing the cause if it is known, secondly by regulating the quantity of food, and thirdly allaying the craving by sedative drugs, such as morphine, cannabis indica, or bromide of potassium; the use of cocaine and arsenic has also been suggested, but some cases prove rebellious to all remedial treatment. *Robert Saundby.*

BUNION.—(See HALLUX VALGUS).

BURNS AND SCALDS.—When a large area of the body is involved, burns and scalds give rise to many complications, and they are injuries which it is difficult to treat satisfactorily. In the early stages profound shock and great bodily depression must be combated; indeed, the mortality following burns is greatest during the first twenty-four hours which follow the injury. This shock must receive appropriate treatment, saline injections being most valuable, and at the same time every effort must be made to prevent any further loss of vitality through prolonged exposure and manipulation. In any case of extensive burns there is a danger of asphyxia, or of poisoning by carbon monoxide. It is necessary to bear these dangers in mind, for prompt performance of artificial respiration, together with oxygen inhalations, may be most effective in meeting these complications. Subsequently there is considerable risk of septic absorption from the large sloughing surface, and fatal issues are due to the development of low forms of pneumonia, duodenal ulceration, and meningeal inflammation and thrombosis. In the final stages much trouble will be experienced in dealing with large granulating surfaces, and with rapidly contracting scars—scars which if left may cause permanent deformity and disablement.

TREATMENT.—This will therefore be considered according to three main stages: (1) Immediately after infliction; (2) During separation of the sloughs when repair is taking place; (3) When granulations have appeared and the wound is beginning to cicatrize.

1. *Immediate Treatment.*—The patient must be put to bed as soon as possible, the clothes must be cut off, and without delay or exposure a dressing must be applied over the whole of the damaged area. If the burn is very extensive, it is better to deal gradually with different regions than to completely strip and expose the whole surface at once. Charred skin or dead tissues should be snipped away carefully with scissors, if this step can be accomplished quickly. Blisters should be cut open, so that the serum can drain away. If the clothes adhere, and if there is a large amount of dirt present, it is advisable either to

immerse the part in a warm (100° F.) boracic acid bath, or to soak it with warm boracic acid solution.

A number of different applications have been recommended after the above preliminaries. :—

(*a*). *Oily dressings*, which have little tendency to adhere to the burnt surface—eucalyptus oil and vaselin, or the ointment of Réclus :—

R	Antipyrin.	℥j	Phenol	gr. xv
	Salol		Hydrarg. Perchlor.	gr ij
	Acid. Boric.	āā ℥ss	Vaselin. (pur.)	℥vij
	Iodoform.	gr. xv		

This can be diluted by the addition of more vaselin if necessary.

(*b*). *Antiseptic dressings*, which may be left unchanged for some time. Lint soaked in a saturated solution of picric acid is applied to the part, and over this layers of cotton wool secured by a bandage. As an alternative an antiseptic cyanide gauze dressing may be used.

Werner's treatment consists in soaking the burnt part in a 2–5 per cent solution of carbolic acid, which is anæsthetic and antiseptic. The acid is removed by a second bath of normal saline solution, and the surface of the burn is dusted with a powder composed of acetanilide 1 part, zinc stearate 5 parts ; over this narrow strips of Lister's green protective are placed, and the whole region is finally covered with wet sublimate gauze, and bandaged.

Stimulants will be required until the shock has passed off ; later, iron and quinine should be given, digitalis and nux vomica if there is evidence of cardiac weakness. Morphia may be necessary, but must be given with caution.

When the part has been dressed, provided that no symptoms of septic poisoning arise, no attempt should be made to interfere with the damaged part. The dressings may be left alone for several days. But if, as is usually the case, the wound does not remain clean, the dressing must be changed repeatedly, as in the case of any large septic wound. It is often necessary to perform this dressing under an anæsthetic, owing to the pain which it inflicts upon the patient.

2. *Treatment during the Separation of the Sloughs.*—If the burn has not remained aseptic—and it is very difficult to ensure this condition—a considerable amount of offensive discharge will accompany the separation of the dead from the living tissues. At this period, as has been said, there is great danger of complications developing from septic absorption. The separation of the sloughs should be assisted with scissors, so that very little dead tissue remains to harbour putrefactive organisms. All purulent blebs or foci should be opened up, and the dressings should be frequently changed. If the position of the part permits it, a weak antiseptic bath is most satisfactory ; this failing, large fomentations applied to the sloughing surfaces are satisfactory. In milder cases an oily dressing as above described may be continued until granulations have appeared.

If antiseptic baths or lotions are used, they must be made up very dilute as the large surface exposed to their action readily permits of the absorption of the poisons from which they are made, and it is no unusual thing for carbolic or mercurial poisoning to occur during the treatment of a burn.

During this stage the patient's temperature will rise, and he will exhibit signs of septic poisoning.

3. *Treatment when the Wound has begun to Granulate.*—The main objects now are to accelerate the healing process and to prevent undue contraction. If the granulations are flabby and unhealthy, stimulating lotions—lotio rubra—should be applied, and general tonics—nux vomica and iron—should be administered. As a dressing, nothing is more satisfactory than a piece of green protective, a number of holes being cut in it to prevent the retention of the discharge. The

protective is placed directly over the granulating surface, and it is then covered by sterilized gauze. Under this treatment the granulations become flat and healthy, while the growing epithelium is not damaged each time the dressing is changed. The wound should be well irrigated with normal saline or boracic acid solution once or twice a day.

If large areas of granulation remain, and the epithelium is sluggish in covering them, skin grafting must be employed in order to diminish the risk of subsequent contraction.

During this stage every care must be taken to check this contraction, especially in the neighbourhood of joints. For this purpose splints should be employed which exert a force in the direction opposite to that of the adjoining fibrous tissue, and as soon as possible the scar should be massaged and stretched. Gentle kneading and stretching alone are required, or the scar will be torn open.

Scalds involving the mouth or fauces are especially dangerous in that they may produce œdema glottidis—an inflammatory exudation into the aryteno-epiglottidean folds. In all such cases the patient must be carefully watched, and if urgent dyspnœa is noticed, no time should be lost either in performing tracheotomy or in introducing an intubation tube, according to the needs of the case.

W. H. Clayton-Greene.

CAISSON DISEASE (Compressed-Air Illness).—In the iron caissons employed in subaqueous and tunnelling excavations, the workmen are exposed to atmospheric pressures two to three and a half times greater than that of the ordinary atmosphere. In order to work at these pressures, the men in passing into the caisson are subjected to gradual increments of pressure in the adjoining air-lock. They undergo what is known as "compression." Men who are beginning work for the first time, often experience during compression severe pain in the ears, and become giddy. As these symptoms are due to excessive pressure upon the membrana tympani, they are averted by swallowing air and allowing it to pass up the Eustachian tube. After finishing their work, the men, before returning to the outside, undergo in the air-lock "decompression." It is after emerging from the air-lock that the typical symptoms of caisson disease arise, viz., severe pains in the muscles of the limbs and trunk known as "bends," paralysis of the lower extremities and of the bladder, requiring the use of the catheter. Other minor symptoms, such as headache, vomiting, epistaxis, hæmoptysis, and restlessness, usually disappear with rest in bed. For the muscular pains, a hypodermic injection of morphia is often required. Since the more serious symptoms depend upon the sudden disengagement of gas in the blood and tissues, or in other words, upon frothing of the blood owing to a rapid fall of pressure, experience has shown that the most successful treatment is to place the men back again in the air-lock, to compress them slowly, and then very gradually to decompress them. Plenty of time should be spent in the act of decompression—five minutes to each atmosphere being a good average.

Thomas Oliver.

CALCULUS.—(See also GRAVEL.)

Vesical Calculus.—

The detection of stone in the bladder is compassed by several methods. The bladder sound will, in the majority of cases, enable the practitioner to ascertain the presence of calculus, but in some instances the sound, even in the most skilled hands, will fail to detect its presence. When the prostate has a very large intravesical projection, stones are often found lying between the prostate and the base of the bladder in a deep post-prostatic pouch. In some cases stones are formed in sacculations, and it must be remembered that a sacculus of the bladder is sometimes larger than the true bladder cavity, and may have an opening not large enough to admit the index finger. In the first instance the sound cannot possibly feel the stone, and in the second good luck rather than good management would alone guide the sound into

the sacculus. These two instances are sufficient to show that further methods of diagnosis are essential in cases where symptoms of stone exist and the sound fails to detect its presence.

The writer advises two methods: (1) Suction with the litholapaxy evacuator; (2) Cystoscopy. The former can be applied by any practitioner; the latter requires considerable practice to be of serious value.

In the former method four or five ounces of sterile water are injected into the bladder through a No. 10 or No. 12 litholapaxy catheter, and the rubber evacuator bottle filled with water is then applied. When the bulb of the evacuator bottle is squeezed and released, fluid is first made to swirl around inside the bladder, and will often dislodge a stone from beneath the prostate or from some wide-mouthed sacculus, and when the bulb is released the fluid is sucked back sharply into the bottle, and will bring the calculus up against the eye of the catheter with an unmistakeable sharp click.

Cystoscopy of course reveals every part of the bladder, but should be reserved for expert hands, as the writer has seen surgeons who have had some little experience with the instrument mistake phosphate-covered malignant growths for stone on the one hand, and stone covered with shaggy mucopus for growth on the other!

TREATMENT.—The operative treatment of vesical calculus has been revolutionized by the gradual perfecting of lithotrity with removal of the fragments at one sitting, to which the name of litholapaxy is now applied. The death-rate is very low when improper cases are excluded and the operation is placed in skilled hands. The following table from the reports of St. Peter's Hospital, London, will show the marked improvement in results in late years :—

DECADE.	OPERATED UPON BY LITHOLAPAXY.	DEATH-RATE.
1864–73	118	15·25 per cent.
1874–83	196	15·30 ,,
1884–93	362	8·29 ,,
1894–1903	600	4·83 ,,
1904–Jan. 1st, 1907	158	3·79 ,,

It is justifiable to state with assurance that litholapaxy is the operation of choice for the treatment of vesical calculus, but certain cases must be dealt with by lithotomy, either suprapubic or perineal. Where the operator has had no opportunities of acquiring skill with the lithotrite, the safest operation is probably suprapubic lithotomy. The advantages of the crushing over the cutting operation are, however, so obvious that they hardly need to be stated. The stay in bed and in hospital is short—in an uncomplicated case the patient should be out of bed in forty-eight hours and fit to leave the hospital in three or four days; there is practically no loss of blood; there is no scar, as in the case of suprapubic lithotomy, and consequently no distortion of the bladder.

The cases in which lithotomy should be substituted for litholapaxy are :—

1. In very young infants. Children above the age of four do very well with litholapaxy, provided great gentleness and skill with the instruments can be obtained.

2. Stone complicated by very severe cystitis should be treated by lithotomy, so as to secure adequate drainage of the septic bladder, unless prior to operation the cystitis can be cleared up by rest in bed and irrigation.

3. Sacculation of the bladder complicating stone should, if of considerable extent, direct the surgeon's choice to suprapubic lithotomy rather than litholapaxy.

4. If the stone or stones are actually in the sacculus, the difficulty of picking them out with the lithotrite and then crushing them is great if the sacculus is a shallow, wide-mouthed one, and insurmountable if the sacculus is deep and with a small aperture.

5. If a large smooth stone is in a bladder which is much sacculated, but is not actually in a sacculus, lithotomy should be done rather than crushing, for although the stone can be easily caught and crushed, sharp fragments are liable to fall into and be retained in a sacculus, setting up ulcerative changes which finally

lead to perforation and extravasation. The advisability of detecting this condition of sacculation before operating by litholapaxy upon stones which are apparently quite freely movable in the bladder has led the writer to cystoscope all cases of vesical calculus before determining upon the nature of the operation to be performed.

Considerable enlargement of the prostate is not a bar to litholapaxy in skilled hands, but it increases the difficulty of the operation very materially, and the proper treatment, where the patient's consent can be gained, is to remove the calculi by a suprapubic cystotomy, and proceed to a prostatectomy upon the same occasion if the patient's condition warrants it, or after a week or ten days' drainage of the bladder if that viscus is very foul and septic when the lithotomy is done. Stricture of the urethra, unless thoroughly dilated or cut, is an absolute bar to litholapaxy, for the first essential to the success of that operation is that the lithotrite should move easily and freely in the passage.

With regard to the size of the calculus and its composition, it may be said that the more skilful the lithotritist the larger is the stone that can be dealt with by litholapaxy. There is one variety of calculus, fortunately a very rare one, which if large should always be removed by cystotomy, viz., the cystin calculus. This material is so tough that the blades of the lithotrite have but little effect upon it if the stone is large. Usually the nature of the case is only recognized after an attempt has been made to crush the stone. It is wise to change the method in mid-attack, and substitute a suprapubic lithotomy for the litholapaxy.

Perineal lithotomy, either lateral or median, is but rarely seen now in this country. It is practically only required when perineal drainage is desired after the removal of the stone. It possesses no advantages over suprapubic lithotomy except that the patient can be got out of bed somewhat sooner. For the removal of very large calculi from contracted bladders, suprapubic cystotomy should be employed rather than litholapaxy or perineal lithotomy.

Ureteric Calculus.—Calculi having left the kidney may be met with in any part of the ureter, but they are particularly liable to be arrested in three situations: (1) Just at the exit from the renal pelvis; (2) At or just below the spot where the ureter crosses the iliac vessels; and (3) At the entrance of the ureter into the bladder. The diagnosis of ureteric calculus is made from the symptoms, the physical signs, physical examination, and by the employment of radiography, cystoscopy, and ureteric catheterization.

TREATMENT.—When the ureteric stone is small, and in the lower end of the ureter, it may frequently be coaxed into the bladder by finger pressure through the rectum in the male and the vagina in the female. If this fails it may be removed through the ureteric papilla by a suprapubic cystotomy in the male, and by an incision into the vault of the vagina in the female.

Below the brim of the pelvis, stones may be extracted from the ureter by an intra or an extra-peritoneal operation. Wherever possible the extra-peritoneal operation should be chosen. The intra-peritoneal is more properly a trans-peritoneal operation, for the ureter, of course, lies extra-peritoneally throughout its entire course, and in this operation the parietal peritoneum must be incised both on the anterior and posterior walls of the abdomen. Access is gained to this portion of the ureter extra-peritoneally through an incision similar to that used for the extra-peritoneal ligature of the iliac vessels. The peritoneum is stripped up from the sides of the false and true pelvis, and it must be remembered that the ureter goes with (but outside) the peritoneum, and will be found adherent to it.

Calculi arrested in the ureter anywhere above the brim of the pelvis should be approached by an extra-peritoneal incision. Morris's lumbo-ilio-inguinal

incision, which commences in the loin in front of the transverse process of the last lumbar vertebra, and runs parallel with the curve of the crest of the ilium forwards, gives an exposure which allows the kidney and practically the whole length of the ureter to be explored.

Calculous Anuria is the most serious complication of ureteric and renal calculi. This condition occurs usually when one kidney has for some time been doing the whole work, owing to the destruction of the opposite kidney by disease, or after its removal by operation. Calculous anuria does not always depend upon complete obstruction of the ureter by an impacted calculus, although in our opinion the term should be restricted to such cases. Suppression occurs sometimes after the removal of stones from one kidney, the other kidney also being full of stones. The shock of the nephrolithotomy is sufficient to induce suppression although neither ureter is blocked, and to this condition the term calculous anuria is sometimes applied. Very rarely both ureters may become blocked with calculi almost simultaneously, but usually by careful investigation of the history and symptoms it will be found that there is a longer history of symptoms upon the one side than the other.

If the patient is in good condition, and the situation of the ureteric stone can be determined, an immediate operation for its removal should be undertaken upon the lines already mentioned. If the stone cannot be localized, a nephrotomy should be done upon the side where the symptoms last appeared, for it is probable that the kidney in which the symptoms are of long duration is destroyed and functionless. Once the diagnosis is established, operation—either nephrotomy or ureterolithotomy—should be done at once; for if the anuria is allowed to persist for any length of time the kidney will not secrete again. If a palliative nephrotomy succeeds in restoring the flow of urine, it should be followed, when the patient has sufficiently recovered, by a careful exploration for the obstructing stone.

When the anuria is not of the obstructive type, nephrotomy is the right course to pursue, with immediate removal of the stones from the kidney if the patient's condition is sufficiently good, or at a later period if this is deemed wiser.

Renal Calculus.—Renal calculi vary from fine gravel to huge masses of stone completely filling and disorganizing the kidney. Cases of gravel are usually of two types, the alkaline and the acid diathesis accounting for the difference; and it should be remembered that even when no definite calculi are formed, all the symptoms of renal stone may be caused by these conditions, lumbar pain, hæmaturia, and indeed true attacks of renal colic occurring in patients suffering from phosphaturia on the one hand or uric acid storms upon the other. In the treatment of these minor calculous conditions, drugs, diet, hygiene, and the use of natural mineral waters must be relied upon. Phosphaturia usually depends upon over-work and mental anxiety, and varies from the passage of a small amount of phosphates in the urine, accompanied by back-ache, lassitude, and general weariness, to the excretion of huge quantities of phosphates, coagulated sometimes into small calculi, and accompanied by severe attacks of renal pain, hæmaturia, and very often urgency and frequency of micturition, the latter due to the extremely irritating effect of the phosphate-laden urine upon the vesical and urethral mucous membrane.

Treatment.—This consists in giving, if possible, an entire change of life and scene. The over-driven brain-worker should have plenty of reasonable physical exercise in congenial and pleasant surroundings; a change to the sea-side is often most beneficial. The diet should be the fullest and most nourishing that the patient can digest, and alcohol in small quantities has very often a beneficial effect. By drugs the urine can almost always be cleared of phosphates for a

time. The writer has found the following prescription of great value in these cases :—

R	Urotropin.	gr x	Acid. Nitrohydrochlor. dil.	♏x
	Sod. Phosphat. Acid.	gr. xx–xxx	Inf. Gentian. Co.	ad ℥j

Three times a day, after meals.

Urotropin combined with dilute mineral acids and bitters seems to exercise an almost specific effect upon phosphaturia. When however it is very obstinate a visit may profitably be made to one of the mineral water establishments : the best of these is Bad Wildungen, near Frankfort. A " cure " at this Spa, lasting from a month to six weeks, frequently completely clears up a case which diet, drugs, and careful hygiene at home have failed to markedly influence. The treatment of uric acid gravel, on the other hand, proceeds upon exactly opposite lines. A diet practically deprived of flesh, prohibition of alcohol, and the exhibition of alkalies and vegetable acids, are indicated. The waters of Vichy, Contrexéville, and Aix-les-Bains are deservedly popular in these cases owing to their success. In the writer's opinion the best mineral water for this condition is undoubtedly that of Contrexéville. It is claimed by those who have large experience that not only does it induce a very free diuresis, thus diluting the usually concentrated urine of these patients, but that it possesses a specific action upon the musculature of the ureter, and so increases ureteric peristalsis. However well founded this belief may be, there is no doubt that a course of the waters at Contrexéville is often efficacious in causing the discharge of immense quantities of uric acid in the form of red gravel, the so-called cayenne pepper gravel, and in many instances of quantities of small calculi.

Operative Treatment.—The surgeon has the choice of removing the stones from the kidney, or the kidney and the stones together : nephrolithotomy or nephrectomy. Nephrolithotomy is unquestionably the operation of choice, for, although a human being can exist with only about two-thirds of one kidney, the surgeon should always make every attempt to save as much kidney substance as possible. When the kidney is full of stone and suppurating in all directions, immediate nephrectomy is of course advisable, but in all cases where there seems the least chance of saving the kidney, nephrolithotomy should first be performed, and be followed by a nephrectomy at a later date if the kidney obstinately refuses to heal.

Operation in cases of renal calculus is called for firstly to save the kidney, and secondly to save the patient's life. In this connection the practitioner should remember that stones may form and remain in kidneys, causing very slight symptoms through the whole of life. A small fixed stone in the renal cortex, provided no bacterial infection occurs, may exist with absolutely no symptoms, and such stones are not infrequently found in post-mortem examinations of patients who have never complained of symptoms referable to their presence. Such stones too may occasionally cause modified attacks of discomfort, pain, and transient hæmaturia and albuminuria. In such cases it is not essential to urge operation upon the patient, but when repeated and disabling attacks of pain and colic occur, together with evidences of renal destruction, such as continued hæmaturia, albuminuria, and especially pyuria, it is the practitioner's duty to urge immediate exploration.

John George Pardoe.

CANCER.—See articles on Anus, Bone, Breast, Ear, Menorrhagia and Metrorrhagia, Neuromata, Nipple, Nose, Œsophagus, Prostate, Rectum, Stomach (Carcinoma of), Stomach (Indications for Operation), Tongue, etc.

CANCRUM ORIS.—(See Stomatitis.)

CARBUNCLE.—The association of this condition with diabetes. albuminuria, and other debilitating conditions must always be borne in mind. Not that these states necessarily preclude the successful treatment of carbuncle by operation; indeed, in many cases there is an improvement in the glycosuria or general condition after the local infective process has been satisfactorily dealt with. At the same time it will be advisable to consider how far the administration of an anæsthetic is likely to be injurious. If the general condition is on the whole good, radical local treatment under anæsthesia should be resorted to; if, on the other hand, constitutional disease is advanced, the minimal amount of local treatment necessary should alone be attempted.

A second detail of practical importance in connection with the pathology of carbuncle is the fact that the vessels in the substance of the inflamed area are in a state of infective thrombosis, and there is danger of the spread of systemic infection or pyæmia. Carbuncles on the face or scalp are especially dangerous, since the free communication between the superficial veins and the cranial venous sinuses renders the latter liable to fatal thrombosis.

The patient must be liberally fed and well supplied with alcohol, the bowels should act freely, and every effort be made with tonics, iron and quinine, to improve the general health. If the pain is excessive, morphia may be given, though the need for this drug must be made subservient to the state of the kidneys.

Local Treatment consists in :—

1. Complete excision of the whole infected area wide of the disease; this can only occasionally be practised, but is very satisfactory, the resulting wound, after thorough disinfection, being lightly packed with gauze and allowed to granulate.

2. Scraping out the gangrenous core and the application of pure carbolic acid.

It has been urged against this line of treatment that there is some danger of the clots becoming dislodged and carried into the circulation, with the result that pyæmia is set up. If the operation is carried out thoroughly, so that the deep fascia at the bottom of the wound is well exposed, and all the indurated tissue at the periphery of the necrotic area is radically treated, there is little danger of this accident occurring; it is much more likely to supervene if the operator is over cautious, and merely stirs up the centre of the process with a timid hand.

3. Incisions, usually crucial, may be made into the swelling, and pure carbolic acid may be injected, 5–10 minims, into various points of the swelling. The wound is then fomented and the dead material allowed to slough out.

Of these various methods the first is undoubtedly the best, but the second, for many reasons, will be found most convenient, and it is the form of treatment that should be selected. The third method should be confined to those cases where constitutional disturbance is so marked as to preclude the use of a general anæsthetic or any extensive operative proceeding, or where the carbuncle is so situated that very radical measures may lead to great deformity.

Under all conditions it is wise to apply fomentations (carbolic) to assist the sloughs to separate, and a careful eye must be kept on the wound, since the pus occasionally has a tendency to burrow away into the surrounding tissues.

As soon as the sloughs have separated and healthy granulations have made their appearance, the wound should be dressed with protective, and if the epithelium is slow in covering the surface of the wound, skin-grafting may be employed.

W. H. Clayton-Greene.

CATARACT.

Anterior and Posterior Polar Cataracts do not, as a rule, require any treatment.

Complete Congenital Cataract.—These cataracts are often—though by no means always—associated with other defects, both general and ocular. Thus the child may be badly nourished, slow in development, deficient mentally,

or there may be microphthalmus or other signs of imperfect ocular development, or signs of past inflammation of the iris or ciliary body.

It is well known that operations on these cases are often disappointing in their results, or they run a complicated course. This does not necessarily contra-indicate operation—for many cases do well, and those which do not do well are little worse off than they were before; but it should make us very careful to give a guarded prognosis, to examine the child very thoroughly, and to operate only when it is in the best possible state of health.

Age for Operating.—The sooner the child can be made to see, the better for its mental development, and for establishing ocular co-ordination. The operation can be performed immediately the cataract is discovered, even in the first few weeks of life, if the health is good. Later on, teething is no deterrent to operation, unless it is impairing the health, in which case any operative procedure should be postponed.

These cataracts are either fluid, or they contain soft lens matter, or on the other hand they are shrunken, hard, even calcareous, or membranous.

When they are fluid, needling is all-sufficient; when they contain soft lens matter, a curette evacuation in addition may be necessary later on. (It is important to recognize that in some of these cases the pupils do not dilate with atropine; it is advisable here to do a small iridectomy upwards before needling, lest the swollen lens lying behind the contracted iris push this forwards and produce a glaucomatous attack—an awkward complication at this age and in so small an eye.)

In the shrunken form needling should be tried first; but it may be ineffective, and then the capsule may have to be removed bodily with forceps, in order to obtain a clear opening.

Lamellar Cataract.—This condition is, as a rule, only discovered either during or after school life. We therefore meet with these cases at a time of life when it is possible to estimate the acuteness of vision.

We must determine: (1) Which cases should be operated on; and (2) What operation should be selected.

Though many cases of lamellar cataract get normal acuteness of vision with glasses after operation, yet vision of $\frac{6}{12}$ must be considered a good result, and patients have often to be content with $\frac{6}{18}$. We may take it, therefore, as a good working rule, that if the vision is $\frac{6}{12}$ or better, no operation should be undertaken; if vision is worse than $\frac{6}{18}$, an operation may be advised. Vision of $\frac{6}{18}$ forms, as it were, a dividing line. If patients are healthy and intelligent, an operation is advisable; if mentally defective, operation will probably not improve the acuity. It must be remembered, in weighing the pros and cons of operation, that by removal of the lens all accommodative power is lost, and the patient is rendered entirely dependent upon glasses. Two pairs have to be carried, one pair for distance, and one for close work; so that for some individuals vision of $\frac{6}{18}$ with accommodation and without glasses may be more useful than greater acuity with entire dependence upon spectacles.

Operation.—There are two different methods of improving vision in lamellar cataract: optical iridectomy, or removal of lens by needling.

Iridectomy is useful only when the opacity is small, and the periphery of the lens is clear, and when atropine, by dilating the pupil beyond the opacity, improves the vision very considerably. It has the great advantage that accommodation is left intact.

As a rule, unfortunately, the periphery of the lens is so irregular in its refraction that a good retinal image is not obtained through the coloboma. It is absolutely contra-indicated if the vision is deteriorating. If a needling has subsequently to be resorted to, a coloboma is a great disadvantage—

being a disfigurement and a cause of dazzling, by producing a large and irregular pupil.

Needling aims at removing the opaque lens, and giving a clear pupil—the place of the lens being taken by spectacles.

For details of operation, see works on ophthalmic surgery.

After Treatment.—The main points are the prevention of iritis, keeping the pupil well dilated to allow the soft lens matter to pass through into the anterior chamber, and watching the tension of the eye, lest the accumulation of soft lens matter induce secondary glaucoma. If this occurs, the soft matter must be let out by a curette evacuation. Evacuation is frequently necessary when the lens swells up rapidly three to eight days after needling; and, indeed, without any rise of tension many surgeons remove the soft lens matter to hasten the clearing up of the lens. The eye is kept bandaged for at least four days, a round of cyanide gamgee tissue being used as dressing.

The main dangers of needling are :—

1. *Sepsis.*—If this unfortunate accident occurs, little can be done as a rule. Prevention by scrupulous asepsis is all-important. Cases have rarely been rescued by washing out the anterior chamber with either sterilized normal saline solution, chlorine water, or hydrogen peroxide, followed by treatment with atropine, hot bathing, purging, leeching to the temple, and absolute rest.

2. *Increased Tension.*—As mentioned above, this is treated by letting out the soft lens matter, and keeping the pupil well dilated with atropine.

3. *Iridocyclitis.*—Treated by leeching to the temple, hot bathing, atropine, purging, and rest.

Traumatic Cataract.—For the treatment of complications arising immediately after injury of lens, see EYE, INJURIES OF.

Most cases of traumatic cataract are *monocular* and complete, and we have to decide whether an operation is advisable. The cases may be divided into two classes : (1) Those in which the other eye is normal ; (2) Those in which the eye with the traumatic cataract is the better one of the two.

1. Cases in which the other eye is normal. The advantages of removing the cataract are :

(*a*). To increase the field of vision. This is the chief advantage ; and it is of great importance, both to those who follow an occupation dangerous to one-eyed individuals (e.g., mechanics and sportsmen), and those whose occupation under such conditions is a danger to the public (e.g., coachmen, chauffeurs, etc.).

(*b*). To improve the appearance—substitution of a black pupil for a white one. (A man may be unable to get a suitable occupation if one eye is unsightly.)

On the other hand, intra-ocular operations, especially upon injured eyes, are not unattended by risks. To cause sympathetic ophthalmia and blind the good eye in trying to gain a slight increase in the field of vision, is little short of a tragedy both to the patient and surgeon.

Also, it must be remembered that, however successful the operation may be, *binocular vision* will never be regained. The eye without its lens, even though supplemented by a strong convex glass, never works in double harness with a normal eye. Therefore operation on a monocular cataract must never be undertaken lightly, and without having duly considered whether the risk is worth running for the particular individual.

2. Cases in which the eye with traumatic cataract is the better eye must, of course, be operated on ; care being taken that both the patient and the eye are in the best possible state for undergoing the operation.

It may be stated generally of both these classes :—

(*a*). Where the cataract has been caused by concussion, without penetration of the globe, and where there has been little or no cyclitis following the injury,

operation—needling, with curette evacuation where necessary—may, as a rule, be performed with a good chance of success: cases where the cataract has been due to a penetrating injury, followed by severe and prolonged cyclitis, stand interference badly.

(*b*). No operation should be attempted :—

(i) Till at least two months have elapsed since all traces of injection of the eye have disappeared.

(ii) While any keratitis punctata is present.

(iii) If the projection is not perfect.

(iv) In the presence of conjunctivitis or mucocele.

Senile and Complicated Cataract.—In dealing with a case of cataract we must find out whether the lenticular opacity is the sole disease, or if it is complicated by some other ocular disorder.

1. The history should be obtained as to how long the sight has been failing; whether there has been any injury, pain, or sign of inflammation; whether the sight was good or bad, short or long, before the vision began to fail.

2. The pupil should be tested, and examined for adhesions, as indicative of past iritis.

3. The cornea should be examined for opacities, or keratitis punctata indicating cyclitis.

4. The depth of the anterior chamber must be noted.

5. The tension must be carefully examined (to exclude glaucoma complicating the cataract.)

6. Tremulousness of either lens or iris must be noted.

7. The vision should be tested; any improvement that may be obtained with glasses being recorded.

8. The opacity in the lens is next investigated*; the type of cataract being noted, and whether it is *mature* or *immature*.

9. The fundus should be examined, if possible, and a note of the macula, when visible, should be made for future reference. If the opacity be too dense for examining the fundus, then—

10. The projection of light must be tested. Bad projection would indicate some disease in the fundus, e.g., optic atrophy, detachment of the retina, possibly associated with sarcoma of the choroid, or some other severe disease of retina and choroid.

11. Conjunctivitis and mucocele of the lachrymal sac should be carefully looked for.

12. The urine must be examined, especially for albumin and sugar.

With a history of bad sight, especially when due to very high myopia, previous to failure of vision, one must suspect the possibility of central macular changes and a fluid vitreous; hence, a guarded prognosis is given. We have to be prepared for some vitreous being lost at the time of extraction, and the scoop may have to be used, and convalescence prolonged.

If there are signs of iridocyclitis, an interval of at least two months should elapse after all signs of active inflammation have disappeared before operation is attempted.

If increased tension be present, a preliminary iridectomy for the glaucoma is indicated.

If iris or lens is tremulous, the suspensory ligament is probably faulty. Vitreous will very likely be lost, and the lens will have to be delivered with the scoop.

Cataract with bad projection should not be operated on.

* A mydriatic (one drop of a 2% aqueous solution of homatropine and cocaine) should, as a rule, be given to enable the best possible view being obtained. This must be followed by instillation of eserine (2 gr. to the ounce) to prevent glaucoma.

Extraction is contra-indicated in the presence of *conjunctivitis*, and still more so in the presence of a *mucocele*. This latter should be treated by conservative methods first, and, if they fail, the sac should be excised previous to the removal of the cataract.

If sugar be present in the urine, an attempt should be made to reduce it by dieting and drugs before operating. Those cases in which the sugar can be reduced do well, as far as operation is concerned, though a previously invisible diabetic retinitis may vitiate the result. Those cases in which sugar is not influenced by dieting, as a rule do badly.

Cases with albumin should be given a guarded prognosis, and one must expect a somewhat prolonged convalescence; but, if the general health is good, albumin is not a contra-indication to operation.

Monocular Cataract.—When the cataract is monocular, no trace of lenticular capacity being found in the other eye, the cataractous eye must be most carefully examined for some associated disease (history of blow; signs of past or present iridocyclitis, keratitis punctata, etc.; signs of retino-choroiditis in either eye, or detachment of the retina with faulty projection; signs of glaucoma.) Even if the eye be found otherwise healthy, it is only in exceptional cases that a monocular cataract should be operated on. (See TRAUMATIC CATARACT *supra*.)

Double Cataract.—The degree of cataract is as a rule different in the two eyes. No operation should be undertaken while the vision of the better eye is not less than $\frac{6}{12}$. The only exception to this is, if the more mature cataract is becoming *hyper-mature*, when the extraction may be performed earlier.

If one cataract is mature, or nearly mature, and if vision in the good eye has fallen below $\frac{6}{12}$, an operation should be done in the worse eye, so that this may be ready to be used as the vision of the other deteriorates. An operation done sooner is of little use, since an eye with $\frac{6}{12}$, with its lens *in situ*, is much more useful than even a $\frac{6}{6}$ eye minus its lens, supplemented by a strong convex glass.

Immature Cataract.—In dealing with immature cataract it is unnecessary to wait until maturity is reached; though, undoubtedly, mature cataracts are more easy to remove, and convalescence is less complicated, yet operations on immature cataracts, in patients older than fifty-five, as a rule do very well.

When both eyes are equally affected, and the cataract is immature, it is well to wait till vision is $\frac{6}{24}$ before operating. In this case a preliminary iridectomy may be undertaken early, as it often hastens the maturing process.

Having indicated the methods of determining which cases are suitable and unsuitable for operation, we have now to consider *how we can help the patient till the time of operation has arrived.*

1. We prescribe those glasses which give the best vision. A reasonable use of the eyes—short of causing aching—is quite allowable.

2. If the cataract is chiefly nuclear, wearing of tinted glasses out-of-doors is of assistance, since they help to prevent the pupil contracting in a bright light. Weak atropine drops, $\frac{1}{10}$ to $\frac{1}{4}$ gr. to the oz., may be used once a day, just sufficient to dilate the pupil beyond the border of the opacity. In some cases, though unfortunately in very few, this is of great assistance. Care must be taken that the atropine—even though so weak—does not cause increase of tension.

3. The aching and discomfort often caused as the lens is swelling is sometimes relieved by alternate hot and cold bathing of the eyes, or by very weak atropine drops.

4. As mentioned above, in immature cataract in both eyes, a preliminary iridectomy may be performed to hasten maturation.

As regards the operation of extraction, see text-books on ophthalmology.

MANAGEMENT OF A CASE AFTER CATARACT EXTRACTION.—The patient is kept in bed for a week, with strict nursing for at least four days, and is not allowed to sit up till the end of the fourth day. Both eyes are kept bandaged three days. If the patient is liable to hypostatic congestion of the lungs, he is allowed up sooner than a week, and to sit up in bed before the fourth day. If the patient has delusions, he should also be allowed to get up sooner, and the bandage be taken off the unoperated eye before the third day.

Dressing.—The eye is dressed every day: warm boracic lotion is used to wash away any discharge from the lids, a little being allowed to pass into the conjunctival sac. The best dressing is a pad of cyanide Gamgee tissue. Great gentleness and strict antiseptic precautions are to be observed. No extensive examination of the wound should be made till at least the fourth day, if all is going well. The pupil must be kept well dilated with sterilized atropine solution (1 per cent), dropped in after the dressing once a day. At the end of the week, if the wound has healed, the anterior chamber has re-formed, and the eye is not injected, the bandage may be dispensed with during the day, and a pair of dark goggles worn. A pad and bandage should, however, be used at night for at least another week.

As to hobbling the patient's hands, it may be well with a restless patient to tie a light bandage round the wrist at night on the same side as the operated eye, to prevent his knocking the eye in his sleep.

If all goes well, and the eye is free from redness, the patient may go out at the end of a fortnight; but care must be taken for at least a month to protect the eye from cold winds. Glasses are ordered six weeks after the operation.

Should *needling* be necessary, this should not be undertaken till two weeks after all redness has disappeared from the eye, but should not be postponed too late, lest the capsule should lose its elasticity.

COMPLICATIONS.—1. *Suppuration.* If this occurs, the eye will be almost certainly lost. Washing out the anterior chamber with sterilized normal saline, chlorine water, or hydrogen peroxide may be tried, followed by leeching to the temple, hot applications, and atropine. Suppuration is best prevented by strictest antiseptic precautions.

2. *Iritis* should be treated by leeching, purging, and hot bathing, and, if the pupil does not dilate well, atropine should be inserted three or four times a day (sterilized atropine ointment is more efficacious than drops) till good dilatation is obtained; protection of the eye must be maintained proportionately longer. (See IRITIS.)

3. If the anterior chamber does not re-form, or if the wound does not properly flatten down, the use of the pad and bandage must be continued, and the patient kept in bed and at rest for a longer period.

4. Occasionally increased tension occurs. This, if due to cyclitis, must be treated as in 2. If due to entanglement of the capsule, weak eserine may be tried; division of capsule must not be attempted till other means have failed.

5. If the eye has not settled down in three weeks' time, and especially if the iris is muddy, the cornea hazy, and there is keratitis punctata, the danger of sympathetic ophthalmia must be considered, and a careful watch kept on the other eye. (See also OPHTHALMIA, SYMPATHETIC.) *W. Tindall Lister.*

CATARRH, NASAL.—(See RHINITIS.)

CELLULITIS.—(See ERYSIPELAS.)

CEREBELLUM, AFFECTIONS OF THE.

The cerebellum is the part of the central nervous system that is most concerned with the processes by which co-ordination in general is regulated, both in regard to the body as a whole in its relations to space, and to each individual muscular movement that is

performed, irrespective of its precise aim and object. Here are situated nerve centres which are the end stations of afferent tracts, which reach the organ from the spinal cord, bringing sensory impressions from the skin, the muscles, and the joints. These impulses pass to the organ by way of the dorsal and ventral cerebellar tracts in the spinal cord. It is also probable that impulses reach the cerebellum from the cerebral cortex, and other higher centres, but the precise paths along which they travel are not as yet definitely determined. From the nuclei of the cerebellum, impulses pass to the red nucleus, optic thalamus, cerebral cortex, and, it may be, to other parts, mainly by the superior cerebellar peduncles, and there is good reason to suppose that impulses also pass from the nuclei of the cerebellum to spinal centres through the nucleus of Deiters, along the tract which passes from this nucleus through the ventro-lateral region of the spinal cord.

There is evidence in support of the belief that, although the cerebellum is the chief part of the central nervous system which is concerned with the co-ordination of movements, the cerebral cortex, basal nuclei, red nucleus, nuclei in the pons, and even centres in the spinal cord, are also concerned in this complicated process, and that some of these centres act in conjunction with the cerebellum, while others act independently of it. Some co-ordinated movements may accordingly be regulated entirely by the spinal cord, without special assistance from the cerebellum, while others require the conscious co-operation of the cerebrum to aid the cerebellum in executing highly complex co-ordinated movements.

A clear appreciation of the fact that other parts of the nervous system co-operate with, or even act independently of, the cerebellum, is highly necessary in order that the process by which cerebellar defects are compensated may be properly understood. Above all things, it is necessary, in this connection, that it should be clearly recognized that impulses concerned with the co-ordination of movement not only pass to the cerebellum from the cerebral cortex, but also directly to spinal centres, without first communicating with the cerebellum. That the cerebral cortex is largely concerned with the processes by which defects of the cerebellum are compensated, is evidenced by the fact that, whereas after ablation of parts of the cerebellum, compensation rapidly comes about, Luciani has shown that this is not the case if the cerebral cortex be removed before the ablation experiments are performed on the cerebellum. That there is a very intimate relationship between the lateral lobes of the cerebellum and the cerebral cortex is further evidenced by the fact that, in destructive lesions of one cerebral hemisphere, atrophy of the opposite lateral lobe of the cerebellum has been determined.

The cerebellum is prone to the same morbid conditions as affect other parts of the central nervous system, but it so happens that some of these are infinitely rare here, though common elsewhere. Thus, although liable to vascular lesions, these are seldom met with, so that embolism, thrombosis, and even hæmorrhage are rare events in connection with the cerebellum, although hæmorrhage in the pons not uncommonly invades the cerebellum by way of the fibres of its middle peduncles. When these accidents occur, they are to be dealt with on precisely similar lines as are recommended for their treatment when the cerebrum, or any other part of the central nervous system, is concerned. The fact that the cerebellum happens to be the seat of the occlusion or rupture of the blood-vessel, does not in the least influence the main lines of treatment. It is, however, necessary that any local measures which are adopted for the relief of the condition, when the cerebellum is concerned, should be directed to the occipital region. The general measures of treatment are precisely similar, but in insisting on the need for physical repose, it must be remembered that an acute vascular lesion in the cerebellum or its peduncles may result in so much disturbance of co-ordination as actually to cause forced movements of the patient, which have accordingly to be restrained by physical means if that repose is to be obtained which is so necessary for the patient's well-being, notably when hæmorrhage is the lesion responsible for the symptoms.

The cerebellum shares, with other parts of the nervous system, the liability to congenital defects, in which atrophy or mal-development may occasion symptoms by which these defects can be recognized. Abnormalities of the kind may exist alone, or in conjunction with similar defects of the cerebrum, in which case the cerebellar deficiencies give a special colouring to the clinical picture of cerebral diplegia, or whatever other form of congenital cerebral defect is under

observation. There are, however, in addition, two diseases more especially, in which a congenital weakness permits of atrophy of the cerebellum itself, and notably of those tracts in the spinal cord which are intimately related to the organ, in late childhood or early adult life. Thus, both in Friedreich's ataxy and in hereditary cerebellar ataxy, these anomalies are met with, and in both diseases, inco-ordination is the main feature in the clinical picture.

In all these affections it is important to adopt general measures calculated to improve nutrition, and thus favourably influence the tendency to decay which is going on in the nervous system. A liberal diet, fresh air and sunshine, may with advantage be supplemented by nerve tonics, including notably arsenic and iron, and by cod-liver oil and preparations of malt. Massage and electrical treatment are useful to improve the general tone, as well as the state of the muscles. In addition, passive movements, and various forms of exercises, may be needed for the correction or prevention of deformities which have resulted, or are likely to do so, from the defects in the nervous system. The lateral curvature and condition of pes cavus, so characteristic of Friedreich's ataxy, serve as illustrations of defects of the kind that may have to be remedied in this way. In addition to this, however, exercises of a special kind are needed in the treatment of these cerebellar affections, exercises calculated to improve the power of co-ordination of the movements. No better system of exercises can be adopted for this than that introduced by Fraenkel, more especially for the treatment of the inco-ordination of tabes, but it is equally applicable to the treatment of cases in which cerebellar deficiency accounts for the instability. By means of such exercises, nerve centres hitherto not specially concerned in the co-ordination of movements are educated to take on this new work. Paths hitherto not much used for this, are opened up for the transmission of impulses concerned with the regulation and co-ordination of movements, and the muscles themselves are taught how to do their share in the attempts to compensate the defects which permit of the inco-ordination. (See TABES.)

The cerebellum may also share, with the rest of the nervous system, some general disease, of which no better example is forthcoming than disseminate sclerosis. The chief importance of recognizing this is, not so much from the point of view that any special treatment is called for in this malady in virtue of the fact that the cerebellum is affected, but because the defects occasioned by the implication of the cerebellum may give such a strong colouring to the clinical picture as to lead to the belief that an affection of the cerebellum, rather than a more general condition of the nervous system, is under observation. The mistake may thus be made of regarding as due to a cerebellar tumour a condition which is in reality the outcome of disseminate sclerosis, and the error of diagnosis may have the further disadvantage that so grave a misfortune as the undertaking of an operation for the removal of the tumour may result, when in reality no tumour exists. The importance of avoiding the possibility of such an error makes it evident that too much care cannot be exercised in the diagnosis when cases of the kind are under consideration.

It is when the cerebellum is the seat of a tumour or abscess that we are most often called upon to advise treatment. In both cases, the only treatment that offers any possibility of cure is an operation for the removal of the tumour or evacuation of the abscess. Apart from the part to which it is directed, and the special risks which attend manipulative measures in this region, these operations are conducted on similar lines to those which guide the surgeon when he is interfering with other parts of the cranial cavity. The following considerations are, however, worthy of note :—

The optic neuritis which results in cases of cerebellar tumour is liable to be very intense, and to pass rapidly on to atrophy of the optic nerves, so that when

the operation of trephining, with a view to save sight, is under consideration, it ought not to be too long delayed, lest permanent blindness result in spite of the operation, which has not been undertaken early enough. Another important consideration is, that in tumours of the cerebellum, as in the case of all subtentorial tumours, the effects of direct pressure on the medulla are great, and thus sudden death from arrest of respiration is especially liable to occur in these cases. If, therefore, an operation is to be undertaken with a view to prolong life, even when no attempt is to be made to remove the tumour, it were well not to delay it too long, for respiration may cease suddenly at any time in these cases, and it rarely if ever happens that relief of pressure, aided by artificial respiration, is capable of saving the patient's life.

In the after-treatment of cases in which tumour or abscess has been successfully operated on, the special exercises recommended for improving co-ordination should be employed. The recovery of the normal powers of co-ordination, after the successful evacuation of an abscess in the cerebellum, is usually so rapid as rarely to call for any special measures of the kind, but it is otherwise when tumours of the cerebellum are concerned. In these cases, in addition to massage and faradism to improve the tone of the muscles, and remedy any paralytic defect that may be present, exercises like those of Fraenkel, especially intended for improving co-ordination, should form a part of the treatment recommended. *J. S. Risien Russell.*

CEREBRAL HÆMORRHAGE.—(See Apoplexy, Coma and Hemiplegia.)

CEREBRAL IRRITATION. — The train of symptoms known by this name is due to a laceration or contusion of the frontal lobes. The condition of the patient is one of extreme mental irritability. Absolute rest and quiet are essential, and the patient should be disturbed as little as possible for the purpose of examination. It is undesirable that the patient should be forcibly fed by means of a nasal tube, and it should be remembered that he may often be persuaded to take food voluntarily, or will eat it if it be left by the side of the bed. Although the patient may have fairly recovered in two or three weeks, persistent mental weakness is not unlikely to remain; prolonged rest should therefore be insisted upon. *S. Maynard Smith.*

CHALAZION.—(See Eyelids.)

CHANCROID, THE.—The chancroid is a local contagious ulcer of the genital organs, infective in nature, and usually considered to be due to inoculation with the streptobacillus of Ducrey. As these sores tend to spread locally with great rapidity, and early to infect the inguinal glands, the primary object of treatment is the destruction of the bacillus. To effect this, iodoform, or one of its equivalents (see Syphilis), may be applied after the sore has been carefully cleansed in warm water. But if the ulcerative process does not subside under this treatment, then more strenuous measures must be adopted, consisting of application of carbolic acid, nitric acid, or Ricord's paste, composed of equal parts of sulphuric acid and finely powdered willow charcoal. By these means, the infective process will be stopped, and the resulting ulcer may be treated with antiseptic powders or lotions. *J. Ernest Lowe*

CHICKEN-POX.—(See also Fevers, Acute Infectious.) This disease is usually of so trivial a nature as to require no treatment except confinement to bed until all the vesicles have become scabs. Irritation of the skin and itching will be relieved by sponging with tepid boracic lotion, or moistening the skin with a 2 per cent solution of carbolic acid. The child should be prevented

from picking the pocks; if there be much eruption on the scalp, the hair should be cut short.

If the pocks become gangrenous, the constitutional symptoms may be severe. The sloughing pocks must be fomented with warm boracic lotion till the crusts have separated; the ulcers that remain must be treated with a stimulating antiseptic lotion or ointment, and the patient put on a generous diet.

In the rare variety, varicella bullosa, the excoriations left by the ruptured bullæ require treatment with some such application as zinc or boracic ointment.

The patient may be considered to be free from infection when all the scabs have separated, or, in the case of V. gangrenosa, the ulcers have healed.

Quarantine period: three weeks. *E. W. Goodall*

CHILBLAINS.—The general and prophylactic treatment is the same as in RAYNAUD'S DISEASE (q.v.). Cod-liver oil, maltine, and tonics should be administered. Locally the following applications are useful:—

℞	Caustic Potash	½%	Alcohol	āā	20%
	Glycerin		Water		60%

The hands are bathed in warm water and the above rubbed in.

℞ A 30% ointment of ichthyol in lanolin or vaselin.

℞	Lin. Aconiti		Ol. Amygd. Amaræ		℥v
	Lin. Bellad.	āā ℥jss	Lin. Sap.		ad ℥ij
	Tinct. Opii	℥iij			

½ to 1 dr. is applied to the painful part night and morning.

Recently, the administration of soluble salts of calcium has been recommended in order to increase the coagulability of the blood. The chloride or lactate may be given in doses of 10–15 gr. thrice daily, flavoured with syrup of orange or liquid extract of liquorice. Very good results have been reported in some cases.

For electrical treatment, see RAYNAUD'S DISEASE and ELECTROTHERAPEUTICS.

Robert Hutchison.

CHLOROSIS.—(See also ANÆMIA.)—The first point in the treatment of this condition is the recognition of the various factors, usually slight in degree, concerned in its production. These are connected:—

1. With the characters of the blood in youth, especially from fifteen to twenty-two, when this form of anæmia is most prevalent; i.e., the blood at this period has 10 per cent fewer corpuscles; 8 to 10 per cent less hæmoglobin; 5 per cent more water; and, in comparison with other diseases, is smaller in quantity than at any other period of life.

2. With growth and development at the period of puberty.

3. With occupation—throwing additional strain on the body, and at the same time usually associated with more confinement, less air and light, and more physical strain, than in the period of life prior to puberty.

4. With disturbances in digestion, diminished appetite, dyspepsia, and constipation—affecting not only the general nutrition, but also in a special degree the amount of iron ingested. Whereas a normal dietary contains daily $\frac{1}{11}$–$\frac{1}{8}$ gr. iron, the dietary of three chlorotic girls was found to contain only $\frac{1}{50}$–$\frac{1}{20}$ gr.

5. With periodic loss of blood at this period, slight in itself, but important when combined with diminished intake of iron, and greatly aggravating the chlorosis, when, instead of the natural and protective process of amenorrhœa, the opposite condition of menorrhagia is present.

To these more constant and important factors may be added the disturbances connected with psychical and mental emotions, associated in a special degree with

this period of life. The effects of these are aggravated by one circumstance quite peculiar to this period of life, and to this condition, i.e., that girls consider pallor to be rather attractive than otherwise; and in the classes in which chlorosis is most prevalent they not infrequently from pure choice adopt a dietary such as rice (the poorest of all in iron constituents), tea, and milk, and avoid or have even a repulsion to meat, the one food which contains the iron of which they stand in need.

If to these be added the factor which undoubtedly exists in certain families more than in others, i.e., the natural predisposition to pallor, we have before us a brief summary of the physiological and pathological factors which, operating together, amply suffice to explain the origin of this anæmia, and place it not only in the group of secondary anæmias, but also among the purest and most typical forms of secondary anæmia.

To the above factors of non-infective nature there may, however, be added others which are infective, notably, sepsis; originating especially in oral sepsis, and associated with gastric and intestinal sepsis; and independently causing varying degrees, slight or severe, of septic anæmia. The combination of chlorosis, pure and simple, with this septic anæmia is, in the writer's experience, a very common one; and gives to many cases of chlorosis their severe and chronic character, and their resistance to the ordinary measures of treatment to which, in the absence of this septic anæmia, they would otherwise respond.

The measures then to be adopted in treating chlorosis are the following :—

1. *Digestive.*—The correction of the gastric and intestinal disturbances (dyspepsia and constipation) which are so frequently associated with the condition.

2. *Dietetic.*—The substitution of foods richer in iron for those which the patient has been taking.

3. *Medicinal.*—(*a*) The supply of additional iron in the form of preparations which experience has shown to be the least disturbing to digestion, the most assimilable, and least constipating; and (*b*) The use of other tonics, notably of arsenic, hypophosphites, and of strychnine, which experience also shows exercise a beneficial influence, not only directly on the blood-forming powers (arsenic), but also on the nervous tone of the whole intestinal tract (phosphites and strychnine).

4. *Hygienic.*—The correction, so far as is possible, of those habits of life which place too great a physical strain upon the general bodily powers at this period of life, and deprive the patient of the air and light which are as necessary to the formation of hæmoglobin as they are to the formation of the colouring matter of plants. (See ANÆMIA.)

5. *Climatic and Balneological.*—Measures supplementary to the foregoing in severe cases which resist the ordinary and generally successful measures of treatment.

Digestive Treatment.—It is essential in cases of chlorosis to correct any digestive disturbances, and to remove the constipation, as a first step in the treatment. As the condition is usually one of chronic dyspepsia, not infrequently of gastric catarrh, and in some cases actual ulceration of the stomach (gastric ulcer), these can be best removed by stomachic sedatives, especially soda and bismuth preparations. The following are some of the preparations with combinations which will be found useful for this purpose :—

STOMACHICS.

℞	Sod. Bicarb.	gr. xv	Sp. Chlorof.		℥xx
	Sp. Ammon. Arom.	℥xxx	Inf. Caryophyl.		℥j

To be taken three times a day before meals.

℞	Sod. Bicarb.	gr. xv	Tinct. Card. Co.	℥xxx
	Ammon. Carbonat.	gr. v	Aq. Menth. Pip.	ad ℥j
	Succ. Taraxac.	℥ı		

To be taken three times a day before meals.

℞	Magnes. Carbonat.	gr. vij	Syr. Zingiber.	℥xxx
	Ammon. Carbonat.	gr. iij	Aq. Menth. Pip.	ad ℥j
	Tinct. Lavand. Co.	℥xxx		

To be taken three times a day before meals.

℞	Bismuth. Carbonat.		Pulv. Tragacanth. Co.	āā gr. x
	Sod. Bicarb.		Aq. Menth. Pip.	ad ℥j

To be taken three times a day before meals.

℞	Bismuth. Subnitrat.	gr. x	Acid. Hydrocyanic. dil.	℥iv
	Magnes. Carbonat.	gr. xv	Aq. Menth. Pip.	ad ℥j

℞	Pot. Bicarb.		Tinct. Rhæi	℥viiss
	Sod. Bicarb.	āā gr. xv	Inf. Calumb.	ad ℥j
	Sp. Ammon. Arom.	℥xv		

To be taken twenty minutes before meals.

℞	Sod. Bicarb.	gr. xv	Tinct. Senn. Co.	℥xv–xxx
	Sp. Ammon. Arom.	℥x	Inf. Gent. Co.	ad ℥j

To be taken five minutes before meals.

℞	Tinct. Nucis Vom.	℥v	Sp. Chlorof.	℥x
	Tinct. Sennæ Co.	℥xv–xxx	Inf. Quass.	ad ℥j
	Ammon. Carbon.	gr. iij		

To be taken five minutes before meals.

Constipation should be corrected by suitable aperients, and these can often be effectively combined with the iron which we also desire to administer—as in the following preparations:—

APERIENT IRON COMBINATIONS.

℞	Ferri Sulphat.	gr. iv	Tinct. Zingiber.	℥xx
	Magnes. Sulphat.	℥j	Inf. Gent. Co.	ad ℥j
	Acid. Sulphuric. Arom.	℥x		

Twice daily, at 11 a.m. and 6 p.m.

(*Sir A. Clark.*)

℞	Ferri Sulphat.	gr. iv	Tinct. Zingiber.	℥xx
	Sod. Bicarb.	gr. xx	Sp. Chlorof.	℥x
	Sod. Sulphat.	℥j	Inf. Quass.	ad ℥j

At 11 a.m. and 6 p.m.

℞	Magnes. Sulphat.	gr. lx	Aq. Chlorof.	ad. ℥j
	Liq. Ferri. Perchlor.	℥xv		

Every morning.

℞ Pil. Aloes et Ferri gr. iv–viij

At night.

℞	Aloin	gr. ½–j	Ferri Sulphat.	gr. j
	Ext. Bellad. Vir.	gr. ¼	Ext. Gentian.	q.s.
	Ext. Nucis Vom.	gr. ⅛		

To be taken at night.

Even when digestive intestinal disturbances appear to be absent it is always well to commence the treatment of chlorosis by measures directed especially towards this tract. Unless this is done, it will often be found that the iron which we desire to administer disagrees, and its administration has to be stopped until

a healthier condition of the stomach and intestine has been restored by the use of the foregoing preparations.

Dietetic Treatment.—The appetite is in many cases so poor that the diet indicated is one often described as light and easily assimilable. It is usually held to include more especially such articles as milk, soups, and farinaceous foods, in the form of milk puddings, with fish and chicken. It will be seen, however, from the following table that this class of food does not contain the amount of iron of which this condition stands in special need. This is particularly true of farinaceous food, especially of rice, which is actually the poorest in iron, and is the one most frequently used, if not actually abused, if, as is stated, some of the domestic class, in which chlorosis is notoriously most prevalent, make a practice of eating dry rice for the very purpose of producing a pale complexion.

The chief point as regards diet is the necessity of increasing the amount of meat, which contains two to eight times more iron than is present in such an article as rice ; three or four times the amount contained in flour ; twice or thrice the amount contained in potatoes ; two to seven times more than contained in milk. The following table gives the percentage of iron in the various classes of food most commonly in use :—

List of Foods with their Iron Contents (*Bunge*).

100 Grammes of	Percentage in Mgrams of Iron.	100 Grammes of	Percentage in Mgrams of Iron.
Rice contains ..	.. 1·8	Strawberries ..	.. 8·9
Rye	.. 4·9	Cabbage ..	.. 3·9
Wheat ..	.. 5·3	Spinach ..	.. 35·9
Oats	.. 13·1	Cows' milk ..	.. 2·3
Corn	.. 3·6	Human milk ..	.. 2·7
Potatoes ..	.. 2 to 6·4	Beef	.. 4·8 to 16·6
Peas	.. 6·6	Eggs	.. 5·7
Beans	.. 7·4 to 8·3	Fish	.. 1·5 to 84·2
Lentils	.. 8·3 to 9·5	Veal	.. 2·7
Apples ..	.. 13·2		

Food.—The diet in anæmia should, therefore, to a considerable extent consist of animal food—preferably underdone—and in severe cases, especially of children, great advantage can be obtained by its administration in the raw form, pounded up and given either alone or with various meat extracts to mask its appearance and taste.

Patients should be encouraged to take—in however small a quantity—chopped or scraped beef, mutton, chicken, eggs, bread and butter, milk ; amongst vegetables, lettuce ; amongst fruits, oranges, stewed apples, and prunes. Pastries and sweets, for which chlorotics often have special relish, are harmful in most cases, and should be avoided.

The chief difficulty with most anæmic patients is the loss of appetite and the enfeebled digestion. The best treatment for this is to send the patient to bed. With rest in bed, even a feeble digestion can supply the wants of the body, with a little to spare for improvement. So long as they continue to go about and do their work, such patients make no progress, whatever the character of the food, or however much iron they take. Digestion may be assisted by administration of hydrochloric acid and pepsin, or malt with each meal. Food should be taken in smaller amounts and at intervals of four hours. Liquids should be taken sparingly, especially with food.

Medicinal Treatment.—The most important measure is administration of iron, continued for eight to ten weeks at least ; then intermitted for two or three weeks, and afterwards taken in smaller quantity, and continued for several months. The object to be aimed at is not merely to restore the blood to its

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normal percentage of hæmoglobin, but to afford time for the body to lay up some reserve of iron in its blood-forming tissues.

The particular form of iron preparation is immaterial, provided only that it does not disturb the digestion, and that it agrees with the patient. The inorganic preparations in ordinary use are perfectly efficient, and give the best results. The choice of the particular preparation is guided largely by the condition of digestion and of the stomach.

Reduced iron, ferrous carbonate of iron in one form or other, or one of the Scale preparations, e.g., citrate of iron and ammonia, is the least irritant; proto-chlorides and sulphates are distinctly more irritating, and the ferric salts still more so.

Reduced iron is tasteless, but repellant in appearance, and is apt to cause unpleasant eructations. It may be given in 2-5 gr. doses, in rice, capsule, or chocolate form, or in form of a powder to be taken between two slices of bread. *Perchloride of iron* gives very good results in anæmia from convalescence, but is apt to cause disturbance of digestion. *Citrate of iron and ammonia* gives good results, especially when it is necessary to continue iron for a long time. It is especially suitable for children on account of its pleasant taste. The best results are, however, got with *ferrous carbonate*, especially when freshly prepared, as in its well-known combination of ferrous sulphate with potassium carbonate, in Blaud's pill, or pil. ferri (B.P.), or ferri carbonas saccharatus (3–5 grs.)—a good chalybeate very free from astringency—also contained in mistura ferri composita (B.P.) In many cases the iron may, with advantage, be administered alone with laxatives, such as aloes or saline cathartics, as in some of the combinations already given.

The following are some of the combinations which have been found most useful :—

Arsenic is a valuable blood tonic in many cases of anæmia, either alone or in the form of liquor (3–5 min.) arsenicalis, or in combination with iron, either as arsenious acid in doses of $\frac{1}{60}$ gr., or as arseniate of soda.

BLOOD TONICS.

℞	Liq. Arsenical.	℥ iij	Tinct. Card. Co.	℥ xxx
	Syrup.	℥ xxx	Aq.	ad ℥ j

IRON TONICS.

℞	Tinct. Ferri Perchlor.	℥ xv	Sp. Chlorof.	℥ xv
	Acid. Phosph. dil.	℥ x	Inf. Quass.	ad ℥ j

Three times a day after meals.

℞	Ferri et Ammon. Cit.	gr. v	Aq.	℥ j
	Acid. Citric.	gr. x		

To be taken with Sodium Bicarb. gr. x in state of effervescence three times a day.

℞	Tinct. Ferri Perchlor.	℥ x	Tinct. Card. Co.	℥ xxx
	Glycerin.	℥ xxx	Aq.	℥ j

Three times a day after meals.

℞	Ferri et Ammon. Cit.	gr. v	Glycerin.	℥ lx
	Sp. Ammon. Arom.	℥ xxx	Inf. Calumb.	℥ j

To be taken three times a day after meals.

℞	Tinct. Ferri Acetat.	℥ x	Liq. Ammon. Acet.	℥ ij
	Acid. Acetic. dil.	℥ xxx	Aq.	ad ℥ j

Red corpuscles contain proteid matter, fat, iron and potash.

℞ Pil. Ferri (= Sulphate of iron and carbonate of potash.)
Is very satisfactory.

℞ Mist. Ferri Co. (potash, carbonate and iron sulphate.)
Exceedingly good.

℞	Liq. Ferri Perchlor.	♏xv	Inf. Quass.	ad ℥j
℞	Ferri Sulphat.	gr. iv	Tinct. Zingiber.	♏xx
	Sod. Bicarb.	gr. xx	Sp. Chlorof.	♏x
	Sod. Sulphat.	℥j	Inf. Quass.	ad ℥j
		Twice a day.		(*Sir A. Clark.*)
℞	Tinct. Ferri Perchlor.	♏x	Glycerin.	♏xx
	Liq. Arsenical.	♏ij	Aq.	ad ℥j
		Three times a day in a wineglass of water after food.		

Iron Waters are useful in various forms of anæmia, especially in those due to acute illness or actual loss of blood, also cases of long-standing chlorosis.

The waters to be preferred are those containing bicarbonate of iron with free carbonic acid. In cases where there is dyspepsia, with intestinal catarrh or a tendency to hepatic disorder, their use is better preceded or accompanied by that of muriated or sulphated alkaline waters, or of aperient drugs. They are contra-indicated in feverish conditions, and in severe disturbances of the digestive organs.

With regard to such chalybeate springs the best known are those of Spa in Belgium, Schwalbach, and St. Moritz. Spa contains a considerable amount of bicarbonate of iron and a large amount of free carbonic acid. The latter makes them pleasant to most people. Schwalbach waters are strong, fairly pure chalybeate, containing an excess of free carbonic acid with scarcely a trace of sulphuretted hydrogen. At St. Moritz, Switzerland, the springs are also chalybeate, rich in carbonic acid, and very pleasant to the taste. Compared with those of Schwalbach they are relatively poor in iron, but owing to the climatic conditions they are in many cases more effective than stronger springs at lower situations. On the other hand, the high altitude (5,800 ft.) is not suitable for nervous or excitable patients, and distinctly disadvantageous, according to the writer's experience, for severe cases of any form of anæmia, especially chlorosis. The worst case of chlorosis he has ever seen—the only one which ever gave him immediate cause for anxiety—he once found at an altitude in Switzerland. The rarefied atmosphere, combined with the great deficiency in hæmoglobin, caused severe dyspnœic distress such as he has never before seen in any chlorotic patient. This distress had begun and been attended by fainting attacks, half an hour from the time when the patient began to ascend from the level of the valley (1000 ft. altitude) up to the four or five thousand feet at which the patient was found.

Amongst English chalybeate springs Tunbridge Wells is one of the oldest (1606) and best known. The waters do not contain free carbonic acid. Cheltenham and Melksham contain muriated, sulphated waters. The tonic effect of such waters is greatly aided by the use of the chalybeate baths. These act chiefly by virtue of the large amount of carbonic acid present, and the stimulating tonic effect which the bubbles of this gas exert on the nerve endings of the skin.

Balneological.—The benefit derived from courses of such waters is greatly enhanced by—if not largely due to—the change of scene, the enforced rest, the stricter dietetic régime, the stimulating and tonic effects of baths—especially those saturated with free carbonic acid, as at Schwalbach and Homburg—which many of the foreign Spas provide.

The foregoing general principles for the treatment of chlorosis are applicable to the treatment of all cases of non-infective anæmia. The principles applicable to the treatment of "Infective Anæmias" are of a different and more directly etiological and preventive character. These are dealt with under the heads of SEPTIC ANÆMIA and PERNICIOUS INFECTIVE ANÆMIA.

William Hunter.

CHOLANGITIS.—(See BILE-DUCTS, CATARRH OF.)

CHOLECYSTITIS.—Inflammation of the gall-bladder may be catarrhal, suppurative, or phlegmonous.

Simple catarrh of the gall-bladder is frequently associated with that of the ducts, the catarrh commencing in the gall-bladder and spreading into the ducts, or vice versa. And the causes of the two affections are much the same—very commonly it is a gall-stone in the gall-bladder, but perhaps more often than in catarrh of the ducts, it arises from some general blood infection or some local abdominal lesion which leads to a microbic affection of the gall-bladder. The organisms may either be introduced into the gall-bladder through the blood-stream or pass into it through the biliary canals. The bacilli of typhoid have been frequently found as well as the *B. coli* in the gall-bladder. A simple cholecystitis will be denoted by tenderness and pain, with distension of the gall-bladder and often some pyrexia; but jaundice is by no means constant.

Probably, in a great many cases the disease subsides, the catarrhal products of the inflammation finding exit by the intestine; in other cases it passes into the suppurative form.

Treatment is the same as that of catarrh of the biliary ducts.

A peculiar form of inflammation of the gall-bladder sometimes occurs in which the catarrhal products result in coagulæ or partial or complete casts of the interior of the gall-bladder. This gives rise to spasmodic attacks of pain, resembling attacks of biliary colic, though on the whole of less severity. So much do they resemble biliary colic that the gall-bladder has been opened on a diagnosis of gall-stones.

The treatment is mainly that of chronic catarrh by cholagogues and salines. Aspirin is spoken of as giving great relief during the attacks, but morphia is sometimes required. If the affection be very persistent, it is best to open and drain the gall-bladder.

Suppurative and phlegmonous inflammations of the gall-bladder give rise to empyema of gall-bladder or to sloughing of its walls; they occur sometimes from gall-stones, sometimes without, from a virulent microbic affection.

The treatment is immediate operation, and drainage or excision of the gall-bladder.

Sidney Phillips.

CHOLELITHIASIS.—(See GALL-STONES.)

CHOLERA.—(See also BACTERIOTHERAPEUTICS.) During an epidemic, great care must be taken in the treatment of all disorders of the alimentary system, as these in many cases predispose to attacks.

At the onset of the disease a brisk purgative is of value; calomel, or castor oil, or castor oil and opium, are those most frequently used. When the disease is established, no powerful drugs must be given by the mouth in large quantities, as little absorption takes place from the stomach. Not only may such drugs be useless, but a portion may remain in the stomach to be absorbed during the period of reaction, and so prove injurious.

Intestinal antiseptics such as β-naphthol, izal, and salol, have been frequently used, but without very beneficial results. More frequently the treatment is

directed towards relieving the symptoms. Such mixtures as the following seem to give relief :—

R	Acid. Sulph. dil.	℥xx	Tinct. Capsici	℥v
	Chlorodyni	℥xx	Aq. Menth. Pip.	ad ℥j

Every two hours.

Hot applications to the abdomen, warmth, and rest as far as possible, must be enforced. Hypodermics of morphia may be given.

In the collapse stage, heat is essential and may be supplied by the use of warm blankets, hot water bottles to the feet, thighs, and axillæ. Injections of ether and strychnine may be required. Transfusion with normal saline solution sometimes produces marked benefit, but this is often temporary, and though the transfusion may be repeated, the effect is then less marked. During the stage of reaction, treatment must be entirely symptomatic and not too active.

C. W. Daniels.

CHORDEE.—(See GONORRHŒA.)

CHOREA, ACUTE.—(See RHEUMATISM, ACUTE.)

CHOREA, CHRONIC.—*Exercises* are prohibited in all acute cases of chorea. They are only of use when, although heart, pulse, temperature, appetite, and digestion are normal, all pains and aches have disappeared, and general health has seemed fully restored for some weeks, choreic movements still continue.

Such may be termed *residual* chorea. The movements have become habitual, and may be chronic if untreated, but usually soon yield to carefully graduated exercises. These should be of the simplest character at first. Taking and crowning the pieces arranged on a draught-board, or building houses with small wooden blocks, should be practised. Freehand drawing and writing large letters with coloured chalks on a black-board ; touching, at word of command, small coloured balls hung at varying heights by strings to a frame ; aiming with a pointer at the different circles of a target, are all useful and easy exercises as a commencement. More difficult, are building card houses and setting backgammon pegs in holes drilled in patterns into a board.

Threading needles, sewing, and writing in small text should be left to the last. Many other useful exercises can be taken from the kindergarten apparatus. The principle is, to keep those which require the greatest amount of precision and co-ordination until the easiest are mastered. No exercise should be employed if it tire or bore the patient.

For slouching, clumsy gait, ungainly attitudes, humped shoulders, dropped chins, all of which are sometimes sequelæ of chorea, ordinary drills are essential. (See also HABIT SPASMS.)

Leonard G. Guthrie.

CHOREA GRAVIDARUM.—In the majority of cases the patient, with the exception of the fact that she has involuntary movements, goes through a normal pregnancy, has a normal labour, and brings forth a normal child. If the movements have not ceased before labour, they probably will do so during the next month or two.

The frequency with which spontaneous abortion occurs, and also the tendency to the occurrence of acute maniacal attacks, have been exaggerated. It is possible that abortion is more common in these cases than in pregnancy uncomplicated by chorea, and it is true that acute maniacal attacks do occur, by which the patient is worn out, but these grave cases are rare. Most attacks of emotional insanity, whether maniacal or melancholic, are transitory, and not of grave prognostic significance.

The treatment may be summed up briefly thus : Assure the patient that the probability is that she will have a normal labour and eventually recover. Endeavour to find out whether she has any source of worry. Make her sleep, give her plenty of nourishment, and keep her in bed in a quiet room with good nursing until the movements cease. Good nursing is essential, otherwise bedsores will probably develop. In many of these cases the exciting cause is to be found in mental worry, anxiety, or some shock. Removal of the source of worry, e.g., dread of difficulty and danger in the approaching confinement, will often have a marked effect in improving her condition. Marriage, in cases of illegitimate pregnancy, is to be advised as a part of the treatment.

The patient must be made to take a liberal diet, containing a large proportion of carbohydrates ; in fact " over-feeding " is necessary. If the patient refuses to take food—a rare occurrence—forced feeding must be resorted to. Dr. Cecil Wall has pointed out a most important fact in connection with the difficulty occasionally met with in getting these patients to take food, viz., that a dental ulcer may be present, due to the frequent movements of the tongue against a sharp tooth.

The patient *must* sleep. Light massage and " nursing " are preferable to drugs as methods of inducing sleep. If sedatives are necessary, chloral hydrate or chloralamide, combined with alcohol, are the drugs most to be recommended. They need not be given in large doses as a rule, nor need they be frequently repeated. Iron is indicated in cases where there is anæmia. The value of arsenic is very doubtful. Induction of abortion is to be avoided if possible. Formerly this method of treatment was responsible for many deaths from sepsis, and even at the present time there is some danger of sepsis following induction of abortion, the constant movements of the patient rendering asepsis difficult to obtain, in spite of the most minute precautions. This method of treatment, if ever employed, must be reserved for the small percentage of cases in which emaciation, sleeplessness, and the violence of the movements, are exhausting the patient's strength. As, however, in these more severe cases induction of abortion is not always followed by improvement, and always brings with it a new danger, it is not to be resorted to lightly. *H. Russell Andrews.*

CHYLURIA.—(See FILARIASIS.)

CIRCUMCISION.—(See PHIMOSIS.)

CIRRHOSIS OF LIVER.—In the early stages of cirrhosis the symptoms are but slight, and are more often due to perihepatitis or to the effects of alcohol upon the gastro-intestinal tract than to the cirrhotic process ; in non-alcoholic cirrhosis the symptoms are few, till quite late in the disease. Abstention from alcohol will often lessen the flatulence, retching, and indigestion, but it is impossible to keep such patients under close observation, and the craving for alcohol being usually a part of the disease, abstention from it is more often enjoined than observed ; at any rate, it should be impressed upon the patients that alcohol is most injurious when taken little diluted, and when the stomach is empty. Cirrhosis is not always due to alcohol ; it occurs in animals such as cows and cats ; often no cause is to be discovered. Syphilis is the cause in some cases, the liver being then lobulated and perihepatitis usually marked. Alcohol, however, seems prejudicial in cirrhosis from any cause ; so, too, are rich, irritating, or highly spiced foods, which often congest and enlarge the liver temporarily.

The best diet is said to be milk, but this dietary is impossible to carry out in men following an active occupation, who can only be advised to take plain and light food and to drink water, or Vichy or Seltzer water, freely at meals.

The accompanying gastric catarrh is best treated by alkalies and bitters, the latter sometimes relieving the alcoholic craving. Abstention from alcohol

and care in diet and mode of living may sometimes succeed in staying the progress of the earlier stages of the disease.

In the late stages, the cirrhotic process continues even after alcohol ceases to be taken, but nevertheless abstention from it should still be advised, as it accelerates the disease. In these stages, the symptoms are due to obstruction in the portal circulation, to failure of liver function owing to destruction of hepatic cells, and often also to accompanying perihepatitis and advanced gastric catarrh.

Diarrhœa may be checked by astringents and by opium if necessary, but a laxity of the bowels lessens the tendency to ascites, and should not be abruptly stopped.

Constipation, on the other hand, must be dealt with gently, or intractable diarrhœa may come on. Small doses of calomel occasionally, and more frequently phosphate or sulphate of soda, are best.

Hæmatemesis and **Melæna** must be stayed by astringents and opium, but hæmatemesis may be repeated and profuse, and may fail to yield to any remedy. It is undesirable to operate on hæmorrhoids in advanced cirrhosis, the result being sometimes very profuse hæmatemesis.

Ascites is sometimes due to portal obstruction within the liver; not infrequently perihepatitis produces or contributes to its causation. Diuretics, of which oleum copaibæ is one of the most useful, may lessen it; iodide of potassium is also useful. Inunction with the linimentum hydrargyri seems to lessen it in some instances, but too often it persists. The fluid should then be drained off gradually by two or three Southey's tubes, which are preferable to the larger trochar and cannula. The abdomen, whether drained suddenly or gradually, usually rapidly refills at first; but tapping must be resorted to again and again. It is true that the ascitic fluid seldom fails to reaccumulate; but the tapping relieves discomfort and often enables the subject of it to continue at his work, which would be otherwise impossible. In some cases, after repeated tappings the ascites ceases. Tonics, including iron, are beneficial in helping absorption of ascitic fluid. Dickenson advocated great restriction of the amount of fluid taken. Local peritonitis, or sometimes hæmorrhage into the abdomen, may occur after tapping. When ascites persists after repeated tapping, operation has been practised, with the object generally of overcoming the obstruction to the return of blood through the portal circulation. Talma's operation consists in opening the abdominal cavity; the peritoneum over the liver and diaphragm is scraped or curetted, so as to set up adhesive inflammation, the surfaces are brought into contact by stitches, and an addition to the original operation is the inclusion also of the great omentum between the diaphragm and liver. Roberts, of Philadelphia, practises another operation, stitching the great omentum to the abdominal wall. Another operation consists in division of the portal vein and uniting its distal end with the ascending cava, thus diverting the blood from flowing through the liver. These operations have been attended with some measure of success. In many cases the ascites in cirrhosis is due to local perihepatitis, and mere breaking down of adhesions lessens it.

When grave toxæmic disorders begin in the late stage of cirrhosis, such as hæmorrhages from the skin and from mucous membranes other than those whose blood returns into the portal system, delirium, and typhoid conditions, little can be done except to tide patients over their most serious discomforts.

Sidney Phillips.

CLAUSTROPHOBIA.—(See AGORAPHOBIA.)

CLAW-FOOT.—(See TALIPES, ACQUIRED.)

CLEFT PALATE.—The following conditions are associated with this deformity: (1) A defective power of deglutition; (2) An imperfect articulation; and sometimes, (3) A visible disfigurement.

To ameliorate these conditions it is imperative for the deficiency in the palate to be closed, and since the natural growth of the parts towards the line of cleavage has been permanently arrested, the closure can only be effected by operative procedures. The most favourable time for the performance of such an operation is undoubtedly within the first three months after birth. The malnutrition, that is the direct result of the inability to suck and to perform properly the act of swallowing, is a serious menace to the life of the patient, and in many cases the operation has to be performed with the immediate purpose of saving life. Further, these patients are particularly liable to suffer from disorders of the respiratory tract, especially when the cleft involves the nasal as well as the oral cavities. If surgical intervention is postponed until after the child has begun to talk, there is less chance of eradicating the faulty method of speech by careful after-education than there is of preventing it by means of an early operation.

Since immediate success depends upon the rapid and complete union of the raw surfaces in the mouth, and the failure to so unite is a direct consequence of infection of the wound by the septic secretions of the nose and mouth, it is an additional advantage to perform the operation in the mouth of an edentulous infant rather than in that of a child whose teeth have already erupted and by their early decay have greatly intensified the septicity of the mouth. The mouth of a three-months-old child can more easily be cleaned before, and kept clean after, operation, whilst its natural food, milk, can be sterilized until the wound has healed. Lastly, an infant can be more readily kept quiet after the operation, it is less liable to fidget the wound with its tongue, it is less prone to vomit, and suffers little from shock.

The Operation.—This must be modified according to the type of deformity present, but the best principles upon which to work are those embodied in Lane's flap operation, in which a large mucoperiosteal flap from one side of the palate, with its hinge along one margin of the cleft, is turned across the cleft so that its free edge can be stitched beneath the mucoperiosteum detached along the whole length of the opposite side of the cleft. All tension on the flap is thus avoided, and large raw surfaces can be brought into firm apposition. Clefts which involve the hard or soft palate, or both, can be treated in this manner. Hæmorrhage from the posterior palatine artery is an occasional source of trouble: as a rule it can easily be controlled by direct pressure over the opening of the posterior palatine canal in the hard palate. If this fails to arrest it, a solution of adrenalin 1–1000, to which has been added an equal quantity of a saturated solution of calcium chloride, may be applied, or the opening of the canal may be plugged by Horsley's aseptic wax.

Fine silk or silkworm gut (ophthalmic D) sutures should be used, and may be removed at the end of a fortnight after the operation, or allowed to fall out spontaneously. Lane's cleft palate gags, needle-holder, curved needles, and raspatory form a necessary outfit. The operation must be performed with strict aseptic precautions.

After-treatment.—Absolute rest and quiet are essential. The child must be prevented from crying by careful nursing, and may be kept lightly under the influence of bromides for a week. Immediately after the operation a small dose of opium—2 or 3 drops of the tinctura opii by mouth—or even $\frac{1}{10}$ grain of morphia subcutaneously, must be administered. Sterilized milk from sterilized vessels must be given carefully by spoon, according to the ordinary rules of infant feeding. The mouth must not be sprayed or swabbed: any form of

local treatment merely induces spluttering and crying, with a consequent tendency to disruption of the freshly-united surfaces. No attempt should be made to examine the site of operation until a week has elapsed, unless a raised temperature suggests that the flaps have become infected and necrotic. If this occurs early, frequent inhalations of oxygen are useful for keeping the mouth clean. Slight deficiencies in the line of union can be closed by turning small flaps across them at a later date. As soon as the child begins to talk, great care must be exercised in its education to inculcate from the commencement a correct habit of pronunciation.

George E. Waugh.

CLUB-FOOT.—(See TALIPES, ACQUIRED.)

COCAINE HABIT.—(See DRUG HABIT.)

COLD IN THE HEAD.—(See RHINITIS, ACUTE.)

COLIC (in Adults).—These patients should be induced to take regular exercise, or, if this is impossible, they should have general and abdominal massage, either by hand or by mechanical means (Zander apparatus). Where circumstances permit, a course of treatment at Marienbad is beneficial. If, as is often the case, the patient eats too much, the diet should be limited in amount, and the use of vegetables and fruit containing much cellulose should be forbidden.

The drug treatment must include the regular use of aperients. During the attack relief may be obtained by giving 10 min. of the carminative tincture (B.P.C.) or 2 min. of the essential oil of cajaput, cloves, or peppermint, taken on a lump of sugar, or the following mixture :—

R	Tinct. Opii	℥x	Aq. Menth. Pip. Dest.	ad	℥j
	Ol. Ricini	℥ss			

To be taken at once.

(See also PLUMBISM.)

Robert Saundby

COLIC (in Children).—In children flatulent colic occurring as a consequence of indigestion and fermentation of food is a common complaint. In hand-fed babies it may be due to over-feeding, to an inappropriate dietary, to want of cleanliness of the feeding-bottle, or to a chill setting up gastric catarrh ; indeed, catarrh of the stomach is rarely absent either as cause or effect. All these matters must be attended to, of course, without delay.

The attack of pain may be usually arrested by a copious enema of hot water (95°–100°), slowly injected into the bowel, or by ten to twenty drops of spirits of nitrous ether in a spoonful of water given by the mouth. The effect of the draught is to produce a discharge of flatus, followed by a copious flow of urine, and the pain ceases. Hot applications to the belly externally also help in promoting a dispersion of the wind. To prevent its recurrence, a dose of castor oil, or rhubarb and soda, should be given to clear away fermenting matters from the bowel. When this has acted the child may begin to take an antiseptic with carminatives. Thus for an infant of six months old :—

R	Resorcin	gr ij	Tinct. Cardam. Co.		℥v
	Sp. Ammon. Aromat.		Aq. Carui		℥xxx
	Sp. Chlorof.	āā ℥ss			

To be given every three hours.

Ingluvin is also a useful remedy in doses of two grains every three hours ; also the sulphate of zinc medicine recommended for vomiting.

A more obstinate form of colic which resists most antiflatulent remedies is sometimes met with in infants, both nursed and hand-fed. In nursing babies it is the consequence of the milk being too rich in proteid. In this case the

child shrieks with pain directly he has taken the breast. It is cured by giving the infant one or two ounces of fresh barley-water just before nursing, so that the milk is diluted as it reaches the stomach ; or by a grain of Finkler's papain in a spoonful of water immediately before the child is put to the breast. If the attacks are only lessened but not cured by this means, a $\frac{1}{30}$ gr. of codeina, given two or three times a day, rarely fails of its effect. It may be ordered with

℞	Resorcin	gr ij	Glycerin.	℥ x
	Sodii Bicarb.	gr j	Aq. Anethi	ad. ℥ xxx

In hand-fed babies the same treatment may be adopted, putting the dose of papain into the feeding-bottle ; or we may follow Dr. Poynton's suggestion, and add citrate of soda to each bottle in the proportion of one grain to each ounce of the milk. It must not be forgotten in these cases to introduce a sufficient variety into the dietary, giving at least two differently flavoured foods alternately in the day, and providing a third for the night ; also to see that the feet and legs of the child are kept warm. Cold feet alone may be a cause of colicky pains.

Older children are sometimes subject to attacks of severe abdominal cramp coming on repeatedly in the day and persisting for a week or more at a time. In these cases every attention must be paid to the warmth of the feet and the avoidance of chill. The dietary must be revised, limiting the quantity of fermentable food, such as starches and sweets ; and a mild aperient must be given to clear away undigested matters from the bowels. A useful remedy in these cases is :—

℞	Ol. Terebinth.	℥ iv	Glycerin.	
	Ol. Ricini	℥ viij	Mucilag.	āā ℥ xv
			Aq. Menth. Pip.	ad ʒij

Given every three hours (for a child six years old).

The mixture acts upon the bowels and stimulates the urinary secretion.

If there be much tympanites the turpentine may be combined with codeina and nitrous ether :—

℞	Ol. Terebinth.	℥ v	Codeinæ	gr $\frac{1}{30}$
	Sp. Ætheris Nitrosi	℥ xx	Glycerin.	℥ xv
			Aq. Menth. Pip.	ad ʒss

To be taken every four hours.

At the same time it is advisable to lessen the quantity of milk allowed as food, and to give in preference pounded fish, mutton or chicken, rusk or toast buttered cold, etc.

The colic which sometimes arises from an overloaded bowel can be distinguished by palpation of the belly, when the fæcal masses may be felt as hard superficial lumps studding the course of the colon. Sometimes they can be indented by firm pressure with the fingers. To clear these away a full dose of calomel should be ordered, to be followed after a few hours by a saline aperient ; and the latter may be repeated every three hours or so until a sufficient effect is produced. The calomel has a marked influence in softening the fæcal masses, but in cases of long standing it may be necessary to use purgative injections, and even to break up the hard lumps in the rectum by mechanical means, before they can be expelled. (See CONSTIPATION.)

The colicky pains which precede a stool in cases of lienteric diarrhœa are treated of elsewhere. (See DIARRHŒA, INFANTILE.) *Eustace Smith.*

COLITIS.

Acute Colitis.—Acute or simple colitis is a catarrhal inflammation of the colon comparable to bronchitis or urethritis. There is usually persistent diarrhœa, which comes on suddenly, without apparent cause, accompanied by

vomiting, pain in the abdomen, cramp in the calves of the legs, and signs of collapse. The distinctive character of the stools is that they contain much mucus and usually bright red blood. There may be a little elevation of temperature, but this is by no means constant. The following treatment may be adopted :—

1. The patient should be at once put to bed between hot blankets, hot fomentations should be applied to the abdomen, and hot bottles to the feet.

2. Gentle manual friction to the walls of the abdomen, and the calves and thighs will be found beneficial.

3. To a tumblerful of cold fresh cow's milk two tablespoonfuls of old liqueur brandy or old pot-still whisky should be added, and this should be sipped slowly.

4. A saturated solution of camphor in alcohol should be given in 3-min. doses every ten minutes for an hour, and subsequently hourly, for six hours.

These measures will usually be found efficacious, but should they fail, and especially if the presence of an irritant in the intestines is suspected, a tablespoonful of castor oil should be given, followed in two hours by 20 min. of tinctura chloroformi et morphinæ composita.

Other remedies which may be found useful are :—

1. Perchloride of mercury, $\frac{1}{2}$ gr. in 6 oz. of water, a drachm every ten minutes for an hour, and then hourly.

2. Grey powder, $\frac{1}{3}$ gr. every hour for twenty-four hours.

3. An enema of laudanum, 15 min. in an ounce of mucilage of starch at a temperature of 100°. The dose should be smaller for children, not more than a drop of the tincture of opium for every year of the child's age.

4. Pulvis kino compositus, 10 gr. three times a day, with tincture of capsicum 3 min.

5. A hypodermic injection of acetate of morphine, $\frac{1}{3}$ gr.

Attention must be paid to dietary, and a selection may be made from the following list :—

(1) Barley-water ; (2) White of egg flavoured with lemon juice ; (3) Whey, preferably white-wine whey ; (4) Milk, with one-third lime-water, or peptonized ; (5) Milk, rum, and isinglass ; (6) Sanatogen.

For the treatment of colitis in children, see DIARRHŒA, INFANTILE.

Mucous Colitis.—Membranous colitis, muco-membranous colitis, membranous enteritis, mucous colic, or tubular diarrhœa, is a chronic disease of the large intestine, characterized by the passage of mucus in strings, or in the form of a tubular membranous cast. It usually begins with constipation, and is followed by persistent diarrhœa, with attacks of abdominal pain. Intestinal sand may be passed, and the patient is usually neurasthenic. The following treatment may be adopted :—

1. The patient should be kept strictly in bed.

2. Carbonate of bismuth, in drachm doses, suspended in mucilage and water, should be given four times a day.

3. A systematic high irrigation with a solution of borax in water (10 gr. to the pint) gives good results.

4. The kidneys should be flushed out frequently by large doses of a natural carbonic acid mineral water of low mineralization, such as Source Perrier.

5. A dose of half a drachm of bromide of sodium, or some similar sedative, should be given at bed-time to allay the nervous irritability.

A drug on its trial is methylene blue, or tetramethylthionine chloride, which is given in doses of from $\frac{1}{10}$ to 1 gr. in pill, four times a day. It may also be used as an enema in a 1 per cent solution. It colours the urine blue.

Much attention should be paid to diet, and beef essence, mutton broth,

peptonized milk gruel, raw meat, sanatogen, and port wine jelly, may be given cautiously.

Dr. de Langenhagen advocates the following system of dietary, the problem consisting in nourishing the patient in such a way that the excrement shall be neither abundant nor irritating. The food is selected from these aliments: milk, meat soups (chicken and other), with every particle of fat removed, beef-tea, porridge made of barley, oatmeal, maize, ground rice, arrowroot, raccahout, etc.; eggs, boiled, scrambled, or in custards, but neither fried nor as omelets (as fat is to be avoided); white light fish, i.e., sea fish boiled, or if fried, the skin and all parts imbued with fat should be taken away; finely-minced, very lean roast and boiled mutton, or beef, veal, or chicken; sweetbreads and brains. Vegetables mashed very fine and passed through a sieve may be given. As a rule, it will be found best to give only dry pulse vegetables, such as dry haricot beans, peas, and lentils; mashed potatoes may also be given, but on no account should any green vegetables be allowed. Even when finely chopped, they pass through the intestinal tube and thence into the fæces, without having been through any digestive action; they are expelled in the same state as they were eaten. It is necessary to forbid all spinach, cabbages, salads, and all raw fruits. Stewed or baked fruits without skins may be allowed, also boiled and baked batter-puddings and custards. Very little bread should be taken, and that little should be eaten stale or toasted dry. Wine and all alcoholic drinks should be absolutely banished. The best drink is pure, fresh, spring water, or a very light table beer mixed in equal parts with a slightly mineralized table water. Milk does not suit all stomachs; it frequently disagrees when it is given in too large quantities at a time; but given moderately, it is generally digested, and has rarely to be excluded from the bill of fare. All fatty matter should be strictly forbidden, and all pork, except very lean ham. No game, crabs, lobsters, crayfish, or other crustaceans should be allowed. All hashes, stews, rich gravies, sauces, and pastry of every kind, should be forbidden. In serious or inveterate cases, greater severity still is needful. Patients should in these cases take nothing but milk, light cereal porridges, eggs, beef-tea, and sometimes a very little finely-minced raw meat. In cases where milk is not digested, warm infusions, such as those of chamomile and lime-tree bark, may be given. Bread should be strictly forbidden, or be given in very small quantities, in the form of rusks or dry breakfast biscuits.

Ulcerative Colitis.—Ulceration of the colon may be dysenteric, tuberculous, malignant, or syphilitic in origin, whilst enteric ulcers are by no means confined to the ileum and jejunum. The ordinary form of simple ulcerative colitis, which is now much more prevalent than formerly, is probably microbic, although the organism has not been isolated. These cases usually run a chronic course, and may last many years. The treatment will vary according to the pathological condition and the severity of the symptoms.

1. The patient must be kept in bed and at rest, and as far as possible the open-air treatment should be adopted. There is as a rule no advantage in sending the patient to a sanatorium, and it will suffice to keep the windows open day and night.

2. Disinfectants of various kinds, chinosol for example, will be required, and in some cases it is advantageous to keep the patient constantly in a warm bath, the arrangements for which, even in a private house, usually present little difficulty.

3. An irrigation of borax, 10 gr. to the pint, should be given at a temperature of 80°, the patient being in the knee-elbow position. About 5 pints should be used, and, if introduced slowly by syphonage, is usually retained, although it may give rise to a little temporary discomfort. The injection should be used

twice a day for four days, so as to thoroughly wash away the accumulated mucus.

4. These preliminary enemata should be followed by high rectal injections of a 1 per cent solution of argyrol, introduced in the same way, and with the same precautions. They may be administered daily, or every alternate day.

Other modes of treatment which have occasionally been found useful, but not infrequently fail, are :—

1. Opium and morphine in all forms, whether given by the mouth, hypodermically, or by the rectum.

2. Carbonate of bismuth, in from drachm to ½-oz. doses, three times a day. No injurious effects follow the administration of these large doses, provided the specimen employed is free from impurity. Salicylate of bismuth in 20-gr. doses may be tried.

3. Astringents of various kinds, such as kino, rhatany, acetate of lead, perchloride of iron, and sulphate of copper.

4. Intestinal antiseptics such as β-naphthol, salol, resorcin, and various preparations of formic aldehyde.

5. Ipecacuanha, 20–30 gr. every six, eight, or twelve hours. No fluid of any kind should be given for at least two hours before each dose. The de-emetinized ipecacuanha varies much in composition and is of doubtful efficacy.

6. Sulphate of sodium or sulphate of magnesia, 1–oz. doses in solution, in the morning. It may be repeated daily unless it increases the diarrhœa. In suitable cases it may be given three times a day, each dose being alternate with a 10-gr. dose of sulphate of quinine.

In every case much attention must be paid to dietary, and it is impossible to lay down definite rules on the point, as so much depends on the idiosyncrasy of the patient. As a rule, meat in all forms, soups, beef-tea, meat-essences, and other similar preparations increase the diarrhœa, whilst vegetables and fruit of all kinds are equally inadmissible; milk and lime-water, peptonized milk (peptonized either hot or cold), whey, white of egg, plasmon, arrowroot, peptonized milk-gruel, milk blancmange, rice pudding, rice cream, semolina pudding, and tapioca pudding are all useful. Barley-water and linseed tea are useful in allaying thirst, and contain a certain amount of nourishment.

With regard to operative procedures, those most commonly favoured are :—

1. A right-sided colotomy.

2. The establishment of an anastomosis between the ileum and the lower end of the colon.

3. Syphoning the vermiform appendix, and, after tying in a rubber catheter, irrigating the bowel from above with copious injections of normal saline solution at 100° F., allowing it to run out at the rectum. *William Murrell.*

COLLAPSE.—This condition differs from Shock, Surgical (q.v.) in that the vasomotor centres in the medulla are not exhausted as in shock, but are either temporarily paralyzed (as in the case of a blow in the abdomen), or are unable to maintain the blood-pressure on account of a sudden diminution in the quantity of circulating fluid in the blood-vessels (as in hæmorrhage). The best treatment in cases due to hæmorrhage is saline intravenous infusion, combined with the head-down position and bandaging the limbs. In sudden collapse, artificial respiration should be carried out until the patient has recovered.

J. P. Lockhart Mummery.

COLOTOMY (Colostomy).—By this is meant the formation of an artificial anus in some portion of the colon. Lumbar colotomy is practically never performed now, and the only operation is that through the abdominal wall. The usual procedure is that generally known as inguinal colotomy, in which

some portion of the sigmoid colon is used to form the artificial anus. The transverse colon or cæcum may be used in certain special cases, however, and the site of the opening will then vary accordingly.

Colotomy is now performed under the following circumstances: (1) To relieve obstruction; (2) As a preliminary to excision of the rectum in some cases; (3) To deflect the fæcal current in cases of severe and intractable ulceration of the lower bowel; (4) To relieve pain and discomfort in cancer, more especially in epithelioma of the anus.

The Operation.—With the usual antiseptic precautions an incision about three inches long is made in the left inguinal region, the centre of the incision being about half way between the umbilicus and the left anterior superior spine of the pubes. The muscles are split in the line of their fibres, and the peritoneum is opened. A loop of sigmoid flexure is then sought for and pulled out through the incision. If difficulty is experienced in finding the sigmoid flexure, the parietal peritoneum should be traced outwards with the fingers until the

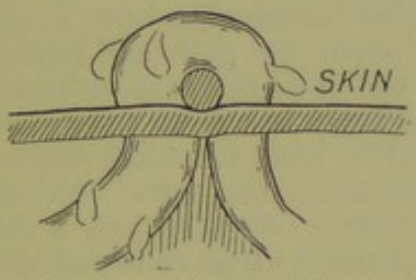

Fig. 1.—Diagram to show method of performing colostomy with a rod or clip.

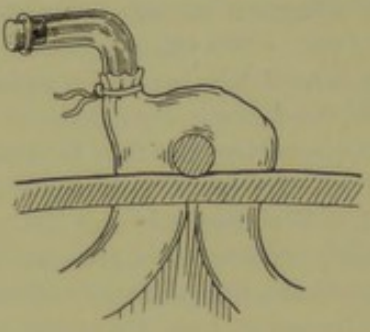

Fig. 2.—Diagram of colotomy, with a Paul's tube tied into the upper end of the bowel. Method used when bowel has to be opened at once.

bowel is found. The sigmoid flexure must be pulled out until the highest portion which can be made to reach the incision is found, and this should be used to form the spur, the rest being returned. A piece of glass rod or a clip is then pushed through the mesentery just beneath the bowel (*Fig.* 1), so that the ends of the rod will rest upon the skin on each side of the incision, and support the loop or knuckle of bowel outside the abdomen. Each end of the incision should then be partly closed by a stitch, which should also take up one of the longitudinal muscle-bands on the bowel.

The operation is now complete, and a small piece of sterilized protective or rubber sheeting should be placed over the projecting bowel, and the whole covered with the usual dressings. If it is necessary to open the bowel at the time of the operation, a Paul's glass tube (*Fig.* 2) should be tied into the projecting loop of bowel.

After-treatment.—At the end of twenty-four to forty-eight hours after the operation a cut should be made transversely into the bowel with a pair of scissors. If there is any bleeding it should be stopped by pressure. At the end of eight to ten days one blade of a pair of scissors should be passed along the hole in which the glass rod is lying, and the bowel cut completely in half, so as to release the rod; any projecting bowel can also be trimmed off. The bowel is quite insensitive.

In some cases where a permanent colotomy opening is to be established, the bowel may be made to traverse an opening between the superficial and deep muscles of the abdominal wall for a short way before being brought through the skin. This gives the patient rather better control over the opening than the ordinary method.

Results of Colotomy.—In old days a colotomy opening was often a source of much distress and discomfort to the patient. Now, with a good colotomy opening, the patient has practically no inconvenience whatever, and can keep himself as clean as if the bowels acted in the ordinary way. One of the writer's patients played football all one winter without the colotomy opening causing him any trouble.

J. P. Lockhart Mummery.

COMA.—Coma may be defined as that degree of unconsciousness so deep that we are unable, by any ordinary stimulus, to rouse the patient. In this respect it differs from sleep or stupor.

For the treatment of the comatose state it is essential that we should be able to recognize its underlying cause; and, to do this, we would suggest the following routine method of rapid examination, suitable for cases of coma to which we are called without any previous knowledge of the patient.

First, we enquire carefully into the previous history of the case, as to the patient's previous health, and as to whether the coma was sudden or gradual in onset, whether it was preceded by other symptoms, such as convulsions, headache, etc. We then proceed to examine the patient, feel his head for signs of injury, smell his breath, examine the pupils (noting their size, equality or inequality, and their reaction to light), and count the pulse and respirations. We observe whether the face is symmetrical or not, and whether there is conjugate deviation of the head and eyes in any direction. The optic discs should be examined. We then lift the limbs in turn and let them fall, observing whether there is any difference between the flaccidity of the two sides. We examine the abdominal and plantar reflexes on both sides. We then pass a catheter, draw off the urine, note its specific gravity, and test it for albumin and for sugar. Finally we note the temperature in both axillæ. And in certain cases we perform lumbar puncture and examine the cerebrospinal fluid.

We are now in a position to make a diagnosis as to the probable cause of the coma. And the first question we have to determine, is whether it is due to a general toxæmia, such as poisoning by alcohol, opium, diabetes, uræmia, etc., or whether it is the result of some gross intracranial lesion, such as hæmorrhage, meningitis, abscess, tumour, etc.

As a general maxim, it may be stated that if coma be toxæmic in origin, practically all the signs and symptoms will be bilaterally symmetrical. On the other hand, most cases of gross intracranial disease are either unilateral or asymmetrical, and will, therefore, produce a corresponding preponderance of symptoms on one side of the body, so that, in addition to the general phenomena of coma, we have a certain number of unilateral signs.

Let us consider the unilateral cases first. The commonest cause is that of spontaneous **Cerebral Hæmorrhage.** Here the onset of unconsciousness is generally sudden, the face is flushed or cyanosed, the skin sweats profusely, the breathing is stertorous, and the pulse is slow, full, and bounding. It is unnecessary here to recapitulate the various physical signs by which we assure ourselves that the patient is hemiplegic as well as comatose.

Most cases of spontaneous cerebral hæmorrhage occur in patients past middle age, in whom the arteries are no longer soft and healthy. And there is often a history of kidney disease, with its resultant cardiac hypertrophy and high-tension pulse. If the hæmorrhage be intradural, as is usually the case, the cerebrospinal fluid, even after centrifuging, is slightly tinged with blood, instead of being clear and limpid as in health. Cerebral hæmorrhage, however, may also, in rare cases, occur in young people with healthy vessels, as, for example, in a child during violent convulsions or in a paroxysm of whooping-cough, or in a patient suffering from one of the so-called "bleeding diseases":—purpura,

hæmophilia, leukæmia, etc. Cerebral hæmorrhage also occurs in many cases of general paralysis of the insane, and may be the first thing to call attention to that disease. The symptoms are similar to those of ordinary cerebral hæmorrhage, but we generally have a history of previous mental failure, grandiose ideas, loss of memory, attacks of emotional excitement, and a slight indistinctness of articulation. In the absence of such history, we may be unable to diagnose anything more, at the moment, than the mere attack of hæmorrhage.

In the treatment of the coma of cerebral hæmorrhage it is essential to keep the patient at rest. We should avoid lifting him about, even from one room to another. It is often advisable to improvise a bed in the room where the patient has been struck down. The patient should be laid with his head and shoulders slightly raised, and the face turned to one side, so as to prevent the tongue from falling back towards the pharynx. In this way stertor is diminished, a matter not only of some importance for the patient himself, but of comfort to his friends. An ice-bag should be placed on the scalp, over the probable side of the intracranial hæmorrhage. The bowels should be emptied as soon as possible. To attain this, we place a couple of minims of croton oil on the back of the tongue, and later, if necessary, assist matters by a simple enema. Careful and assiduous nursing is of the utmost importance, not only with regard to the prevention of bedsores, but to minimize the tendency to hypostatic congestion of the lungs. A water-bed is advisable in patients who are profoundly paralyzed. The bladder must also be watched, to prevent distension, and if necessary a catheter must be passed regularly. The patient should not have any stimulants administered, and, until the coma has passed off, food should be minimal in amount and confined to fluid articles. (See also APOPLEXY.)

The treatment of the various surgical conditions producing coma, such, for example, as traumatic "cerebral compression," brain abscess, or intracranial tumour, does not fall within the scope of this article.

But there are other varieties of coma due to organic intracranial lesions where the physician may often do something to relieve the symptom. Thus, for example, in cases of coma from **Meningitis,** we can occasionally restore the patient to consciousness by performing lumbar puncture and withdrawing some of the cerebrospinal fluid, which will be found under excessive pressure. (See MENINGITIS and LUMBAR PUNCTURE.) In more than one case of meningitis the writer has seen a patient, when apparently moribund, thus restored to consciousness. The procedure can be repeated several times if necessary.

The other class of comatose cases is due, not to any gross intracranial lesion, but to some general toxæmia poisoning the cerebral centres. In this group, the chief diagnostic point in differentiation from gross organic disease is the absence of unilateral signs.

In the coma of **Opium Poisoning,** with its excessive slowness of respiration, its pin-point pupils, its small, rapid pulse, and cold, clammy skin, we must at once endeavour to get rid of any poison that has not been absorbed, and to counteract by appropriate remedies that which has already gained entrance into the circulation. If the opium has been taken by the mouth, we wash out the stomach by means of a stomach-tube. If this is not available, we give emetics, such as sulphate of zinc, 20 gr. in water, or better still by the hypodermic administration of apomorphine hydrochloride $\frac{1}{10}$ gr. Having thus emptied the stomach, we next proceed to wash it out with a solution of potassium permanganate, 15 gr. to 8 oz. of water; and the patient should be stimulated by means of flipping the face and chest with a wet towel. When the coma begins to pass off (but not till then), we may walk the patient about. Hot

coffee should be administered either by stomach tube or by enema, and hypodermic injections of sulphate of atropine, $\frac{1}{20}$ gr., or of ether, may also be administered. If respiration threatens to fail, artificial respiration must be performed. (See also POISONING.)

The coma of acute **Alcoholic Poisoning** is rarely so deep as in opium poisoning. The breath smells of alcohol, as also do the stomach contents, whether vomited or obtained by gastric lavage. The stomach should be washed out and hot coffee then administered. Cold friction to the skin, energetic faradism, and even artificial respiration may be necessary.

Post-epileptic Coma requires no direct medicinal treatment. The patient will probably recover consciousness spontaneously. The important thing is to see that the patient is in a position in which he can breathe freely. Numerous epileptics have been drowned by falling into a shallow pool of water during a fit, lying there in the prone position and becoming asphyxiated during the period of post-epileptic coma. (See also EPILEPSY.)

In **Diabetic Coma,** where we have the characteristic condition of the urine (containing not merely glucose but also diacetic acid), it is necessary to administer alkalies freely, not only by the mouth, through the stomach-tube, but by hypodermic, or, better, by intravenous, injections of sodium bicarbonate or of sodium chloride. Carl v. Noorden recommends a 0·6 per cent solution of sodium chloride, and to this solution sodium bicarbonate may be added, to make it up to 3 per cent of the latter salt. The fluid should be warm, and a large quantity should be injected : 2½ pints at least. Such treatment usually relieves the coma, temporarily at least, though the condition is liable to relapse. (See also DIABETES.)

In **Uræmic Coma,** whether in acute or chronic renal disease, we must endeavour to eliminate the toxic substances by the skin and intestine. For this purpose we give diaphoretics, such as pilocarpine nitrate, ½ gr. hypodermically, or a hot pack or hot bath, whilst the bowels are induced to act by a couple of minims of croton oil placed on the tongue. Venesection and the withdrawal of 15 or 20 oz. of blood sometimes gives marked relief, and the abstraction of 1 oz. or more of cerebrospinal fluid, by lumbar puncture, has often a strikingly beneficial effect. (See also NEPHRITIS)

The coma of **Sunstroke,** frequently associated with extraordinary hyperpyrexia, is best treated by cold douches to the head and spine, and by cardiac stimulants, such as ether or strychnine, hypodermically. (See also SUNSTROKE.)

The coma of **Pernicious Malaria** is excessively dangerous, and, unless promptly treated, is likely to be fatal. There is no time here to wait for the absorption of quinine from the intestinal canal. We must give it hypodermically, into the muscles, or better, intravenously. Baccelli recommends a solution containing acid hydrochlorate of quinine 1 gram, sodium chloride ·075 gram, and distilled water 10 cc. Of this, half the quantity is injected at a time. If hyperpyrexia be present, cold baths must also be employed. (See also MALARIA.)

Purves Stewart.

COMPRESSED-AIR ILLNESS.—(See CAISSON DISEASE.)

CONGESTION, PULMONARY, and ŒDEMA.—This condition is associated especially with failing heart and renal disease. It is accompanied by the general signs of cardiac failure in other portions of the body, e.g., ascites, œdema of body, legs, etc. Often it supervenes as a last complication within a few days of death, and indeed it may frequently be looked upon as the beginning of the actual process of death. Hence failure to treat the condition successfully in a large number of cases.

Where there is a possibility of relieving the patient, the first point is to stimulate the heart. Cardiac stimulants should be vigorously pushed.

R	Tinct. Digital.	℥xv	Potass. Acetat.		gr x
	Inf. Digital.	℥ij	Aq. Chlorof.		ad ℥j

Every two hours for four doses, and then every three hours, watching the effect on heart and lungs.

Often it is difficult to give digitalis in sufficient doses owing to its irritant effect on digestion and the consequent incidence of vomiting and diarrhœa. In such a case strophanthus and caffeine form a good combination.

R	Tinct. Strophanth.	℥x	Aq.	ad ℥j
	Caffein.	gr ij		

Every two hours for four doses, and then every three hours.

This also needs careful watching, as the strophanthus tincture varies somewhat in strength, and patients react to it very unequally. Some preparation of strychnine may be added to either mixture.

If the arteries are somewhat hard (it is no use if they are actually calcified), and tension high, the addition of a small quantity of liquor trinitrini (1 min.) to the medicine is of help. Sometimes in such cases, strychnine and iodide of potassium relieve more than anything else.

R	Tinct. Nucis Vom.	℥v	Potass. Bicarb.	℥x
	Potass. Iod.	gr iij	Ammon. Carb.	gr iij
			Aq. Camph.	ad ℥j

Every four hours for six doses, then according to circumstances.

Alcohol.—If the temperature is not raised, it is, in my opinion, uncertain whether alcohol renders much service in these conditions. Very different conclusions are reached on this point from the same data. In a doubtful case it is well to try the effect of small doses of good brandy and be guided by the result. One thing is certain, that if alcohol does not do definite good in this condition, it is harmful.

Besides stimulating the heart directly, it is possible to help indirectly. Dry cupping or a few leeches to the thorax, or in extreme cases, bleeding from the median basilic or external jugular vein are advisable.

Collections of fluid in pleuræ and peritoneum should be carefully looked for, and if present in any quantity, slowly removed by paracentesis. Such a collection in the peritoneum is readily made out; in the pleura a comparatively large amount may easily evade notice, the side remaining resonant in spite of a considerable quantity of fluid, if the lung is not completely collapsed. If the fluid in one or both pleuræ be removed, it is remarkable how, temporarily at any rate, the heart regains control and œdema of lungs disappears.

Sometimes by altering the patient's position, or making him sit and sleep, or try to sleep, in a comfortable easy chair, much relief may be given to the lungs. The fluid tends to gravitate to some extent into the legs, where it is less mischievous than in the thorax. In many cardiac cases, where there is no renal complication, it is advisable to puncture the legs. This may be done either by means of Southey's tubes, or by multiple small punctures, the fluid being allowed to drain into sterile cotton-wool packed round the legs. Needless to say, the skin must be thoroughly cleansed, and the instruments used sterile. In renal cases there is such a tendency to acute inflammation of the skin that this proceeding is not advisable.

Diaphoretics.—These are sometimes successful in this condition. Such a stimulant diaphoretic as :—

℞	Sp. Æth. Nitr.		Sp. Armorac. Co.	āā ℥xx
	Sp. Ammon. Arom.		Aq. Chlorof.	ad ℥j

is worth trying, with or without the addition of powerful cardiac stimulants.

But if there be marked œdema of lungs, the stronger diaphoretic measures, such as hot packs, hot air baths, pilocarpine, etc., must be used, if at all, with great caution.

Diuretics.—The object aimed at is to lessen the quantity of fluid in lungs by increasing the amount of urine. It is only rarely that this measure succeeds, although it has often been observed that in the natural resolution of œdema of the lungs much urine is passed. It is, however, always worth a trial. The following is suitable :—

℞	Potass. Acet.	gr xxx		Sp. Junip.	āā ℥xxx
	Tinct. Scill.	℥xv		Decoct. Scopar.	ad ℥j
	Sp. Æth. Nitr.				

Three times daily.

Purgatives.—The most useful are the watery purgatives, magnesium sulphate, sodium sulphate, Carlsbad salts, and such waters as Hunyadi, Friedrichshall, Apenta, and the like, with an occasional dose of calomel.

Gustave Schorstein.

CONJUNCTIVA, DISEASES OF—

Conjunctivitis.—The essentials in the treatment of all conjunctivitis consist in (1) Ridding the conjunctiva of any specific germ, if present ; (2) Washing away the discharge and preventing its collection behind the closed lids ; (3) Keeping a careful watch on the cornea ; (4) Maintaining the health of the patient.

The chief danger in conjunctivitis is the implication in one way or another of the cornea—either ulceration, which may go on to perforation and loss of the eye, or cutting off the blood supply by intense swelling of ocular conjunctiva and episcleral tissue, supplemented by pressure of the swollen lids, which may lead to degeneration and even sloughing of the whole cornea.

Hence, in every case of conjunctivitis, the cornea must be thoroughly examined at the first visit, and a careful watch kept that the earliest sign of impairment be detected, from the point of view both of treatment and prognosis. In any case of doubtful nature, smear-preparations of the discharge should be taken, or a swab sent for laboratory investigation.

In examining the cornea, great care must be taken not to press on the lid, lest the surgeon himself cause the perforation of an ulcer which has already nearly penetrated. The skin of the lid should be dried and lifted with the thumb placed lightly close to the ciliary margin. If this is impracticable from the amount of swelling, a lid retractor may be used ; or if the patient is refractory and there is much blepharospasm, an anæsthetic must be given. (In using the retractor care should be taken not to touch the cornea with the instrument, lest an abrasion be caused, which may be the starting-point of an ulcer. If a retractor is not at hand, the loop end of a sterilized hairpin bent round, makes a handy and useful instrument.)

Applications are made to the conjunctiva of varying strengths, suitable to the nature of the inflammation, combined with frequent irrigations with some bland solution, to wash away the discharge. The lid margins are moistened with ointment to prevent their sticking together, and to allow the discharge to escape. *No bandage should be used*, but the eyes are protected by a shade, or dark glasses. If the discharge is profuse, and the lids are so swollen that they cannot be everted, the external canthus must be divided to allow applications

being made right up to the fornix. This is easily done with one snip of a strong pair of sharp scissors, of which one blade is passed into the conjunctival sac, the other being outside. The cut is made straight through, from skin to conjunctiva, in the line of the external palpebral ligament. The resulting scar soon becomes quite invisible.

If corneal ulceration occurs, atropine is given, and our treatment of the conjunctiva must be still more assiduous. If necrosis of the cornea sets in, eserine, 2 gr. to the ounce may be given as a corneal stimulant, and if there is much chemosis, and the swollen lids are pressing unduly and impeding the circulation, division of the external canthus is also called for.

Tonics are ordered if necessary, and plenty of fresh air. Even in the milder cases, close work of all kinds is prohibited, and the patient is told to avoid all dust and smoke.

To prevent the spread of the infectious forms of conjunctivitis, strict injunctions must be given that no one but the patient uses his towel, sponge, etc., and that such articles, and handkerchiefs, are carefully disinfected.

In the severe forms of infective conjunctivitis, where one eye alone is attacked, the other must be protected at once by a glass shield (Buller's shield).

Nitrate of Silver.—Of the various silver salts used for painting the lids, silver nitrate is the most efficacious in cases of severe conjunctivitis associated with purulent discharge. Protargol and argyrol cause less pain, but their curative effects are not so thorough.

A few hints as to the method of applying silver nitrate may be of value :—

1. A stronger solution than 2 per cent should not be used. One light application of this strength is generally sufficient, but if a greater effect is desirable, any degree of cauterization can be obtained by mopping the conjunctiva after the first application and painting again, and so on, till the required effect is produced. With the stronger solutions, too great an effect may be obtained at the first application. After using the 2 per cent solution, it is not essential to neutralize with salt solution. The excess should be mopped up, keeping it as much as possible from the cornea, and the eyes should then be bathed with boracic lotion.

2. The stick of pure nitrate of silver should *never* be used in conjunctivitis.

3. When the discharge is profuse, the eyes should be painted once a day ; in very exceptional cases twice a day, but never more frequently. *A second application should never be made till the slough produced by the preceding painting has come away.*

4. Silver nitrate should never be used (*a*) in membranous conjunctivitis, when the membrane is adherent and cannot easily be wiped off ; (*b*) When there is brawny infiltration of the lid, lest the caustic produce a deep necrosis of the tissues of the lid.

5. As the discharge diminishes, the applications must be correspondingly less frequent, and when it has ceased, painting must not be made more than once or twice a week, the conjunctiva being brought back to its normal condition with zinc chloride (1 gr. to the ounce), zinc sulphate (2 gr. to the ounce), or copper sulphate (1 or 2 gr. to the ounce).

6. The best way of applying the solution is with a cotton-wool mop, made by twisting a little wool round the drawn-out end of a small glass rod. Be sure that the end of the rod is quite smooth and rounded. The projecting portion of wool makes a soft brush, which can easily be removed and renewed. A fresh one is used for each eye. (A camel-hair brush is not so aseptic, and the quill is apt to scratch the cornea when painting out the fornix, so important in gonorrhœal conjunctivitis.)

The effects of too frequent or too strong applications of silver are sloughing of the lids, and a grey-white opacity or even destruction of the cornea. Too

prolonged use of silver causes permanent greyish or brown staining of the conjunctiva.

Gonorrhœal Conjunctivitis and Ophthalmia Neonatorum.—Though many cases of ophthalmia neonatorum are not due to gonococcal infection, the treatment is identical in the two cases.

Every man or woman with gonorrhœa should be warned of the risk of acquiring conjunctivitis, and in order to avoid this, be instructed how to maintain the necessary cleanliness (e.g., by not washing the face in the bath, using a special face towel, care with regard to the sponge, etc.), since this disease in adults often runs a very serious course, and may lead to the loss of one or both eyes, even in spite of treatment. Also those attending to these cases must realize the importance of absolute cleanliness, and of disinfecting or destroying everything that has come in contact with the discharge.

In ophthalmia neonatorum, prevention is better than cure. (1) The baby's face and lids should be carefully wiped directly the head is on the perineum. (2) After the child is born the eyes should be well washed with a sublimate solution, 1–2000. (3) If there is any suspicion that the case is not a clean one, a drop of a 2 per cent solution of silver nitrate should be dropped into each eye in addition to the above treatment. (4) As soon as there is any sign of inflammation, treatment should be begun forthwith.

Constitutional Treatment.—This is very important; the general health must be maintained with generous diet, and tonics and stimulants if necessary, and in the case of adults, the depressing influence of the disease should as far as possible be alleviated.

Local Treatment.—If one eye only is affected, the other should at once be protected with a Buller's shield, great care being taken in adjusting it, so that the plaster is made to adhere very firmly down the nose. The chief danger of the complaint being ulceration and perforation of the cornea, a thorough examination must be made at the first visit (see above, CONJUNCTIVITIS), and also later from time to time.

In the first stage (infiltration) when there is brawny infiltration of the lids, or membrane adherent to the conjunctiva, *silver nitrate must not be used*, but instead, cold compresses, and frequent irrigation* with mild antiseptics, such as sublimate solution, 1–10,000. In adults, leeches may be applied to the temples if there is much pain.

As soon as the second stage is reached, the discharge thoroughly established, and the brawny condition of the lids has subsided, painting with 2 per cent solution of nitrate of silver must be begun, combined with very frequent irrigation. The painting should be done once a day, or, where the discharge is very profuse, twice a day. A second application must not be made until the slough produced by the preceding painting has come away. The wool swab should be introduced right up to the fornix, great care being taken not to injure the cornea either with swab or finger nail. If there is so much swelling of the lid that painting cannot be carried out, and the discharge cannot get away, the external canthus should be divided. The irrigation with sublimate solution, 1–10,000, should be carried out every hour during the day, and every two hours during the night, either with a small gutta-percha syringe or with swabs of wool soaked in the lotion. All discharge is scrupulously washed away, and the lid margins moistened with ointment to prevent sticking.

* A useful plan, if complete nursing is not available, is for the patient to have a bowl of cold lotion, with rounds of lint soaking in it, placed on the right side of the bed, and an empty bowl on the left side. A cool round is taken from the right bowl, applied to the eye, and, as soon as it is warm, placed in the left bowl and replaced by a fresh one.

As soon as the discharge has ceased, painting must be stopped and replaced by astringent drops (e.g., zinc chloride, 1 gr. to the ounce), or the application of the copper sulphate stick.

Complications.—(1) Corneal ulceration. Silver is not contra-indicated, but neither zinc chloride nor copper sulphate should be used. Atropine ointment, 4 gr. to the ounce, should be inserted between the lids twice a day, and still greater care must be used in manipulation, to prevent perforation. While there is purulent discharge, even if there is infiltration of the ulcer, perforation, or prolapse of the iris, nothing in the way of operation can be done until the conjunctival sac is clean. (For later treatment see CORNEA, DISEASES OF.

(2) If there is intense swelling of the lids and conjunctiva, and the cornea becomes grey and hazy from cutting off of its blood-supply, the external canthus should be divided to relieve pressure, and eserine drops, 2 gr. to the ounce, instilled twice a day to try to improve the nourishment of the cornea. (See also GONORRHŒA.)

Acute Catarrhal Conjunctivitis—The most severe cases of acute catarrhal conjunctivitis should be treated in the same way as gonorrhœal cases (q.v.). In the milder forms, it is not necessary to keep patients in bed; they are better for being up and getting all possible fresh air, the eyes being protected with dark glasses and a shade. The conjunctiva should be painted once a day with 2 per cent silver nitrate, or 30 per cent protargol, so long as the discharge is profuse, and the conjunctival sac be washed out four times a day with sublimate solution 1–10,000 (more often if the discharge is very profuse), boracic ointment being smeared along the edges of the lids, especially at night.

When the discharge has ceased, chloride of zinc drops, 1 gr. to the ounce, should be used three times a day, and the silver discontinued.

If ulceration of the cornea occur in the acute stage, atropine ointment, 4 gr. to the ounce, should be inserted between the lids, in sufficient quantity to keep the pupil well dilated. Ulceration is no indication to stop the use of silver, but the ulcer itself should only be painted if it is infiltrated, and then very lightly. The cornea should be carefully protected from the silver if necrosis is threatened. While there is discharge a bandage must not be used even if ulceration be present. Cauterization with actual cautery or pure carbolic is of no use in the presence of septic discharge, but if the ulcer remains infiltrated after the discharge has ceased, cauterization may be of great service. (See CORNEA, DISEASES OF.)

Chronic Catarrhal Conjunctivitis.—In all forms of chronic inflammation of the conjunctiva the refraction should be tested as a routine measure, and the correcting glass worn constantly. It is striking how even cases due to trachoma improve if the refractive error is corrected. The general health of the patient should be attended to, and avoidance of dust and smoke be enjoined.

Locally, if there be discharge, lightly painting with 10-gr. silver nitrate solution, or 30 per cent solution of protargol, is useful. If small yellowish-white concretions are seen in the conjunctiva, these should be picked out with a needle, after anæsthetizing with cocaine and a drop of adrenalin. Astringent lotions, such as zinc sulphate (1 or 2 gr. to the ounce), zinc chloride (1 gr. to the ounce), weak alum, or tannin solution also are of service; these should be used three times a day, but not the last thing at night. Before going to bed a mild ointment of boracic acid, or yellow oxide of mercury, ½ per cent, may be smeared along the edges of the closed lids to prevent their sticking.

In *angular conjunctivitis*, zinc sulphate, 2 gr. to the ounce, is generally the most useful lotion, but this often acts better combined with occasional painting with protargol or nitrate of silver.

Follicular Conjunctivitis.—The recognition that the conjunctival condition

is only a local manifestation of a general tendency to lymphatic overgrowth, shown elsewhere by adenoids, large tonsils, etc., is of the first importance in successful treatment. Fresh air, good simple food, and tonics, especially iron and cod-liver oil, are indicated. The refraction should be carefully tested, and the correcting glasses worn regularly (especially in cases of hypermetropia and astigmatism). Locally, zinc chloride, 1 gr. to the ounce, is found most useful in the chronic condition, while if there is discharge, painting with protargol or silver twice a week is advisable till this ceases.

Follicular enlargement is often found associated with the more acute inflammations of the conjunctiva, especially acute catarrhal conjunctivitis. The combination of these two conditions at times may closely simulate trachoma. The importance of making a correct diagnosis cannot be over-estimated.—PHLYCTENULAR CONJUNCTIVITIS.—See CORNEA, DISEASES OF.)

Membranous and Diphtheritic Conjunctivitis.—Membranes on the lids are met with fairly commonly in severe conjunctivitis, apart from diphtheria, and cases can be conveniently divided into two groups:—

1. *Those in which the Membranes can easily be wiped off without leaving a Bleeding Surface.*—These should be treated as cases of acute catarrhal conjunctivitis (q.v.), but till the membrane disappears, solutions of nitrate of silver must be used sparingly, and if fresh membranes form which remain adherent, it must be altogether withheld.

2. *Those in which a tough Membrane is adherent, and if pulled off leaves a Bleeding Surface.*—These should be treated as diphtheritic till *the result of bacteriological examination is known*—a procedure of the utmost importance, both in making a correct diagnosis and in the after-treatment.

The patient must be isolated, and precautions against the spread of infection taken. If only one eye is affected, the other must be protected by a Buller's shield. As in other forms of diphtheria, antitoxin is our first line of defence; and since the disease is usually very severe, the cornea becoming rapidly and irredeemably affected, when diphtheria is suspected, antitoxin should be injected without delay.

General Treatment is the same as in diphtheria elsewhere. The patient's health must be kept up with plenty of food, stimulants being given if necessary. Rest in bed is essential. The heart must be regularly examined, and great care taken to avoid cardiac failure.

Locally, the chief danger being ulceration or necrosis of both cornea and lids, we have to maintain as far as possible the circulation in the conjunctiva, episcleral tissue, and lids, and our manipulations must be as gentle as possible.

In the first stage, when the lids are brawny and tense, hot compresses must be used continuously in the severe cases, and the discharge washed away with frequent irrigation of the conjunctival sac with a gutta-percha syringe, gently inserted between the lids at the internal canthus, some bland fluid such as boracic lotion being used. No silver nitrate or any caustic must ever be used in this stage. If the lids cannot be easily everted, they should not be forced open beyond the degree necessary to make a diagnosis and allow the discharge to come away freely. When the second stage has been reached, the lids have become soft, the membrane has come away, and the discharge is free, a 2 per cent solution of silver nitrate may be used once a day for painting the lids, so long as the discharge lasts (see above, CONJUNCTIVITIS).

When antitoxin cannot be secured, quinine lotion (sulphate of quinine, 4 gr. to the ounce, dissolved with the smallest possible quantity of dilute sulphuric acid) should be used to irrigate the conjunctival sac, four times a day.

Even if the cornea is affected, little more can be done. In the case of ulceration, we must be still more gentle in our manipulations, and atropine ointment should

be inserted between the lids twice a day. Where the cornea becomes grey without ulceration, and necrosis is threatened, some prefer eserine ointment, 2 gr. to the ounce.

If in the treatment of severe cases the lids tend to become adherent to the ocular conjunctiva (symblepharon), the two must be kept apart during the healing process by daily passing a glass rod round as far as the fornix, and oily applications should be used, such as castor oil or vaselin.

Trachoma.—The contagious nature of this serious disease is not, as a rule, sufficiently realized either by the patient or his friends. Warning on this point, therefore, should be impressive, considering the pain and discomfort the disease causes, its long duration, and its menace to sight. Towels, handkerchiefs, sponges, and flannels should be rigidly kept for the patient alone. Few cases, if treated regularly, get well in less than six months : many, owing to neglect, last a lifetime; hence perseverance on the part of both doctor and patient is an all-important factor in successful treatment.

The chief dangers of the disease are :—

1. Pannus and ulceration of the cornea, leading to opacities and consequent impairment of sight.

2. Scarring of the lids, leading to entropion and trichiasis (which latter again leads to more ulceration and opacity of the cornea).

3. Shrinking and xerosis of the conjunctiva.

These are late signs, and occur when the disease has lasted many months: our object must, therefore, be to get the disease under control before they have occurred. The treatment of these conditions will be mentioned later.

The health of the patient should be well maintained. The eyes should be protected from glare, dust, and wind, with large tinted glasses, and as in all cases of chronic inflammation of eyes and lids, the refraction should be tested when possible, and if there is any error, the correcting lenses in neutral tint should be worn.

Acute Cases.—Occasionally in the early stages there is a considerable amount of swelling of conjunctiva and lids ; sedative treatment should then be adopted, e.g., hot boracic bathing four or five times a day, and mild applications of silver nitrate solution, 5 gr. to the ounce, once a day. But when the acute symptoms have subsided, the conjunctiva must be vigorously treated with astringents.

Chronic Cases.—(1) Where florid granulations exist, these should be expressed with either Grady's or Knapp's forceps. This is a very valuable but painful procedure, and should be carried out either after thoroughly cocainizing the conjunctiva with powdered cocaine, or under a general anæsthetic, preferably the latter. After everting the lids, all the granulations are thoroughly broken down and removed by squeezing between the forceps. (The eyes of both surgeon and assistants should be protected by glasses during expression to prevent contagion.) After expression, soothing applications may be made for a day or two, followed by energetic astringent treatment.

(2) When the conjunctiva is velvety, and there are no granulations (or any existing granulations have been expressed), regular painting must be carried out three times a week, or in severe cases every day, either with a 2 per cent solution of nitrate of silver, the copper stick, or a 2 per cent solution of perchloride of mercury in glycerin—the latter is painful but is often very efficacious. The patient has his conjunctival sac well washed out with sublimate solution, 1–8000, four times a day, and the edges of the lids smeared with boracic ointment, 1 dr. to the ounce, at night, to prevent the lids sticking together.

(3) When scarring has begun, daily application with the copper stick is by far the best remedy, and this should be continued till all traces of hypertrophy

of the conjunctiva have disappeared. Where such frequent applications of copper either cannot be made or are unnecessary, the patient may use copper sulphate drops, 2 gr. to the ounce, twice a day, in addition to the sublimate lotion.

Pannus.—This usually gets well with the above treatment of the lids; when it is severe, atropine should be given, either by itself as drops or ointment, or in combination with the copper drops. If it persists, it may need special treatment with jequirity, the jequiritol serum, X rays, or peritomy.

Ulceration of the Cornea must be treated on ordinary lines. (See CORNEA, DISEASES OF.) Atropine should be given, but neither the copper stick nor the solution of sublimate in glycerin should be used. Nitrate of silver, on the other hand, is not contra-indicated.

For treatment of entropion and trichiasis, see EYELIDS, DISEASES OF.

For shrinking and xerosis of the conjunctiva little or nothing can be done beyond trying to relieve the patient by bland oily or mucilaginous applications, such as parolene.

Spring Catarrh.—Treatment in this condition is of little avail: most good is obtained by the use of dark glasses, and of mild astringent lotions combined with adrenalin, e.g., boracic acid 10 gr., zinc sulphate ½–1 gr., adrenalin solution 1 in 1000) 1–2 dr., water to the ounce.

Xerosis of the Conjunctiva.—

1. Little can be done for those cases associated with severe disease of the conjunctiva (trachoma, pemphigus, etc.), beyond giving oily or mucilaginous preparations.

2. Cases of xerosis associated with degeneration of the cornea (keratomalacia), in marasmic children chiefly need treatment for the general condition, and locally hot applications to improve the nourishment of the cornea, boracic bathing, and eserine drops, 2 gr. to the ounce.

3. Cases in which neither conjunctiva nor cornea is severely affected need only general feeding up, fresh air, attention to the digestion, and maltine and cod liver oil.

Burns and Scalds of the Conjunctiva (Caustics, etc.).—The chief dangers are ulceration, sloughing of the cornea, and symblepharon.

The conjunctival sac must be washed free from all irritating substances. Great gentleness should be exercised, only warm bland fluids, such as boracic or normal saline lotions, being used, both for this and for washing away the discharge. If *acid* has burnt the eye, a solution of sodium bicarbonate, 5 gr. to the ounce, is useful at the first washing, to neutralize it.

The eye must be kept scrupulously clean, and the discharge prevented from collecting behind the lids by frequent irrigation. If the cornea is in danger from pressure of the lids on the swollen conjunctiva, or if the eye cannot be kept properly clean owing to tense swelling of the lids, the external canthus should be divided. Rounds of lint, which have been soaked in hot boracic lotion, just laid over the eyes are very comforting. In severe cases the patient should be kept in bed.

If there is any ulceration of the cornea, iritis or cyclitis, atropine ointment, 2 or 4 gr. to the ounce, should be used, sufficient to keep the pupil well dilated. If the cornea is in danger of sloughing, eserine ointment, 2 gr. to the ounce, may be tried. If the opposing surfaces of palpebral and ocular conjunctiva are ulcerated, adhesions (symblepharon) are very liable to occur. These must be prevented by passing round daily a smooth-ended glass rod right into the fornix, and by using oily non-irritating applications, e.g., atropine ointment, when atropine is indicated, or pure soft vaselin. (Boracic ointment is almost always irritating to the conjunctiva.)

Tumours of the Conjunctiva.—*Dermoid Tumours* are excised, the conjunctiva being brought together as far as possible over the resulting wound.

Papillomata and *Polypi* are snipped off right to their base; this is then cauterized with either the platinum loop or with a sharply pointed stick of nitrate of silver.

Granulations are treated in a similar manner, and if associated with a chalazion which has ruptured, the latter must, of course, be scraped out at the same time.

Epithelioma and *Sarcoma* are very rarely met with, but must be removed thoroughly, allowing a wide margin. *W. Tindall Lister.*

CONSTIPATION, HABITUAL.—The prevention of **Atonic Constipation** must be sought by inculcating regular habits, insisting on the necessity for taking food which contains a due proportion of cellulose, and on the importance of daily riding or walking exercise, which is perhaps the best natural stimulant of intestinal peristalsis. The importance of green vegetables and fruit as articles of diet is constantly overlooked, so that they form no regular part of the dietaries of children at school or of the inmates of many institutions, while they are regarded as superfluous by a large part of the people, who from motives of economy and time, as well as from not understanding their importance, do not give themselves the trouble to provide them. The importance of daily exercise is more generally admitted, and happily, with a large part of our population, a sufficient amount of walking is still inevitable.

The *Special Diet* that should be used by persons with a tendency to constipation should include either porridge or brown bread, and uncooked fruit or uncooked vegetables, such as salads and cresses, with each meal; where these articles of food cause indigestion, it may be impossible to persist in their use, but we may content ourselves by substituting well-cooked green vegetables and stewed fruit, such as pears, apples, figs, and plums.

It is also probable that many constipated persons drink too little water, and that it may be actually necessary to prescribe a certain amount to be drunk in the course of the day, although it should not be hard water. Constipated persons should not drink milk with their meals, and China tea may with advantage replace the more astringent varieties from India and Ceylon.

Of the places at which mineral-water cures for the treatment of constipation may be obtained, Marienbad unquestionably stands first. Its waters belong to the group of sulphated alkaline waters, and contain sulphates, chlorides, and bicarbonate of sodium, with free carbonic acid gas. Of the group of mineral water stations near Frankfort, Homburg is the most popular. There are several springs at Homburg, of which those used for intestinal troubles contain chiefly sodium chloride, with chlorides and carbonates of the alkalies and alkaline earths. These waters do not contain salts which are generally regarded as purgative, but in the quantities given, their action is effective. Kissingen is no longer fashionable with English people, but its waters are suitable for the treatment of constipation; they contain chiefly chlorides of the alkalies with carbonic acid gas.

The waters of Harrogate are beneficial in chronic constipation, but the type of person who derives most benefit from them is the obese, full-blooded, gouty patient of middle or past middle age, and harm may be done to delicate people. The waters contain chiefly common salt, with a little sulphate of soda and a large amount of sulphuretted hydrogen. Cheltenham waters are highly suitable for the treatment of constipation, as many of the springs contain sulphate of magnesia, sulphate of soda, and common salt; in some respects they compare favourably with the foreign waters which have been mentioned; but the wave of fashion has receded temporarily from the Gloucestershire Spa.

Although nothing is really equal to the natural exercise of riding and walking, yet, where from age or obesity these become difficult, or there is want of will to persist, they may be in part replaced by passive exercises. Abdominal massage, alone or combined with electricity, either by making the hand an electrode, or by giving a short faradic sitting after or before the massage, or the mechanical kneading of the abdomen performed by a machine in a Zander Institute, such as exist at most foreign spas, helps to stimulate peristalsis. Electricity may also be applied by a large flat electrode over the abdomen, through which a slowly interrupted galvanic current of from 5 to 10 milliampères may be passed for ten or fifteen minutes.

Some patients find benefit from the application of a wet abdominal compress worn for some hours.

The Drugs prescribed for constipation are so numerous that it is impossible to name them all; it will be sufficient to draw attention to those which are most used. It is desirable that an aperient should be one which can be taken for a long period of time without doing harm, and therefore one would not include under this head such drugs as the preparations of mercury, which, although very useful for clearing out the bowel when it may be desirable to do this, are obviously not suitable for daily use. It is also desirable that the aperient used should be one which can be easily regulated, mild in its action, and equal in its effects, so that a given dose may be relied upon to produce only a known effect. On the whole, mineral waters, or the salts which constitute the purgative base of these waters, best fulfil these requirements; but many delicate invalids, especially neurasthenics, find saline aperients depress them. Of these aperients the sulphate of soda is the most pleasant, and is as trustworthy as its less palatable rival, sulphate of magnesia. The plain sulphate of soda may be given, dissolved in a small quantity of hot or cold water, with directions to sip it slowly either before getting out of bed, or directly after rising in the morning. A pleasant modification is to use the effervescing form of the powder, but it should be sipped slowly in the same way as the plain salt. The principal mineral waters containing sulphate of soda are Carlsbad, Rubinat, and Condal. The quantity of sulphate of soda to be taken must be regulated by the requirements of each case; about a teaspoonful is usually the best dose to begin with, or a wineglassful of the mineral water.

Phosphate of soda is a mildly aperient salt, which is also sold in an effervescing form; the dose and mode of administration are the same. Sulphate of magnesia, from its bitter taste, is not so popular, but is a very effective aperient, and can be obtained as an effervescing powder. Seidlitz powders are still liked by many patients, although their action is rather uncertain, and apt to cause sharp purging. This is probably due to the addition of sulphate of magnesia to heighten their effect. The proper Seidlitz powder should contain only sodium potassium tartrate (Rochelle salt) and sodium bicarbonate with tartaric acid.

The vegetable aperients most in favour are the various preparations of senna, cascara, and aloes. Senna is the mildest and, perhaps for that reason, the most popular of these drugs, but has acquired, not altogether with justice, a reputation with the profession for causing griping, which seems only to occur when it is used in large doses; it forms the principal ingredient in the compound liquorice powder (pulvis glycyrrhizæ compositus) and the official confection and syrup. The official preparations are all made from the leaves, but the legumes or pods also contain a purgative principle, and are somewhat extensively used at the present time. Many patients find that a cold infusion of from eight to ten of the pods in 3 or 4 oz. of water taken every night at bedtime is a very efficient remedy; or a few of the pods may be stewed with prunes, and then

picked out, the prunes and accompanying syrup forming an agreeable mild aperient. The well-known syrup of figs is said to owe its efficacy to a watery extract of senna pods.

The various preparations of cascara sagrada act more powerfully. The liquid extract has a strong bitter taste, which is covered with difficulty by syrup and aromatic drugs. It is, therefore, preferable to prescribe it in capsules or pills. The dose of the dry extract is from 2 to 8 gr., and it may be given every night at bed-time ; or in obstinate cases, three times a day before meals.

Aloes in its various preparations, especially aloin, is a favourite remedy with many practitioners, and forms, as is well known, the active principle of a large number of pills, in combination with nux vomica or strychnine and belladonna. The dose and modes of administration are so well known that they need not detain us.

Phenol-phthalein is a comparatively recent addition to our stock of aperients, and has had the advantage of a good deal of advertisement ; it is regarded by some practitioners as an excellent remedy, but is still on trial ; the dose is from ½ to 10 gr.

Sulphur is a good laxative, its action being mild and certain, but it has the disadvantage of causing offensive stools. It is contained in the compound liquorice powder to which reference has been made. It is often given in the form of the official confection (confectio sulphuris) either alone or with an equal quantity of the confection of senna. The tabloids of guaiacum and sulphur, recommended some years ago by Sir Alfred Garrod, are frequently employed on account of their slight laxative action. A similar combination exists in the well-known Jephson's powder, which is composed of two parts of precipitated sulphur and one part of powdered guaiacum, of which the usual dose is a teaspoonful ; it is a rather powerful laxative, although harmless, and may be taken suspended in milk.

Castor oil is well known for its mild and certain effect, but its nauseous taste is an objection to its frequent use ; although nothing is better when it is desirable to get the bowels to act after they have been confined for some days ; under these circumstances a dose of ½ oz. or 1 oz. is required. Small doses may be given in capsules ; in the constipation of old people it acts very well, in doses of ½ dr. to 1 dr. A better way of giving it is with an equal quantity of glycerin, taken either at bedtime or the first thing in the morning ; this mixture is not unpleasant to take, but can be ordered in capsules if preferred. A powdered form of castor oil, pulvis olei ricini, has been introduced quite recently ; it is nearly tasteless.

Enemata have never become such popular remedies for habitual constipation in this country as on the Continent, a belief being generally entertained that they ultimately weaken the action of the bowel. Their utility is fully recognized by the profession as a means of emptying the lower bowel in all cases where we are in doubt as to the diagnosis, or suspect the presence of local ulceration, and desire to unload the bowel in the gentlest manner, or where there is an accumulation of inspissated fæces which cannot be expelled. Enemata should be employed in the constipation of typhoid fever, or whenever the patient is very weak, as their action is mild and confined to the lower bowel. Larger enemata can be given, and not uncommonly, copious irrigations are used in the hope of filling the whole of the colon with fluid, and so modifying its contents. Enemata often cause considerable pain, and should, therefore, be given slowly, the quantity being regulated by the feelings of the patient. The use of a long tube passed up the bowel beyond the region that can be explored with the finger is not recommended ; if employed, the tube should be of soft rubber like a stomach-tube, but of somewhat greater diameter, and it should be introduced without the use of any force, and never where there is reason to think there may be

ulceration of the bowel; it is a method which always has in it some element of danger, and is rarely, if ever, necessary. An enema should consist of from ½ to 1½ pints of fluid; this may be plain soap suds or thin gruel, and to either of these bases may be added 1 oz. of castor oil or glycerin, or 1 oz. of castor oil with ½ oz. of turpentine. The temperature of the enema should be about that of the body. Large enemata of olive oil are sometimes used for softening masses of fæces. Rectal injections of glycerin by means of a vulcanite syringe, the quantity used being about ½ oz., are a popular and effective means of producing an action of the bowels.

The use of all means that involve the introduction of a syringe are obviously inapplicable in cases where there is a tendency to piles, and very frequently after they have been employed for a few days the local disturbance causes so much soreness, that in spite of gentleness and care, other methods of acting on the bowel have to be employed; but this rarely occurs where the enema is only used once every two or three days and is not continued for more than a few weeks.

In the treatment of **Spasmodic Constipation** it is necessary to avoid those articles of food previously recommended, on account of their containing a certain proportion of indigestible cellulose in the shape of fibre, seeds, and membrane, which stimulate the muscular coats of the bowel. We must forbid the use of porridge and brown bread, uncooked fruit and raw vegetables, such as salads and cresses, and order even cooked fruit which contains seeds and skins, to be passed through a hair sieve. As these cases are invariably associated with neurasthenia, the hygiene and mode of life should be so regulated as to improve the general health. This is undoubtedly best effected by change of scene, with residence in a bracing place; but if the case is too far advanced to benefit by these means, a complete rest cure of at least three months' duration should be carried out. During this period, general massage of the trunk and limbs is desirable; but abdominal massage does more harm than good, and if permitted at all must be of the very gentlest kind. Gentle rubbing of the abdomen with the hand sometimes seems to relieve pain, but it must be cautiously carried out. Electricity, if employed at all, must only be used in the shape of a weak galvanic current applied by means of a flat electrode large enough to cover the whole of the abdomen. Abdominal compresses and fomentations give relief, and their use may be combined with the rest cure.

The drug to be tried is belladonna in the form of tincture, 5 to 10 min. two or three times a day, or of extract in pills ⅓ to ½ gr. before each meal, and it may be combined with menthol, ½ to 1 gr. for each dose.

Olive oil may be given by the mouth in keratin-coated capsules containing ½ to 1 dr., or in doses from a teaspoonful to a tablespoonful, half an hour before meals. Castor oil, alone or combined with glycerin, may be given by the mouth, or glycerin enemata by the bowel. Large olive oil enemata at the temperature of the body are very soothing to the bowel, as well as effectual in overcoming this form of constipation. *Robert Saundby.*

CONSTIPATION IN CHILDREN.—In infants, even when at the breast, constipation is a common trouble. It may be due to deficiency of sugar or fat in the milk, to excess of proteids, or to improper feeding generally, which burdens the alimentary canal with a large and undigested residue, and excites a mild catarrh of the bowels. Regulation of the diet should, therefore, be the first step in the treatment. A nursing mother should be instructed not to put her child to the breast too often or to quiet it by that means whenever it cries. With hand-fed infants, measures should be taken to prevent a too firm clotting of the curd of the cow's milk by the addition of a third part of fresh barley water,

or by adding to each ounce of the milk one or two grains of citrate of soda, as in Sir A. E. Wright's method, recommended by Dr. Poynton. Sufficient variety in the diet is to be insisted upon (see VOMITING IN CHILDHOOD), and if there be any want of sugar or fat in the food a teaspoonful of fresh syrup or cream can be added to the bottle or given pure after the meal two or three times a day.

Costiveness may result from dryness of the stools owing to too little fluid in the food. If this be the case, see that the food is not made too thick, and it is well to supplement the meals by some plain water or barley water. This is especially necessary in warm weather, when the skin is acting freely. A stint of water is often shown by diminished secretion from the kidneys and the appearance of sand in the urine. In the summer young children love water, and will drain a whole feeding-bottle full if allowed to do so. Therefore, if the urine be scanty and high coloured, and especially if sand be found on the diaper or at the bottom of the chamber pan, four or five ounces of cold water (boiled and filtered) should be allowed between meals several times a day. By this means the bowels can often be made regular in a very short time.

Any cause which is sufficient to set up a mild catarrh of the bowels will induce constipation in a young child, for the increased mucous secretion covers the fæcal masses with a slimy coating, so that the muscular wall, in its contractions, slides ineffectually over their surface. For this reason short-coating an infant is often a cause of constipation. As long as the catarrh continues a cure cannot be effected; therefore attention must be paid at once to the child's clothing, his bath, and his general management, so that any error may be righted without delay.

However induced originally, constipation cannot continue long without adversely affecting the peristaltic movement of the bowels. The colon becomes accustomed to be overloaded, and its contents no longer have a stimulating effect upon its lining membrane, so that the muscular contractions begin to flag. In badly nourished infants this sluggishness of movement is combined with actual weakness of the muscular walls; and if to this be added dilatation of the bowel from accumulated fæcal matter and gas, the expulsive force left at the disposal of the patient is small indeed.

For the successful treatment of constipation in the infant this cause of sluggishness of bowel must be kept in mind, and the administration of drugs should be seconded by systematic massage of the abdomen. For this it is seldom necessary to call in the aid of a professional masseuse: an intelligent nurse will soon learn to apply firm pressure with the ball of the thumb round and round the belly in the course of the colon.

In cases where the costiveness is of considerable standing, a cure can rarely be effected without the aid of aperients, for the bowels have to be educated to provide a daily relief. If the accumulation be large it will be necessary to begin with a dose of calomel, followed after a few hours by a saline aperient; and it may be necessary to supplement the latter by a copious injection of warm water. In ordinary cases, however, watery injections are to be avoided for fear of over-dilating the bowel; it is far better to provoke an evacuation by a suppository of soap or glycerin. Afterwards, to keep up a regular action of the bowels, any mild aperient may be ordered, such as liquorice powder or cascara sagrada, and it is generally advisable to combine the laxative with small doses of nux vomica and belladonna:—

℞	Ext. Cascaræ Liq.	♏ x–xx	Tinct. Nucis. Vom.	♏ ½	
	Tinct. Bellad.	♏ iii–v	Glycerin.		
			Aq.	āā ad	3j

This dose can be given every night. As children vary greatly in their

response to laxative remedies, it will be necessary to find out in each case the dose required to produce a satisfactory result. This treatment must be persevered with for weeks or even months, gradually reducing the dose of the aperient as improvement advances until it can be dispensed with altogether.

In cases where the stools are too dry, if the addition of fluid to the food is not followed by improvement, it is advisable to give a small dose of some saline aperient in the last bottle taken at night, and ten or fifteen grains of phosphate of soda, or a good tablespoonful of fluid magnesia added to the meal will be found to have a useful influence in increasing secretion from the mucous membrane. In some cases it is better to combine the saline with a tonic ; thus :—

℞	Sodii Sulphat.	gr x	Ac. Sulph. dil.	℥j
	Quinin. Sulph.	gr ½	Glycerin.	℥x
	Tinct. Nucis Vom.	℥½	Inf. Calumb.	ad ℥j

To be given three times a day.

Many other drugs may be used as alternative remedies to those already mentioned, and if taken regularly may be prescribed in comparatively small doses. Thus, half a grain of sulphur, if taken every night, often has a sufficiently regulating influence upon the bowels. In young infants a small piece of manna dissolved in hot water and strained through muslin may be added to the last bottle of the evening ; or a teaspoonful of olive oil may be given after the last meal. It may be here stated that the aperient syrups of commerce, sold under the name of " elixirs," if they owe their sweetness to sugar, are not fit remedies for children. The syrup of which they are composed quickly becomes stale, and, fermenting in the child's stomach and bowels, is a fruitful source of indigestion and flatulence.

In the case of children after the age of infancy, a regulation of the diet and habits of life forms an important part of the treatment. Certain articles of food—eggs in some children, excess of starch in others—have a constipating tendency. As in the case of infants, a sufficient variety should be enjoined in the diet, and care should be taken that the child is not fed exclusively or almost entirely on starchy and saccharine matters. Mutton, fish, chicken, and green vegetables should all form part of his diet, and he should be led to eat whole-meal bread and take porridge for his breakfast two or three times a week.

In many children, both boys and girls, habitual neglect of the calls of nature induces a habit of constipation which it is not easy to overcome. Regularity in this respect is therefore to be insisted upon, and the child should be trained early to go to stool every morning as part of the daily routine. In school-girls want of exercise may be a cause of costiveness, but this is easily remedied.

To produce an immediate evacuation the same measures may be resorted to as those recommended for infants. Afterwards, if the costiveness is an habitual condition, it will be necessary to prescribe a mild laxative to be taken regularly every evening, so as to recover the habit of a daily stool. The dose must be taken just before the last meal. For this purpose two grains of the extract of cascara sagrada may be given as a pill, combined with one-sixth of a grain of extract of belladonna and the same quantity of extract of nux vomica. Excessive dryness of the stools may be modified by giving an ounce or more of apenta or other natural aperient water when the child goes to bed. In obstinate cases of the kind a useful remedy is :—

℞	Sodii Sulphat.	℥ss	Glycerin.	℥xv
	Tinct. Bellad.	℥x	Inf. Sennæ	
	Tinct. Nucis Vom.	℥j	Inf. Calumb.	āā ad ℥ss

To be taken before food once, twice, or three times a day.

For a child of six years.

If only one dose is taken, it should be given in the evening before supper.

If the bowels have been sluggish and insufficiently relieved for weeks together, there may be a great accumulation, and ordinary aperients yield but scanty results. In such a case a good dose of castor oil will often produce an effect not attained by the most drastic purgatives; but if this fail, a valuable resource is to put aperients on one side and turn to belladonna, giving it in frequent doses until it produces wide dilatation of the pupil. Children, it must be remembered, take belladonna well. It is best to give one-quarter of a grain of the pure extract every two hours, and as a rule, when a decided impression has been made upon the pupils, the bowels are copiously relieved.

If the accumulation have gone on to complete impaction of the bowel, it will be necessary to persevere for some time with enemas, so as to break up the fæcal masses which occupy the sigmoid flexure and rectum. It is best to give first a full dose (2–4 gr.) of calomel, followed by castor oil, so as to produce a softening effect upon the masses, and then to use a large injection of thin, warm gruel, containing an ounce of castor oil and half an ounce of oil of turpentine. The injection must be given very slowly, pausing frequently when the distension of the bowel causes discomfort until this has subsided, and by this means large quantities of fluid can be introduced. A persevering use of this method will succeed in the most obstinate cases, especially if the belladonna treatment be employed at the same time. If the impacted mass occupy the rectum within reach of the finger it can be broken up by an instrument, or even the handle of an ordinary spoon, and the action of the enema is greatly assisted by this means. Other ingredients may be employed in the injection for softening and disintegrating the masses, such as Brewer's yeast, six to eight ounces used pure, or ten to fifteen ounces of pure olive oil, or eight ounces of ox-gall mixed with an equal quantity of water, as recommended by Dr. W. Murray; but to be efficacious these injections must be introduced very slowly and gently, so that they may be retained as long as possible. *Eustace Smith.*

CONVULSIONS, INFANTILE.—Convulsions in infancy and childhood may be considered under the following headings: (1) Eclampsia neonatorum; (2) Predentition convulsions; (3) Convulsions during the period of primary dentition; (4) Convulsions occurring between primary and secondary dentition.

1. **Eclampsia Neonatorum.**—Convulsions in the newly-born may be asphyxial, due to supervenosity of blood, and venous turgidity arising from prolonged and difficult labour, especially in the first-born. Cyanosis is frequently present in such cases, and the treatment then consists in the application of leeches—one to each mastoid process—or in actual blood-letting.

Willis, in the 17th century, having seen a series of infants die of convulsions, shortly after birth, in a single family, bled the next arrival at once, and claimed that it escaped convulsions, and survived, in consequence of his treatment.

Blood-letting is only justifiable when the infant is obviously healthy, though plethoric. Pallid, puny, and anæmic infants who become convulsed shortly after birth should be treated by warmth, stimulants, and saline injection *sub cutem.*

Convulsions from Cortical (meningeal) Hæmorrhage at Birth.—Prolonged and difficult labour suggests this cause. Supracortical hæmorrhage, if not fatal, causes various kinds of birth-palsy—spastic hemiplegia, paraplegia, or diplegia, with or without epilepsy, and mental deficiency. Hence, if diagnosed, operative measures are clearly indicated. Unfortunately, focal commencement of fits is not an infallible guide to diagnosis, even when transient local paresis or paralysis of a limb or limbs follows the convulsions. Such paresis must be persistent, or there must be rigidity of the affected limbs, and the convulsions must be invariably of Jacksonian type, in order to justify the diagnosis of cortical hæmorrhage, and recommendation of craniectomy.

2. **Pre-dentition Convulsions,** in the absence of traumatism, organic disease of heart, lungs, and kidneys, congenital syphilis, otitis media, and the various forms of meningitis, simple, basic, purulent, and tuberculous, are usually traceable to improper food or over-feeding. A highly neurotic family history suggests predisposition to fits, which may be induced by very trivial disorders of digestion.

Inward convulsions are so called for the excellent reason that the infant is not outwardly convulsed, but merely rolls its eyes, moans or grins, clenches its fists, and draws up its legs at frequent intervals.

In some cases, the infant suddenly ducks its head, doubles up its body or straightens it out, the breath is held for a few seconds, and a scream or moaning cry of pain follows. Consciousness is not lost. Most of the above-mentioned seizures are due to colic.

A dose of castor oil, with a minim or two of laudanum, usually puts a stop to them, and prevents recurrence, if suitable diet be supplied.

3. **Convulsions during the Period of Primary Dentition.**—In healthy children, whose gums are also healthy, dentition is a painless process. It is only painful when the gums are tender, swollen, and inflamed. It is then associated with pyrexia, catarrh—nasopharyngeal, mid-aural, bronchial, or pulmonary—and far more frequently with gastro-intestinal disturbance, vomiting, colic, diarrhœa, or constipation. All these conditions may render the gums tender and unhealthy, and so the passage of a tooth gives rise to pain and irritation, and, in neurotic infants, may cause convulsions.

Yet an infant who at one time cuts a tooth with some or all of these symptoms, may cut the next without any discomfort. Hence coincident ailments, rather than dentition itself, are the probable cause of "teething convulsions." A fretful, feverish infant is almost invariably over-fed; thus, its sufferings are aggravated, and convulsions are induced by colic, not by teeth.

"*Teething Convulsions.*"—When, in the case of convulsions, the gum over an erupting tooth is obviously swollen, tender and painful, it should be lanced. But gum-lancing without such indications should not be practised. Catarrh and colic are more potent causes of convulsions than dentition. The practice of gum-lancing seems to have been abused, when the gums have been generally swollen, dry, tender, and inflamed, as though all the teeth were trying to come to the surface at once. This condition is the result of feverish catarrh, most frequently gastro-intestinal in site. A brisk purge—castor oil is the best—should be given, with a minim or two of laudanum; and a low diet of pure milk, well diluted with barley-water, should be prescribed. Protection from chill is important. Restless, feverish infants who are supposed to be "merely teething," should not be taken out of their cots to look at the moon on frosty nights.

Earache from middle-ear catarrh is a common cause of symptoms (including convulsions) supposed to be those of dentition. Any infant, except a congenital idiot, will indicate the site of its pain by pulling its ear and rolling its head when suffering from otalgia. If recognized early, blistering to the mastoid process, and hot dry applications to the external ear, will often relieve. A leech to the mastoid process of infants who are robust is effectual. Puncture of the membrana tympani, even when the membrane is not bulging, but is merely congested, is sometimes strikingly successful in cases of apparent basic meningitis associated with fits.

The generally swollen and tender condition of the gums mentioned above, should be treated by scrupulous cleanliness, and by application of glycerin of borax with chlorate of potash, 10 gr. to 1 oz., with which the gums should be gently rubbed. Chlorate of potash may also be given internally in all cases of stomatitis or gingivitis present during dentition.

4. **Convulsions between Primary and Secondary Dentitions.**—Excluding gross meningeal and cerebral diseases as causes, after the second year of life, colic from improper or excessive feeding is held to take the first place. Convulsions in such cases are usually regarded as produced by reflex irritation. But they may also depend on absorption of toxins produced by unwholesome and decomposing food. Toxæmic convulsions may also result from severe burns and scalds, and may occur as uræmic symptoms.

Reflex convulsions have been attributed to diseased or impacted teeth, to errors of refraction, especially astigmatism, to diseases of the throat, nose, and ear, to the presence of foreign bodies in the various orifices of the body, to phimosis and balanitis, and to the presence of intestinal parasites.

It is the duty of every practitioner in a case of convulsions to search for any condition which may have lowered general health, and to rectify it if possible. But convulsions are more often the indirect than the direct result of any of the so-called "reflex irritations" enumerated. In many cases a hopeful prognosis based on the removal of thread-worms or of a prepuce, or the correction of astigmatism only leads to disappointment.

Fits, as the result of an exanthem, are certainly rare, and when they occur it will usually be found that the child has had them before, or becomes liable to them afterwards.

Of psychical causes, fright or shock must be mentioned, and in such cases recurrence may be expected, if not diminution of intelligence.

Infantile Convulsions in General.—Treatment aims at stopping the fits, removing the exciting cause, and preventing recurrence.

Hot baths, with or without mustard, and mustard packs, are of doubtful efficacy, but may relieve colic when present.

Ice to the head should be used when there is hyperpyrexia, and the patient should be placed in warm water, which should be gradually cooled to 50° F., or even 40° F. In all cases, the lower bowel should be washed out with saline solution (one drachm to the half pint of warm water). Then a rectal injection of chloral and bromide, 3–5 gr. of the former, and double or even treble the quantity of the latter, in 2 oz. of water, for a child of six months of age, should be given.

Inhalations of chloroform may be used to allay spasms until the injection has become absorbed.

Inhalation of nitrite of amyl is recommended by some, and hydrobromide of hyoscine in hypodermic injection of $\frac{1}{200}$–$\frac{1}{100}$ gr. is said to be useful in protracted cases of convulsions. It is, however, not free from danger in debilitated infants. Injections of morphia ($\frac{1}{20}$ gr.) for a child of six months, are preferable to those of hyoscine, but should never be repeated within twelve hours. When cyanosis is present, leeching or even venesection, should be employed; provided that the infant is fairly strong, $\frac{1}{2}$–1 oz. of blood may be abstracted.

Emetics are never advisable, but the stomach should be washed out if there is any suspicion of its containing poison or irritants of any description. Of all emetics mustard is the most dangerous.

Whilst treatment is in progress, the probable exciting cause of the convulsions should be ascertained by observation and enquiry. Whatever this may be, a full dose of calomel or castor oil never does any harm, and often has the best effects when given after the convulsions have ceased. After-treatment consists in keeping the child quiet, and warm or cool, as indicated by the temperature. Attention to diet is of course all important, for the vast majority of infantile convulsions are set up by gastro-intestinal disturbance.

Reflex sources of irritation, such as nasopharyngeal obstruction, worms, local genital complaints, ear and eye troubles should be attended to. Rickets should be treated in the usual manner.

Leonard G. Guthrie

CORNEA, DISEASES OF.

Ulceration of the Cornea.

A thorough examination of the whole cornea must be made at the first visit. If there is *blepharospasm*, it must be overcome either by the instillation of cocaine drops, by the careful use of lid-retractors, or if necessary by giving an anæsthetic. The greatest care must be exercised lest a deep ulcer be perforated by rough manipulation. If there is any doubt as to the limits of the ulcer, it should be defined by staining with a solution of fluorescein.*

The chief points to be attended to are: (*a*) Is the ulcer clear or infiltrated? (*b*) Are the edges sharp or rounded? (*c*) Is the ulcer superficial or deep? (*d*) Is there hypopion? (*e*) Is the anterior chamber shallow or deep? (*f*) Has the ulcer perforated or not, and if so, is there any anterior synechia or prolapse of iris?

In treating an ulcer of the cornea, we must (1) remove the cause; (2) prevent spreading of the ulcer; (3) keep the conjunctival sac clean; (4) give rest and sedative treatment, hot applications, atropine, bandage; (5) attend to the general health.

1. With ulcers of doubtful origin, the lid margins should be carefully searched for *inverted lashes*, which by rubbing the cornea may be the cause of the ulcer; these should be epilated. The upper lid also should be everted and examined for a *foreign body* which may be scratching the cornea.

2. If the ulcer is *infiltrated or spreading*,† it *must be cauterized*, either with the platinum loop (electro-cautery) or with pure carbolic acid. For this a general anæsthetic is necessary only in children; the cornea can as a rule be rendered quite insensitive by four or five instillations of a 2 per cent solution of cocaine at intervals of two minutes. The ulcer is defined by a drop of fluorescein, all excess of stain being washed away. While cauterizing, the lids are separated and the eyeball steadied with the fingers of the left hand. This is a better plan and less painful than using a speculum and attempting to fix the eyeball with forceps.

If the platinum loop is used, the ulcer is thoroughly cauterized wherever it is infiltrated, and if there is any overhanging edge it is burnt away.

If pure carbolic acid is used, the ulcer should first be carefully cleansed with the spud, and any overhanging margin scraped or cut away with scissors. It is then well dried with a corner of clean blotting-paper, and the carbolic acid stippled on with a very small camel's-hair brush, which is only just moistened with the acid. The blotting-paper should be applied frequently to prevent spreading of the acid beyond the edges of the ulcer. In this way the whole ulcerated surface is cauterized, and the effect should be as localized as if it were done with the actual cautery.

3. If there is much conjunctival discharge, the lids should be painted daily with a 2 per cent solution of silver nitrate, only so long as this lasts. The conjunctival sac should be washed out with warm boracic lotion three times a day. Pressure should be made over the lachrymal sac to see if there is a mucocele (*vide infra*).

4. *Rest* is secured by the use of atropine, which paralyzes the ciliary muscle, dilates the pupil, and prevents the formation of posterior synechiæ. In young people, atropine drops or ointment (4 gr. to the ounce) should be used three times

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* Fluorescein 8 gr., sodii bicarb. 12 gr. to the ounce. One drop is instilled into the eye, followed by a few drops of boracic lotion or solution of cocaine. The ulcer stains green.

† An *infiltrated* ulcer is whitish-yellow in colour, either all over or at the spreading margin; its edge is sharp or undermined, the surrounding cornea is stippled and hazy, and the eye is injected.
A *healing* ulcer has, as a rule, a clear base; its edge is rounded, the surrounding cornea is clear, and the injection is passing off.

a day to keep the pupil well dilated. With elderly patients, and especially when the anterior chamber is shallow, atropine must be given with great caution, lest we induce an attack of glaucoma. In doubtful cases, homatropine drops, 2 gr. to the ounce, which can easily be overcome with eserine, may be tried tentatively, and, if no rise of tension occurs, we may proceed to the use of atropine drops, 1 or 2 gr. to the ounce. If glaucoma complicates an ulcer, eserine must of course be used in place of atropine.

A light *bandage* should be worn, sufficient to keep the lid down and at rest. The only exception to this is when there is profuse conjunctival discharge, when a bandage is contra-indicated.

Hot applications are most comforting to the patient. We can use either hot bathing, hot fomentations, the Japanese muff-warmer, or Maddox's electric pad where low voltage electricity is obtainable. Hot bathing with a pad of cotton-wool dipped in very hot boracic acid lotion over the closed lid should be carried out four or five times a day for a quarter of an hour at a time, frequent additions of boiling water being made to keep the lotion as hot as can be borne. Hot fomentations are very comforting, and may be applied between the bathings, but unfortunately they soon get cold. They should be made with several layers of boracic lint, a large piece of protective, and plenty of wool. When damp heat causes a sodden condition of the lids, dry heat may be substituted by means of the small Japanese muff-warmer or the electric pad.

5. Attention to the general health is most important, especially in phlyctenular keratitis and in chronic ulceration of the cornea, the bowels being regulated, and light nourishing diet and tonics given, and plenty of fresh air.

Simple Ulcer.—Hot bathing, atropine, light bandage, and tonic, is all that is necessary. The patient is not confined to bed unless the ulcer is spreading or deep and liable to perforate.

Infiltrated Ulcer.—This must be cauterized (*vide supra*) and then treated as in simple ulcer. If the ulcer shows signs of spreading after three days, it must be cauterized again.

If a spreading ulcer is complicated with a *mucocele*, and continues to spread in spite of the above treatment and of careful daily syringing of the lachrymal sac with 20 per cent solution of protargol, the sac should be excised, or the eye may be lost.

Hypopion Ulcer.—The patient should be kept in bed, the ulcer cauterized, atropine used six times a day, and heat constantly applied ; a purgative should be given and the diet regulated.

If the hypopion increases in spite of treatment, it must be let out by paracentesis of the anterior chamber. A general anæsthetic should be given, as cocain does not anæsthetize an inflamed eye properly ; fixation of the eye is almost unbearable, and the pain after emptying the anterior chamber is very severe. After washing out the conjunctival sac, a broad needle is passed into the anterior chamber parallel with the surface of the iris, at the lower edge of the cornea—1 mm. in from the sclero-corneal junction. The lower lip of the incision is then depressed with the curette, to allow the hypopion to escape ; if this is sticky and does not come out readily, it may be pulled out with smooth iris forceps. Atropine ointment is inserted between the lids, fomentations are applied, and the eye is bandaged.

Perforating Ulcer.—If perforation is liable to occur, the patient should be kept in bed, and the manipulation should be very gentle. In cauterizing an ulcer which is about to perforate, the margin should be dealt with first, and finally the base ; and it is often a good plan to allow the cautery just to burn through the base and so let out the aqueous and any hypopion that may be present.

When perforation has occurred and there is prolapse of the iris, the prolapse in most cases should be left alone. When, however, the prolapse is very minute and recent, and there is little or no conjunctival discharge, it may be picked up in the forceps, drawn well out and cut off close to the cornea, and the iris allowed to retract. This should not be done if the opening in the cornea is larger than 1 mm. in diameter.

When the whole of the pupillary area is entangled in the corneal opening, *secondary glaucoma* will result as soon as the anterior chamber ceases to leak. An iridectomy should be performed in these cases directly the conjunctival sac is clean.

When the corneal scar will not flatten down, an iridectomy should also be performed, if possible—freeing the iris from the back of the cornea. When owing to the peripheral situation of the adhesion the entangled portion of the iris cannot be freed, an iridectomy is done on one, or if necessary on both, sides of the entanglement, and the eye kept carefully bandaged till the cornea is thoroughly consolidated.

Blind eyes with staphylomatous corneæ should be excised, or—after thorough evisceration—a glass globe may be sewn into the sclerotic (Mules' operation).

Keratocele.—Sometimes in the floor of an ulcer, which has nearly perforated, a small, black-looking protrusion is seen which is due to a bulging of Descemet's membrane. The ulcer is treated in the ordinary way, and a firm bandage is applied. If the keratocele remains, thus preventing the proper healing of the ulcer, it should be pricked with a broad needle (taking care not to injure the lens capsule), the aqueous evacuated, and the bandage again applied.

Dendritic Ulcer should be cauterized with pure carbolic acid (*vide supra*), and if in three days the ulcer is spreading, it should be cauterized again. In obstinate cases the actual cautery is more effective than carbolic acid.

In **Neuropathic Ulcer,** in which there is loss of corneal sensation, we must be very careful to avoid strong caustics. The eye should be washed out with hot quinine lotion (2–4 gr. to the ounce) four times a day, hot fomentations applied, atropine instilled, and the eye carefully tied up: either the hydrochlorate or the sulphate of quinine is used, but if the latter it must be dissolved with the smallest possible addition of weak sulphuric acid. If the ulcer does not get better quickly the lids should be pared and sutured together along their outer halves, to give a greater protection to the cornea.

Phlyctenular Conjunctivitis and Keratitis.

Phlyctenular disease being an indication of lowered nutrition, the main object of treatment must be to improve the general health, in order to cure the disease and prevent recurrence. The child should be given plenty of fresh air and light, nourishing food, and except in the worst cases, he should be allowed to run about out-of-doors, both eyes being protected with a broad shade or dark glasses. In the initial stages mercury is indicated to cleanse the intestinal tract (hydrarg. c. creta with sod. bicarb. three times a day), followed after a few days by syrup of the phosphates of iron, or malt and cod-liver oil.

Local Treatment.—

Phlyctens of the Conjunctiva.—Hot boracic bathing, followed by application of yellow oxide of mercury ointment, 4 gr. to the ounce, twice a day, and the use of a broad shade over both eyes. The ointment is inserted between the lids with a small round-ended glass rod. When associated, as is commonly the case, with catarrhal conjunctivitis, the conjunctival sac should be painted every other day with 2 per cent silver nitrate till the discharge ceases.

Phlyctens at the Margin of the Cornea.—In addition to the above treatment,

atropine, 2 gr. to the ounce, should be added to the yellow oxide ointment till healing is well advanced ; it can then be discontinued. Here also any catarrhal conjunctivitis must be treated as mentioned above.

In those cases in which a marginal phlycten begins to travel across the cornea, dragging a leash of vessels after it (fascicular ulcer), the same treatment is adopted, but the grey advancing crescent must be cauterized, preferably with the actual cautery. These ulcers do not perforate, but if they cross the pupillary area, the resulting scar severely impairs vision, so that their career must be checked at the earliest possible date.

Phlyctens of the Cornea proper are dangerous both from their liability to perforate and the scars which they leave ; indeed, after repeated attacks the whole cornea may become covered with a vascular coat (phlyctenular pannus), which in addition to the nebulæ left by the ulcers, seriously impairs the sight. In this group it is very important to give soothing treatment till healing has begun. We therefore withhold the oxide of mercury and give atropine ointment alone, 4 gr. to the ounce, till healing is well advanced. Great attention must be given to the general health in addition to local treatment, hot bathing, protection from light, etc. If the ulcer is infiltrated it must be cauterized (see above, INFILTRATED ULCER).

There is often marked *blepharospasm* in phlyctenular disease, and this is best treated by dipping the face into a basin of cold water and holding it there till the child struggles for breath, once or twice a day, as is necessary. The conjunctiva should be treated with nitrate of silver if there is catarrh, and *cracks* at the outer canthus touched with a sharply pointed stick of nitrate of silver.

INTERSTITIAL KERATITIS.

In the interstitial keratitis due to inherited syphilis, we have not only the cornea to treat, but the irido-cyclitis which almost always accompanies the keratitis, and indeed in some cases occurs as an initial phase.

Locally we give dark glasses, hot bathing, and atropine four times a day to keep the pupil dilated and to prevent the formation of posterior synechiæ. The tension should be watched, lest the irido-cyclitis cause secondary glaucoma (see GLAUCOMA). The general state of the patient must be looked after, and tonics should be given. Mercury and iodide are of service provided they do not impair the health, but they are, curiously, not of so much use here as in other syphilitic complaints.

In the late stages, when inflammation has subsided, massage of the cornea with yellow oxide of mercury ointment (4–8 gr. to the ounce) helps to clear the cornea.

HERPES OPHTHALMICUS.

The common ocular affection in this condition is an interstitial infiltration of the cornea associated with more or less cyclitis. The cornea also is rendered insensitive to a greater or less extent. Our treatment must therefore be : (1) Protection of the cornea from irritants by a bandage or dark glasses ; (2) Sedative applications, such as hot bathing and atropine. *N.B.*—Unfortunately the cyclitis often raises the tension slightly, and atropine may make this worse ; hence it must be exhibited with caution, very weak drops (1 gr. to the ounce) being used at first to see if the tension is increased or not. If it is increased, atropine must be withheld, and we must rely on hot bathing and leeching. If ulceration occurs, similar treatment is adopted.

General treatment should be directed against any gouty tendency that may

be present. In some cases, potassium iodide and arsenic are of service; in others Tweedy's pill does great good:—

R	Quin. Sulphat.	gr j	Ext. Bellad.	gr ½
	Calomel	gr $\frac{1}{10}$ to ¼	Confect. Rosæ	q.s.

To be taken three times a day after food.

The severe neuralgia occasionally met with can only be relieved with morphia; but the use of this must be withheld as long as possible, as the duration of the neuralgia is often prolonged.

Conical Cornea.

The vision is often greatly improved with glasses, especially a high concave or convex cylinder, which may at times give surprising assistance. When glasses are of no use, and both eyes are affected, an operation holds out a good chance of improvement in many cases, either cauterizing the cornea or removing an elliptical portion from the apex of the cone. *W. Tindall Lister.*

COUGH.—(See Bronchitis, etc.)

CRAFT PALSIES.—In every one of these, whether writer's cramp, or the cramp of pianists, violinists, telegraphists, typists, tailor's cutters, hair-cutters, hammer-men, cow-milkers, watchmakers, harpists, cigarette-makers, etc., etc., we should bear in mind that the craft palsy is essentially a cerebral fatigue, that it comes on, not during the period when the sufferer is learning his occupation, but when he has become expert and has to perform the particular skilled movement for prolonged periods at a time. Moreover, the limb is perfectly normal for all movements except that particular one. Thus in writer's cramp the patient is able to use the hand normally in piano-playing or in grasping and using a heavy tool.

Treatment.—This is always tedious. Drugs are valueless, except perhaps an occasional tonic mixture in patients whose general health is below par. Massage, and electrical treatment of the affected muscles, are but palliative at best. In every case, what is essential is complete cessation from the particular movement which has produced the cramp.

In writer's cramp—the commonest and most typical of craft palsies—it is not enough for the patient merely to reduce the amount of his writing; he must give it up entirely for three months at least. Change of scene and avoidance of worry are easy to prescribe, but often difficult of attainment, inasmuch as the patient's livelihood often depends on that particular movement which brings on the cramp.

During the period in which he is not allowed to use the hand for writing, he may learn to use the other hand for this purpose, or, better, he may learn to use a type-writing machine. But even then, such patients may subsequently develop typist's cramp.

After the three months' rest from writing, the patient may begin to write again, but must employ a different method. A thick cork pen-holder is often of service, and he should be made to grasp it about its middle, not close to the point. Sometimes it is advisable to place the penholder between the index and middle finger instead of between the thumb and index. In writing, the elbow must rest on the desk or table, the table must be placed at a comfortable angle, and the patient must write from the shoulder, not from the wrist or fingers. This is sometimes ensured by having a penholder which passes through a spherical piece of cork about the size of a hen's egg, so that the hand grasps the ball and moves en masse, fine digital movements no longer being called for.

Other professional neuroses are to be treated on the same lines as writer's cramp, complete rest being the first essential. *Purves Stewart.*

CRAMP.—Cramp is commonly defined as painful muscular spasm, the pain arising, presumably, from compression of the nerve-endings within the muscle by the tonically contracting muscle-fibres. This explanation, however, is probably incomplete, inasmuch as it fails to explain why, in a healthy individual, the strongest voluntary muscular contractions, no matter how powerfully executed, are painless.

Whatever be the mechanism whereby the pain of cramp is produced, we recognize, clinically, that the spasm of cramp is involuntary, and that it is generally associated with some toxic condition. The poison may be produced locally, as in the case of over-exertion of muscles in subjects who are out of training, or it may be due to deficient blood-supply to the muscles, as in the painful cramps of intermittent limp. Or the poison may be conveyed to the affected muscles and nerve-centres from without, as in the reflex cramps of strychnine poisoning, tetanus, etc. Or the toxin may be produced within the body, as in the cramps of tetany, or of diabetes. Or again, it may be a mere exaggeration of a general spasticity in such diseases as paralysis agitans. Curiously enough, the spasticity of organic paralytic lesions of the pyramidal tract, as in hemiplegia, is rarely painful, although organic irritative lesions, such as myelitis or meningomyelitis, frequently accompanying painful cramps.

Let us consider these different varieties in turn. In the cramp of over-fatigued athletes, which is generally, as we have seen, associated with deficient previous training, the pain is best relieved by rest, by a hot bath, and by energetic massage, together with passive stretching of the affected muscles. Various liniments, such as liniment of belladonna, of turpentine, of chloroform, or combinations of these, may be employed with benefit, to aid the rubbing and to produce an after-sensation of cutaneous warmth.

In the cramp of "intermittent limp," rest is essential (the patient perforce rests while the pain lasts); whilst local hot applications, e.g., a hot foot-bath, together with massage, will benefit the pain. In addition to these, iodides and nitrites should be administered internally, in the hope of relaxing the arterial spasm which appears to be one of the underlying causal factors. Many patients suffering from intermittent limp are inveterate and excessive tobacco smokers, and this, too, must be corrected.

In *Strychnine Poisoning*, chloral may be administered in full doses, 1 dr. of the syrup with 30 gr. of potassium bromide, repeated in half an hour, if required. Or it may even be necessary to administer chloroform. Good results have also been got from the hypodermic administration of curare, not only in strychnine poisoning, but also in tetanus. The painful cramps of *Tetanus* should always be treated by tetanus anti-toxin. Where this is not available, Baccelli's mode of treatment, by the hypodermic administration of a 2 to 3 per cent aqueous solution of carbolic acid, in doses of 1 to 1½ cc., repeated ten or twelve times daily, should be borne in mind. Antitoxin is best given by intrathecal injection through a lumbar-puncture needle, a corresponding quantity of cerebrospinal fluid being first withdrawn. It is often necessary to give chloroform as a preliminary measure, to permit of the introduction of the lumbar-puncture needle. The efficacy of tetanus antitoxin may be enhanced by the addition to the intrathecal injection of β-eucaine $\frac{1}{20}$ gr., or by hypodermic administration of curare, $\frac{1}{3}$ gr., three times a day. These two remedies act in entirely different ways, the eucaine anæsthetizing the posterior roots, thereby cutting off the painful impressions, the curare producing paralysis of the intramuscular motor end-organs, and so affecting the muscles themselves.

The painful cramps of **Tetany** (q.v.), in children, are usually an evidence of rickets. Here our treatment must consist of antirachitic regimen and diet. The tetany of adults, associated with gastric dilatation or with extirpation of

the thyroid gland, may be very severe. In the latter variety, thyroid extract must be administered, whilst in the former the dilated stomach must be treated. Symptomatically, rest, warmth, and massage are all valuable. Pilocarpine hypodermically sometimes relaxes the spasm, as soon as diaphoresis is established.

The cramps of **Paralysis Agitans** (q.v.) are often very resistant to treatment. On the whole, the remedy which most frequently affords a degree of relief is hyoscyamine, given by the mouth in doses of $\frac{1}{120}$ to $\frac{1}{60}$ gr. twice or three times a day. Local applications, such as gentle massage, heat, galvanism, etc., also do some good. Faradism is useless and tends to aggravate the rigidity.

Purves Stewart.

CRETINISM.—The treatment of cretinism in a child is more difficult than that of myxœdema in the adult, as it has to be carried on during the active period of growth and mental development. Ultimate success depends upon the diagnosis being made, and the treatment commenced, at the earliest possible date. If this is done, and the treatment is adequately and continuously kept up, the child's mental and bodily development should make steady and normal progress equal to that of other children of the same age. If, on the other hand, the disease has been allowed to develop for months or even years without treatment, the arrest of mental development is so great that it is unlikely that the mental powers will ever reach the same level which would undoubtedly have been attained if treatment had been carried out from the commencement of the disease. The same does not apply so strictly to the physical development of the child, for it is remarkable what rapid physical progress may be made in a case of cretinism, even of some years' duration, the lost time being largely made up by the unusually rapid rate of growth which takes place under treatment, while mental development lags behind.

The treatment of an early case of cretinism is carried out in much the same manner as that of myxœdema in the adult. At the commencement, a small dose of 1-2 min. of liquor thyroidei, or $\frac{1}{4}$ to $\frac{1}{2}$ gr. of dry thyroid powder, should be given each night. The dose may be gradually increased by the addition of 1 min. every week or fortnight, according to the progress made, until from 5–7 or even 10 min. is reached, according to the size of the child. If excessive doses are given, the pulse becomes too frequent, the weight diminishes, pains may be felt in the limbs, the temperature may rise, or diarrhœa may be set up.

When the cretinism is even of ten or fifteen years' duration, striking results can still be obtained. Larger doses, 3–5 min., of the extract may be given from the commencement, the effects being carefully watched. If any tendency to fainting appears, the patient should be kept in bed and very small doses given at first, which may be gradually increased.

The improvement in a cretin under treatment is remarkable, and often rapid. The swelling steadily diminishes and finally disappears, growth is resumed, and may take place very quickly, for as much as six inches has been gained in height in the course of six months. The temperature becomes normal, the skin moist, and the hair grows naturally. In the case of adult female cretins, menstruation becomes established, and the mammary glands rapidly develop. After a time, mental development begins to progress, new words are learned, and the range of speech gradually increases.

George R. Murray.

CROUP.—For the purpose of this article "croup" signifies catarrhal laryngitis or "catarrhal laryngeal spasm." Laryngeal diphtheria, which is sometimes spoken of as *true* croup, is dealt with separately. (See also LARYNGITIS.)

1. **Treatment during an Attack.**—The child should be placed in a warm bath, to which mustard is added (1 oz. to the gall.). An emetic should be administered,

e.g., 10 gr. of powdered ipecacuanha or 1 gr. of subsulphate of mercury Ipecacuanha wine is not trustworthy. The child should then be placed in bed surrounded by an improvised "tent," into which steam is introduced from a bronchitis kettle. A hot fomentation should be placed over the larynx, plenty of hot liquids given to drink, and 2 gr. of calomel administered. If the stridor does not yield to these measures, and if dyspnœa becomes urgent and retraction of the lower interspaces marked, it may be necessary to proceed to intubation (see DIPHTHERIA and LARYNGEAL OBSTRUCTION). Should there be the least suspicion that the case may be one of true diphtheria, and not a mere laryngitis, an injection of antitoxin should be given (see BACTERIOTHERAPEUTICS and DIPHTHERIA), and the child carefully isolated.

After the acute stridor has disappeared, the child must be kept in bed so long as there is any hoarseness, steam inhalations being employed for a quarter of an hour at a time several times a day, and fomentation of the larynx maintained. Five minims each of antimonial and ipecacuanha wine should be administered every three hours.

For two or three nights following an attack a dose of antipyrin (1 gr. for every year of the child's age), or of chloral in similar proportion, should be given at bedtime to prevent recurrence of spasm.

2. **Preventive Treatment.**—In order to prevent recurrence of attacks, the nose and pharynx should be thoroughly examined for obstruction from adenoids, etc., and these dealt with, if found. Exposure to damp air and sleeping in unwarmed rooms should be avoided. The throat and neck should be sponged daily with cold water, and the child gradually accustomed to open air and free ventilation. In weakly or anæmic children a course of cod-liver oil and iron may be advantageous.

Robert Hutchison.

CURETTAGE.—(See ENDOMETRITIS.)

CYCLITIS.—(See IRITIS.)

CYSTITIS.—Inflammation of the bladder may be either acute, subacute, or chronic, and in all cases is due to infection with micro-organisms, either of a specific type, such as the typhoid bacillus, or the common organisms of suppuration.

Acute Cystitis.—TREATMENT.—Rest in bed is the first indication, with warm stupes or fomentations frequently repeated to the suprapubic region, and the hot sitz bath two or three times a day. The baths should be taken really as hot as the patient can stand them, from 105° to 110° F. They are best given by placing the patient in a hip-bath, with the body and legs well wrapped in blankets. Hot water should be repeatedly added to keep up the temperature, and the stay in the bath should be from ten to twenty minutes. Upon leaving the bath the patient should be rapidly rubbed dry with hot towels and return to bed, when the large fomentations should be repeated.

The diet must be very light and easily assimilated; spices, peppers, and condiments of all kinds are to be avoided; milk, chicken and veal teas, jellies, broths, custards, and eggs, with light farinaceous foods, are indicated. Alcohol in any shape or form should be absolutely forbidden.

Plenty of liquid should be taken, for although this increases the diuresis, and so in the early stages may increase the frequency of micturition, it is desirable to render the urine as fluid and bland as possible. Hence such mineral waters as those of Vichy and Contrexéville are to be recommended, and the milk may be diluted with them in any quantity.

Treatment by Drugs.—The drugs to be ordered vary with the nature of the cystitis, which may be of the acid or alkaline variety. Very commonly the urine

in an acute cystitis is highly acid in the early stages, and tends to alkalinity and ammoniacal decomposition as the case progresses. In such cases there is usually a mixed infection present, the bacteria of ammoniacal decomposition, of which the most common is the *Bacillus ureæ liquefaciens*, only making their presence felt as the cystitis progresses. In some cases an acute cystitis may remain acid throughout. In such cases copious doses of alkalies, together with urinary sedatives, should be given at frequent intervals. A very useful prescription is the following :—

℞	Potass. Bicarb.		Tinct. Hyoscyam.	℥xxx
	Potass. Citrat.	āā gr xx	Inf. Buchu	ad ℥j

To be given every three or four hours until some relief is obtained, and then reduced in frequency.

Decoctions of uva ursi and of triticum repens are sometimes very effectual in relieving the scalding pains on micturition.

If vesical tenesmus is really acute, narcotics must be used, and the best way in which to administer them is by a rectal suppository containing ¼ gr. or ½ gr. of morphia repeated twice or thrice in twenty-four hours. Their administration should cease immediately relief from the most pressing symptoms is obtained. In the acute cystitis of gonorrhœa, and indeed in the majority of cases where the urine is acid in reaction, the oil of sandalwood in full doses exerts a marked calmative effect. In cases where great nausea is excited by the drug it should be given in capsules, but where the patient is fairly tolerant it exerts its action in the quickest and best manner when given in the form of an emulsion. The writer has found the following formula of great value :—

℞	Ol. Santal. Flav. puriss. (fresh)	℥xv	Salol	gr v
	Pulv. Acac. (fresh)		Ess. Menth. Pip.	℥iij
	Potass. Bicarb.	āā gr xxx	Aq.	ad ℥j

Ft. emulsio. To be taken every four hours until evidence of its excretion by the urine is strongly marked by its characteristic scent, when the administration should be reduced in frequency.

It is essential that a regular and free action of the bowels should be obtained by the administration of such simple laxatives as compound liquorice powder, confection of senna, or such waters as Hunyadi Janos or Apenta. In addition, a daily enema of plenty of hot water, given very gently and carefully, and really hot, not only assists in emptying the lower bowel, but also is soothing and comforting to the patient.

In those cases where the urine is alkaline almost from the commencement, with an ammoniacal odour and a tendency to the deposition of triple phosphates, the drugs are of a different character. Prominent amongst those of value is urotropin, which should be given in full doses, 10 gr. to 20 gr., three times a day, except in the case of children, where it must be given with care ; and its congeners, cystamin, hetralin, and the like. The balsamic drugs, such as benzoate of ammonia and soda, with boric acid, and dilute mineral acids, are of value. A drug of great value, when the tendency to deposition of phosphates is very marked, is the acid phosphate of sodium in full doses of 30 to 40 gr. in 3 or 4 oz. of water, repeated every four hours or so. Sandal-wood oil without the alkalies will be found of service in such cases.

Treatment by Bladder Washes and Instillations.—In the most acute stages it is best not to use any form of bladder washing by means of the catheter, and to rely upon the methods already indicated ; but as the extreme symptoms subside the cure may be accelerated by washing out the bladder with various lotions. The best of these is perhaps silver nitrate solution in very weak strengths.

The bladder should first of all be washed out with boiled water through a

No. 10 or No. 12 soft rubber catheter. The eye of the catheter should be large and smooth, and the instrument should be passed with great gentleness. When, owing to prostatic enlargement, there is difficulty in passing the soft catheter, a silk-web Coudé catheter of the same calibre should be employed, or sometimes a fully curved metal catheter will be found to meet the difficulty. Whatever instrument is used the greatest gentleness should be exercised, and if spasm of the compressor urethræ muscle hinders the passage of the instrument, it should be combated by the injection of a few drops of a weak cocaine or eucaine solution into the bulbous urethra. A solution of 2 per cent cocaine or 4 per cent eucaine is usually quite sufficient.

The boiled water is used for its mechanical properties, to wash away the tenacious muco-pus and to allow the astringent and antiseptic solution which follows to exert its full effect upon the bladder walls. The bladder should be washed until the water comes back clear, and usually one or two pints will be needed for this purpose. It is better to use a smoothly working four- or six-ounce syringe, made of glass or metal, with an asbestos or metal piston, with which to give this lavage. These instruments can be boiled. and the irrigation can be better performed than with the irrigator, or funnel and tube. If preferred, a two-way catheter can be used, but the total calibre of this instrument must be considerably larger, to allow of free ingress and egress of the fluid. Distension of the bladder must stop just short of pain. The bladder having been washed clean, a pint or more of the antiseptic solution should be used.

There are many excellent drugs for this purpose, but the most successful is silver nitrate, in the strength of 2–4 gr. to the pint of distilled water to commence with, and increased daily by 1 gr. to the pint until the strength of 10 gr. to one pint is reached. Some patients are much more tolerant than others of this drug, and the strength must be suited to the exigencies of each case.

Lysol ½ to 1 per cent, perchloride of mercury 1–20,000 to 1–10,000, carbolic acid 1–500, protargol ½ per cent, are all useful. After the use of these drugs the bladder should be washed clean again with boiled water, and a few ounces of the latter allowed to remain.

A recent and very useful but expensive drug is argyrol. This should be used in a somewhat different manner. It is practically painless, and after the preliminary washing of the bladder, 2 or 3 oz. of a 5 or 10 per cent solution should be injected into and allowed to remain in the bladder.

Treatment by Operation.—As a rule operation is not required in acute cystitis. In a few cases, however, the inflammation is of the most acute and fulminant type, and within a day or two of the onset of the attack, sloughs of the vesical mucous membrane come away with the urine, mixed with blood and pus. Pain, frequency of micturition, and tenesmus are acute, and the usual remedies appear to have little or no effect. In such cases the bladder should be thoroughly drained by a suprapubic cystotomy (*vide infra*), and constant irrigation should be instituted.

Subacute Cystitis.—As a rule subacute inflammation of the bladder is the sequel and the closing stage of acute cystitis, but in some cases the inflammatory condition is subacute from the commencement of the illness.

The symptoms differ only in degree from those of acute inflammation. The frequency is much less marked, pain is not nearly so severe, and hæmaturia is very rarely noted.

TREATMENT is carried out upon the same lines as that of acute cystitis, but intravesical medication may be commenced at once by means of irrigations and instillations through the catheter. Urinary antiseptics and sedatives should be given by the mouth, and it is not necessary to confine the patient absolutely to bed.

Chronic Cystitis.—It is convenient and practical to classify chronic inflammation of the bladder as *Simple*, *Gonorrhœal*, and *Tuberculous*, the first class comprising for convenience all cases of cystitis not due to the gonococcus or tubercle bacillus.

1 *Simple Chronic Cystitis.*—This is seldom met with except as a result of some further disease of the urinary system.

Obstructions to micturition in the form of stricture or prostatic enlargement, trophic changes due to disease of the central nervous system, and constant reinfection from above from a pyelitic or pyelonephritic kidney are all common causes of a chronic cystitis, whilst vesical calculus is always accompanied by a more or less chronic inflammation of the vesical mucous membrane. But in some cases a chronic cystitis may persist without any of these contributory causes, having as its starting-point enteric fever, pneumonia, influenza, or some general infection of a bacterial character.

Treatment.—As chronic cystitis is in the great majority of cases dependent upon some other condition for its persistence, the treatment must in the first instance be directed to a removal of the cause. The removal of stone from the bladder, the cure of a tight stricture, or the removal of an enlarged prostate, are commonly followed by the cure of the chronic inflammation of the vesical mucous membrane, and the reader is directed to the sections dealing with these subjects for instruction in their treatment.

But sometimes, as already mentioned, no contributory cause can be discovered, and in these cases the chronicity of the infection appears to be due to the imperfect power of resistance of the patient to the particular pathogenic organism. Here the usual local measures must be adopted, consisting of intravesical medication with the various urinary antiseptics, and the patient's general health must be fortified by a generous diet, ample supply of fresh air, and freedom, where possible, from over-fatigue, worry, and anxiety. In these cases the treatment by mineral waters is sometimes exceedingly efficacious, and the choice of a spa should be determined by the alkaline or acid nature of the cystitis. For the former Bad Wildungen in Germany has for many years had a high and deserved reputation, whilst in cases where the gouty or uric acid diathesis is marked, and the chronic cystitis is always of an acid character, the waters of Contrexéville and Aix-les-Bains often exercise an exceedingly beneficial influence. The question of serum-therapy and vaccins is considered in the section upon tuberculous cystitis. (*Vide infra.*)

2 *Gonorrhœal Cystitis.*—In by far the greater number of cases, gonorrhœa, fortunately, does not attack the bladder ; indeed, in many instances, the infection travels no higher in the urinary tract than the bulbous urethra. But when the gonococcus gains access to the urethra behind the compressor urethræ muscle, the prostatic mucous membrane, the prostatic follicles, and the mucous membrane of the neck of the bladder become infected. Gonorrhœal infection of the bladder of an acute nature occurs in some cases, and when the acute symptoms have subsided, a chronic infection is sometimes left behind which usually is limited to the neighbourhood of the trigone and orifice of the bladder. The gonococcus appears to possess an extraordinary vitality and to be able to remain hidden, probably in the crypts and follicles of the prostate, for almost indefinite periods, causing repeated relapses after perhaps long intervals of apparent cure, in cases where there has been no possibility of reinfection.

This lurking of the gonococcus in the recesses of the prostate and seminal vesicles undoubtedly explains the constantly recurring attacks of gonorrhœal inflammation of the neck of the bladder, and chronic gonorrhœal cystitis cannot be considered apart from infection of the prostate and seminal vesicles.

The diagnosis of gonorrhœal prostatocystitis having been made, careful and

prolonged treatment is necessary, and the treatment of the cystitis must be considered together with that of the urethroprostatic infection. Thus the anterior urethra must be treated by the appropriate measures; all strictures, granular patches, infiltrations, and infected glands of Littré must receive due attention.

The treatment of the prostatocystitis consists of instillations and irrigations, combined with the emptying from the prostatic follicles and seminal vesicles their infected contents, by means of rectal massage.

Posterior irrigation should be given by what is usually known as Janet's method. An irrigator can, holding 2 pints or more, with eight or nine feet of rubber tubing, and a conical glass nozzle which will fit the urethral meatus, is all the apparatus that is required. The patient empties his bladder, and the anterior urethra is well washed out with boiled water.

In most cases it is well to inject into the bulb about 30 min. of a 2 per cent solution of cocaine. The patient holds this in by compressing the meatus with his fingers for a moment or two. By stripping the solution along the urethra in a backward direction, the surgeon can then force it into the bulb, and by further backward pressure of the fingers upon the bulb, pressing the latter against the arch of the pubes, the solution can be forced into the membranoprostatic urethra through the compressor urethræ. In this way the mucous membrane of the bulb and deep urethra is cocainized. If preferred, this injection may be given by a Guyon's syringe, the little bulb of which is passed down into the deep urethra, and the fluid injected. The object of this anæsthesia is to obviate spasm of the compressor urethræ, which sometimes prevents the free flow of the irrigation into the bladder.

The patient lies on a couch with the irrigator suspended about five or six feet above him. The nozzle is then introduced into the meatus, and the fluid allowed to flow very gently until the whole anterior urethra is ballooned, when, the pressure being gradually increased, the compressor gives way, and the fluid is felt to pass along the urethra and flow into the bladder, the fingers holding the penis feeling a distinct thrill. Deep inspiration and expiration by the patient materially assist this proceeding. As soon as a desire to micturate is felt, the irrigation is stopped, usually when about 10 or 12 oz. of solution have been used. The patient is then placed in the knee-elbow position, and the contents of the prostate and seminal vesicles are expressed by rectal massage. The patient then stands and empties the bladder.

This irrigation should be given each day for about ten days to a fortnight. The best solution to employ is permanganate of potassium, commencing with a strength of 1–5000 and increasing to 1–1000 or 1–500. It must not be forgotten that in these cases the infection is usually a mixed one, and although the gonococcus responds very readily to this solution, other pus-producing organisms may be present, and in these cases, after a rest of a week or so, a further course of irrigation should be given every other day for a fortnight with perchloride of mercury solution, commencing with a strength of 1–20,000 and increasing to 1–15,000 or 1–10,000. Perchloride of mercury is exceedingly irritating to the bladder, and the weaker strengths will therefore be advisable.

In those cases where erosion and ulceration of the posterior urethral mucous membrane are present, instillations of a few drops of strong solutions of silver nitrate, copper sulphate, or zinc sulphate often prove exceedingly useful, whilst argyrol in solutions of 10 to 30 per cent has latterly proved of great service. These instillations are given either through a fine catheter or by means of a Guyon's deep urethral syringe. This is passed well through the compressor urethræ, so that the eye lies in the prostatic urethra. The fluid is then injected, and flows over the prostatic mucous membrane and the neck of the bladder, which should be emptied before the injection is given. Sometimes direct

applications to the deep urethra are required, and these must be given through the tube of a urethroscope. (See also GONORRHŒA.)

3 *Tuberculous Cystitis.*—Once the diagnosis of tuberculosis of the bladder is made, the prognosis should be most guarded, even when the area infected is but small, and so far as the clinician can judge, is confined to the bladder. When extensive infection of the bladder is already established, with or without tuberculosis of other parts, the prognosis is grave indeed, for the writer cannot bring forward a single case which can be called a permanent cure, though much can be done to ameliorate the condition of even advanced cases.

Even when, under treatment, a patient has apparently lost all symptoms, when micturition is normal and painless, the urine clear and bright, and tubercle bacilli have not been present in the urine for many months, a too favourable prognosis as to immunity from trouble in the future should be carefully guarded against. For tuberculosis of the bladder is marked by the same phenomena of apparent cure and certain relapse as in the lymphatic glands, the lungs, and joints, the intermittency of the disease being one of its most marked characteristics.

Treatment of tuberculous cystitis by operation has almost ceased, and in our opinion, most rightly. Simple drainage of the bladder, either by the perineum when the disease is limited to the vault of the bladder, or suprapubically when the base alone is infected, has been practised, upon the theory of giving rest to the bladder as, for instance, rest is given by fixation of a joint in early tuberculous arthritis. But unfortunately drainage opens the way for the almost inevitable introduction of septic organisms, and the addition of sepsis to a tuberculous bladder may be likened to applying fire to tow.

Scraping of the evident tuberculous patches through a wide suprapubic cystotomy, and under the guidance of a strong light thrown upon them through a speculum, has the disadvantage that only the obvious patches are treated, and the miniature and early tubercles remain to mature in their turn. Indeed, the history of surgical intervention in tuberculous cystitis is one long tale of failure, and it must not be forgotten that the sinuses left by operation frequently become tuberculous, and the urine which was previously acid may become alkaline when infected with other organisms, and phosphatic crusts tend to form and adhere to ulcerated patches and to the walls of sinuses established by operation.

When sepsis has been added to a pure tuberculous infection by improper and dirty catheterism—and by this is not necessarily meant gross surgical uncleanliness, but slight neglect of the stringent aseptic precautions necessary in catheterizing these cases—drainage and thorough irrigation of the bladder may certainly give some relief and remove the more distressing symptoms ; but the relief is limited to the sepsis, and cannot be expected to cure the tuberculosis.

Irrigations of, and instillations into, tuberculous bladders meet with no more success from a curative point of view than direct surgical operations, except in so far as they tend to clear up a septic element which may complicate the case. And bearing in mind the ease with which a tuberculous bladder can be infected with organisms of suppuration, it is advisable to limit catheterism and instrumentation generally to the necessities of diagnosis and the relief of retention of urine. But although the surgical treatment of tuberculous cystitis has to be painted in such dull colours, within the last few years its treatment by inoculation has been attended with some success, and in cases where the infection is not of long standing, and is fairly limited in extent, some apparent cures have resulted. The present treatment of tuberculous cystitis by tuberculin injections is based upon the work of Prof. Sir A. E. Wright upon opsonins, and is controlled by examination of the tuberculo-opsonic index.

The preparation employed is tuberculin R. (Tuberculin Rükstand) of Koch, which is an emulsion of the dead bodies of tubercle bacilli, sterilized by heat. The theory upon which the treatment depends is that the tuberculin produces in the blood serum certain substances (opsonins) which act upon the bacilli in such a way as to render them a more easy prey to the leucocytes (phagocytes) of the patient's blood. Briefly stated, after an injection of tuberculin R., the phagocytic powers of the leucocytes show a decrease for a certain period, followed by a definite increase. The former is called the negative phase, the latter the positive phase. If during the negative phase another injection is given, the negative phase is deepened, and consequently harm is done instead of good; but if the second injection is given towards the end of the succeeding positive phase, the following negative phase is smaller than the first negative, and the next positive phase is higher than the first. Stated in terms of a chart, for instance a temperature chart, the gradual rise of opsonic power follows very much the course of the rise of temperature in a typical case of typhoid fever.

Now, if this be true, it is obvious that numerous estimations of the opsonic index must be undertaken to prevent injections being given at too frequent intervals, i.e., during the negative phases, and so causing a cumulation of negative results. But in the treatment of tuberculous cystitis by tuberculin, two facts emerge from clinical observation: (1) The period between injection and the summit of the positive curve which ensues upon the negative one is fairly constant in any given patient. Therefore, after the first injection, if by several estimations of the opsonic index the period of maximum intensity is found to be from fourteen to twenty-one days, it is fairly safe to interspace the doses by that period. (2) In common with several other observers, the writer (struck with the lamentable failure of surgical measures) treated a considerable number of cases with tuberculin R. some years prior to the publication of Wright's work upon opsonins, and observed that too large a dose or too frequent a dose was followed by a clinical negative phase, i.e., that frequency of micturition, pain, and hæmaturia were all increased by over-dosage or too frequent administration; in these cases the doses were regulated entirely by the clinical signs, and results were obtained very little inferior to those obtained by estimations of opsonic indices. In a small number of cases apparent cures were noted, but, bearing in mind the strong tendency to partial spontaneous cure, and to periods of immunity from symptoms, it is not wise to place too great a reliance upon the permanence of these cures.

Still, it appears to be safer to use injections of tuberculin R. at intervals suggested by an estimation of the period required in the case of the first dose to bring the index to its positive maximum, controlled thereafter by the clinical symptoms and the effect of successive doses upon them. This is a most important point in the tuberculin treatment of tuberculous cystitis, for the continual estimation of the opsonic index is by present methods entirely out of the scope of the general practitioner, requiring much time and considerable acquaintance with the methods of bacteriological research. Even in advanced cases, a certain amount of improvement and some relief of the most distressing symptoms have been noted; and to sum up the matter, the writer has found more success to follow inoculation with tuberculin R. than has attended any operative or local treatment.

In cases where the bladder is constantly receiving infection, either from the kidneys above or from the genital system below, surgery has, however, to be called to the patient's aid. Thus, if the patient's condition permits, a tuberculous testis, vas deferens, and seminal vesicle should be removed entirely.

In the event of renal tuberculosis being the origin of the bladder infection, the question of nephrectomy entirely depends upon the condition of the opposite

kidney. If the latter is healthy, the wisest course to pursue is to remove the diseased kidney by a lumbar nephrectomy, and by prolonging the incision downwards and forwards, to remove the corresponding ureter as close to the bladder as possible. It is in this connection that the value of expert cystoscopy has been so strikingly manifested, for by it alone, or combined with ureteric catheterization and intravesical separation of the urine, can the condition of the presumably sound kidney be ascertained. It should therefore be an axiom of modern surgery that a nephrectomy for tuberculosis of the kidney should never be undertaken until after careful cystoscopy and separation of the urine from the two sides, either by ureteric catheterization or intravesical separation.

These surgical measures should be followed by a course of injections of tuberculin R. to deal with the secondary infection of the bladder.

General Treatment of patients suffering from tuberculous cystitis follows well recognized lines. Just sufficient exercise should be permitted to keep the patient's general health in good order. Cod-liver oil, malt, and fattening foods are indicated, but alcohol should be diminished, and, wherever possible, entirely prohibited. The bowels should be regulated by mild aperients and, if necessary, enemata. The diet should be easily assimilated and generous. Fresh air, warmth, and avoidance of fatigue and chill are very necessary.

Drugs as a rule have very little effect upon the course of the disease, though pain and frequency of micturition may be relieved somewhat by the use of urinary sedatives. Of these the most efficacious is perhaps the oil of yellow sandal wood, in doses of 10–15 min. three times a day. In the case of patients who are unable to assimilate this somewhat nauseous drug, gastro-intestinal irritation is caused by it, evidenced by dyspepsia, nausea, and sometimes a skin eruption. These effects are less likely to ensue if care is taken to obtain only fresh oil of the purest quality.

Henbane in full doses, i.e., ½–1 dr. of the tincture, sometimes relieves the pain and frequency, whilst decoction of triticum repens, taken in doses of 4 to 6 oz., makes the urine somewhat more bland and less irritating.

In the later stages of the disease, when a cure is evidently not to be hoped for, opium is the only drug to give relief, and it is neither necessary nor desirable to refuse it. In the form of suppositories of morphia, or by hypodermic injection, it does somewhat to soothe the really acute pain and distress of the closing scenes of this most distressing malady. *John George Pardoe.*

DACRYO-ADENITIS AND CYSTITIS.—(See Lachrymal Apparatus.)

DEAF-MUTISM.—(See Ear, Diseases of.)

DELIRIUM TREMENS.—(See Alcoholism).

DENGUE FEVER.—There is no specific treatment. Hypodermics of morphia may be required if the pains are severe. Quinine is useless. Low diet and rest in bed are essential. The joint affections are often induced by too early exertion. Hot applications to the affected joints in the early stages give relief, and mild counter-irritants, such as painting with iodine or iodide of mercury, are useful in the later stages. *C. W. Daniels.*

DENTAL CARIES.—(See Teeth.)

DERMATITIS HERPETIFORMIS.—Obviously, the most important thing in connection with this disease is the diagnosis, but assuming that this has been correctly made, the treatment now indicated is generally to some extent helpful in alleviating the patient's sufferings from a very obstinate disease. The most

important remedy is rest, and admission to hospital almost always results, in the working classes, in the rapid disappearance of the disease, which, however, unfortunately reappears when the sufferers resume work. In the better classes the same result follows a sojourn in any health resort, with the same recurrence of the disease on the return to work. The longer the interval, however, the better the chance of the disappearance of the disease, or at least of the lightening of the severity of the attacks.

Internally, the best remedy is arsenic, which almost always controls the eruption. But it must always be taken under strict supervision, for its continued free administration is associated with grave risks. Ichthyol, strychnine, atropin, salicin, and many other drugs have been recommended ; but none of them has the controlling power which arsenic possesses.

Of the many external applications, the most useful is the least likely, for it would not occur to any one to apply to so sore and inflamed a skin so rude a preparation as sulphur ointment, and yet there is no remedy which gives such immediate relief to the itching. Ichthyol ointment is applied by some, and carbolic oil and other anti-pruritic applications may be tried.

Norman Walker.

DIABETES INSIPIDUS.—The hygienic treatment of this condition involves attention to the state of the skin, warm clothing, and the avoidance of chill and fatigue. The diet should be as far as possible free from salt and poor in nitrogenous constituents. No restriction should be placed on the consumption of fluids.

Treatment by drugs is very unsatisfactory. If there be a syphilitic history, iodide of potash should be given. Of the many drugs which have been tried, the following are the most likely to be of help : Liquid extract of ergot (1 to 2 dr. three times a day) ; opium up to the limits of tolerance ; gallic acid (up to 40 gr. a day) alone or combined with opium ; valerian in very large doses (probably most useful in hysterical cases). Suprarenal preparations have not proved encouraging.

Robert Hutchison.

DIABETES MELLITUS.—(See also GLYCOSURIA.)

1. **Dietetic Treatment.**—Having determined, by the permanent presence of sugar in the urine, that one has to deal with diabetes and not with a mere glycosuria, one must next ascertain, by means of the perchloride of iron or other test, whether any acetonæmia exists. Assuming this to be absent, the next step is to decide as to the severity of the particular case in hand. For this purpose a " test diet " should be given, consisting of 1 lb. of meat, 3 eggs, green vegetables, butter, and 4 oz. of white bread, part of the latter being eaten at each meal. The amount of sugar in a mixed sample of the urine should be estimated after the lapse of three days, and if it contains less than 70 grams of sugar in the twenty-four hours (which is the amount yielded by the starch in 4 oz. of bread) one has to deal with a mild case in which there is a certain tolerance of carbohydrates. If, on the other hand, the amount of sugar excreted be more than 70 grams, then the case is a severe or " composite " one, with no tolerance of carbohydrates, and in such a case it will often be found that acetone is present in the urine as well as sugar.

The subsequent regulation of the diet must be determined by the particular class of case to which the patient belongs. If he can take 4 oz. of bread without glycosuria resulting, one must go on adding bread to the diet until one finds the limit of his tolerance, and then keep him on a diet containing rather less than that amount, or its equivalent, in some other form of carbohydrate-containing food (see Table below), for it is never safe to allow a diabetic to take starchy foods up to the limit of his powers of assimilation. The patient should adhere

to this diet, provided his weight remains satisfactory, for some weeks, when the amount of starch may be cautiously increased, a watch being kept for any return of glycosuria. If, on the other hand, the case be one of the severe or composite type, in which sugar is excreted even upon a carbohydrate-free diet, it will be necessary to restrict the intake of proteids as well as that of carbohydrates, for in such a case sugar seems to be derived from the proteids too. Eighteen ounces of cooked meat, or its equivalent in some other form of proteid food, should be the limit allowed in such a case. The writer's own practice is to give 6 oz. of meat, 3 eggs, 4 oz. of casoid bread, and 2 pints of sugar-free milk (see below) along with green vegetables and butter. If the sugar excretion does not fall, or if the patient loses weight, a known quantity of ordinary bread is added to the diet.

Should the perchloride of iron test show the presence of aceto-acetic acid in the urine, it is not advisable to put the patient on a quite strict diet, certainly not at once. In such a case one should be content if the sugar excretion can be kept at about 100 grams per day.

It will be evident from these considerations that there is no uniform "diabetic diet." Each case must be treated on its own merits.

In arranging the details of the diet the following tables will be found useful.

I. Foods which Yield Little or No Sugar.

All animal foods (except liver, sausages, cheese and cream, and oysters).
All clear soups.
Unsweetened jellies.
Green vegetables, but not peas, beans, or lentils.
Asparagus, celery, young rhubarb, tomatoes, cucumber, and mushrooms.
All nuts (except chestnuts); early oranges, apricots, strawberries, and gooseberries.

II. Table of Carbohydrate Equivalents.

Two oz. of bread	=	2 oz. of pea or lentil flour
,,	,,	,,	$1\frac{7}{10}$ oz. of rice
,,	,,	,,	$1\frac{1}{2}$ oz. of oatmeal or barley flour
,,	,,	,,	$1\frac{4}{5}$ oz. of cornflour, arrowroot, sago, tapioca, or rice
,,	,,	,,	10-15 oz. of the sweeter fruits
,,	,,	,,	40 oz. of apples

Use of Special Articles of Food: —

Bread.—No completely satisfactory substitute for bread in the dietary of diabetes has yet been found. The best are those which contain casein.* A variety of cakes and biscuits prepared from cocoa-nut, almond flour, bran, aleuronat, roborat, and other ingredients are made by the makers of special foods for diabetics, and serve to introduce variety into the diet.

Milk.—The sugar of milk is less harmful to diabetics than most other forms of carbohydrate, but there are few in whom it does not aggravate the glycosuria. Cream, however, is permissible in most cases, unless a very strict diet is being enforced. A special milk, entirely free from sugar, has been prepared under the writer's directions, and can be obtained in a sterilized form from Messrs. Callard, Regent Street, W. It can be given diluted with soda water or flavoured with tea or coffee, or made into custards with eggs, and will be found of great assistance in many cases.

Fatty Foods are of the greatest use in diabetes; butter, cream, cream cheese, bacon, ham, and salad oil being the best forms.

Vegetables.—Green vegetables contain so little starch that they may be allowed in every case. They should be taken with melted butter. Asparagus, celery,

* Such breads are supplied by The Protene Co., Welbeck Street, W., Callard & Co., Regent Street, W., Bonthron & Co., Glasshouse Street, W.

young rhubarb, tomatoes, vegetable marrow, cucumber, and mushrooms are also harmless.

Potatoes are not permissible in cases in which a strict diet is being enforced. If a limited quantity of carbohydrate can be taken they are a useful food, as they can be made to absorb so much fat ; 6 oz. of cooked potato may be reckoned as the equivalent in starch of 2 oz. of bread.

Fruits.—Most fruits are not permissible ; but early oranges, apricots, strawberries, and gooseberries may be taken in moderation. Nuts of all sorts, except chestnuts, are allowed, and are of great value to the diabetic on account of their richness in fat.

Lævulose, or fruit sugar, is fairly well assimilated in some cases of diabetes. and may be given a trial in quantities of 1 or 2 oz. per day. It is rather expensive.

Beverages.—Malt liquors, sweet wines, and sweetened aerated drinks must be avoided, and so must liqueurs and cordials made with sugar. On the other hand, spirits and all natural wines are allowable, and should form part of the regular dietary of diabetics, as alcohol aids in the digestion of fat, besides replacing sugar to some extent. Harvey's sugar-free ale (Burgoyne, Burbidges & Co., Coleman Street, E.C.,) is a pleasant and harmless drink for patients who like malt liquors.

Tea and coffee may be allowed freely ; pure cocoa extract contains so little starch that it also is permissible.

As diabetics are apt to suffer from hunger, at least four meals should be allowed in the twenty-four hours. It is safest to make any change in diet gradually, especially if acetone be present in the urine ; and in the latter case a perfectly strict diet is rarely advisable unless for quite short periods.

Hygienic Treatment.—The diabetic should be warmly clothed, and should avoid chill, over-exertion, and worry. Muscular exercise is useful, but must always stop short of fatigue. Care should be taken to have a daily action of the bowels. If acetone be present in the urine, special precautions should be taken to avoid the onset of coma. Any sudden change of habits, any fatigue or chill, are then specially dangerous.

Drug Treatment.—Opium is the drug from which most benefit is likely to be obtained. It may be given either in the form of the extract or of crude opium, ½ gr. of the former or 1 gr. of the latter being given as a pill after each meal, and the dose gradually pushed up to the limit of the patient's tolerance. If constipation prove troublesome, 2 or more gr. of extract of cascara may be added to each dose. Codeine is probably less useful than opium, but is preferred by some. It may be given in the form of the phosphate as a pill, beginning with a dose of ½ gr. and gradually increasing it.

In the milder cases salicylate of sodium is sometimes useful ; it may be pushed until 60 gr. are taken daily. Aspirin, given in similar doses in a little water to which a drop of lemon-juice has been added, suits some patients better. Many other drugs, such as uranium nitrate, yeast, and arsenic have been recommended at various times, but none of them can be depended upon. It may be said with confidence, indeed, that no drug exerts any real influence in the severe form of the disease. If the urine gives a positive reaction with perchloride of iron, the administration of sodium bicarbonate should be begun at once in order to ward off acid toxæmia, doses of ½ to 2 oz. or more may be given in the twenty-four hours, dissolved in milk or soda water. Such quantities are well borne even for prolonged periods, but the writer has known them lead to the development of general anasarca in a few instances, which, however, disappeared with the cessation of the use of the drug. Tabloids of suprarenal capsule have been found useful in the bronzed form of diabetes.

Treatment of Complications.—If coma threatens, the diet should be reduced

to skimmed milk and Vichy water. Bicarbonate of soda should be pushed both in liquids and in the form of enemata (1 oz. to ½ pint of hot water), or, if the case be urgent, it may be given by subcutaneous transfusion (1 dr. to a pint of 0·7 saline). If coma be already present, 150 ccm. of 0·7 per cent salt solution, to which has been added 5 grams (75 gr.) of bicarbonate of soda, may be injected into a vein.

Give antipyrin for headache; oxygen inhalations for dyspnœa; and brandy, digitalis, and ether (subcutaneously) for heart failure.

If phthisis, eczema, boils, carbuncles, or gangrene occur in the course of diabetes, the treatment of the main disease must be energetically carried out, and the local complication dealt with on the lines laid down in the special article relating to it. (See PHTHISIS, CARBUNCLE, etc.) *Robert Hutchison.*

DIARRHŒA, HILL.—In the more severe form this closely resembles sprue, and similar dietetic treatment is required, though it is not necessary to continue the treatment for so long a period. In the milder forms, a less severe regimen suffices. The Indian authorities advocate the administration of a drachm of liq. hydrarg. perchlor. a quarter of an hour after food, and two hours later, 10–15 gr. of pepsin. (See also SPRUE.) *C. W. Daniels.*

DIARRHŒA, INFANTILE.—Diarrhœa may be acute or chronic.

Acute Diarrhœa may be *Catarrhal* or *Septic.*

Catarrhal Diarrhœa constitutes the ordinary simple form of looseness of the bowels to which all infants and young children are so liable. Infants during teething are peculiarly prone to this derangement, for teething sets up pyrexia, and a feverish child is more sensitive than another to changes of temperature.

An ordinary mild intestinal catarrh can be quickly cured by a dose of castor oil to clear away irritating matters from the bowel, followed by a mild astringent mixture. The latter must vary according to the nature of the evacuations.

If the stools are fermenting and acid, an alkali is required. The time-honoured chalk and catechu mixture may be given three times a day; or we may order instead

℞ Bismuth. Carb. gr v | Pulv. Cretæ Arom. gr j*

In a teaspoonful of glycerin and water three times a day.

Ordinary loose fæcal evacuations containing undigested curd of milk yield quickly, as a rule, to—

℞ Zinci Oxid. gr j | Glycerin. ℥x
Tinct. Opii ℥½ | Aq. Carui ad ℥j

To be given every four hours, following, of course, the necessary aperient.

If, however, they persist, one grain of tannigen may be added to each dose. As alternative prescriptions we may employ:—

℞ Sp. Ammon. Arom. ℥ss | Tinct. Rhei Co. ℥iij
Tinct. Opii ℥½ | Glycerin. ℥x
Aq. Anethi ad ℥j

Every four hours.

Or,

℞ Tinct. Coto ℥iij | Glycerin.
Creosot. ℥¼ | Mucilag. āā ℥x
Tinct. Opii ℥½ | Aq. Carui ad ℥j

To be taken three times a day.

* The doses ordered are suited to a n infant of twelve months.

As long as the stools continue to show the presence of undigested curd, it is advisable to give from time to time a dose of castor oil or rhubarb and soda. At the same time the diet should be reconsidered, and, if thought desirable, the quantity of milk taken at each meal may be reduced, or one grain of citrate of soda may be added to each ounce of milk in the feeding-bottle, as recommended by Sir A. E. Wright and Dr. Poynton.

If the stools are foul-smelling, an antiseptic is required. Of these one of the best is a combination of tincture of iodine and glycerin of carbolic acid, a half to one drop of each, given in glycerin and water three times a day; or, if bismuth and chalk are being taken, one grain of salicylate of soda may be added to each dose of the mixture. As alternative remedies we may use :—

℞	Resorcin	gr ij	Tinct. Cardamom. Co.	℥v
	Tinct. Rhei Co.	℥iij	Aq. Chlorof.	℥x
	Tinct. Opii	℥ss	Aq. Menth. Pip.	ad ʒj

To be taken three times a day.

Or,

℞	Liq. Hydrarg. Perchlor.	℥v	Aq. Chlorof.	℥x
	Tinct. Opii	℥ss	Aq.	ad ʒj

Three times a day.

Green stools, if acid, should be treated with the above bismuth remedy; if alkaline, they yield readily, as a rule, to a teaspoonful of a 2 per cent solution of lactic acid given every hour.

Whatever be the form of drug employed, it is useful to add to each dose a small quantity (¼–1 drop) of laudanum. The sedative delays the peristaltic movement of the bowel and gives the astringent a longer time to act. It is well, however, whenever an opiate is included in the prescription, to warn the attendants that the child is on no account to be waked up to take his medicine.

When the catarrh affects principally the lower bowel, the stools contain visible mucus in large quantities, with blood in patches and streaks from the straining. In this variety, which is often called "dysenteric diarrhœa," castor oil, opium, and ipecacuanha in small doses are especially indicated :—

℞	Ol. Ricini	℥ij	Vin. Ipec.	℥j
	Tinct. Opii	℥ss	Glycerin.	℥x
			Aq. Cinnamom.	ad ʒj

To be given every four hours after food.

If in these cases the tenesmus is great and the bowel protrudes during defæcation, a local sedative is indispensable. Two drops of laudanum in a teaspoonful of thin warm boiled starch must be injected into the bowel after a stool, or a suppository containing one-fifteenth of a grain of cocaine in five grains of cocoa butter may be used instead, and repeated twice a day.

In cases where the tenesmus is extreme and the prolapsed mucous membrane protrudes as a bright crimson ball, which cannot be retained within the sphincter even for a moment, the projecting part should be first fomented with warm water; then half an ounce of thin warm boiled starch, containing three drops of laudanum and five grains of powdered ipecacuanha, should be injected into the rectum, and the fundament be afterwards covered with a thick poultice of boiled starch. The enema may be repeated twice a day, but the fomentation and poultice must be renewed after each action of the bowels.

The form of looseness called "lienteric diarrhœa" requires a different treatment. The looseness is due to exaggerated peristaltic movement of the bowels. The peristalsis is induced by the act of eating, and the stools are preceded by severe griping pains and marked by extreme urgency. An infant while taking his bottle stops sucking, cries in pain, and discharges the stool in a sudden gush.

An older child has often to hurry away from the table during the course of a meal. This variety is quickly cured by small doses of arsenic and nux vomica :—

℞	Liq. Arsenicalis	℥ss	Glycerin.		℥x
	Tinct. Nucis Vom.	℥½	Aq. Carui		ad ʒj
	Tinct. Cardamom. Co.	℥v			

To be given three times a day.

The quantities must, of course, be made larger for older children, but the arsenic solution should not exceed a drop for the dose.

The above is the medicinal part of the treatment of diarrhœa ; but this is only a part. The looseness is due to a catarrh ; therefore with a child so affected every precaution must be taken that the mischief is not maintained or renewed by a series of fresh chills. The washing bath must be stopped for a few days, and only sponging of the face and hands and of the buttocks after a stool, should be allowed. The feet and legs must be made and kept warm, and the abdomen, as the most vulnerable part, should be covered with a substantial flannel binder. In cold weather the child should be kept indoors, but his living rooms must be carefully ventilated, and no milk or food of any kind should be allowed to remain in them when not in actual use. Moreover, dirty napkins should be removed from the nursery at once.

For food, an infant may take cow's milk (boiled), lime-water, and barley-water in equal proportions ; but it must be remembered that the barley-water must be fresh, and that in warm weather it is not a safe addition to the food when more than six hours old. Mellin's food may be added to each alternate meal for the sake of variety, and the child, if twelve months old, may take once a day a cup of veal broth with a rusk. If the looseness continue after two or three days of the treatment, it will be advisable to stop the milk and give instead quite fresh whey and cream, broth, Mellin's food and barley-water, or albumen water, until the stools have again become natural.

In the case of older children, starchy puddings, jam, and fruit must be strictly forbidden, and the diet limited to rusk and milk, broth, sole or plaice boiled or broiled, dry toast and butter, etc. In them, too, the bath is to be forbidden for the time, and great attention must be paid to the warmth of the feet and legs.

Septic Diarrhœa, often called summer diarrhœa, is distinguished by two prominent symptoms : the temperature is raised, and the skin, especially that of the abdomen, is markedly inelastic. The latter is a sign of the utmost gravity, for, however mild the other symptoms may appear, unless the elasticity of the skin can be restored the child will surely die.

A high temperature is best reduced by enemas of cooled water ; but in making use of the remedy we must bear in mind the tendency in this complaint to sudden collapse, and remember that a too rapid reduction of the bodily heat may be attended by serious symptoms of heart failure. It is wise to begin with a temperature of 80–85° F., and 4 oz. of boiled water cooled to this heat should be passed slowly into the bowel. Any sign of depression must be noted, and it is judicious to give a dose of brandy both before and after the operation, and apply heat to the child's feet when he is returned to his cot. The injection is to be repeated at intervals as the temperature rises again, gradually increasing the quantity of fluid, and using water as cool as the child will bear without showing symptoms of shock. We should try to keep the rectal temperature below 102°.

To restore the lost elasticity of the skin the patient is wrapped as high as the arm-pits in a towel wrung out of cold water, which has been made more stimulating by the addition of a ⅛ part of brandy or eau-de-cologne, and is then closely covered from the neck downwards with dry blankets well tucked in.

The child may remain thus swathed for many hours, or even several days, with great benefit. Every few hours he should be taken out of the wraps, rubbed dry, and repacked as before. The diuretic action of 10 drops of nitrous ether given in a little water every two hours is a useful addition to this treatment, for a copious flow of urine is often followed by immediate return of the healthy resilience of the skin. The wet pack is well borne as a rule, and usually helps to reduce the temperature of the body; but if it have an opposite effect, or lead to cardiac depression, its use must be at once abandoned.

If vomiting be obstinate, the stomach should be washed out and nothing but cold sterilized water allowed to be taken. As the thirst is extreme, water may be given frequently; indeed, the child, if he can suck, may be allowed to take it at will from a feeding-bottle. After washing out the stomach, a poultice containing $\frac{1}{8}$ part of mustard should be applied to the epigastrium; and a few doses of calomel ($\frac{1}{8}$ gr. put upon the tongue every half-hour) help greatly to allay the irritability of the stomach. Ingluvin, too, is a remedy which often produces the happiest results, given in doses of 3 gr. every two or three hours.

As long as the vomiting continues water should be the only fluid allowed to be taken, but when this is found to be retained we may attempt cautiously to feed the patient with white wine whey, plain whey, or albumen water. They must be given cold and in gradually increasing quantities, but at first we should only allow 1 teaspoonful every quarter of an hour. Milk is to be strictly forbidden.

To control the purging, astringents do more harm than good while the temperature continues high, and an antiseptic in some form is indispensable. The best of these, indeed the only one which I have found of any appreciable value, is calomel. It should be given in doses of $\frac{1}{6}$ gr. every two or three hours in conjunction with either compound ipecacuanha powder $\frac{1}{6}$ gr., or naphthalin $\frac{1}{2}$ gr., resorcin 2 gr., chloral hydrate 1 gr., or β-naphthol $\frac{1}{4}$ gr.

When the temperature has fallen, if the diarrhœa still continues, the astringent class of remedies may be resorted to. Of these perhaps the most useful is the salicylate of bismuth:—

R	Bismuth. Carb.	gr v	Sod. Salicyl.	gr j
	Glycerin.	℥x	Aq.	ad ʒj

Every three or four hours.

but any of the remedies recommended for catarrhal diarrhœa may be made use of.

One of the special dangers connected with septic diarrhœa is the tendency to general collapse, and the first sign of prostration must be met with energetic stimulation. The mustard and linseed poultice before recommended should be applied over the heart, or the infant may be put into a mustard bath and held there until the skin is well reddened; white wine whey in frequent doses of 1 teaspoonful should be given if it can be retained, and $\frac{3}{4}$ of a drop of liq. strychninæ, with 5 drops of ether, should be injected under the skin. This latter remedy, with or without the ether, should be repeated every hour while the prostration continues.

In children after the age of infancy the hypodermic injection of morphia has an almost immediate effect in checking the vomiting and purging. The earlier in the complaint the remedy is used the better; it is of no further advantage after prostration has set in. For a child of four years of age, $\frac{1}{20}$ gr. may be used combined with 5 drops of ether, and the injection may be repeated in three hours if it is considered that a sufficient effect has not been produced.

Chronic Diarrhœa is the result of continually recurring catarrh of the bowel. To put a stop to it we have to take every possible precaution to avoid a fresh chill. The child's feet and legs, which are always bitterly cold, must be wrapped thickly

in cotton-wool, and the washing bath—at any rate for the first fortnight—must be prohibited. When it is resumed the child must be sponged for one minute in hot (100°) soap-suds.

In the diet, milk must be forbidden, and the food should consist, for an infant, of fresh whey and barley-water ; whey and cream ; veal broth and barley-water ; and yolk of egg beaten up with veal broth or barley-water. Mellin's food or extract of malt may be added to any of these foods for the sake of variety.

Older children should take no milk, and very little starch. Pounded mutton or chicken ; minced sole or plaice ; eggs ; fat of bacon ; toast or malted bread may be allowed ; butter may be given freely ; and well-boiled cauliflower or vegetable marrow, or in winter, large Spanish onions stewed for five hours *with frequent changes of the water*, are unobjectionable. In bad cases, raw mutton pounded and strained through a sieve should be given in quantities as large as the child can be induced to take. This is especially useful when the patient is passing large unformed putty-like stools, consisting chiefly of fat and starch.

For medicine, nitrate of silver combined with opium should be our mainstay :—

℞ Argent. Nitrat. Cryst.	gr ½	Acid. Nit. dil.		♏ss
Tinct. Opii	♏j	Glycerini		♏x
		Aq.		ad ℥j

We may use as alternatives :—

℞ Liq. Hydrarg. Perchlor.	♏x	Aq. Chlorof.		
Tinct. Opii	♏j	Aq. Destill.		ää ℥ss

Three times a day.

Or,

℞ Ext. Hæmatoxyli	gr j	Tinct. Opii		♏j
Tinct. Krameriæ	♏iij	Glycerin.		♏x
		Aq.		ad ℥j

Three times a day.

Or,

℞ Salol	gr ij	Pulv. Cretæ Aromat. c. Opii	gr ss
Bismuth. Subnit.	gr v		

Ft. pulv. To be given with 2 or 3 minims of glycerin three times a day.

Any of the astringent mixtures recommended for simple diarrhœa may be used, but lead salts should be avoided as inadmissible for infants.

If the stools are large and pasty, a dose of powdered rhubarb, 3 gr., aromatic chalk powder, 1 gr., should be given first, and after its action the nitrate of silver medicine ; but, indeed, the latter is useful in every stage of the complaint. Much mucus in the stools is an indication for the perchloride of mercury mixture already recommended, or for the castor oil and opium mixture.

When the diarrhœa has been arrested a tonic is often required to give tone to the bowel and brace up the mucous membrane. The best of these is perhaps pernitrate of iron, 2 drops of the solution being given with $\frac{1}{6}$ drop of the tincture of nux vomica in a teaspoonful of infusion of calumba three times a day after food. It should be sweetened with glycerin.

In cases of tuberculous ulceration of the bowel with diarrhœa, the same measures will usually be sufficient to control the purging by curing the intestinal catarrh. The nitrate of silver is especially useful in these cases. It must be remembered, however, that the improvement in the stools does not imply an arrest in the ulcerative process. *Eustace Smith.*

DIARRHŒA, NERVOUS.—As the cause of this condition is purely nervous, so the treatment must be directed to the general health by prescribing rest, change of scene, or, under suitable conditions, a Weir-Mitchell course (rest cure). Simple astringent remedies are of little use, but opium or its alkaloids,

administered cautiously, are of considerable service, because these preparations not only diminish the intestinal peristalsis, but act as sedatives to the general nervous system. Unhappily, even in small doses, they disagree with many people. The bromides are not open to this objection, but are less effective ; they are, however, worth trying. (For other forms of diarrhœa, see ENTERITIS, COLITIS, etc.) *Robert Saundby.*

DIARRHŒA, TROPICAL.—Chronic diarrhœa, or recurrent attacks of diarrhœa, are very closely allied to dysentery. They frequently follow it, and are often associated with similar lesions. If mucus be present in such stools, with or without blood, the disease should be regarded and treated as chronic dysentery. If amœbæ are found, the diagnosis is certain. In other cases, a close enquiry into the habits and diet may reveal irregularities as the cause. The commonest errors are abuse of alcohol or an excessive meat diet.

In many such cases an increase in the amount of fresh vegetable food, not excluding green vegetables, and making free use of native roots, such as yams, arrowroot, sweet potatoes, etc., and limiting the amount of meat, will result in speedy improvement. Moderate but regular exercise is of great value. A preliminary purgative should be given before commencing the treatment.

The abdomen and loins must be kept well covered by a broad flannel belt or bandage. (See also DIARRHŒA, HILL). *C. W. Daniels.*

DIPHTHERIA.—The two cardinal points in the treatment of this disease are : (1) *The early use of antitoxic serum ;* and (2) *Rest in bed.*

1. The imperative need of giving antitoxic serum (or antitoxin, as it is briefly called), at the earliest opportunity, in all forms of diphtheria, cannot be too earnestly impressed upon the practitioner, even though the nature of the disease may be doubtful when the patient is first seen. Diphtheria is usually subtle in its onset, and frequently swift in its evolution. In its treatment hours are of value, and the earliest hours are the most precious. It is perilous to wait till diphtheria bacilli have been demonstrated (unless they are demonstrated on the spot in a smear preparation), till the local exudation has become definitely membranous, or till symptoms of toxæmia appear. In the large majority of cases, antitoxin, if given on the first day, will cut short the disease by preventing the spread of the membrane, and by neutralizing the action of any toxin that may, even so early, have been absorbed. Paralysis and cardiac troubles are rare and slight in cases treated with antitoxin on the first day.

On the faintest suspicion of diphtheria of whatsoever form (i.e., faucial, laryngeal, etc.), 2000 units of antitoxin should be injected. In mild cases seen on the first day, this dose will usually suffice ; but if the case is a severe one, as it often is after two or three days' illness, the dose must be increased to 8000 or 10,000 units. Half the first dose should be given within twenty-four hours, unless a very marked improvement has taken place. A third dose (half the first) may be given in very severe cases when the local exudation is slow in yielding or shows signs of extending. The writer is of opinion that 16–20,000 units, altogether, is about the limit beyond which it is unnecessary to go.

Probably the most efficacious mode of administering antitoxic serum is by intravenous injection ; but the most convenient method is by hypodermic injection.* The best site is the lateral region of the abdomen. If given

*Experimental evidence shows that intravenous injection is more efficacious than subcutaneous. The whole of the antibody (antitoxin) in the serum is at once introduced into the circulation, whereas in subcutaneous injection it takes from two to three days for the antibody to be present in the circulation in any efficacious amount; and even then the amount present is very much less than the amount injected. The practical difficulty is that it is by no means always an easy matter, in a severe toxic case of diphtheria, to hit off a vein in which to inject the serum. As for the administration by the mouth or rectum, experimental evidence is quite against its efficacy.

anywhere in the back, the patient may be prevented for three or four days, by the tenderness and stiffness that sometimes follow, from lying on the back with comfort. The swelling caused by the injection of the serum usually disappears in fifteen to thirty minutes, according to the amount. Care should be taken that the serum enters the subcutaneous tissue, and not the skin or the muscles. It is the injection into these structures that causes pain. Every aseptic precaution should be used ; the skin should be washed with soap and water, spirit, and some antiseptic solution, and the syringe boiled just before the injection. The most convenient forms of syringe are Roux's and those made (except as regards the needle) entirely of glass. The needle should be connected with the nozzle by three or four inches of indiarubber tubing.

Before injecting the serum, the air that may be present should be expelled from the needle, tubing, and syringe. The puncture made by the needle should be sealed with a little cotton-wool dipped in collodion. When filling the syringe, be careful that the serum is exposed to the air for the shortest possible time. Once having uncorked a bottle or tube of serum, use all the contents immediately ; do not recork the bottle to keep for future use. But so long as a bottle has not been uncorked, and has been preserved in a dark, cool place, the serum retains its efficacy for several months.

Antitoxin will sometimes give rise to a rash (urticaria or a variety of erythema multiforme) which itches intolerably ; the application of spirit lotion, or lead and opium lotion, or menthol ointment (1 dr. of menthol to an ounce of par. alb. mol.) will allay this irritation ; calcium chloride in 5-gr. to 15-gr. doses should also be given every four hours. For the pains in the joints and fasciæ that sometimes occur, lead and opium lotion, or glycerin and belladonna, externally, with a suitable dose of laudanum internally, is the best treatment. Sodium salicylate is not usually of much avail. An abscess at the seat of injection will occasionally occur.*

2. Next to antitoxin, *rest* is the most important factor in the treatment of diphtheria. The pathological change most to be feared is fatty degeneration of the cardiac muscle. It is highly probable that this occurs in all cases where toxæmic symptoms, however slight, are present. It is certainly present in all severe cases ; and it sets in early in the disease. Therefore, the patient should be confined to bed at once, and kept there for ten days or a fortnight after the disappearance of the exudation in mild, or of toxæmia and cardiac symptoms in severe, cases ; indeed, he must be restricted to the recumbent position, and the effect of sitting up in bed should be observed for a few days before he is allowed out of bed. The condition of the circulation should be carefully and frequently observed. When the patient is first allowed out of bed, it should only be to sit in an easy chair for two or three hours ; and the effect of even this slight exertion should be carefully watched. Any sudden or prolonged exertion is absolutely to be prohibited for several weeks after an attack of diphtheria, the length of time varying according to the nature of the attack. If the exudation has persisted for several days ; if there has been albuminuria for more than one or two days ; if there has been any cardiac irregularity, or any paralysis (nasal voice, squint, etc.), the necessity of this prohibition is emphasized. In severe cases, not only physical but mental excitement is to be avoided.

So long as any exudation is present, local treatment should be carried out with a view of removing it ; but if the patient vehemently resists, as is often the case

* The rashes, etc., due to serum usually appear a week to a fortnight or more after the injection. But occasionally when a patient has already had horse-serum several weeks or months before, the rash may come out within a few hours or a day or two ; and there may also occur severe symptoms (high temperature, rigor), in addition ; (anaphylaxis, supersensitation). Hence some caution should be exercised in horse-serum for relapses or second attacks ; it should be given only if they threaten to be serious.

with children, it should be omitted, because the struggles of the patient are harmful to him. When the exudation is extensive, syringing the nose and fauces should be practised; but with limited exudation, gargling or swabbing will be sufficient. The following liquids are useful: warm water, normal salt solution, saturated solution of boracic acid, 1–600 to 1000 chinosol, and the following alkaline solution:—

℞	Sod. Biborat.	ʒj	Sod. Chlorid.	ʒss
	Sod. Bicarb.	ʒj	Tinct. Lavend. Co	ʒj
	Potass. Chlorat.	ʒss	Aq.	ad Oj

Solutions that are so strongly bactericidal as to be able to destroy the bacilli *in situ* do more harm than good, being as inimical to the mucous membrane as to the micro-organisms. By setting up inflammation they actually further the spread of the diphtheritic exudation.

Syringing should be performed with a ball or Higginson's syringe, or with a douche-can and tube. When using these syringes, care should be taken that the nozzle is not so long as to reach the soft palate, lest injury be inflicted on this structure.

In nasal diphtheria the nasal fossa should be syringed out with the alkaline solution mentioned above. Hæmorrhage is very rarely so profuse as to require treatment. If it occur, the nose should be syringed with iced water, having alum or tannic acid dissolved in it. In very severe cases of hæmorrhage the nares must be plugged.

Cardiac Failure.—In diphtheria this occurs in two forms: (1) There is the comparatively slowly progressing failure, which may be observed to a greater or less degree in all cases of toxæmia during the first fortnight of the disease. The ordinary cardiac stimulants are quite useless in this condition. But adrenalin chloride is worth trying (Dr. J. D. Rolleston); 5 min. of the solution in a drachm of camphor water should be given every four hours, the dose being gradually increased to twice these amounts every two hours. If there is vomiting, and rectal feeding has to be resorted to, 3 dr. of the solution (15 min. of adrenalin) may be given in each nutrient enema every four hours. (2) There is the cardiac paralysis of convalescence. This frequently takes the form of a syncopal attack. Here strychnine, brandy, and similar stimulants are of great value. The patient should be placed on his back with his head lowered, and hot-water bottles should be applied to the feet. But if the warnings already given as to the necessity of strict rest during the first few weeks of convalescence are heeded, serious attacks of syncope will not often be met with.

Vomiting is another symptom of diphtheria that frequently calls for treatment. This, too, may be early or late, and the former is most intractable. The following treatment, in roduced by Dr. G. C. Garratt, should be tried All nourishment by the mouth must be omitted, and nutrient enemata given every four hours, 20–30 min. of tincture of belladonna being added to each enema, with 20 gr. of potassium bromide once every twelve hours. About an hour after each dose of bromide, introduce slowly into the child's stomach 10 or 12 oz. of water at 115° F., to which a little sodium bicarbonate has been added. In order to do this the child must be wrapped in a large towel; the body and legs are held by a nurse, and the head is laid upon a mackintosh spread over the operator's knees. A good-sized silk-gum œsophageal tube, previously bent to a suitable curve, must be passed through the mouth into the stomach. If the water is rejected, pour in some more till it is retained. Take out the tube quickly, and after waiting a few minutes, put the child to bed. Strychnine and alcohol must not be given. Vomiting occurring at a later stage is best treated by giving nourishment by enemata.

Paralysis.—If paralysis, however slight, sets in after the patient has been allowed to get up, he should be ordered back to bed at once. The length of time it will be necessary to keep him there depends upon the course and extent of the paralysis.

If there is regurgitation of fluids through the nose, or coughing and spluttering when the patient drinks, he should be allowed only thickened liquid food, such as cornflour. Young children should be fed by means of a tube passed through the nose and œsophagus ; if there is vomiting, nutriment must be given by means of enemata till it ceases ; and if enemata are not retained, subcutaneous injections of sterilized horse's serum, 20–30 cc. every four hours, may be given for two or three days.

When the respiratory muscles are affected, the foot of the bed should be considerably raised, to prevent saliva trickling into the air-passages, and to facilitate the escape of mucus from the lungs ; 20–30 min. of tincture of belladonna should be given by the mouth or rectum every four hours. The patient may also be made to inhale oxygen at intervals. Ciliary paralysis will prevent an adult from reading ; the provision of suitable plus glasses will remedy this inconvenience. Strychnine is a very useful drug in paralytic cases. When the patient is beginning to recover, the wasted muscles should be massaged.

Laryngeal Diphtheria.—Directly there are signs of affection of the larynx, the patient should be placed in a warm, moist atmosphere. This may be accomplished by means of a bronchitis kettle. If the patient is in a ward or a large room, it will be necessary to put him under a tent into which the steam escapes. Another dose of antitoxin should be given. Under this treatment most cases will get well without the surgeon's aid. But if the laryngeal symptoms are urgent, surgical relief must be afforded. The writer usually waits till the dyspnœa prevents the patient getting any rest, or till there is considerable recession. In private practice the relief afforded must be by tracheotomy, but in hospital practice it should be by intubation. The latter operation requires the constant attendance of a medical man within three or four minutes' call ; hence it is unsuitable for private practice.

In hospital practice the only contra-indication to intubation is a moribund state of the patient from suffocation ; then tracheotomy is essential.

Intubation.—The instruments necessary for intubation (*Fig.* 3) are : (1) The intubation tube ; (2) The obturator or pilot, which fits into the lumen of the tube, and is rigidly fixed by a slot and bolt to (3) The introducer ; to the introducer is attached a sort of arm, which can be moved by the thumb in such a way as to release the tube from the pilot ; (4) A gag. A long loop of silk or thread is attached to a hole in the head of the tube.

In the writer's opinion the best instruments are those modified by Bayeux from O'Dwyer's pattern, and made by Collin, of Paris. A set of all the requisite instruments is supplied in a box ; besides the instruments mentioned, there is an extractor for the removal of the tube. The size of the tube to be used varies with the age of the patient. An anæsthetic is quite unnecessary. The patient should be laid flat on his back. In most cases of diphtheria it is undesirable to place the patient in the upright position on account of the liability to syncope. It is, moreover, easier to steady the head in the recumbent than in the upright posture. The operator requires the freest control over the instrument at the moment when the tube is being introduced into the larynx, and he will obtain it by placing the recumbent patient well below him. The writer lays the patient across the end of the bed, so that the patient's right side is nearest to its foot. The operator stands at the foot of the bed. One nurse holds the patient's head, another secures the arms and legs. An intelligent child will often not require to be held, so far as the arms and legs are concerned. The operator should satisfy

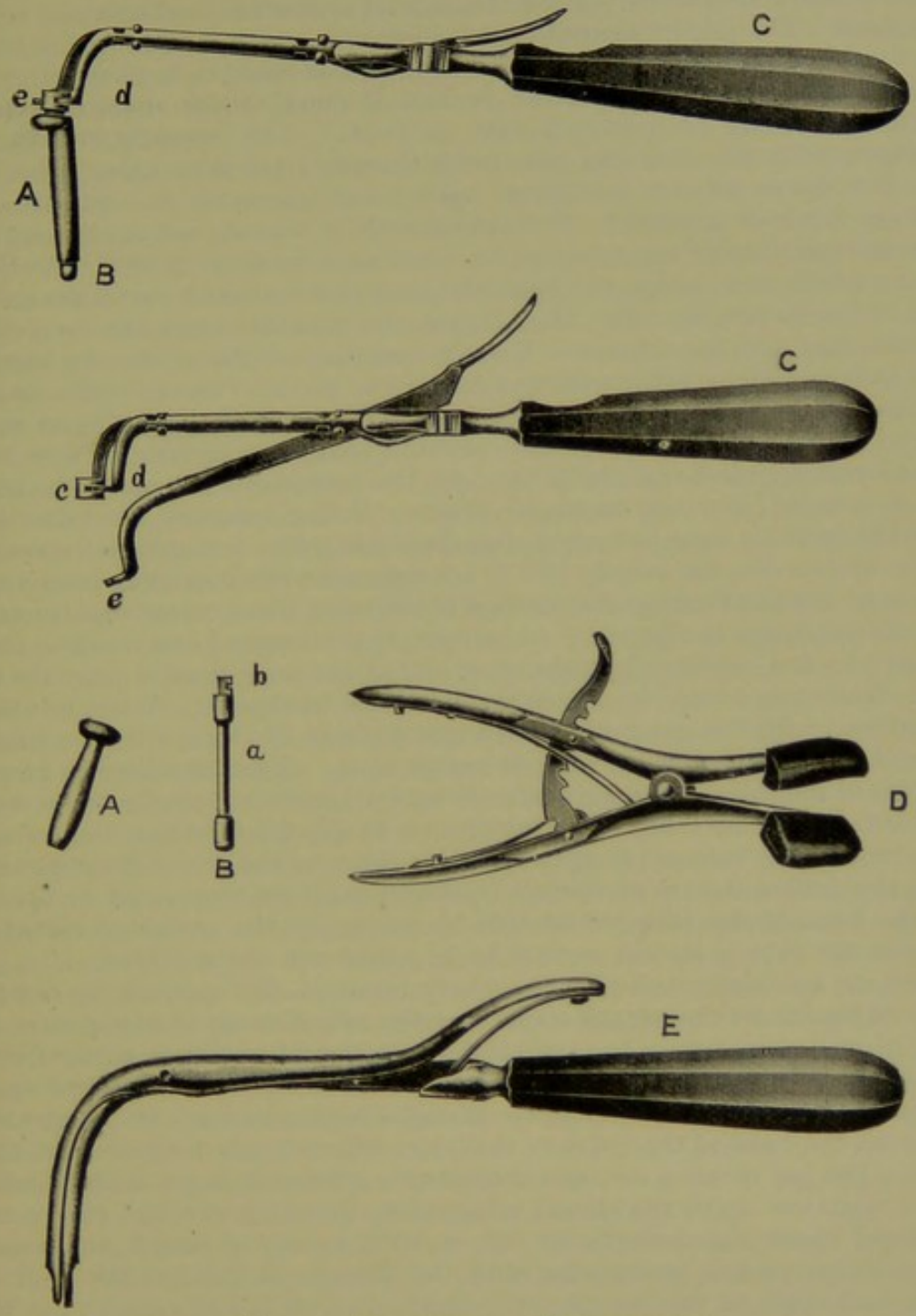

Fig. 3.—Intubation Instruments.

(A) Intubation tube.

(B) Obturator or pilot; at (a) there is a joint to enable it to fit easily in the tube.

(C) Introducer; the notched upper portion (b) of the pilot is inserted into a socket (c) at the end of the introducer, and is kept firmly in place by the bolt (d); (e) is the movable arm of the introducer for pushing the tube off the pilot. In the illustration it is much more depressed than it would be at the moment of use. The illustrations show the instruments separately and put together for use. The tube (A), where shown separately, is seen from the front.

(D) Gag.

(E) Extractor; the blades are slightly separated.

himself that the tube is not too tightly fixed on the pilot, and that it can be easily pushed off by the arm on the introducer. The tube should be placed upon the pilot so that the projecting portion of the head is directed backwards as regards the patient. The gag is inserted into the left side of the mouth, and is kept in place by the nurse who has hold of the head, which must be kept straight, with the face looking directly upwards. If there is much mucus in the mouth and pharynx, it should be removed with a swab. The operator, holding the introducer, with the pilot and tube (with thread) fitted into place, in his right hand, introduces his left forefinger behind the tongue to the epiglottis, the condition of which is noted.* Not infrequently it is bent backwards, and must be straightened before the tube can be introduced into the larynx. The finger is then pushed over, or by, the epiglottis, and the arytenoid cartilages and the orifice of the larynx are felt. Here, again, the operator notes the condition of the parts, and acts accordingly. Extreme swelling of the glottis, for instance, would induce him to put a smaller tube on the pilot. The tip of the finger is held against the arytenoids just over and at the back of the laryngeal orifice. The end of the pilot is then passed carefully along the anterior surface of the curved forefinger till it reaches its tip. By this movement the end of the instrument is brought over the laryngeal orifice. Before inserting the tube in the larynx the operator must be certain that the whole tube—not only its lower end—is in the middle line, for usually this is not the case while it is being passed along the finger. Having rectified the position of the tube, the operator slips it past the tip of his finger into the larynx. In performing this action I find it nearly always necessary to flex slightly the right wrist and at the same time to raise the right elbow. I say 'slips into,' for undue pressure must be avoided. When intubation is performed with the patient in the upright position, the tube will often enter by the weight of the instrument, without any pushing. If laryngeal spasm prevents the entry of the tube, it may be overcome by very gentle but continuous pressure; or advantage may be taken of an inspiration to slip the tube past the cords.

The tube is then released from the pilot by means of the arm of the introducer; during this action, the tip of the left forefinger must on no account be removed from the head of the tube, which will be resting on the arytenoid cartilages; otherwise the tube is almost certain to be pulled out of the larynx.

When the introducer and pilot have been removed, the operator, by means of the tip of his left forefinger, ascertains that the tube is safely in the larynx. The loop of thread should then be removed by cutting and pulling it gently through the hole in the tube, taking care that the knot in the thread is not pulled against the small hole in the tube. While the thread is being removed, the finger should be kept on the head of the tube, or the latter will certainly be pulled out of the larynx. The gag is taken out, and the patient, if relieved, is put back to bed.

Some operators leave the thread attached to the tube, in which case it must be fastened round the patient's left ear or, with a piece of plaster, to his cheek. But the writer prefers to dispense with the thread; it irritates the epiglottis, tongue, and angle of the mouth; the child will pull it and remove the tube. Hence it is necessary to restrain his hands by cardboard splints on the arms, or by some other method; and this irritation and restraint are most irksome. The only reason for retaining the thread is that the nurse may be able to pull out the tube at once, should it become suddenly blocked. But as a matter of fact this seldom happens; moreover, the nurse can be taught to get the tube out by the method of expression, now to be described.

Extubation.—Removal of the tube may be accomplished in two ways. The

* It is convenient to twist the silk or thread loop once round the right index finger, keeping it moderately tight. It will help to secure a loosely fitting tube in place on the pilot. When the tube is in the larynx, it is easy to disengage the thread from the finger.

first is by expression ("*énucléation*"). This is most easily performed with the patient in the sitting position—an objection to this method in toxic diphtheria—but it can also be done while the patient is lying on his side. The patient's head is thrown back as far as it will go. This position throws the larynx and trachea prominently forward. The patient's mouth should be open. The operator places the right thumb on the trachea immediately below the larynx, and his left hand on the occiput. Then, with simultaneous and sudden actions he presses this thumb firmly backwards towards the spine and flexes the patient's head. The lower portion of the tube has the shape of an inverted, truncated cone, and under the pressure of the thumb the tube slips up into the pharynx, against the posterior wall of which it impinges; by the forward movement of the pharyngeal wall in the flexion of the head the tube is directed into the mouth, and even out of it if it is open. Removal may also be effected by the extractor, the two small, separating blades of which must be inserted into the upper part of the tube. The patient must be gagged, and the method of putting the blades into the tube is very much the same as that employed in introducing the tube into the larynx.

In cases where there is laryngeal spasm immediately after the first removal of the tube, so that immediate re-intubation is required, a small dose of opium, or bromide of potassium, or chloral hydrate, should be given a few hours before it is proposed to remove the tube again.

The patient who is wearing an intubation tube, must be fed by means of an œsophageal catheter passed through the nose. But he may have a sip of water occasionally, for the slight cough thereby excited helps to keep the tube clear. After three or four days the tube should be removed. It may have to be returned. The writer is of the opinion that if the patient cannot do without the tube after three periods of retention of three or four days each, recourse should be had to tracheotomy. If the tube is frequently expelled by coughing, tracheotomy should be performed.

Intubation should never be undertaken without having the tracheotomy instruments ready to hand, because, very occasionally, diphtheritic membrane may be pushed down during intubation so as to block completely the lumen of the trachea, in which case the patient rapidly becomes worse, and tracheotomy must be performed. This operation will also be necessary in cases where repeated intubation has failed to relieve. (See LARYNGEAL OBSTRUCTION.)

Vulvar and conjunctival diphtheria should be treated locally by frequent irrigation with a saturated solution of boracic acid, and warm boracic fomentations.

No patient convalescent from diphtheria should be considered to be free from infection till at least two consecutive bacteriological examinations of the fauces and nasal passages have proved to be negative; or till at least three weeks have elapsed since the local exudation has finally disappeared.

Quarantine Period.—One week; but all persons who have come in contact with the patient (contacts) should be examined for the presence of diphtheria bacilli, and should be treated as suspicious cases (suspects), capable of conveying the disease, till at least two consecutive negative bacteriological examinations have been obtained.

In institutions for children, when the prompt removal of two or three successive cases of diphtheria has failed to arrest the outbreak, the prophylactic injection of antitoxic serum is of value. All the children who have been exposed to infection should receive 500–600 units subcutaneously.* (See also BACTERIOTHERAPEUTICS, LARYNGEAL OBSTRUCTION, LARYNGITIS, and FEVERS, ACUTE INFECTIOUS.)

E. W. Goodall.

* But prophylactic injections should not be given without strong reasons; for should serum have to be given at any subsequent date the phenomena of supersensitation may be produced. (See note on page 216.)

DIPHTHERITIC CONJUNCTIVITIS.—(See CONJUNCTIVA, DISEASES OF.)

DIPLEGIA.—(See PALSIES, CEREBRAL, OF CHILDHOOD.)

DIPSOMANIA.—(See ALCOHOLISM.)

DISLOCATIONS.

Lower Jaw.—This dislocation is always in a forward direction, and is more commonly bilateral. In recent cases there is usually little difficulty in reduction, the patient often effecting this without assistance.

REDUCTION.—No anæsthetic is required as a rule. (1) The patient is seated in a chair, and the surgeon stands facing him. The thumbs, well guarded by wrapping in handkerchiefs, are introduced into the mouth and placed far back on the lower molar teeth of each side (*Fig.* 4). The thumbs then press the back part of the jaw downwards, whilst the fingers of the two hands, meeting beneath the chin, press the fore part of the jaw upwards. The condyles are thus levered downwards, and when once disengaged from the eminentia articularis slip into their socket, and the jaw closes with a snap. (2) When the first method fails, wedges of cork are placed between the molar teeth of the upper and lower jaw, as far back as possible. The surgeon then presses the chin firmly upwards, and thus levers the condyle downwards, reduction taking place as before. If the dislocation be unilateral, the measures detailed are applied to the affected side only.

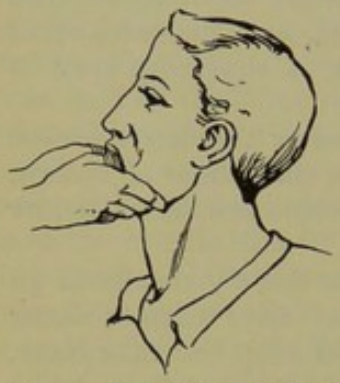

Fig. 4.—Reduction of Dislocation of Lower Jaw.

After-treatment.—A four-tailed bandage is put on as for a fracture of the jaw, the patient being fed on slops. At the end of a week careful passive movements are begun. The dislocation is apt to recur and the joint to become permanently lax; it is therefore advisable to keep the bandage applied for a fortnight longer, removing it thrice daily for the purpose of movements; moreover, the patient should be instructed to avoid opening the mouth widely for three months.

Sternal end of the Clavicle.—Dislocation forwards is by far the most common displacement. Backward and upward dislocations also occur, the order of frequency being as named.

Forward Dislocation.—The sternal end of the bone is more or less completely displaced on to the front of the manubrium sterni.

REDUCTION is readily effected, and no anæsthetic is required. The surgeon stands behind the patient, and placing his knee between the scapulæ, pulls the two shoulders backwards. Direct pressure on the displaced end of the clavicle may be applied at the same time.

After-treatment.—A large pad is placed in the axilla, and the arm is bandaged to the side, the elbow being kept well forwards. It is very difficult to maintain complete reduction, but the parts should be kept at rest in the manner described for three weeks, in order to allow of union of the lacerated ligaments. It is well to warn the patient of the probability of permanent deformity, but at the same time he may be assured that there will be little or no impairment of the utility of the limb.

Backward and Upward Dislocations are of rare occurrence. They are reduced and treated as is the forward variety, and the above remarks with regard to permanent deformity and utility hold good. In backward dislocations, dyspnœa and dysphagia may be produced by the pressure of the displaced end of the clavicle, and the great vessels may be similarly pressed upon. If the pressure cannot be relieved owing to the failure of reduction, the head of the bone must be excised.

Acromioclavicular Joint.—The ligaments being torn, the scapula, with the whole upper limb, drops downwards and leaves the acromial end of the clavicle projecting beneath the skin over the shoulder. (Occasionally the clavicle passes beneath the acromion instead of, as in the first case, resting upon its upper surface.)

REDUCTION is readily effected by pulling the shoulder backwards and applying direct pressure in a downward direction to the displaced end of the clavicle.

After-treatment is unsatisfactory. In many cases it is well-nigh impossible to keep the bones in position. The most likely method of effecting this is to place a soft pad over the outer third of the clavicle and to apply a plaster-of-Paris spica bandage to the shoulder, afterwards keeping the patient in bed for three weeks. The danger of injury to the skin from pressure over the displaced acromial end of the clavicle must not be lost sight of. If pain or serious impairment of movement result from persistence of the deformity, the cartilage is removed from the contiguous bony surfaces in the joint, and these are then wired together.

Shoulder.—At least 50 per cent of all dislocations take place at the shoulder-joint. It is, however, unusual to meet with a case of dislocation of the shoulder in a patient under the age of twenty. Violence, such as would in the adult produce this injury, is in early life more likely to give rise to a fracture of the clavicle or a dislocation at the elbow.

The classification is as follows :—(1) Downwards—subglenoid ; (2) Forwards —subcoracoid, subclavicular ; (3) Backwards—subspinous ; (4) Upwards—subacromial, supra-acromial. The head of the humerus leaves the joint through the lower and anterior part of the capsule, and thus comes to lie beneath the glenoid cavity. The head may remain here, giving rise to a *subglenoid* dislocation, or more commonly passing forwards it reaches a position in front of the glenoid fossa and below the coracoid process, constituting a *subcoracoid* dislocation. Very rarely the head passes still further forwards and inwards, and rests beneath the clavicle, a *subclavicular* dislocation being thus produced. Instead of taking this forward course, the head of the humerus may, after reaching the subglenoid region, pass backwards into the subspinous fossa, and thus give rise to a *subspinous* dislocation—a condition even more rare than the last described. Such unusual forms as the *subacromial* and *supra-acromial* dislocations need no further mention.

REDUCTION must be undertaken at once. Should there be doubt in diagnosis, the X-ray screen may be employed if available ; it is useless and dangerous to wait for twenty-four hours in the hope that the swelling may diminish and facilitate examination. During that time the displaced head of the bone may cause irreparable damage to the nerves of the brachial plexus or the axillary vessels. Whenever possible a general anæsthetic should be administered. The necessary manipulations are thus rendered easier, less force is required, and less damage is likely to be caused to the structures around the joint.

For Subcoracoid and Subglenoid Dislocations the following methods are applicable, and should be applied in the order stated. (1) *Traction downwards and outwards.* The patient is placed flat on his back on a couch. The surgeon stands beside him, and, grasping the arm above the elbow, pulls steadily upon it in a downward and outward direction. Then, abducting the limb, he gradually changes the direction of the pull until the arm is at right angles to the body. An assistant standing on the other side of the patient keeps the trunk steady by means of a towel which is passed around the chest, and upon which he pulls in a contrary direction to the traction exercised by the surgeon. This method is effectual in the great majority of cases, especially if an anæsthetic be given. (2) *Kocher's method.* The patient, if not anæsthetized, sits upright in a chair, and a towel, which is passed round his chest and the back of the chair, is held

by an assistant, who thus keeps the trunk in a steady position. If anæsthetized, the patient lies on his back, and the assistant steadies the trunk by pressing each shoulder firmly down upon the couch, applying his hands over the front of the acromion and clavicle. The surgeon stands on the affected side of the patient, and flexing the forearm to a right-angle (*Fig.* 5), grasps the limb with one hand just above the elbow and the other at the wrist. (If the right shoulder be dislocated,

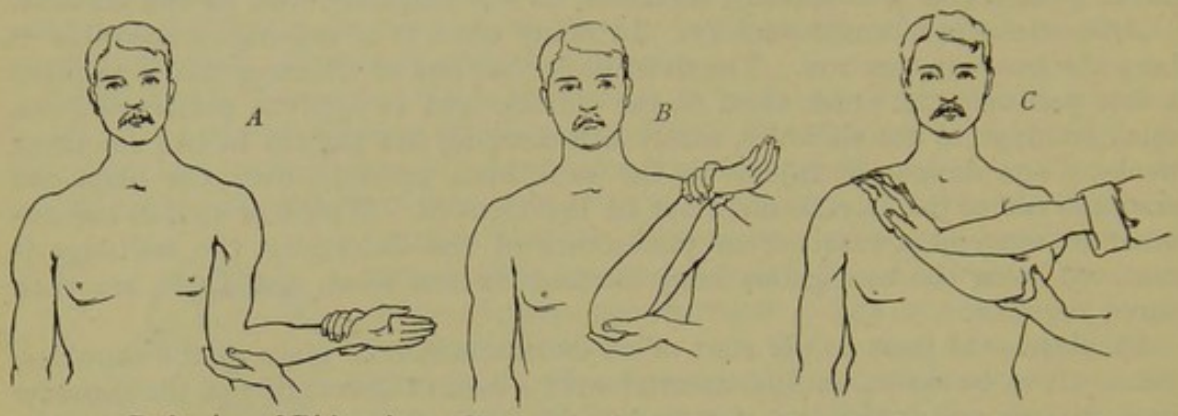

Fig. 5.—Reduction of Dislocation of Shoulder by Kocher's method. *A*.—The arm is pressed to the side and externally rotated. *B*.—The arm being maintained in an externally rotated position, the elbow is raised in front of the body. *C*.—Reduction completed by internally rotating the arm.

the surgeon's right hand grasps the wrist, his left hand the elbow ; the opposite applies for the left side.) He then presses the elbow firmly to the side of the chest, and, maintaining it thus, moves the wrist outwards until the forearm points directly outwards from the side of the body. The arm being kept in this externally rotated position, he next elevates the elbow in front of the body until it lies almost on a level with the shoulder, and finally internally rotates the

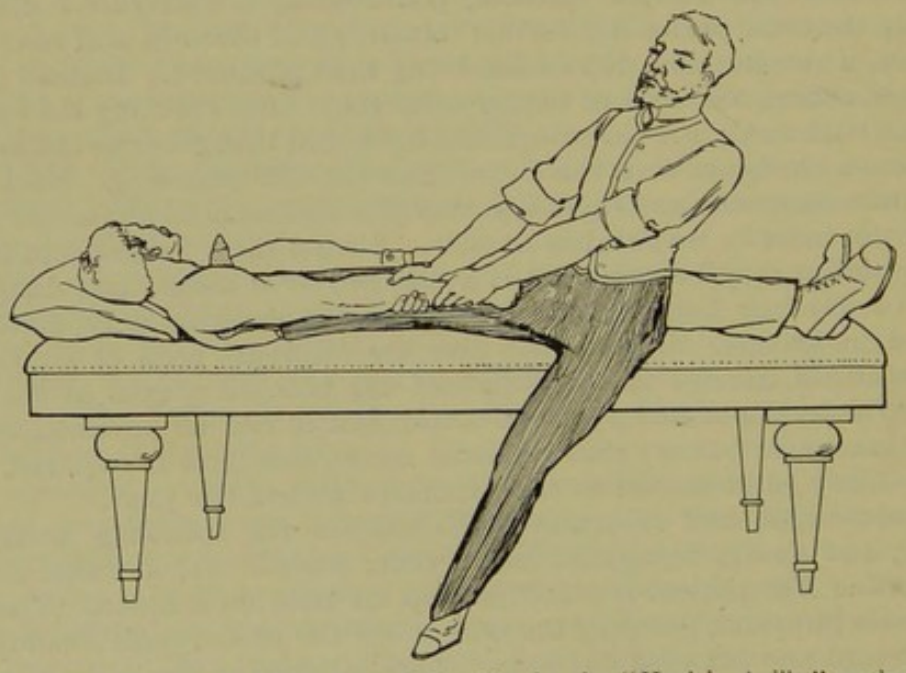

Fig. 6.—Reduction of Dislocation of Shoulder by the "Heel in Axilla" method.

forearm by swinging the wrist across so that the hand comes to rest on the opposite shoulder. (3) *Extension with the heel in the axilla.* The patient lying flat on his back, the surgeon sits on the edge of the couch and places his unbooted heel in the axilla. Seizing the wrist he pulls upon it in a downward and outward direction, and then bringing it towards the side he levers the head of the humerus outwards, his heel acting as a fulcrum (*Fig.* 6). Care must be taken that the

skin of the axilla is not wrinkled into folds, but that it lies flat and smooth under the heel.

For Subspinous and Subclavicular Dislocations.—Extension, aided by rotatory movements, is made in the axis of the dislocated humerus until the head of the bone is brought beneath the glenoid fossa. After this the methods already described will complete the reduction.

After-treatment.—A wool pad is placed in the axilla, the arm is bandaged to the side, and the forearm supported by a sling. At the end of a week massage is begun, and passive movements are carried out daily with gradually increasing freedom. Particular care should be taken to obtain free abduction, but the *combined* movement of abduction and external rotation is at first to be avoided. At the end of a fortnight the bandage is discarded for a sling. At the end of three weeks active movements are encouraged, and the patient may return to work at the end of five or six weeks.

Unreduced Dislocations.—If more than six weeks have elapsed since the dislocation, great difficulty will be experienced in reduction, and having regard to the danger of fracture of the humerus, rupture of the axillary vessels, or laceration of the branches of the brachial plexus, it may be looked upon as unjustifiable to attempt the reduction by ordinary methods of a dislocation of more than two months' standing. In cases, therefore, where a trial under an anæsthetic of the methods given above fails to effect reduction, or in cases in which such attempts are thought inadmissible, the question of operation has to be considered. The utility of the limb in its dislocated position, the general condition and occupation of the patient, and the amount of pain and discomfort suffered, will decide for or against operative measures. The best results are given by an excision of the head of the humerus, which relieves the pain and restores the mobility of the limb.

Elbow.—This injury is of frequent occurrence, especially in early life, since the cartilaginous coronoid process—the main factor in preventing backward displacement—is then of small size. The injury is almost always a backward displacement of the ulna and radius from the lower end of the humerus, the two bones of the forearm maintaining their relative positions to each other. Lateral and forward displacements also occur, and occasionally the ulna alone is dislocated backwards, the relationship of the radius and humerus being unchanged. Dislocations of the radius are considered separately.

Fig. 7.—Reduction of dislocation of Elbow.

Reduction.—An anæsthetic is usually unnecessary. The "knee" method is applicable to all the above-mentioned dislocations except that in the forward direction. The patient sits in a chair, and the surgeon, resting his foot on the chair, places his knee against the front of the lower end of the humerus. Holding that bone steady with one hand, he flexes the patient's forearm with the other, which seizes the limb at the wrist (*Fig.* 7). The lateral aspect of the surgeon's knee acts as a fulcrum, and the flexion of the forearm levers the upper end of the ulna away from the humerus until the coronoid process is disengaged, when the bones slip into position. The forward dislocation may be reduced by pushing the forearm firmly backwards whilst keeping it fully flexed.

After-treatment.—The arm should be kept in a sling and active movements

forbidden for two or three weeks. Passive movements and massage may be undertaken at once.

Unreduced Dislocations.—If a dislocation has remained unreduced for a period of more than a month, replacement is unlikely and is accompanied by considerable risk. Up to the time mentioned the method above described may be employed under an anæsthetic, preceded by movements to break down adhesions. If these fail, or if lapse of time has rendered the attempt inadmissible, operation should be resorted to when the general condition of the patient is favourable and a movable elbow of importance. The operation called for is an excision of the elbow, and it gives satisfactory results.

The Upper End of the Radius.—As a result of falls on the hand, dislocations of the upper end of the radius may take place in a forward or backward direction.

REDUCTION is readily accomplished without an anæsthetic by flexing the forearm to a right angle and pulling upon it in that position, whilst the thumb of the other hand makes direct pressure in the requisite direction upon the displaced radial head.

After-treatment.—Some care is called for to prevent the recurrence of the displacement. The elbow is kept fully flexed upon a poroplastic splint for three weeks. After a few days, however, the splint may be removed daily for the purpose of careful massage and passive movements in the direction both of extension and rotation.

Dislocation of the Radius Downwards.—"Pulled-elbow" results from the practice of dragging children along by the hand. The radial head is separated from the capitellum of the humerus, and a portion of the orbicular ligament slips in and becomes nipped between the articular surfaces. The child cries with the pain and keeps the elbow semi-flexed, whilst tenderness and swelling are noted on examining the joint from behind.

REDUCTION.—Fully flex the limb, and, after keeping it in that position for a few moments, rapidly extend it. No after-treatment is needed beyond controlling the movements of the joint for a day or two.

Wrist.—This injury is of rare occurrence. The carpus passes backwards from the radius.

REDUCTION is readily effected by pulling upon the hand.

After-treatment.—The forearm and hand are placed upon a well-padded straight splint, and are lightly bandaged to it. The splint must not reach beyond the metacarpo-phalangeal joint, and the fingers must be left free. Passive movements of the fingers are begun at once and persevered in. Passive movements of the wrist are begun after five or six days, but the patient must not be allowed to use the hand for a month.

Metacarpo-phalangeal Joint of Thumb.—The first phalanx passes backwards on to the dorsum of the head of the metacarpal bone, which projects into the palm of the hand. The tendon of the long flexor muscle may become hitched round the neck of the metacarpal bone, which is also embraced by the short flexor tendons and the torn glenoid ligament.

REDUCTION may usually be accomplished by the following method (*Fig.* 8): An assistant fixes the hand and metacarpal bone. The surgeon then grasps the thumb and bends it back to a right angle. He then drags upon it in its hyper-extended position, at the same time pressing the head of the metacarpal backwards. Having thus "unlocked" the displacement, he draws the base of the phalanx forwards until it is level with the end of the metacarpal, and then rapidly flexes the thumb into the palm. Traction upon the thumb may be rendered easier by employing a clove-hitch of soft bandage or one of the special instruments sold for the purpose. If reduction by this method fails, a tenotome, with the sharp edge towards the extremity of the thumb, is introduced

in the middle line behind the joint just above the base of the phalanx. The point of the knife is then made to pass onwards towards the palm between the short flexor tendons. Next the blade is made to cut on to the base of the phalanx, thus dividing the glenoid ligament, which, running across between these tendons, is the chief obstacle to reduction.

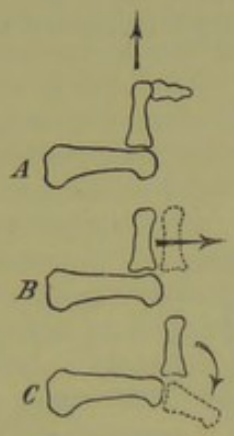

Fig. 8.—Showing position of bones in reduction of Metacarpo-phalangeal Joint of Thumb.

A.—Traction exercised in the direction of the dislocated first phalanx.

B.—The base of the phalanx drawn forward until it is level with the head of the metacarpal bone.

C.—Reduction completed by flexing the thumb into the palm.

Hip.—When the head of the femur is dislocated from the acetabulum, it follows, as a rule, certain definite paths, and comes to lie more or less exactly in one of four positions. These are known as the four "regular" dislocations. It may be, however, that the severity of the injury is such as to cause very great and widespread laceration of the soft parts around the joint. It is upon the comparative integrity of these soft parts, and more especially of the Y-shaped ligament of Bigelow, that the regular course of the displaced head depends. If this ligament be ruptured, the head of the femur may assume almost any position around the acetabular cavity or even remote from it. The limb assumes no definite position, movements may be abnormally free and flail-like, and there is usually little difficulty in reduction. These latter are known as the "irregular" dislocations, and will not be further dealt with.

Regular Dislocations.—(1) *Dislocation on to the Dorsum Ilii*: the limb assumes a position of flexion, adduction, and internal rotation. The head of the femur may be felt above and behind the acetabulum. *N.B.*—When the femoral head is forced directly back, the displacement may be associated with a fracture of the posterior margin of the acetabulum. (2) *Dislocation into the Sciatic Notch*: flexion, adduction, and internal rotation are all present, but are less marked than in the preceding class. The head of the bone is behind the acetabulum, but owing to the greater thickness of the gluteal muscles it is less easy to feel. (3) *Dislocation into the Thyroid Foramen*: the limb is to a slight extent flexed, abducted, and externally rotated. The head of the bone may sometimes be felt in the perineum. (4) *Dislocation on to the Pubic Bone*: flexion, abduction, and external rotation are each rather more marked than in the thyroid displacement, whilst the head of the bone is readily felt lying beneath or above Poupart's ligament.

Reduction.—The patient lies on his back on a mattress placed on the floor, and is anæsthetized.

For Dislocations on to the Dorsum Ilii or into the Sciatic Notch, the following methods should be tried. (1) The surgeon stands near the feet of the patient, facing his head; he grasps the affected limb with one hand below the knee, with the other at the ankle (*Fig.* 9); he then fully flexes the hip, maintaining the adducted position, and next abducts, externally rotates, and finally extends the limb with one sweeping movement. It sometimes happens that this method fails, a click being felt as the movements of abduction and external rotation are

being carried out, indicating that the head has once more slipped back into its former dislocated position. Under these circumstances the following plan should be tried. (2) The surgeon stands over the patient, facing his head, and flexes the hip-joint to a right angle. The flexed leg of the patient is between the thighs of the surgeon (*Fig.* 10), who bends forward and folds his fore-arms beneath the patient's knee. Then, whilst an assistant holds the pelvis firmly down to the mattress, the surgeon exerts strong traction directly upwards.

For Thyroid and Pubic Dislocations.—(1) The surgeon, grasping the leg as in method (1) above, flexes the thigh in its abducted position. With one continuous movement he then internally rotates and adducts the limb, finally extending and bringing it down beside its fellow. (2) Thyroid dislocations may be reduced in a manner similar to method (2) above, the limb being, however, slightly abducted and traction exerted in an upward and outward direction.

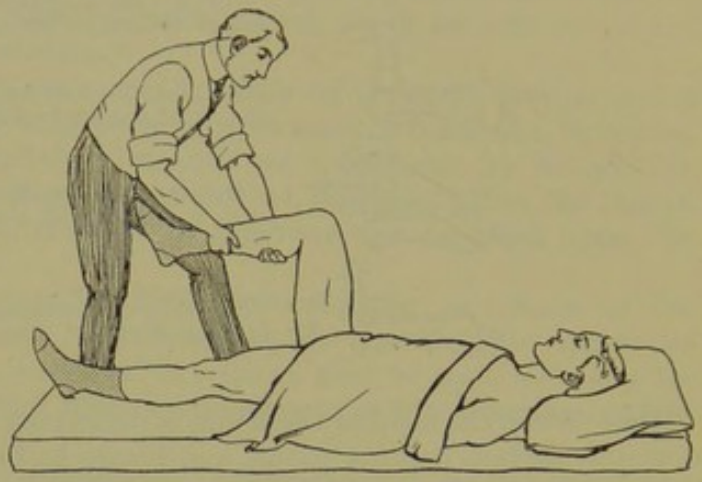

Fig. 9.—Reduction of Dislocation of Hip by Method (1).

After-treatment.—The patient is kept in bed for a fortnight with a Liston's long splint applied. At the end of this time massage is begun, and passive movements are carried out daily. Active movements are allowed a week later, and at the end of a month the patient may be allowed up on crutches. Work may be resumed as a rule at the end of two months. When there has been extensive laceration of muscles and ligaments, weakness of the limb and lameness may continue for a long time; whilst should the sciatic nerve have been injured, there may be paralysis and wasting of muscles. Massage, movements, and galvanism should then be assiduously employed. In the cases referred to where there is fracture of the acetabular margin, there is a tendency for the dislocation to return, and rest must be considerably prolonged.

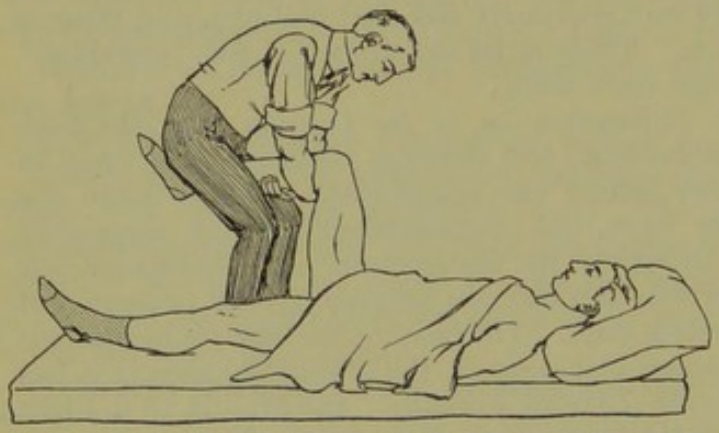

Fig. 10.—Reduction of Dislocation of Hip by Method (2).

Knee-joint.—Displacements rarely occur at this joint. The tibia may pass forwards, backwards, or laterally. The latter is the more common variety, the displacement being usually incomplete and the border of the tibia resting between the condyles of the femur.

Reduction should be performed under an anæsthetic. The thigh is flexed, and traction is made upon the leg. The replacement is aided by direct manipulation and by rotation of the limb.

After-treatment.—The limb is placed on a baek splint for three weeks, and passive movements are then begun. Permanent weakness of the joint is apt to remain, and there may be persistent œdema of the foot and leg.

Patella.—This is a very rare dislocation. The patella usually passes outwards, so as to lie upon the external condyle.

REDUCTION.—Flex the thigh fully on to the abdomen, and extend the knee. The extensors being thus relaxed, direct manipulation effects replacement.

Ankle-joint.—Lateral dislocations do not occur without fracture, and are considered under the heading of Pott's Fracture of the Fibula (see FRACTURES). The backward dislocation is commoner than the forward, and may be accompanied by fracture of one or both malleoli.

REDUCTION is effected by pulling upon the foot, with the knee fully flexed, to relax the gastrocnemius (*Fig.* 11). If this be ineffectual, even under an anæsthetic, the tendo Achillis should be divided subcutaneously.

Fig. 11.—Reduction of Dislocation of Ankle.

After-treatment.—The limb is put up on a back splint with a foot-piece, care being taken to keep the foot at a right angle. Massage is begun after three days, the splint being removed for the purpose. The splint is dispensed with at the end of three weeks.

Astragalus.—The astragalus, when dislocated, is displaced both from the tibio-fibular mortice and from the upper surface of the os calcis. The dislocation may be complete or incomplete, in the former case being often compound.

REDUCTION may sometimes be accomplished in the incomplete forms. An anæsthetic is given, and direct pressure in the requisite direction is made on the astragalus whilst the foot is firmly pulled upon. During these manipulations the knee is well flexed, to relax the tendo Achillis, or that structure may need division. In the complete forms reduction is impossible, and excision of the astragalus should be performed through a free incision.

After-treatment.—The limb is put up on a back splint, the foot being kept at right angles. Massage is begun after three days, and passive movements after a fortnight. When the astragalus has been excised, massage and movements are commenced as soon as the wound is firmly healed.

Subastragaloid Dislocation.—In this injury the astragalus retains its position with regard to the tibia and fibula, whilst all the other bones of the foot are displaced from beneath it, usually in a backward direction.

REDUCTION should be attempted by pulling the foot forwards whilst counter pressure is made on the front of the lower end of the tibia. During this procedure an assistant keeps the knee well flexed. In difficult cases the tendo Achillis, and possibly also the tibial tendons, may need division. When reduction fails, the astragalus should be excised. This will admit of the foot being placed in a fair position.

After-treatment should be carried out as for dislocation of the astragalus.

S. Maynard Smith.

DROPSY, CARDIAC.—(See HEART, VALVULAR DISEASES OF.)

DROPSY, RENAL.—Certain forms of chronic renal disease are accompanied by dropsy, and in many instances, but not in all, this calls for treatment apart from the general treatment of the disease. Dropsy in renal disease may be purely of renal origin, but in some instances it is of secondary cardiac origin and associated with cardiac dilatation, the result of so-called failing compensation.

Whether the dropsy be renal or cardiac in origin, it is always accompanied

by a diminution in the flow of urine. This diminution, however, is not always the cause of the dropsy, and it is a most important point as regards the treatment of the condition, for the question whether diuretics should or should not be given turns on the question whether the scanty flow of urine is the cause or the result of the dropsy. It is useless to give diuretics if the condition of the kidney is such that it is unable to eliminate water ; on the other hand, diuretics may be of some service if the dropsy is dependent on a primary blood-change leading to increased transudation of fluid through the walls of the vessels. It certainly cannot be said that diuretics are always contra-indicated in chronic Bright's disease associated with dropsy. At the same time, treatment should be directed, not only to promote the excretion of water by other channels, in addition to the kidney, but also so far as possible to prevent the development of the dropsy itself.

The promotion of the excretion of the dropsical fluid by other channels than the kidney, for instance the bowels and the skin, necessitates the reabsorption of the dropsical effusions into the blood-stream, and these dropsical effusions contain large quantities of toxic material. Thus, it is not as a rule advisable to employ measures which act suddenly and violently, to effect this purpose. There is a considerable amount of evidence to show that the quantity of chlorides present in the food and in the blood-stream has a material influence in increasing any dropsy present, and possibly may even cause it. The urine, in cases of tubal nephritis associated with dropsy, may eliminate chlorides with difficulty, and it has been shown that the administration of chlorides to these patients is liable to be followed by an increase in the dropsy. This increase may not only be detected by physical examination, but it is often sufficiently rapid and marked in amount to show itself by an increase in the body weight of the patient. It is not difficult to restrict the amount of chlorides in the food by avoiding its use as a condiment in cooking, and by ordering a diet that is poor in chlorides. Certainly, this method of treatment would seem desirable in cases where dropsy is marked and increasing. Although it is useless to treat dropsy by an undue restriction of the amount of fluid ingested, it is often useful in chronic cases to avoid giving large quantities of milk and other fluids, which may lead to the production of a hydræmic plethora, and such patients may do better on a diet of solid food, meat and bread.

The excretion of water by other channels than the kidney must be promoted by moderate purgation, as already explained, and, to a limited extent, by measures directed to bring about sweating. In chronic renal disease it is often difficult to produce sweating, and generally the best results are obtained by moderate measures, such as warm baths or hot-air baths, where the temperature is not unduly raised. Uræmic symptoms, and even fatal uræmia, have been known to occur as a result of the indiscriminate use of hot-air baths of high temperatures, and it is possible that such effects may result from the sudden absorption of large quantities of the dropsical exudation associated with the copious sweating. Hot-air baths should be used rather with the idea of promoting a gentle action of the skin than of procuring the subsidence of large dropsical effusions. Pilocarpine is sometimes recommended in such cases, and it is of course possible to produce profuse sweating by this means ; but there is always the risk of causing considerable pulmonary embarrassment, owing to the copious secretion from the bronchial tubes seen under the influence of this drug, and in free doses it may also lead to the development of cardiac weakness, and on the whole, its use is not to be recommended for the relief of dropsy.

Very striking results can often be obtained by the use of diuretics. Acetate, citrate, and nitrate of potash are of service, but one of the most useful diuretics in chronic renal disease is caffeine, provided it be used in small doses and inter-

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mittently. Caffeine is a powerful diuretic; but its action is peculiar in the fact that the best diuretic results are seen when small doses are given. Large doses, and frequently repeated doses, tend to produce an opposite effect to that seen with small quantities, and it is not uncommon, where the drug is continually administered, for a diminution in the amount of urine to occur, associated with the development of headache and sickness, and other unpleasant symptoms. Caffein, in very large doses, may even produce suppression of urine, and this is not an uncommon result in the laboratory, after its experimental administration. Clinically, it not uncommonly produces a diminution in the flow, together with headache and vomiting. If the drug is administered in small doses and intermittently, only good results are obtained. It may be given in 5-gr. doses of the citrate every four hours for three or four doses; the administration should then be stopped for twenty-four or forty-eight hours, and then the drug given again. In this way a notable diuretic effect may be produced. It is often useful to combine with the citrate of caffeine small doses of digitalis, which, although not a diuretic in the strict sense of the term, may produce an increased flow of urine, thanks to its action in improving the circulation. Digitalis is not advisable in cases of renal disease associated with considerable high tension, owing to its well-known action in increasing the blood-pressure. Indeed, in all cases of chronic Bright's disease, the administration of diuretics must be largely determined by the results seen. If the giving of a few doses of caffeine is not followed by any beneficial diuretic effect, no useful purpose is served by persisting in its administration. Broom tops, squills, and other drugs of a similar kind, are often also useful. Where the amount of dropsy is large, and especially where it is refractory to treatment along the lines indicated, it is best to remove the fluid by Southey's tubes. There is no objection to the use of these in renal disease, provided care be taken to make and treat the punctures aseptically. In cases of generalized anasarca, with fluid in the pleural and peritoneal cavities, puncture of the legs with Southey's tubes is often sufficient to procure relief generally; but if this is not the case, the collections of fluid in the chest should be removed by paracentesis, which should be performed slowly owing to the well-known tendency to the development of pulmonary œdema in this disease, and the risk of this complication occurring as a sequel to the too rapid drawing off of a pleural effusion. (See also NEPHRITIS.)

J. Rose Bradford.

DRUG HABIT.—We do not propose to enumerate all the drugs to whose abuse patients may become addicted. Alcohol, the commonest of them all, is dealt with in a special article. Of the others, the most important are morphine and cocaine. The cocaine habit is even more serious than the morphine habit, and more difficult to eradicate.

In the treatment of morphinomania or cocainomania it is a *sine qua non* that the patient should be removed from his own home to some special institution where he can be under continuous observation and control. Nothing must be left to the patient's own good-will. If left to himself, he will break the most solemn pledges with the utmost callousness.

We have then to decide whether an attempt shall be made to stop the drug suddenly, or whether its dose shall be gradually reduced day by day. Experience shows that sudden stoppage is rarely tolerated, and is only feasible in the mildest cases, where the habit has been of comparatively short duration, and the dose has not been large.

Even the "rapid" method, where the dose is reduced progressively so as to reach zero within six or twelve days, causes the patient great distress, though less than by the sudden method. Best of all—in the absence of specific treatment by hyoscine, to be described presently—is the gradual method, in which some

six weeks are occupied in reducing the dose to zero. One way of accomplishing this is to make a solution, say 1 oz., of the full strength of the drug to which the patient has been accustomed, and for every syringeful withdrawn from the bottle, to replace a corresponding quantity of boiled water. The strength of the solution is thereby gradually reduced until at last the patient gets an infinitesimal dose of the drug.

During the process of demorphinization or decocainization, one of the chief difficulties is insomnia. To combat this, it is usually necessary to administer hypnotics. For this purpose we may employ full doses of trional, 30 or 40 gr. at a time. Or we may follow Neil Macleod and deliberately induce bromide poisoning by enormous doses of sodium bromide, up to 1 oz. twice daily. We thereby produce a state of narcosis from which the patient awakes, probably in an excited, delirious condition, but having lost his craving for the drug. By this method it is claimed that three days are often enough to produce the full effects. And though heroic in its nature, we have to remember how desperate a disease is morphinomania, and, still more, cocainomania.

But amongst physicians who have opportunities of observing the progress of morphine habitués, it is the universal experience that treatment by simple withdrawal of the drug, however gradually this be done, is always associated with intense suffering to the patient. And it must be admitted that the percentage of cures so obtained is not a large one. Within recent years, however, a more efficacious method of treatment has been elaborated, chiefly through the work of Lott, an American observer, whose results in morphinomania have been corroborated by many others. This treatment consists essentially in the administration of massive doses of hyoscine, pushed to the point of producing a mild delirium.

Briefly, the routine pursued is as follows: The patient must be secluded in a special home, in a quiet room, away from other patients. He is put to bed, and reliable nurses must be in constant attendance day and night, for the first few days at least. The medicinal treatment commences with $\frac{1}{100}$ gr. of hyoscine hydrobromate hypodermically. Every hour after this, for twenty-four to forty-eight hours, $\frac{1}{200}$ gr. is administered, watching carefully the pulse and respiration. As a result, symptoms of hyoscine intoxication supervene. They resemble those of the other members of the belladonna group: the pupils become widely dilated, the tongue and throat very dry, and within twelve hours or so the patient develops a mild restless delirium, accompanied by picking at the bed-clothes, and by visual hallucinations, referred to various parts of the room. Such visions, as a rule, are not disagreeable to the patient. When this stage is reached, the hyoscine is continued just often enough to maintain the delirium for twenty-four or forty-eight hours (from $\frac{1}{200}$ to $\frac{1}{100}$ gr. every two or three hours during this period). After this, the hyoscine is stopped, and the patient, when his delirium comes to an end, has lost his craving for morphine. During the early part of the hyoscine period, it may be necessary to give a small dose of morphia, $\frac{1}{4}$ gr., once or even twice. This will not affect the ultimate result. As a rule, hyoscine alone is all that is required. Strychnine may, however, be added ($\frac{1}{60}$ gr. occasionally) to sustain the heart, if necessary. During the period of delirium, the patient should have water to drink, to relieve the dryness of his mouth and throat.

After thirty-six or forty-eight hours of artificial hyoscine delirium, the drug is discontinued, and in a few hours the patient is mentally clear again. Then begins a second phase of the treatment, which consists in regular hypodermic administration of pilocarpine, $\frac{1}{8}$ gr. every hour, to produce sweating, and thereby to favour elimination of the hyoscine, gradually increasing the intervals between the pilocarpine injections. Joint pains, especially in the knees and elbows,

also pains in the back, and diarrhœa, tend to develop at the end of this period. The diarrhœa is checked by a mixture containing bismuth salicylate 60 gr., with liquid extract of coto bark 6 min., suspended in mucilage or syrup. The pains are alleviated by massage, hot baths, or galvanism. If the patient is sleepless, 30 gr. of bromide of potassium, combined, if necessary, with 10 gr. of chloral hydrate, may be required.

The results of such treatment have been most gratifying. It necessitates, however, careful supervision by the physician. Certainly, by this method the danger of collapse from withdrawal of morphia is obviated. And the large number of successful cases which have now been recorded has been sufficient to place the method beyond the experimental stage. *Purves Stewart.*

DUPUYTREN'S CONTRACTION OF THE PALMAR FASCIA.—This is a disease peculiar to adult life, occurring in fact more commonly in persons over the age of thirty-five. It affects men much more frequently than women. The deformity produced is one of flexion of the fingers, first of all at the metacarpo-phalangeal, and later on at the interphalangeal joints, so that the fingers become drawn up into the palm of the hand. There is not, as a rule, much flexion of the terminal phalanges. The digits chiefly affected are the ring and little fingers, and usually the disease is confined to these ; but cases are recorded in which all the fingers, and even the thumb, have been involved.

The diagnosis is by no means difficult, as the deformity is so typical. It is distinguished from contraction of the flexor tendons by the fact that the flexion of the fingers remains the same in every attitude of the wrist, whereas in the latter condition dorsiflexion of the wrist increases the palmar flexion of the fingers. Contractions due to suppuration, traumatism, or burns are readily detected after reference to the history of the case. In congenital flexion of the fingers the interphalangeal joints are chiefly affected, and the patient is usually a child, or can remember the deformity from early childhood. Transient or incomplete ulnar paralysis may cause the ring and little fingers to assume an attitude not unlike that of a mild Dupuytren's contraction, but the metacarpo-phalangeal joints are not flexed, and there is no resistance to passive movement in the direction of extension.

TREATMENT may be (1) Non-operative, or (2) Operative.

Non-operative Treatment.—There is no doubt much may be done for developing cases of Dupuytren's contraction by persistent massage, passive movements of the fingers, and the employment of suitable absorbent ointments, containing a salt of mercury, iodide of lead, or iodide of cadmium. With these measures, combined with the application of a good splint at night, a mild case can be prevented from becoming worse, and may even be cured if the treatment be carried on for a sufficiently long time. The splint employed by the writer is a simple metal one composed of a broader hand-piece, making an angle with a narrower portion which is applied to the forearm ; when the splint is in position, the wrist is dorsiflexed. The splint can be bent so that the angle of dorsiflexion is diminished or increased as the surgeon wishes. It should be well padded, and applied to the front of the hand, the fingers being straightened out upon the hand-piece as much as possible, and kept in position by padding and bandages. It is inadvisable to exercise much pressure upon the fingers, as sloughs form very readily upon the tips of the fingers and the backs of the knuckles, and, therefore, correction of deformity should be gradual.

Operative Treatment.—Where there is much deformity, operation is imperative, and the operative procedure may be either subcutaneous—fasciotomy with a fine tenotomy knife—or removal of the fibrous bands through an open incision. The subcutaneous operation is the one most advocated in this country, and the

results to be obtained are most satisfactory. All the tight bands are divided with the tenotome through, it may be, many punctures in the skin. The edge of the knife is directed away from the surface, the blade being insinuated so as to separate the skin from the subjacent fibrous tissue. The puncture should not be made in any of the transverse creases in the palm, and care should be taken not to damage the skin over the fibrous knot. As a rule it will be necessary to divide one or more bands in the palm and the slips which run to the side of the first joint of each finger: in dividing these processes the digital nerves should not be injured, as the vitality of the fingers is impaired. It is inadvisable and unnecessary to correct all the deformity at one sitting, as the pressure upon the knuckles and tips of the fingers would be too great when the hand is splinted. The metacarpo-phalangeal joint can usually be fully extended at once, and the others gradually straightened in the succeeding week or ten days. The hand and fingers must be freely exercised and massaged, and the splint retained until the patient can keep his fingers fully extended, and his wrist dorsiflexed with his own muscular power. Even then he should continue to wear his splint at night, and keep a sharp look-out for any return of the deformity.

The open operation may be a plastic section of the skin and fibrous tissue, as devised by Busche, who makes a V-shaped incision in the palm, and unites it so that it forms a Y. Goyrand and Kocher turn back a flap of skin, and dissect out the bands of fibrous tissue underneath, grafting, if necessary, any raw area which may be left after the deformity has been corrected. *Robert Jones.*

DYSENTERY.—Under this name are included several conditions, distinct probably both as regards etiology and the nature of the lesions produced. Various diseases of the anus and lower part of the rectum are frequently mistaken for dysentery. These include malignant and other chronic diseases of the rectum, fissures, fistula, and bilharzia disease. In such conditions appropriate surgical or other treatment is required.

Acute Dysentery.—Rest in bed, warmth, and low diet are necessary. The diet should be restricted to milk, diluted with one-fourth barley- or rice-water, and given in small quantities, 4 oz. only at a time. Arrowroot, made rather thick, is of decided value. If abdominal pain or griping be severe, large hot fomentations should be applied to the abdomen. Straining at stool is to be discouraged. The two main lines of medicinal treatment are by (1) Ipecacuanha and (2) Saline aperients.

1. *Ipecacuanha Treatment.*—Large doses should be given, 15–30 gr., repeated after 8 hours. Some practitioners give a single dose only on the first day.

In order to check the vomiting, the patient must be kept absolutely at rest; no food or fluid should be given for an hour or more before the administration of the drug. Laudanum (20 min.) or chloral hydrate (20 gr.) should be given, twenty minutes before the ipecacuanha is administered. The ipecacuanha may be made up into conveniently sized pills, and these may be coated by dipping into melted salol, or the ipecacuanha powder can be suspended in water or dilute syrup, and swallowed. If vomiting results, the dose must be repeated. Sinapisms applied to the epigastrium further tend to check the vomiting. On the following day the dose may be reduced by 5 gr. and given once, with the same precautions. In a case progressing favourably, the amount of ipecacuanha given can be reduced by 5 gr. daily. It is well to continue the daily administration of small doses (5 gr.) for some time after apparent convalescence. Return to an ordinary diet must be gradual, and large meals of any kind avoided.

Meat is more deleterious than vegetable food, and even green vegetables can be taken with impunity, when meat would cause a relapse. The disadvantage of the ipecacuanha treatment is the nausea and vomiting that so often results.

2. *Treatment by Saline Aperients.*—The use of this method of treatment is steadily increasing. In principle it aims at securing a steady intestinal flush with a minimum of discomfort. A convenient method is to give 2 or 3 dr. of a saturated solution of sulphate of soda, with 5 min. of dilute sulphuric acid, in a wineglassful of water, every two hours till a liquid feculent motion is passed, and then increase the intervals between the doses to four or six hours. After the first two days, a dose once or twice a day will suffice. Intestinal antiseptics, such as β-naphthol 10 gr., salol, etc., may also be given. Some practitioners prefer smaller doses of either sulphate of soda or magnesia, at first given hourly. Castor oil or olive oil in full doses, with 15–20 min. of laudanum, is preferred by others, and gives satisfactory results in mild cases.

Medicinal enemata should not be given in the acute stage.

Chronic or Relapsing Dysentery.—Here results are less certain. The same treatment as in the acute cases often gives satisfactory results, but by no means invariably. These relapses are often due to dietetic errors, and frequently to constipation. Constipation after dysentery is not easy to deal with. In many cases it appears to result from an atonic condition of the intestines. Natural waters sometimes suffice. Cascara sagrada and belladonna are more trustworthy. The liquid extract of cascara (5–10 min.), with tincture of belladonna (5 min.) in an ounce of chloroform water every night, will often relieve the condition ; the dose may then be steadily reduced.

Bismuth and astringents are of considerable value where diarrhœa occurs with or without mucus. Opium, in any form, must be used cautiously, as the condition of the intestine is often atonic. Increase in flatus often follows its administration, and then it may even aggravate the condition.

In the severer chronic forms, large enemata, given with a long soft flexible tube, are sometimes employed. Before giving these enemata, the intestines should be washed out with a large (2-pint) enema of weak carbonate of soda solution, 20 gr. to the pint. Of these enemata, boracic lotion is of value ; nitrate of silver, ½–1 gr. to the ounce, and other stimulating lotions, are also used, and in amœbic dysentery, sulphate of quinine. These enemata should be given very slowly, and must be warm (blood-heat). They should be retained for a longer period each day. They should not be long retained if they cause pain. Where the motions are frequent, the ordinary enema opii B.P., with 20 gr. of quinine sulphate suspended in it, is sometimes of great value, as the quinine is slowly dissolved.

Native remedies must not be despised. Most of these are fresh decoctions, such as those of bael fruit or the skins of the mangosteen, and do not seem to be of much value, either after drying, or solution in alcohol, though successful when freshly prepared.

Alcohol as a rule is contra-indicated. In intractable cases, surgical intervention may be advisable. (See also COLITIS and BACTERIOTHERAPEUTICS).

C. W. Daniels.

DYSIDROSIS.—Those who regard this as a nerve disease, recommend the administration of tonics, and if these are otherwise indicated, the advice is good. In most cases, however, local measures are more efficient in cutting short the attack, and local measures certainly seem to be of value in preventing future ones. These consist in bathing the hands and feet (if they are affected) in weak antiseptic lotions, careful drying, and the application of a salicylic dusting powder, say, 3 per cent in powdered talc. This acts in a twofold manner, the powder drying up the fluid, while the salicylic acid hastens the exfoliation of the epidermis, which is necessary before the evidence of the disease altogether passes away.

The condition is generally associated with hyperidrosis, and the use of medicated soaps, notably formalin or resorcin, should be recommended to patients who are liable to dysidrosis.

Norman Walker.

DYSMENORRHŒA.—Dysmenorrhœa in its most typical form is congenital in its origin, or starts within a year or two after the commencement of menstrual life. In such cases severe pain is felt just before or at the onset of the flow. The severe pain seldom lasts more than a few hours, but may return as the period draws near its close. The pain is spasmodic in character, hence the name spasmodic dysmenorrhœa. In typical cases the patient is quite free from pain in the intervals between the menstrual periods. The pain appears to depend on painful, irregular spasm of the uterine muscle, and is especially apt to occur in imperfectly developed uteri. The tissues around the os internum sometimes appear to possess a grisly hardness. The size and shape of the os externum have no bearing on the condition. The tissues surrounding the os internum are sometimes very sensitive, and acute pain is then caused by the passage of a uterine sound.

Pain of this type occasionally develops in women, who had previously suffered little or nothing, as the result of anæmia or overwork. In such cases rest and a course of iron usually soon set matters right.

Well-marked spasmodic dysmenorrhœa of congenital origin is by no means easy to deal with. The pain may sometimes be relieved by medicinal measures, but their action is somewhat uncertain. Some cases are cured by operation, others only relieved, whilst not infrequently dilatation of the cervix fails entirely.

If the patient is otherwise healthy, perhaps the treatment that most often gives relief is the administration of salicylate of soda in 10-gr. doses, three times a day after meals, for a week preceding each menstrual period, and at the onset of the pain phenacetin or antipyrin in 15-gr. doses every hour, until three doses have been taken: with the onset of the pain the salicylate of soda is discontinued. Care should be taken that the bowels are freely relieved at the time when the onset of the period is expected. If the patient is at all anæmic, an ergot and iron mixture, taken for a week before each period, is sometimes more effective than the salicylate of soda.

Bromides are of little or no use, and opium should never be given. Many other drugs have been recommended, and occasionally seem to do good, such as tincture of castor, cannabis indica, etc.

If the pain is really very severe, and is not benefited by drug treatment, dilatation of the cervix may be tried. It is important to remember that this does not cure all cases of spasmodic dysmenorrhœa, and it is generally impossible to foretell in any individual case what will be the result of such an operation. Dilatation of the cervix in cases of dysmenorrhœa has to be carried out under an anæsthetic, and the most careful antiseptic precautions must be taken. Graduated metal or vulcanite dilators are used. Hegar's dilators are rather too straight, and increase in size rather too quickly to be convenient in some cases of dysmenorrhœa where the uterus may be a good deal anteflexed. The cervix should be dilated by bougies to a size corresponding with No. 14 on Hegar's scale. When the dilatation is completed it is generaly wise to curette the uterus, especially in cases of long standing. It is unwise to pack the uterus and unnecessary to pack the vagina. Cases which dilatation of the cervix with curetting fail to cure or relieve are generally best advised to put up with their troubles. If on account of the intensity of the pain further operative treatment is called for in a young woman, it is perhaps wiser to remove the uterus and leave the ovaries, rather than extirpate both ovaries and leave the uterus. Neither hysterectomy nor oöphorectomy should be undertaken for this trouble unless the symptoms are unusually severe and all other methods have failed to give relief.

W. J. Gow.

DYSPAREUNIA.—The cause of the pain may be vulval, vaginal, or more deeply situated.

Vulval causes.—Inspection of the vulva may reveal a tender spot, painful red patch, inflamed tag of hymen, or hymeneal fissure, vascular caruncle, etc., or the orifice may be too small. For the first four conditions, abstention from sexual intercourse, and application of lead lotion and a soothing dusting powder, such as dermatol, will be sufficient. A vascular caruncle should, of course, be removed. For treatment of cases in which the vaginal orifice is too small, *vide* VAGINISMUS.

Vaginal causes.—An acute or subacute vaginitis may be found, for which rest, and soothing douches of lead or boracic acid, should be ordered. A vaginal cyst, if causing dyspareunia, should be removed.

More deeply situated causes.—Retroversion with tenderness of the body of the uterus, low position of tender ovaries, or inflammation of the tubes and ovaries, may be the cause of severe dyspareunia. For the treatment of these conditions, *vide* the articles on the treatment of retroversion (UTERUS) and of SALPINGO-OÖPHORITIS.

In some cases *tenderness of the urethra* is the cause of the pain. Hyoscyamus may be given internally, and bougies made up with 5 gr. of dermatol in cacao-butter may be inserted into the urethra two or three times a week.

In cases of spasmodic dysmenorrhœa, dyspareunia is common. Dilatation of the cervix is sometimes successful by itself in removing this trouble; in other cases the vaginal orifice is too narrow.

Incomplete intercourse seems to be responsible for some cases of aching in the pelvic organs and dyspareunia. If no cause can be found, a cacao-butter pessary containing cocaine may be tried. *H. Russell Andrews.*

DYSPEPSIA, ACID.—The treatment of this condition is by no means satisfactory; it is often difficult or impossible to remove, or at any rate to prevent the recurrence of the exciting cause. Everything possible should be done to improve the general health. Rest and change of air are of value, and such cases derive benefit from a course of treatment at Vichy. So long as the attack lasts the diet must consist chiefly of meat and other albuminous food, with fat and a minimum of starchy food. Patients often do well on Salisbury diet of lightly-cooked minced meat with hot water. Alkalies with bismuth should be given before each meal.

℞	Sod. Bicarb. Bismuth. Carb. Magnes. Carb.	āā gr. x	Muc. Tragacanth. Aq. Menth. Pip. dest.	ℿ xv ad ℥j

Two tablespoonfuls before each meal.

According to Pawlow, olive oil, when introduced into the stomach before meals, diminishes and delays the secretion of gastric juice, but the quantity of oil used was 100 cc., that is 3½ oz. It has been used in much smaller doses, from 1 dr. to ½ oz., to check hypersecretion, not only in simple neuroses, but where it has been associated with gastric ulcer and other organic conditions. The good results which have been recorded suggest the desirability of giving a further trial to this treatment.

℞	Ol. Oliv. Pulv. Tragacanth. Co.	℥j gr. xx	Aq. Flor. Aurant.	ad ℥j

Two tablespoonfuls before each meal.

The use of the stomach tube is indicated in these cases, where relief cannot be obtained in any other way, as by its means life may be made tolerable.

Some authors speak highly of belladonna and its alkaloid atropine as possessing the power to diminish the secretion of gastric juice, but in practice they are not trustworthy. Bromide of potassium is also theoretically indicated, but is not of much service. (See also GOUT.)

Robert Saundby.

DYSPEPSIA, ATONIC.—The rational treatment of this condition by removal of the cause is unhappily often beyond our power, but where possible we should prescribe rest, such as can often only be obtained by leaving home. More obstinate conditions call for a Weir-Mitchell course, which should not be for less than three months. The diet should be an abundance of simple digestible food suited to the patient's taste. These are eminently unsuitable cases for strict regimen; they are apt to starve themselves, to follow every quack system, and to eat every patent food; but it may be desirable to warn them against indigestible food, and if gastritis be present, a diet suitable for that condition must be ordered.

The most useful medicine after any gastritis has been allayed is the following acid mixture, together with a vegetable aperient, of which cascara is, perhaps, the most generally successful. (See also ELECTROTHERAPEUTICS.)

℞	Ac. Nitrohydrochlor. dil.		Succ. Taraxac.	℥j
	Tinct. Nucis Vom.	āā ♏x	Aq.	ad ℥j

Two tablespoonfuls after each meal.

Phthisical Dyspepsia.—The treatment of this disease does not differ from its treatment when met with apart from tuberculosis. (See PHTHISIS.)

Robert Saundby.

DYSPNŒA.—(See ASTHMA, BRONCHITIS, CROUP, HEART, etc.)

EAR, AFFECTIONS OF.

I.—AURICLE.

Carcinoma demands early and wide removal of the affected parts and the neighbouring glands. The upper half of the auricle is the usual site. An artificial auricle can afterwards be worn. In inoperable cases X rays should be used.

Cysts.—*Sebaceous* cysts, usually found in the lobule and back of the auricle, require dissecting out. Occasionally *serous* cysts form spontaneously in the upper and outer part between the perichondrium and the cartilage; these should be opened and drained. *Dermoid* cysts are occasionally found in front or behind the auricle, and should be dissected out.

Eczema, Acute and Chronic.—

Acute Eczema yields to simple treatment. The parts should be kept covered with boracic acid or oxide of zinc ointment, smeared thinly on butter muslin carefully applied to the inequalities of the ear, and kept in position by absorbent wool and bandage. A 10 per cent watery solution of ichthyol gives good results. For cleaning, parolein or oatmeal and water should replace soap. Recurrence is apt to occur, and attention must be paid to the general health.

Chronic Eczema.—The crusts should be removed with a greasy poultice or paroleine, and then either of the following applications should be applied three or four times a day:—

℞	Ung. Hydrarg. Nit.	ʒj	Ol. Amygdal.	℥j
℞	Liq. Carbon. Deterg.	♏v	Zinc. Oxid.	ʒj
	Hydrarg. Ammon.	ʒss	Vaselin.	℥j

To prevent scratching, it may be necessary to tie a child's hands or to cover them with lint. The general health will usually require attention. Arsenic internally is sometimes of value.

Erysipelas is occasionally associated with chronic eczema of the meatus. Ichthyol in water, 25 per cent, should be painted on the parts twice a day, with protection by means of absorbent wool and a bandage, together with the usual ordinary general treatment. Chronic eczema of the meatus, if present, should be treated to prevent recurrences.

Fibroma.—This tumour occurs in the lobule in connection with the holes made for the wearing of earrings. The tumour should be removed by means of a V-shaped incision, the opening of the V being at the edge of the lobule.

Frost-Bite.—In recent cases the ear should be rubbed with snow or cold water until the circulation returns. Any ulcers which may subsequently form require boracic-acid ointment.

Hæmatoma.—This is an effusion of blood, usually due to injury, between the perichondrium and the cartilage, and if allowed to run its course, a shrunken, deformed auricle results. The blood should be evacuated by a free incision under antiseptic precautions, and a double cyanide gauze dressing, packed carefully into all the inequalities of the auricle, should be kept on with wool and bandage. The cleft between the auricle and the head should be filled with the gauze.

Herpes.—Boracic-acid ointment, with absorbent wool and bandage, is all that is necessary. Herpes of the auricle may be associated with neuritis of the auditory and facial nerves.

Injury.—The auricle may be severely torn or cut. The parts should always be purified carefully and replaced in position with a few stitches, however impossible the chances of healing may appear, even if the whole organ has been removed.

Lupus is rarely primary in the auricle. The treatment is the same as in other parts of the body, but sometimes the disease in this position is more easily treated by excision.

Malformation.—Small fistulæ in front of the ear, leading towards the meatus, may be dissected out if they are the site of recurring inflammation.

If the auricle is rudimentary and no passage exists, operations undertaken with the view of forming an auricle or of making a meatus are contra-indicated. An artificial auricle should be worn, the rudimentary organ being used for its attachment. Supernumerary auricles can be dissected out.

If the auricle is very large, it can be reduced in size by a carefully planned operation; or if it projects in an unsightly manner, an elliptical portion of skin is removed from the back of the auricle and from over the mastoid process, and the edges of the resulting wound brought together by stitches. It may be necessary to remove part of the cartilage.

Papilloma.—Occasionally ordinary warts are seen on the auricle, but do not demand special treatment. Single papillomatous growths should always be excised, especially in later life, as they may be the starting-point of epithelioma.

Perichondritis.—If the perichondrium becomes infected as a result of injury, operative or otherwise, the cartilage sloughs away and a shrunken auricle results. Free incisions should be made, and hot boracic fomentation constantly applied.

Syphilis.—The auricle is very rarely the site of a primary sore, but of course shares in the rashes in the later stage. Occasionally a tertiary ulcer is seen, and may be mistaken for carcinoma. Rarely small tertiary ulcers are found on the edge of the auricle. Ordinary treatment always suffices.

II.—EXTERNAL AUDITORY MEATUS.

Aspergillus or Otomycosis.—This is only occasionally seen in England. Frequent re-accumulation of masses of epithelium with dark spots on it, associated with irritation and swelling of the meatal walls, should arouse suspicion. The microscope will put the diagnosis beyond doubt. In treating it, the object is to destroy the fungus. The meatus should be syringed with warm 1–500

perchloride of mercury night and morning for four days, and the meatus filled afterwards with hydrarg. perchlor. 1 gr. ; sp. vini rect. 1 oz., the head being placed on one side and the solution allowed to remain in for a quarter of an hour. If much inflammation of the parts is present, it should first be treated by hot boracic acid lotion syringing and hot fomentation.

Atresia.—If congenital, treatment is most unsatisfactory unless it can be definitely determined that the middle and internal ears are healthy and the atresia is simply due to a mere partition of soft parts. The partition should be cut away and the passage kept open by means of leaden tubes until the raw surfaces have skinned over. It may be necessary, however, to turn the auricle forwards, remove the partition, and skin-graft.

Atresia may result from injury or inflammation, and the same treatment will be necessary.

Stenosis occurs as a result of chronic eczema, inflammation, injury, or bony growths. As long as a permanent opening, however small, remains, it will be found that it is sufficient for hearing, and nothing need be done, after the local trouble is cured.

Carcinoma.—This may start in the cartilaginous part of the meatus after long-continued eczema or at the site of a wart ; or the passage may be secondarily involved from neighbouring parts. Free removal is the only treatment. It will be found that even if complete removal is impossible, free removal of parts will relieve the intolerable pain.

Caries.—Death of part of the bony meatus may occur as the result of a localized abscess, but it is usually secondary to extension from the middle-ear tract.

If due to the former, free curetting and the removal of the diseased bone through the meatus will effect a cure. It may be necessary, however, to turn the auricle forward to obtain enough room.

Cerumen.—The mass will, as a rule, be easily removed by syringing. Before syringing the ear, an examination should be made to make sure that it is required. Great harm may be done by needless syringing.

The syringe should be of one-ounce capacity, with a projecting rim for the fingers, and should have a nozzle with a thin but smooth point. Care should be taken that the syringe is pure, either by immersion in and filling with carbolic solution 1–20, or by boiling. Not uncommonly one syringe is made to do duty for all ears, septic or not, without any purification, and occasionally great harm results. The water should be previously boiled and used warm. A good guide is to have the water of such a temperature that it is pleasantly hot when applied to the back of the hand.

The patient should be seated opposite a window, with the light falling on the ear to be syringed. The auricle is then pulled—downwards in an infant, downwards and backwards in a child, and upwards and backwards in an adult—in order to straighten the passage.

The syringe having been filled, and all air having been expelled, the nozzle is placed just inside the meatus, and the water is projected along the posterior wall in a slightly jerky manner, the process being repeated until the mass is expelled.

The ear should then be emptied of water by turning the head on one side ; and it should then be examined to make sure that the passage is clear, and a light plug of wool is introduced and worn for a few hours.

If there is difficulty in removal, or if it is obviously very hard, the mass may be softened by filling the passage, while the head is placed on one side, with the following solution, used warm, and allowing it to stay in for a quarter of an hour three times a day :—

℞ Sod. Bicarb. gr. xv | Aq. dest. ää ℥j
Glycerin.

Parolein or peroxide of hydrogen are also useful. When ordering the instillation, the patient should be warned that it may make the hearing temporarily worse.

If the passage is swollen and tender, hot fomentation, together with the instillation, should be used before syringing. Occasionally the passage is filled with layers of desquamated epithelium mixed with cerumen (*Keratosis obturans*), and the mass is often very difficult of removal, especially as the walls of the passage are usually very tender. Syringing after frequent softening may be efficacious, but it is often necessary to gently separate the mass from the wall at one point with a small silver loop, and then to seize the separated part with ear forceps and gently pull the whole mass out. In very nervous patients an anæsthetic may be necessary. After removal of the epithelial plugs an enlargement of the floor of the bony meatus is occasionally found. The ear should be examined and cleaned about once in two months, to prevent discomfort and deafness.

Diphtheria.—This is usually due to spread of the infection from the middle ear, but it may be purely local. The local treatment consists in syringing the ear four times a day with a saturated solution of toluol, the application of hot fomentation, and the usual serum injection.

Eczema localized to the meatus is very often due to the bad habit of picking the ear with the nail, or with the pernicious instruments sold for cleaning the ear. As the itching is often nearly intolerable, great self-control is necessary to abstain from scratching the parts. Brisk rubbing in front and behind the ear, well away from the meatus, with the first two fingers, will alleviate the extreme irritation. The passage should be gently painted two or three times a day with

℞ Ung. Hydrarg. Nit. ʒj | Ol. Amygdal. ℥j

A little being poured out, after shaking, on to the bottom of an inverted tumbler, is lightly applied with a camel's-hair brush, which should be thoroughly cleaned and dried after each application. The patient should be warned not to rub the parts with the hard part of the brush, as the temptation to do so is very great.

At night a broad ring pad may be worn round the ear, or the pillow may be curved round in such a way as to prevent rubbing. The secretion tends to collect in the meatus, and often becomes very offensive ; syringing with boiled boracic lotion or sterile salt solution once or twice a day before applying the mercurial application is then necessary.

Sometimes the passage becomes extremely contracted, when a thin wick of wool soaked in the application should be worn all night, and gradually increased in thickness as the passage opens. General anti-gout treatment is useful. The eczema may be due to the irritation of a septic middle-ear discharge. Arsenic is useful.

Endothelioma.—This rare tumour of the meatus requires thorough removal of the whole cartilaginous meatus, with subsequent skin grafting to keep the passage open. As most of the pinna is left, the resulting deformity is slight.

Epithelial Plugs, or Keratosis Obturans.—(See CERUMEN, *supra*.)

Erysipelas.—Recurring attacks often begin in the meatus in cases of eczema. The disease is likely to spread beyond the auricle on to the head, but the deep meatus and the middle ear are rarely if ever effected. Ichthyol during the attack and cure of the chronic eczema are the lines of treatment.

Exostosis and Hyperostosis.—Bony growths in the meatus take three forms : (1) Multiple, sessile, ivory, in the deep meatus ; (2) General thickening of the bony meatus or hyperostosis ; (3) Single pedunculated.

1. *The Multiple Growths* are usually three in number. They very rarely cause symptoms, but the chink between them is readily blocked with cerumen. They

hardly ever require removal, but they may cause retention of pus in suppuration of the middle ear, and will then have to be dealt with. They may be removed through the meatus with a small trephine (Pritchard's), worked by a dental engine or electric motor, or the auricle may be turned forwards and the growths chiselled off.

2. *Hyperostosis* again very rarely requires surgical interference. The excess of bone may be removed through the meatus with a chisel and hammer, or by a burr worked by a motor.

3. The *Single Pedunculated* variety is rarely seen. It grows close to the orifice of the meatus, and may quite occlude the passage, causing deafness. The growths are easily broken off with dental stump forceps.

Foreign Bodies.—Unless the foreign body is a living insect, its presence in the meatus rarely causes much discomfort or danger. The danger lies in roughly attempting to remove it.

In all cases, the presence of the foreign body must be ascertained by means of a good light reflected into the ear through a speculum from a head mirror. In children an anæsthetic will sometimes be necessary. If a living insect is present, the head should be placed on one side and the meatus filled with parolein or chloroform vapour ; the insect will either come out of its own accord or will be killed, when it is easily removed by syringing.

Other foreign bodies should be *syringed* out, and unless the operator is skilled in aural work nothing further should be attempted. Rough attempts at removal may result in rupture of the membrane, removal of the ossicles, facial paralysis, meningitis, or cerebral abscess. The syringing should be done under aseptic conditions (see CERUMEN, *supra*). If there is a chink between the foreign body and the meatal wall, the stream should be directed through it. If the foreign body is heavy, the ear may be turned downwards and the syringing done from below.

If the meatus is swollen external to the foreign body, removal should not be attempted—unless symptoms indicating urgency are present—until the inflammation has been reduced by hot fomentation. If syringing is not efficacious, instrumental removal will be necessary under strict antiseptic precautions. The meatus and auricle should be purified—the meatus by instillation for twenty minutes of 1–20 carbolic acid solution and subsequent syringing with 1–2000 solution of perchloride of mercury. The auricle is purified in the ordinary way, and all instruments should be boiled and placed in 1–20 carbolic acid. There is sometimes great scope for ingenuity in removing a foreign body.

If removal through the meatus is impossible, more room can be obtained by turning the auricle forward and removing enough of the posterior and superior walls of the bony meatus with a chisel and hammer.

If dangerous symptoms are present, it will be necessary to lay the middle-ear tract thoroughly open, and to deal with any intracranial trouble which may have resulted.

Furunculosis or Boil.—These are always situated in the cartilaginous meatus, and the quickest way of dealing with them is to make a free and deep incision through the inflamed tissues under gas anæsthesia, with a narrow, probe-pointed knife. Even if pus has not yet formed, the relief will be great. After the incision, hot fomentation and frequent syringing with hot 1–2000 solution of perchloride of mercury are necessary. If incision is impossible or refused, a poultice, followed by hot fomentation, should be applied until the boil bursts. Morphia may be necessary to relieve the pain and to procure sleep. Recurrence is often seen, and to prevent this it is necessary to thoroughly purify the cartilaginous portion of the meatus after the inflammation has subsided. This should be done by instillation of 1–20 carbolic acid for twenty minutes, followed by a light gauze

plug soaking with 1–2000 perchloride of mercury, every day for three days. The general health will require attention. If recurrence takes place in spite of thorough purification and attention to the general health, Sir Almroth Wright's opsonin treatment will be found valuable.

Boils are sometimes associated with chronic eczema and with suppuration of the middle ear.

Herpes.—Herpetic eruptions may occur in the meatus or on the membrana tympani. If on the membrane, it is important not to mistake the condition for acute middle-ear inflammation. Hot fomentations and morphia internally will relieve the pain before the vesicles have burst ; after rupture has occurred, boracic acid powder should be insufflated. General tonic treatment and rest from worry are indicated.

General or Diffuse Inflammation.—Any cause, such as discharge from the middle ear, aspergillus, or cerumen, should be removed. Hot fomentations and hot boiled boracic syringing should be used, and any granulations which form should be lightly touched with solid nitrate of silver fused on the end of a silver probe.

Papilloma.—Single papillomatous growths should always be widely removed, as they may be the starting point of epithelioma.

Polypi.—As a rule polypi in the meatus are merely exuberant granulation tissue coming from a septic middle ear. Their treatment is described under middle-ear suppuration. When they occur as a result of inflammation of the soft tissue of the meatus, they should be lightly touched with nitrate of silver, and the ear syringed with boiled boracic lotion or 1–4000 perchloride of mercury night and morning. If the bone is carious, the parts should be thoroughly curetted under an anæsthetic. Carcinoma or sarcoma appear as a polypus or mass of granulations ; the very free bleeding and the extreme pain produced by gentle manipulation with a probe will arouse suspicion.

Sarcoma is rare as a primary growth of the meatus, which is more often invaded from a tumour in neighbouring parts. Free removal after turning the auricle forward is the only method of treatment.

III.—MIDDLE EAR.

Carcinoma.—Treatment is palliative—a complete removal is impossible. Free opening of the middle ear, antrum, and mastoid process, with removal of as much of the disease as is possible, is often of value in relieving pain. The X rays should be tried.

Catarrh, Acute and Chronic.—Catarrh of the middle ear results from a catarrh of the nasopharynx spreading up the Eustachian tube.

Acute Catarrh.—In the acute stages, rest, purging, light diet, with complete abstinence from tobacco and alcohol, with hot inhalation of benzoin four times a day for five minutes, and gentle inflation with Politzer's bag twice a day, are all that is necessary. In the subacute stage, chloride of ammonium vapour produced by Godfrey's or Basdon's inhaler is valuable. The vapour is drawn into the mouth from the mouthpiece, and then blown through the nose, for ten minutes night and morning, and twice at each sitting the vapour should be introduced into the middle-ear tract by blowing down the tightly closed nose when the mouth and nose are full of the vapour. If it is desired to inflate one ear more than the other, the patient should place the head on one side, with the affected ear uppermost and the other ear blocked with the finger. A warm sterile astringent and alkaline nasal solution or glyco-thymoline solution should be poured into the nose after the inhaler has been used. Politzer's bag (see EUSTACHIAN OBSTRUCTION, *infra*) will be required once a day, with increasing intervals as the hearing improves. If the blockage is very great, the Eustachian catheter (see EUS-

TACHIAN OBSTRUCTION) may be necessary after the acute stage is over. Injection through the catheter of 10 drops of warm parolein, or a warm sterile solution of pot. iod. 10 gr. to the ounce, or sod. bicarb. 5 gr. to the ounce, is sometimes of value, especially if the catarrhal fluid is very sticky in character.

Change of air, especially to the seaside, is of the greatest value. Tonics should also be given. In very obstinate cases it is sometimes necessary to evacuate the contents of the middle-ear tract by making an incision in the posterior and inferior segments of the membrane, and subsequently removing the catarrhal fluid by means of Politzer's bag, or sucking it out with Siegle's exhausting speculum, or both methods may be employed.

Any unhealthy condition of the nose and nasopharynx will often require dealing with before a complete cure is obtained, and also to prevent recurrences. Adenoids will often be found.

Chronic Catarrh.—If the condition has become chronic, the nose, nasopharynx, and throat should be thoroughly examined and made in as healthy a condition as possible ; the tube should be kept open by regular inflation with Politzer's bag or the Eustachian catheter ; the membrane and ossicle be kept supple by gentle massage with Delstanche's masseur for one minute night and morning, and chloride of ammonium vapour used off and on in the manner previously described.

A high and dry climate will be beneficial, and the diet should be light, with only one meat meal a day ; plenty of fluid should be taken. Alcohol and tobacco should be absolutely stopped. The whole body should be rubbed briskly with a rough towel night and morning, and a Turkish bath may be taken once a month. Occasionally the hearing in these cases is improved by making a hole in the membrane. If the patient states that he hears better in a noise, treatment will be of little value.

Eustachian Obstruction.—The cause in the nasopharynx should be searched for and treated. It may be due to catarrh, often associated with adenoids, new growth, or cicatricial contraction.

The tube should be opened and kept patent by various methods, and the one employed will depend on the cause and persistency of the obstruction. After the subsidence of acute inflammation at the mouth of the tube, or the removal of a new growth from the nasopharynx, the mere act of swallowing will often do all that is necessary. If the closure persists, Valsalva's method of auto-inflation may be efficacious. The nose is tightly held while the patient blows strongly down it and at the same time makes an effort at swallowing. Inflation with Politzer's bag is often necessary, and may have to be repeated daily until the hearing returns. An eight-ounce bag, to the nozzle of which a nosepiece (Pritchard's) is connected by means of a short piece of rubber tubing, is the best. The patient having taken a sip of water, the end of the nosepiece is placed just inside the nose, past the vestibule, which is higher than the floor of the nose, with the opening pointing down the inferior meatus ; the nostrils are then closed round the nosepiece with the finger and thumb of the left hand, and the patient is directed to swallow. When the larynx is seen to move upwards—and it is a good plan to place the patient's head sideways to the surgeon in order to see this—the bag is sharply squeezed with the right hand, taking care that the bag is not jerked upwards, for if it is, the tube becomes kinked and no air passes.

The grasp of the bag should not be relaxed until the nosepiece has been withdrawn and cleaned, for if the bag is allowed to expand with the nozzle in the nose, mucus is sucked in. On efficient inflation the patient will experience an explosion in the ear, and the hearing will at once be greatly improved. The surgeon can hear the air enter the middle ear if an auscultation tube connecting the patient's ear with that of the surgeon is used. Instead of swallowing water,

the soft palate may be made to shut off the nasopharynx from the pharynx by blowing out the cheeks or by saying "hic."

If there is difficulty in opening the tubes with the bag, a few drops of chloroform may be poured into the bag and allowed to evaporate before inflation.

If it is desired to inflate one ear only, the head should be placed on one side, with the affected ear uppermost and the other blocked up with the finger. The nosepiece of the bag should be carefully purified after each patient.

For Eustachian catheterization, a medium-sized short silver catheter, with a ring on the butt corresponding to the point, is the best. Before use it should be boiled, and air should be blown through, to make sure that the instrument is clean and clear. The nose should be examined for anything, such as deviation of spurs from the septum, likely to prevent or hinder the passage of the instrument. If it is impossible to pass the catheter down one side of the nose, both ears may be catheterized through the clear one, a right-angle bend being made in the instrument to reach the tube on the obstructed side. At the first sitting, or if the patient is nervous, a 2 per cent solution of cocaine should be previously sprayed along the inferior meatus. The surgeon, seated opposite the patient, first places the ends of the auscultation tube in his own and the patient's ear. With the last three fingers of the left hand resting on the bridge of the nose, the tip of the nose is tilted up with the left thumb, and the point of the catheter is introduced into the lower part of the nostril, with its opening pointing backwards and the bend forwards. After it is passed through the vestibule, which is higher than the floor of the nose, the surgeon's end of the instrument is raised so that the main part is horizontal and the point rests on the floor of the nose. The instrument is then gently passed straight backwards, being rotated round any obstruction from the septum, until the posterior nasopharyngeal wall is reached. The feeling closely resembles that experienced on pressing the point of the catheter against the palm of the hand.

At this point the ring on the catheter will point downwards; it is then turned inwards and upwards, so that the ring points horizontally away from the ear to be catheterized; the catheter is gently pulled forwards until the posterior edge of the septum is felt, when the point is rotated downwards, outwards, and upwards, until the ring points to the outer canthus of the eye and the point is lodged in the mouth of the tube. The catheter is fixed in this position by the thumb and first finger of the left hand, and the nozzle of the inflating bag fitted into it. On inflation, the air can be heard to pass through the Eustachian tube and reach the middle ear; if catarrhal fluid is present in the tube or middle ear, bubbling will be heard. The blowing should continue until about six clear inflations have been heard; it may, however, take several sittings before the air can be heard to clearly enter the middle ear.

If it is desired to introduce fluid into the middle ear, the catheter is passed, and inflation made to ascertain that the instrument is in the mouth of the tube; the inflating bag is then detached, and by means of a pipette or syringe the warmed solution is injected into the catheter and blown into the middle ear with the inflating bag. Vapours may also be introduced either by a special apparatus or by filling the inflating bag.

Foreign Bodies.—These are not common in the middle ear. In most instances they have been pushed through the membrane by rough attempts made to remove them from the meatus. They demand prompt removal. If aseptic syringing is not successful, the foreign body will have to be removed instrumentally through the meatus under an anæsthetic and with strict antiseptic precautions. It may be necessary to enlarge the opening in the membrane, or even to turn the ear forwards and to chisel away the posterior and superior bony meatal walls to give more room. If sufficient room is not then obtained, the middle-ear tract

must be thoroughly opened, as in the complete post-aural operation ; in fact sepsis may compel the surgeon to adopt this radical measure.

Inflammation, Acute and Chronic.—

Acute Inflammation.—In the early stages, when there is merely injection of the malleal vessels and general redness without bulging of the membrane, the inflammation can sometimes be cut short.

The first thing is to put the patient to bed, purify the meatus by instillation of warm 1–20 carbolic for a quarter of an hour, and introduce a light plug of double cyanide gauze wrung out in 1-2000 perchloride of mercury ; the auricle being also filled and covered with the gauze, which is retained in position by wool and bandage.

Purification and plugging serve several purposes : functional rest is obtained, the parts are ready if an incision has to be made in the membrane, and if an abscess rapidly forms and bursts through the membrane, it does so into an antiseptic dressing. Hot fomentations are applied over the ear without disturbing the gauze, and a small blister is applied behind it. As the inflammation has spread up the tube from the nasopharynx, in the great majority of cases, warm benzoin inhalation through the mouth and nose every two hours should be ordered. A gentle inflation with Politzer's bag will open the tube and relieve the pain. Morphia should be given if the pain is great and preventing sleep. If the pain is not relieved in six or eight hours, it will mean that the inflammation is not cut short, and that it will be necessary to open the membrane. On looking at the ear it will be found that the redness has increased, and that there is bulging of the membrane, usually in the posterior segment. Under gas anæsthesia the membrane is opened by means of a fine sharp-pointed knife. The incision should start from behind the short process of the malleus, and be carried two-thirds round the periphery and as close to it as possible. If the bulging is in Shrapnell's membrane it should be included in the incision. The bleeding will be fairly free. The blood and evacuated material should then be gently wiped out with gauze mops, a light plug again introduced, and the outside dressing and fomentation reapplied. The contents of the middle ear may be serous or mucopurulent. The relief to the patient will soon be obvious. The dressings should be changed about every six hours, the frequency depending on the amount of discharge. It may be found that the discharge is quite slight and rapidly ceases without any syringing, or it may become very profuse, necessitating frequent dressing and the clearing of the meatus by gentle syringing with warm boiled boracic lotion or sterile salt solution ; under these circumstances it is wise to omit the meatal gauze and have an outer dressing only. Strong antiseptic solutions should be avoided.

When the pain is gone, the fomentation should be left off and a daily gentle inflation made with Politzer's bag. As the discharge lessens, the interval between the dressings is gradually lengthened.

After the attack is over, and the patient has regained his health by change of air and tonics, search should be made for any predisposing cause, especially for adenoids. During the attack the patient should be carefully watched for any sign of extension to the antrum or mastoid process, or for intracranial complications.

In young children, before the mastoid cells have formed, pus in the antrum, which is part of the middle ear, will perforate high up behind the ear. In dealing with such a case the ear is turned forwards, and the outer wall of the antrum need only be removed to secure good drainage. The middle ear proper should not be touched. The wound being lightly plugged will heal up from the bottom ; the discharge from the meatus will quickly subside, and perfect hearing will result.

If the mastoid cells, which always communicate with the antrum, have formed, the external signs will be lower down: sometimes these are very vague, but the discharge remaining profuse and mucopurulent, with pain and rise of temperature at night after the trouble has lasted a few weeks, will warrant operation. A most important sign is bulging of the posterior superior deep meatal wall close to the membrane; this sign alone shows that there is pus to be let out, and operation should be undertaken at once. Occasionally, and especially in influenzal cases, the course is extremely rapid, and the mastoid operation may have to be undertaken within a few days of the onset.

In operating when the mastoid cells are involved, the outer bony wall only should at first be removed. The inner wall of the bony wound should not be touched until the cavity has been cleared of blood and pus, and it can be thoroughly inspected by means of reflected light from a head mirror, for the lateral sinus in its varying positions is frequently exposed by the disease, and sometimes the facial nerve, in the descending part of its course, lies naked at the bottom and front part of the cavity. All the affected cells must be exposed and their partitions removed to lay them open into the main wound. The ramification of the cells is sometimes very extensive. Care should be taken that the opening from the lower part of the antrum into the cavity is made free; the outer wall of the antrum need not be touched, nor should the middle ear proper. Healing takes place from the bottom, and the hearing result will be perfect.

The directions which pus may take are very numerous, and depend to a great degree on the anatomical condition. The pus may perforate into the meatus from the antrum or from the mastoid cells. It may get into the neck under the deep fascia through the inner aspect of the mastoid process (Bezold's perforation), or through the digastric or occipital grooves, and it may run down the neck as low as the clavicle, or push into the pharynx or soft palate.

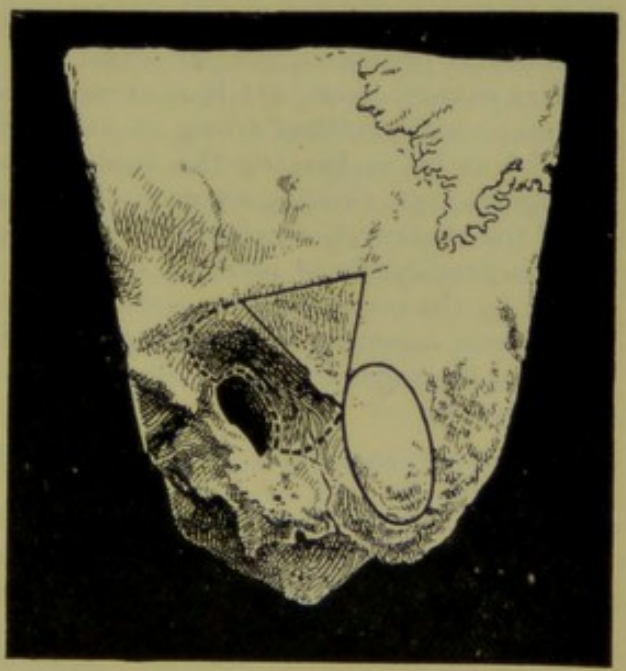

Fig. 12.—Left Temporal Bone. The dotted lines and the posterior and superior outlines of Macewen's triangle show the amount of bone removed in performing the radical post-aural operation.

Not infrequently in adults the mastoid cells are absent, and as the outer wall of the antrum under these circumstances is frequently composed of bone of ivory density, and may be three-quarters of an inch thick, an empyma of the antrum may present no external signs; but the discharge will continue to be profuse, there will be some pain and temperature, and the sagging of the posterior superior deep meatal wall will be seen. In this condition the opening in the bone should commence high up behind the ear in Macewen's triangle, which is a good guide to the antrum in the great majority of cases. In the illustration (*Fig.* 12) the triangle is marked out; the oval outline shows the site at which the mastoid cells should be opened.

Intracranial complications of every variety may occur as a result of acute inflammation of the middle ear.

In all cases of mastoid operation for acute empyema, the middle ear must not be

touched. Pus should be tracked wherever it may run, and the cavities thoroughly opened.

Chronic Inflammation.—Chronic discharge from the middle ear is only a sign of disease; the exact local condition must, therefore, as far as possible be ascertained, to find out the cause:—the nature of the discharge; the site and extent of perforation of the membrane; the condition of the mucous membrane on the inner middle-ear wall; the state of the ossicles; the presence or absence of polypus; granulations, cholesteatoma, and caries of the walls of the middle ear and meatus. Signs of extension to the labyrinth, and of implication of the antrum and mastoid cells, must be looked for, and intracranial complications should be excluded; these are meningitis, cerebral or cerebellar abscess, and thrombosis of the lateral sinus.

The nose, nasopharynx, and pharynx should be examined, and anything unhealthy, especially adenoids, should be removed. The general health should be carefully investigated. In cases of simple, uncomplicated perforation, the ear should be syringed night and morning with warm boiled boracic acid solution, half a pint being used at each sitting. It is best for a previously instructed person to syringe the ear in the same manner as in cases of cerumen. An ounce glass syringe, which should be kept aseptic either by boiling or by immersion in and filling with 1–20 carbolic acid solution, should have a narrow smooth point and a ridge on the barrel to prevent the fingers slipping off. An inch of india-rubber tubing on the point may be used. If it is impossible for someone else to use the syringe, a Higginson's aural syringe is used by the patient himself. If giddiness is produced, the ear should be syringed with the patient lying down, and assurance given that it is of no importance and that it will soon pass off. Inflation with Politzer's bag, at first daily, with gradually increasing intervals, will be useful in keeping the Eustachian tube patent, preventing adhesions in the middle ear, clearing away discharge, and improving the hearing.

If the discharge is offensive, stronger antiseptics should be used, such as 1-4000 perchloride of mercury or lysol ½ per cent. The syringing may be preceded by the instillation for ten minutes of peroxide of hydrogen, 10 vol.

In some cases, especially if the perforation is large and the mucous membrane swollen, the following spirit drops instilled for ten minutes after syringing will be beneficial:—

℞ Pulv. Acid. Borac. ʒj | Sp. Vini Rect. ℥iij

At first ten drops should be diluted with an equal part of hot boiled water, and if no pain is produced, the solution should be gradually increased in strength by lessening the amount of water, until it can be used pure.

If the perforation is in the top of the membrane (Shrapnell's membrane), it may be necessary for the surgeon himself to use an intratympanic syringe, the nozzle of which is passed through the perforation.

As improvement occurs the intervals between the syringing should be gradually increased. If improvement does not take place in two months, the radical post-aural operation, with or without the removal of the ossicles, will be necessary. If the hearing is good and the ossicles appear to be intact, they should be left.

If after six months the ear, although improved, remains stationary and the discharge palpably comes from the middle ear only, the cleansing treatment should be continued; but if the discharge is still offensive, and there is a doubt as to whether the antrum is affected, the radical operation is indicated.

If the patient states that the hearing is markedly but temporarily improved directly after syringing, it means that a cotton wick "*artificial membrane*" placed against the ossicles or their remains will improve the hearing. The wick

should be about one inch in length, and made of double cyanide wool. A piece of the wool is evenly pulled out and laid on hot boracic acid solution and carefully rolled up. The calibre should be such as not to completely fill the meatus. The tip should be dipped in parolein to prevent drying. A straight pair of untoothed forceps are used for its introduction. At first the patient should wear it for one hour a day, the time being gradually increased hour by hour until it can be worn all day. It should always be removed at night. If pain is produced the use must be discontinued, and after a time a further trial be made. The patient will get very expert in its use, and will be able to put it into the proper position more surely and quickly than the surgeon.

If there is much discharge the wick cannot be used, and if there is slight discharge the cleansing treatment should be continued.

Polypi and *Granulation*, unless malignant, indicate either neglect or caries of some part, and it is often impossible to say which. Some cases which look as if operative treatment will be necessary, rapidly heal up when the thorough cleansing treatment is used.

If a polypus, which is simply overgrown granulation tissue, project into or fill the meatus, it should be removed under a general anæsthetic and with all antiseptic precautions, by twisting, snaring, or curetting. The site from which it is growing should be thoroughly but gently curetted. In so doing carious ossicles may be removed. The meatus is afterwards lightly packed with iodoform ribbon gauze, and a gauze and wool dressing is applied. The dressing should be changed daily. If healing does not occur, even after a return for a short time to the cleansing treatment, the radical operation will be required.

Granulations should be lightly touched with nitrate of silver, or chromic acid crystals, both of which can be fused on a probe. It will, however, often be necessary to thoroughly curette the middle ear under an anæsthetic.

Masses of epithelium, or so-called *cholesteatoma*, will often be seen to occupy the middle ear, with or without granulations. The masses can be got rid of by instilling warm peroxide of hydrogen 10 vol. for ten minutes before syringing. After removal, healing may occur under ordinary cleansing treatment, but frequently great destruction of parts is found, with implication of the attic antrum and mastoid cells, especially if the perforation is in Shrapnell's membrane, and demands the radical post-aural operation.

Caries of the Ossicles is very commonly found in chronic suppuration: the descending process of the incus in inferior perforation; and the head of the malleus and body of the incus, often associated with caries of the outer attic wall, in perforation of Shrapnell's membrane. Complete loss is also seen.

If, after thorough trial of the cleansing treatment, healing does not take place, the ossicles and outer attic wall may be removed through the meatus. Most frequently, however, it will be found necessary to perform the radical operation.

With any of the above local conditions there may be signs of antral or mastoid implication which will demand a prompt radical operation; or there may be intracranial complications, when the radical operation should always be performed as a preliminary; for then not only is the origin of the trouble dealt with, but signs of extension from some part of the exposed cavities will show the way to the intracranial complication, the site of which is often doubtful.

Facial Paralysis may recover under treatment; but if it is permanent, the nerve should be joined to the hypoglossal.

The Internal Ear or Labyrinth is occasionally implicated, especially in tuberculosis of the middle ear. The chief symptoms characterizing the complication are increased and profound deafness, giddiness, vomiting, and tinnitus. The labyrinth can be attacked surgically after a wide radical operation has been performed.

It may briefly be said that the radical operation consists in opening the antrum, tracking and removing disease wherever it may be found, removing the outer attic wall, clearing out the middle ear, and laying the antrum into the meatus by removing the posterior meatal wall. The dotted line in *Fig.* 12 and the posterior and superior outlines of the Macewen's triangle, show the amount of bone which is removed in performing the operation.

Injury.—The membrane may be ruptured by direct or indirect violence. If by direct, the meatus should be purified, and a double cyanide gauze dressing in the meatus and over the ear should be applied.

If by indirect, such as condensation of the air in the meatus from explosion or blows, the deep meatus should not be syringed or touched, but the cartilaginous meatus should be lightly plugged with gauze wrung out in 1–2000 perchloride of mercury, and changed daily until healing is complete.

If sepsis occurs, the treatment will be the same as in an acute inflammation of the middle ear.

In fracture of the bone involving the middle ear, thorough purification of the meatus, auricle, and side of the head should be performed, and a large double cyanide gauze dressing applied.

Sarcoma.—Sarcoma of the temporal bone, involving or starting from the middle ear, demands the widest possible removal in as early a stage as possible, but often the progress is so rapid that palliative treatment is all that can be done.

Sclerosis.—This disease, although always classed as a middle-ear affection, is due to thickening of the bony labyrinth, producing fixation of the stapes. It is the cause of most of the intractable cases of deafness. It is more frequently seen in women, is very insidious in its onset, is not due to catarrh, although this may also be present ; there is no Eustachian obstruction or depression of the membrane. Hearing better in a noise is usual, and is often noticed from the onset of the deafness. Sometimes the deafness remains stationary for a long time. Heredity is a marked feature. Child-bearing has a distinctly prejudicial effect ; in fact, some patients date the onset from a confinement. Absolute deafness does not result.

There is no treatment which can really be said to have a distinct effect upon it. If catarrh is present, it should be treated in the usual way. The patient should live as healthy a life as possible, and in the later stages artificial aid will be necessary in the form of a trumpet or speaking-tube. It is a good plan for the patient to go to a trustworthy maker and try the various forms of trumpets, as it is impossible to say which will be most useful. All the patients unconsciously learn a certain amount of lip-reading, and it is wise to have lessons from a good teacher fairly early in the course of the disease. Co-existent anæmia and rheumatism should be treated.

Syphilis.—The middle ear is sometimes affected by the specific inflammation in the nasopharynx producing Eustachian obstruction, or even spreading along the tube to the middle ear. Ordinary anti-syphilitic treatment and regular inflations with Politzer's bag will clear up the trouble. The nosepiece of the bag should be purified and kept distinct, and afterwards burnt, or a piece of drainage tube can be used in place of the nosepiece.

Tuberculosis.—Early tuberculosis of the middle ear is characterized by the painless onset of deafness, usually unilateral, associated with a red swollen condition of the membrane resembling that found in painful acute inflammation ; in other words, from the appearance of the membrane one would expect the patient to be in great pain ; but discomfort only is complained of. The infection may be secondary to tuberculosis of the lungs or of the nasopharyngeal tonsil (adenoids), or it may be primary, especially in infants. The disease may progress very rapidly, attacking the bone, producing facial paralysis, mastoid disease,

caries or necrosis of the labyrinth, and extension to the meninges. Glandular infection occurs early.

The local treatment, combined with sanatorium and general treatment in the early stage, is to purify the meatus and keep an antiseptic dressing in it. The discharge is slight unless further infection occurs, when it becomes profuse and offensive, requiring frequent syringing with 1–4000 perchloride of mercury, or lysol ½ per cent.

If adenoids are present they should be removed. If there are signs of bone implication the ear should be turned forwards and all affected bone freely removed, the resulting wound being lightly stuffed with iodoform gauze, and allowed to heal from the bottom. If the labyrinth is attacked it may be dealt with after a wide radical operation has been performed.

The affected glands should be removed a short time before the bone is dealt with. Tuberculin treatment may be tried.

If the facial nerve is completely destroyed, the distal end should be joined to the hypoglossal. (See also BACTERIOTHERAPEUTICS and PHTHISIS.)

IV.—INTERNAL EAR.

Anæmia.—Tinnitus and deterioration of hearing due to anæmia or to great loss of blood yields to general treatment.

Congestion.—Deafness and tinnitus are seen in patients who live too well, take too much alcohol and tobacco, and have no exercise. The treatment consists in strict dieting, abstinence from alcohol and tobacco, regular exercise, massage, Turkish baths, and calomel purgation.

Deaf-Mutism.—Occasionally in those cases in which the deafness is due to chronic suppuration of the middle ear, the hearing may be improved by treatment sufficiently for the patient to acquire speech in the normal way. In a few cases in which the deafness is due to Eustachian obstruction caused by adenoids, the removal of the growth and subsequent inflations will be followed by the best results. In the great majority of cases, which are due either to malformation or incurable disease of some necessary part of the hearing apparatus, speech will have to be acquired by the teaching of lip-reading according to the German method. Tuition should begin about the age of five years.

Preventive treatment consists in avoiding the marriage of those in whose family deaf-mutism, due to malformation, is plainly hereditary, and of those who are consanguineous and in whose families there are signs of degeneration, such as deaf-mutism, epilepsy, idiocy, or lunacy.

Drugs.—Those which most commonly cause deafness are quinine, salicylate of soda, nicotine, alcohol, and lead. The treatment consists in avoidance, especially in those who are already deaf.

Quinine deafness is common among those who live in malarious districts; yet the drug is often taken as a prophylactic in a very haphazard way. The deafness and tinnitus are often transitory, but if the drug is persisted in, incurable deafness of varying intensity may be produced. The evil effects on the hearing may be prevented or lessened by combining it with dilute hydrobromic acid in doses of from ½ dr. to 2 dr. with each dose of quinine, or by giving the quinine hypodermically; arsenic should be tried as a substitute in those who are susceptible.

If *Nicotine* is traced as a cause, it should be absolutely prohibited, and courses of strychnine given. In all cases of deafness, smoking is distinctly injurious.

Lead deafness should be treated by sulphate of magnesia, internally, and the taking of proper precautions by those who work with it.

Exudation.—This occurs in leucocythæmia, mumps, and typhoid fever. Treatment consists in rest, blistering behind the ear, and the administration of iodide

of potassium. Hypodermic injection of pilocarpine once a day for ten days may be tried. The deafness in typhoid fever usually passes off without treatment.

Hæmorrhage.—This is apt to occur in whooping cough, anæmia, nephritis, and diabetes. The treatment is unsatisfactory. It should consist in treatment of the cause, and rest, with iodide of potassium internally. Daily hypodermic injections of pilocarpine for ten days may be tried.

Inflammation.—This may be due to extension from the middle ear or from the meninges in cerebrospinal meningitis. If it is due to the former, complete rest, both general and functional, should be insisted on ; the back of the ear should be blistered, hot fomentations applied over the ear, and a calomel purge given. If the symptoms of giddiness, vomiting, markedly increased deafness, and high temperature, with lateral headache, persist, the outer wall of the labyrinth should be exposed by a wide radical operation ; if improvement does not occur in three days, the labyrinth will have to be opened and drained through the vestibule, both in front of and behind the facial nerve. It may be necessary to remove the entire labyrinth. Not infrequently caries will be found in some part of the outer labyrinthine wall, requiring free opening and drainage, or sequestration of part or the whole of the labyrinth may be found and removed. In cases due to cerebrospinal meningitis, treatment consists in complete rest, with blistering behind the ear and a calomel purge. Iodide of potassium should be given internally, and pilocarpine hypodermically, daily for ten days. The prognosis is often very bad, the disease in young children frequently resulting in complete deafness and consequent mutism, necessitating lip-reading lessons.

Injury.—The punctured wounds or fracture at the base of the skull uniting the labyrinth should be treated by strict purification of the ear, meatus, and side of the head, and the application of a double cyanide gauze dressing. The result as regards hearing is very bad, and treatment is futile. Excessive condensation of the air in the meatus may be transferred to the labyrinth through the ossicular chain, as in explosion and blows, producing concussion of the auditory nerve in the labyrinth. The treatment is preventive. Those who are likely to be exposed to explosions, such as sailors, soldiers, and sportsmen, should have healthy ears, noses, and throats, and should plug the ears with a mixture of modelling clay and fibre. The " clay fibre," as it is called by Sir William Dalby, who originated it, may by a little manipulation be made soft and pliable, and therefore fits any ear. A fairly large piece should be used. Sportsmen should protect the left ear, which is the one always affected, unless shooting takes place from the left shoulder. Recovery may take place more or less on rest : other treatment is useless.

All who work in a constant noise, such as boilermakers, and those in the navy who are exposed to the constantly repeated high-pitched penetrating report of the lighter guns, gradually get deaf. This variety of deafness has been likened to the blindness produced by excessive exposure of the eyes to a bright light. The treatment is prevention, by wearing the clay fibre. When the deafness is once established treatment is useless.

Mèniére's Disease.—This, like glaucoma of the eye, is due to increased tension irritating and destroying the nerve terminals in the labyrinth. Treatment should be directed to anything which might cause increased tension. A milk diet is often valuable. Dilute hydrobromic acid, in doses from 40 minims to 1 or 2 dr. three times a day, should be given, and counter-irritation behind the ears by means of blistering should be kept up for a considerable time.

Neurasthenia.—Those who have undergone severe mental strain or worry for a great length of time, without proper rest and exercise, often suffer from deterioration of hearing, and sometimes tinnitus. The treatment consists in rest, change of surroundings, and the giving of strychnine. Sometimes it is necessary for

patients to undergo a formal rest cure. A great shock may cause sudden complete functional deafness. Rest and change, with the application of faradism behind the ears, will, as a rule, effect a cure ; sometimes, however, treatment has no effect, but the hearing often returns spontaneously, perhaps after a counter-shock.

Senile Deafness.—About the age of sixty a gradual deterioration of hearing, without tinnitus, takes place. Local treatment is useless. Treatment directed to the general health and to arteriosclerosis in particular, is all that can be done.

Syphilis.—In congenital syphilis, the treatment consists in repeated blistering behind the ears, continued for many months. One ear should be blistered at a time, in order that the patient may be able to sleep comfortably. Iodide of potassium and mercury are quite useless. If the deafness becomes absolute, lip-reading should be taught.

In secondary acquired syphilis, the patient should be placed under the influence of mercury as soon as possible. Blistering should be applied behind the ears, and hypodermic injections of pilocarpine should be given every day for a fortnight.

In the later stages of the disease, deafness may be associated with facial paralysis. Recovery always takes place under inunctions of mercury, iodide of potassium internally, and blistering behind the ear.

Internal ear deafness due to sclerosis of the auditory nerve is sometimes associated with tabes, and may be the first sign.

Tinnitus.—This is merely a symptom ; treatment of the cause will do all that can be done. The cause is sometimes difficult to find, and requires the most patient local and general investigation.

In nervous patients the unavoidable noises are exaggerated, and sedatives are required. Bromide of potassium or dilute hydrobromic acid, in ½-dr. to 2-dr. doses three times a day, is sometimes useful. Strychnine should be given to those who are run down. Anæmia, and cardiac or renal disease, will require treatment. Patients often think that the noises mean some brain trouble, and that they are going to become insane ; reassurance on this point is often a great relief. If the noises take a purposeful form, such as the hearing of voices or airs, it is a sure sign that the patient is or will be insane, and the friends should be warned. A history of lunacy in the family can usually be obtained.

Tuberculosis.—The infection of the internal ear invariably spreads from the middle-ear tract. The most usual sites of attack are the promontory and its neighbourhood, and the external semicircular canal where it forms the inner boundary of the opening of the antrum into the middle ear. The infection may spread through the diploetic bone round the bony labyrinth, producing necrosis of part or whole. The treatment is removal after a wide radical operation has been performed.

Vertigo.—True auditory vertigo is characterized by the moving of objects round the patient in one direction or another, with falling or staggering, and the association of tinnitus and vomiting. It is only a symptom of increased tension in the labyrinth, and the treatment depends on the cause. Broadly speaking, rest, a calomel purge, light diet, and dilute hydrobromic acid in large doses are indicated.

A. H. Cheatle.

ECLAMPSIA.—This disease affects pregnant women, especially at the onset of labour, and is characterized by convulsions of an epileptiform type, and is apparently due to some toxic substance or substances present in the blood. Albumin is nearly always found in the urine, generally in large quantities.

The severity of the disease varies greatly, and is not altogether to be measured by the number and frequency of the fits. It is difficult therefore to estimate

accurately the effects of treatment. Over-activity in treatment is a common error in cases of this kind. The convulsions are terrifying to the relatives and attendants, and consequently violent methods of treatment are often resorted to. The patient should first be placed under the influence of chloroform, and a careful examination then made to determine the stage and progress of labour. If the patient is in the first stage of labour and the pains are good, no interference is necessary. Unless delivery speedily follows after the expulsive stage is reached, it is perhaps as well to terminate labour with forceps. If on the other hand the first stage of labour is unduly prolonged, dilatation may be aided by means of a hydrostatic bag. When eclampsia occurs in a woman who is not in labour, it is well to employ general and medicinal remedies before having recourse to induction. The general treatment of eclampsia is based on the endeavour to lessen the irritability of the nervous system, and thus diminish the frequency of the fits, and assist if possible in removing or diluting the toxic agent.

Precautions must be taken to prevent the patient from biting her tongue, which is often severely injured in cases of this kind, and to prevent saliva from passing down into the air-passages, which it is apt to do if the patient is deeply comatose and is kept in the dorsal position with a gag in her mouth. Under these circumstances the patient should be placed on her left side.

After the first administration of chloroform it is not desirable to persist in its use unless labour is likely to terminate shortly. In cases where the labour is in an early stage, chloral or morphia in full doses is to be preferred. Half-drachm doses of chloral every two hours until two drachms have been given, or morphia given hypodermically in doses of $\frac{1}{3}$ gr. every two hours until a grain has been given, may be tried. The patient should be kept perfectly quiet and as free as possible from noise.

Violent purgation is probably of no use, and it is better to give an enema rather than a purge. Free sweating may be induced by means of a vapour bath, or if this cannot be arranged for, the patient may be wrapped in a sheet wrung out of hot water, and then covered with blankets. Venesection to the extent of 15–20 oz., followed by the introduction into the veins of 30–40 oz. of saline fluid containing 1 dr. of sodium chloride and $\frac{1}{2}$ oz. of sodium acetate to a pint of water, appears sometimes to be very successful, especially in severe cases when the temperature is high. Saline fluid may be injected subcutaneously instead of into the veins, if this is more convenient. Pilocarpine should never be employed, as it is apt to cause fatal œdema of the lungs.

If convulsions persist after labour is over, the treatment is the same as that above indicated.

The mortality of eclampsia is high. About one in every four women so attacked, die. (See also URÆMIA.) *W. J. Gow.*

ECLAMPSIA NEONATORUM.—(See CONVULSIONS, INFANTILE.)

ECTROPION.—(See EYELIDS, DISEASES OF.)

ECZEMA.—It is absolutely impossible to describe the treatment of eczema as a whole. The term is constantly and grossly abused, and the writer has for long taught that the more one knows about skin diseases, the fewer cases he finds it necessary to label "eczema."

Many cases, many more than are generally suspected, are due to some external irritant, to which the patient is consciously or unconsciously exposed, and the removal of this is essential to success in treatment. Some are connected with the patient's work, and are notorious irritants, such as sugar in the baker's eczema, soda in the washerman's, and various chemicals in the photographer's. In plants, too, one has an enormous number of possible irritants, and all

"eczemas" of the exposed parts should suggest to the physician the possibility of their being brought about in this manner.

The treatment, then, consists in finding out what has produced the dermatitis, and, if possible, avoiding it, and the treatment of such cases as one is unable to find a cause for, resolves itself into purely symptomatic management. The chief complaint in an acute dermatitis is itching, and for this there is no application so generally valuable as a lead and tar lotion.

℞	Liq. Carbon. Deterg.		Glycerin.	℥j
	Liq. Plumb. Subacet.	āā ℥ij	Aq.	ad ℥vj
	Zinc. Oxid.	℥iij		

If the acute stage is past, but there is considerable exudation, it will probably be found that a paste is the most convenient application. Lassar's Paste :—

℞	Zinc. Oxid.		Vaselin.	℥ss
	Pulv. Amyli	āā ℥ij		

has deservedly won for itself great popularity in the treatment of "eczema."

In the scaly forms, ointments are indicated, and here once more tar takes a prominent place in treatment, used in a more concentrated form than in the acuter varieties. In very chronic forms, where the case proves rebellious to ordinary treatment, it is often desirable to convert the chronic into an acute dermatitis, and this is best done by the application of caustic potash according to the method of Hebra. A piece of wool, dipped in liquor potassæ, is scrubbed vigorously to and fro over the patch until a number of red oozing spots appear. The potash is then washed off with warm water, and lead and vaselin ointment applied. The relief to itching following on this application is often marvellous, and although it is excessively painful at the time, patients receive so much benefit from it, that they usually return with the request that the application be repeated.

General Treatment.—While the relationship of indigestion to eczema is very much exaggerated, it is certainly the case that digestive disturbances aggravate an existing eruption, and may cause it to persist, as its disappearance when the digestive functions are restored proves. These should therefore be enquired into, and suitable treatment prescribed. When there is no such disturbance, it is unnecessary to put the patient on any specified diet. Good plain food does no harm to anybody. But there are certain articles of diet which are particularly injurious to the inflamed skin. Of these, the first place is occupied by alcohol, and unless there are very urgent reasons to the contrary, patients with eczema should be teetotal. Close on alcohol, as aggravating factors, come spices and condiments, chutney and curry running it very hard. Salted viands and strong-tasted cheeses are less, though still, injurious, and the writer has met with a number of patients who were convinced that apples were harmful. He does not believe that this is generally the case, but it is perhaps worth mentioning ; for in chronic cases the patient himself can do much to help on his own recovery by a close observance of those articles which experience shows him to be injurious.

Drugs have very little effect on dermatitis, and in particular arsenic is only valuable in those cases of dry scaly "eczema" which one has, as a rule, little difficulty in curing by other means.

Like other diseases, it has been attacked by electricity, and it seems certain that cases have benefited wonderfully under X-ray and high-frequency treatment, though it is obvious that these are only applicable under special circumstances, and are not likely to be adopted as a routine method. (See also GOUT.)

Norman Walker

ELECTROTHERAPEUTICS.—While many methods of electrical treatment come solely within the domain of the specialist, in all probability more than half the disorders treated electrically are dealt with by such currents as are obtainable from a portable combined battery of medium size, with which everyone is more or less familiar.

It is with particular reference to the use of such a battery that the present article is written. Those methods of treatment where more elaborate appliances are required will not be described at length, for they come within the province of the specialist rather than of the general practitioner.

I.—APPARATUS.

Every dealer or manufacturer of electro-medical instruments has some favourite form of combined battery, and an inspection of their catalogues and stock will be more satisfactory than any description that can be given here.

However much they may differ in detail, they all have the same essential parts, which should receive careful inspection and testing before purchase. Speaking generally, the larger the cells composing the constant current battery, the more satisfactory will the instrument be in practical use.

For a portable battery, only dry Leclanché cells are used. The relation of weight and portability must of course be kept in view, and this, in most instances, will determine the size selected.

The number of cells required for the constant current will seldom, if ever, exceed thirty. Besides these, one or two, usually larger cells, will be provided to work the induction coil from which we obtain the faradic current.

The first essential is some means of regulating the force or strength of the currents when making electrical applications. This is of the greatest importance, and is a point in which many batteries fall far short of perfection. We will consider the constant current first.

Resistances, or rheostats, as they are called, have fallen very much into disuse for this purpose, on account of the superior advantages of the cell collector for batteries and the sliding shunt resistance for controlling the current from the main.

Cell Collectors are of two kinds, single and double. The latter form has many advantages where the battery is in constant use; but for a portable battery, which is used only occasionally, and considering that the dry cells composing it have to be renewed every year or so, whether they are used or not, the single collector is all that is really required. It is simpler to work and to understand, and less likely to give trouble. It consists of as many brass studs as there are cells in the battery, and one extra, upon which the arm or crank rests when not in use. The cells are all joined together in series; that is, the zinc of the first cell is connected to the carbon of the second, and the zinc of the second to the carbon of the third, and so on. This leaves a free carbon or positive pole, at the beginning of the series, and a zinc, or negative pole, at the end. The thirty-one brass studs—we are considering the case of a thirty-cell battery—are arranged in a circle. The arm or crank is pivoted on a point coinciding with the centre of this circle, and is of such a length that, as it is wound round, it makes contact with the studs in succession. The free carbon, or positive pole, is attached to the first stud, which is marked O, and also to the + terminal from which the current is taken. A wire is brought from the junction between the first and second cells to the next stud, which is marked 1, and so on all the way round—the zinc or negative pole being joined to the last stud, which is marked 30. The pin upon which the crank is pivoted is joined to the negative terminal. The crank must make contact with one stud just before it leaves another, but care must be taken not to leave it in contact with two studs for any length of time, as this would short-circuit one cell and rapidly exhaust it. The crank should offer a slight resistance to movement, and slide round smoothly, making light but sure contact with each stud as it passes.

It will be seen from the above arrangement, that whatever stud the arm is resting upon, so many cells are in use as is indicated by the number of the stud, and that this number of cells can be increased or diminished by a single cell at a time, thus avoiding unpleasant shocks to the patient. It is most essential that this part of the instrument be made with the greatest care if it is not to be a source of trouble at some future time—in all probability, at a critical moment.

While it would be possible to use a battery as above described for purposes of treatment by the constant current, it will be found more convenient and advisable to have a measuring instrument, and also a means of reversing the current. The wire from the stud marked O and that from the pivot of the crank, are brought to the current reverser. This is made in different ways, but all have a handle which can be moved to one side or the other, which are marked N (normal) and R (reverse) respectively. When the handle

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is opposite N it means that the two terminals of the battery are + and — exactly as they are marked. If moved to the side marked R, the plus terminal becomes minus or or negative, and vice versa.

The Galvanometer, or measuring instrument, should be looked upon as an essential rather than a convenience. It is to the electrotherapeutist what the measuring glass is to the chemist—the one means of ensuring accurate dosage. One of the wires from the current reverser is taken straight to one of the terminals, the other is brought to one terminal of the galvanometer, the other terminal of the latter is joined to the other terminal of the battery. In this way all the current passes through the measuring instrument, and when the handle of the reverser is put over, the flow of current in it is reversed also, which causes the pointer to be deflected in the opposite direction.

Galvanometers, or milliampèremeters as they are often called—the milliampère, or one-thousandth part of an ampère, being the unit of current employed in medical applications—are of two kinds, the magnetic, and the moving coil type. Until quite recently, all medical galvanometers were of the magnetic type. They were undoubtedly accurate, but laboured under certain disadvantages. They had to be carefully levelled and placed in proper relation to the magnetic meridian, to bring the pointer to zero. They are easily affected by the presence of iron or other magnetic bodies near them, and the hand always takes some time to come to rest, which is inconvenient. They are rapidly giving place to the moving coil type of instrument, which, though more delicate, and requiring careful treatment, is much to be preferred.

It reads accurately in any position, is quite independent of the earth's magnetism or the presence of magnetic bodies, and is " dead beat," which is to say, the pointer indicates the amount of current passing at once, without swinging to and fro for some time.

The danger is that it is very liable to damage if the terminals of the battery should be accidentally short-circuited, even for a few seconds. The pointer is flung over to one side, and if it escapes mechanical injury from this, it may have the moving coil damaged by the excess of current. This danger, however, is minimized by having an instrument which is provided with *shunts*. This not only greatly increases its range of usefulness, but acts as an efficient safeguard. The principle of the shunt is, that when a current has the choice of two paths in which to flow, it divides itself between the two, so that the current strength in each path is inversely proportional to its resistance.

The usual scale is five milliampères by fifths, on each side of the centre. If we turn on the first shunt, marked 10, it means that only one-tenth of the total current passes through the moving coil, while nine-tenths passes through the shunt. A " 100 " shunt may or may not be provided, but there should always be one marked 0. When this is turned on it means that the whole instrument is cut out. If it is made a rule to always have this one in use, except when it is desired to take a reading, it is impossible for the instrument to be damaged. It will be understood that, if the 10 shunt is in use, the reading on the dial must be multiplied by ten, when each division between 0 and 1 or 1 and 2 is equivalent to two milliampères, and if the pointer swings over to the end of the scale, it means that a current of fifty milliampères is passing through it.

It should be an invariable rule to turn the crank of the collector back to zero immediately the application is over. A battery or other generator of electrical energy never loses an opportunity of discharging itself, and such opportunities are easily afforded with wet cords and electrodes lying about.

The Induction Coil.—The other part of the combined battery is the induction coil, from which is derived the induced or faradic current. The great characteristic of the currents from *an induction coil* is that they are constantly varying. The pressure is always rising or falling, and even reversed periodically. The induction coil is probably the best known electrical device in use by medical men and others. In its simpler forms it is very inexpensive, and is quite efficient for the purposes for which it is intended. From the fact that it lends itself very readily to great variation in constructional detail, few instruments have been subjected to such numerous modifications; but it must be admitted that the results have not been commensurate with the trouble and ingenuity expended. Every imaginable form of interrupter has been devised, as well as various methods of winding; but the inherent defects of the coil remain substantially uncorrected.

The weak point of every coil is the interrupter—the great difficulty being to get one with a wide range of adjustment, which will work smoothly and evenly at all speeds. The least objectionable form is the one which is operated by a separate magnet. With certain adjustments, and also by adding inertia to the hammer by means of a special rod and sliding weight, almost any speed of interruption can be obtained, from one or two to one hundred or more, per second. Coils provided with this separate contact-breaker are usually of the sledge pattern, which is always to be preferred, since it permits of such good regulation to both primary and secondary coils. The secondary coil should be " tapped " at a point one-third from the beginning, and the wire brought out to a separate terminal. This enables one to use one-third, two-thirds, or the whole, as required; it is, in fact, equivalent to having three secondary coils, and is a great advantage.

A short secondary wire gives a current of low pressure but of large quantity, and as it suffers little by diffusion in the tissues, it is very useful to reach deeply-seated organs. The long secondary winding, on the other hand, gives a very small current but a high pressure or electromotive force. It suffers a greater proportionate loss by diffusion, and consequently its effects are more or less limited to the skin and superficial muscles.

In choosing a coil, always have it put in action, and carefully observe the working of the interrupter. It should work smoothly for ten or fifteen minutes at a time without adjustment, and should not be too noisy. The iron core and the sliding secondary coil should work smoothly, though not *too* easily, so that regulation can be effected without any sudden jumps.

Unfortunately, we have no reliable instrument, fit for everyday use, for measuring induction-coil currents, and we are compelled to employ our own or the patient's sensations as a guide to dosage. In a coil of the kind recommended, both the iron core and the sliding secondary coil are provided with a scale, by which can be read off the relative position of each to the primary coil. By always using the same apparatus, under approximately the same conditions, and observing the adjustments found most suitable, it soon becomes easy to judge with some accuracy the strength of the current that is being applied. A full description of the induction coil and the principles involved in its action will be found in any of the larger text-books on medical electricity.

Conducting Cords should be made of insulated flexible copper wire or tinsel, and provided with suitable tips for securing to the battery terminals and electrodes. These tips are easily obtained, and with a supply of ordinary electric light "flexible," one can easily make one's own cords of any length required—from 1½ to 2 yards will be found very convenient. A spare set should always be kept ready. They are liable, after being in use for some time, to break inside the covering, especially near the ends. In case of failure at any time, it is as well to make sure the fault is not in the cords before obtaining skilled assistance. It is a good plan to use cords of different colours, such as red and green, and always attach the red one to the positive terminal.

Electrodes are plates of various sizes and shapes, made of some conducting material, and are the means by which the electric current is brought into contact with the patient's body. They are made most frequently of metal, such as lead, tin, or pewter, but may be made of carbon. Electrodes must always be covered with some absorbent material, such as flannel or wash-leather, which can be soaked in water—bare metal should never be used in contact with the skin when making electrical applications, except under very special circumstances. It causes pain at the time, and, later, burns or blisters at the point of contact by virtue of the electrolytic products set free in the skin.

In most electrical applications, one pole is applied to the affected part—the *active electrode*; while the other pole is applied with a larger plate placed in some other part of the body—this is called the *indifferent electrode*.

Indifferent electrodes are generally of large size—from 12 square inches to 100 square inches or more. They are made of metal sheet about $\frac{1}{24}$ of an inch thick, and cut to any shape and size required. A terminal is soldered on to the back, to which the conducting wire is attached, and the whole is enclosed in a bag, one side of which is made of flannel or wash-leather, and the back of American cloth. When the front is soaked in water, the back may be dried and slipped under the patient's clothes without wetting the latter. It should be bent to fit the contour of the part as nearly as possible, and kept in place by firm pressure.

Owing to the difficulty of keeping this large electrode in proper contact other devices are resorted to. The electrode is sometimes embedded in potter's clay, which ensures good apposition. Probably the best and cleanest of all is warm water, and in most cases this can be made use of. All that is required is a foot-bath, or other basin, in which the feet or the forearm or hands can be immersed. The electrode is hung over the edge so as to dip well into the water, and the parts immersed. The water constitutes a perfectly fitting electrode, and the warmth, as well as the thorough moistening of the skin, reduces the resistance of the latter, so that large currents can be applied without the least fear of doing any damage.

Active electrodes are of small size, and circular metal discs, covered with flannel or wash-leather, are the most generally useful. A set of four, from ¾ in. to 3 in. in diameter, will meet most requirements. They are made to screw on to a terminal, which is mounted on the end of a handle of wood or ebonite. This makes them very convenient to use, and the operator is insulated from the circuit. For purposes of treatment, plain handles are all that is required. Some are made with a key for opening or closing the circuit, but they are only used for testing purposes.

One good form of disc is made with a rim turned back from the face, and provided with a celluloid ring a little larger in size. A piece of flannel or wash-leather is placed over the disc, and the ring pushed over both, holding the cover firmly in place. The superfluous material is trimmed off with scissors. Re-covering a disc is a matter of a few seconds, so that there is no excuse for using a cover more than once.

It should be an invariable rule to use a new cover, clean towel, and warm water for each patient and each application.

We will now proceed to study the character of the currents obtainable from our combined battery. These are three : the constant or continuous current, and the two induction coil currents.

II.—THE CONSTANT OR CONTINUOUS CURRENT.

The constant current is the current we obtain from chemical action such as takes place in a battery cell. In a closed circuit it flows evenly and steadily, always in one direction, from the positive to the negative pole, and on this account it is possible and easy to measure this current with the greatest accuracy. This is the current supplied by the *cells* of the combined battery. It is regulated by putting more or less cells in circuit by means of the crank of the cell collector, and all the current passes through the galvanometer or milliampèremeter, before reaching the patient, the dose being thus accurately measured.

The action of the constant current is best studied by observing the effects at the two poles. At one time, a certain amount of importance was attached to the direction of the flow of current, and *ascending* and *descending* currents were spoken of. Further observation has failed to detect any special effect possessed by either of them in the interpolar area. The effects produced at the polar areas are distinct and characteristic, so that we now speak of the application of the anode (positive) or kathode (negative), as the case may be, and not of treatment by ascending or descending currents.

Before describing the effects observed at the two poles, it may be pointed out that, to produce any appreciable and more or less lasting effects at any place or part of the body, it is necessary that the *current density* be not less than a certain amount.

By current density we mean the number of milliampères of current passing per square inch (or centimetre) of electrode in contact with the body.

The exact density below which nothing takes place, and above which definite effects are produced, is not known, and probably would be found to differ in different individuals. Using an electrode of 1 square inch, a current of 0·1 milliampère would produce negligible results, while 10 milliampères would very soon produce evidence of its presence. The proper density to employ varies with the effects it is desired to produce. Speaking generally, current densities below 1 milliampère per square inch are of very limited therapeutic value. Except where we wish to produce destruction of tissue by electrolysis, the current density should never be so great as to cause actual pain at the seat of application, and in most instances the sensations of the patient will prove a fairly reliable guide. It will be found that when the electrode is kept on one spot (*stabile*) the density must be less than when it is moved about (*labile*) over a greater or less area. By constantly watching the galvanometer in the case of the constant current, and the adjustment of the iron core or secondary coil of the induction apparatus, one soon learns the strength of current that may be employed with safety and a reasonable prospect of achieving the desired result.

In most cases the current is applied of such strength as to come short of real discomfort, and the duration of the application may vary from five minutes to half-an-hour or more.

In applying electrical currents to the human body, it is important to bear in mind that we are dealing with what is essentially a membranous bag filled with saline solution and tissues of varying consistency—and when we pass a constant, or at least a unidirectional, current through it all, the phenomena of an electrolytic cell are present. Strictly speaking, the case is not quite so simple as this, owing to the presence of fluids moving more or less rapidly along well-defined channels, or percolating through the intercellular spaces. The body offers considerable resistance to the passage of the current, and this is found to be due almost entirely to the resistance of the skin itself. The resistance of the subcutaneous tissues is so low by comparison that it may be neglected for all practical purposes.

The total resistance offered by any individual will depend chiefly on the state of the skin. A thick, dry, and cold skin offers the greatest, while a thin, moist, and warm skin offers the least, resistance. The advantage of freely using warm water, and electrodes covered with material which can absorb water readily, is easily seen. A further reason for so doing is, that the electrolytic products which are set free in the immediate vicinity of the poles are absorbed by, and diluted with, the water in the electrode cover. These products are chemical compounds which irritate and even burn or blister the skin where

concentrated, and by keeping a well-moistened medium between the electrode and the surface of the skin, the latter is protected from their action. The resistance further depends on the size of the electrode—the larger and the more perfectly the latter is applied, the lower the resistance will be—and finally, the longer the current is flowing up to a certain point, the lower the resistance becomes. This is due to the gradually increasing vascularity and moisture of the skin under the electrode.

When a current of electricity is given more than one path, it divides itself between them, the amount going by each channel being in inverse proportion to its resistance. If we place the two electrodes upon the surface of the body, the latter being a conductor, innumerable paths are open to it, but most of the current will travel by the most direct, or path of least resistance, and here the density of current will be greatest.

If we imagine the current to be made up of a number of thin lines or strands, where the density is greatest the strands are gathered together as in a cord. Where the density is less, it would resemble a cord more or less frayed out, though the same number of strands would be present. While some of the lines will take a very circuitous route in their journey from the anode to the kathode, all will be finally gathered in at the latter pole. It may be safely stated that, with the currents used in medical electricity, the current density in the outlying regions away from the direct line between the electrodes is so slight as to be of no practical importance.

If the two electrodes are placed close together, practically the whole current travels through the tissues immediately beneath the skin. If we move them farther apart, there is more diffusion, and the area of greatest density becomes less superficial. Consequently, if we wish to influence deep-seated structures, large electrodes are to be used, and they must be placed some distance apart.

If a small superficial area is to be treated, such as a case of neuralgia of a superficial nerve, a small electrode—usually the anode—is placed over the painful spot, while a large electrode is placed elsewhere. In this way the current density at the small or active electrode can be adjusted and produce definite effects, while no appreciable changes occur at the larger or indifferent electrode, because the same amount of current is spread over an area which may be from twenty to fifty times greater, and the current density proportionately reduced.

When we study the local action of the poles, we find that they differ from each other very greatly.

The Anode is the anæsthetic or sedative pole. Moderate currents have a drying, depleting, and hæmostatic effect on the surrounding area. Certain medical substances, chiefly bases, are diffused through the body by means of this pole. Strong currents cause destruction of tissue, though less than the kathode ; acids—chiefly hydrochloric—and oxygen gas are liberated.

The Kathode is the stimulant pole. Moderate currents cause increase of moisture and quicken absorption. Blood-vessels and canals are dilated, acid radicles are diffused through the tissues. Strong currents are more destructive electrolytically than the anode, alkalies—chiefly caustic soda—and hydrogen gas being set free.

It is a help, to avoid confusing the two, to think of the positive pole as the "acid, anæsthetic anode." This gives the reaction of the electrolytic product, and the chief effect of the anode when used locally. The properties of the kathode are the reverse of these.

Electrotonus.—When a constant or battery current is caused to traverse a nerve, certain changes are produced in its conductivity and irritability, especially in the immediate vicinity of the electrodes. The changes which take place at the anode—anelectrotonus—are not the same as those at the kathode—

kathelectrotonus. At the anode the irritability and conductivity of the nerve for nervous impulses are both diminished. At the kathode there is an increase of irritability, which rises suddenly at closure and acts as a stimulus to the nerve. In either case there is a gradual return to normal after the current ceases to flow.

All the above facts relating to the poles refer to the use of the constant current only, and are of great importance in guiding us in treatment.

We may here refer to what is known as *kataphoresis*. This refers to the movement of electrolytic solutions in the direction of flow of current, which can take place through membrane or any porous diaphragm against the force of gravity. It is sometimes called *electric osmosis*.

The practical application of this property in treatment lies in its employment for the introduction of chemical substances through the skin. While too elaborate for ordinary use, under certain circumstances it possesses a definite value. For instance, if we soak the cover of the anode in a 10 per cent solution of cocaine in guaiacol and apply it to the skin—the negative electrode being of large size and placed over some distant part—the skin under the anode becomes anæsthetic in about ten minutes, with a current density of 10 milliampères per square inch. The removal of inflammatory exudates from a sprained joint is greatly facilitated by the similar use of a strong watery solution of iodine. Other instances of its application will be given when we come to deal with therapeutics. The subject is fully treated in a book by Dr. W. J. Morton, of New York.

III.—THE INDUCTION-COIL CURRENTS.

They are two in number: (*a*) The primary current, or current of self-induction; and (*b*) The secondary induced current.

(*a*) *The Primary or "Self-induction" Current* is obtained when we attach our electrodes to the beginning and end of the primary coil winding. The current being turned on and the vibrator set going, with each movement of the latter we are conscious of a distinct shock, the strength of which depends for the most part on how far the iron core is inserted into the coil. For this current to be perceptible, it is necessary that the primary coil be composed of at least one hundred turns of wire, and most coils have much more than this. The self-induction current is in the same direction as the battery current, and is caused by the inductive influence of each turn on the other turns adjoining. It manifests itself at the moment the vibrating spring leaves the contact screw.

On most coils, near the contact-breaker, a small single-arm, two-way switch is provided, with its contacts marked P and S respectively. When the arm is moved to the side marked P, it means we are getting this self-induction current at the terminals to which the conducting cords are attached. The essential features of this current are that it is composed of short unidirectional waves, between which there is a definite interval. The strength or volume of the current is not large, and it is never reversed in direction—it is an intermittent or pulsating current.

If we insert the iron core, the waves follow one another more slowly, and the strength of current is increased. In beginning any application with the induction coil, the iron core should first be withdrawn to its fullest extent. It is then gradually inserted as the application proceeds, until the proper strength is attained.

In many induction coils, the iron core is fixed in the centre of the primary coil. In such a case, regulation is effected by sliding a metal tube over the core. Its effect is to screen the primary winding from the inductive influence of the iron, and has the same effect as withdrawing the latter. In a coil of this kind the tube is pushed in to its fullest extent at the commencement of the application, and gradually *withdrawn* till the current is sufficiently strong, the movements being the opposite of the movable iron core.

In portable coils such as we are considering, owing to their necessarily small size, the volume of current is small, and it is a very pleasant one for both testing and treatment so far as it goes. Large primary coils have been made, chiefly for bath purposes, when a large volume of current is desired, but they are being displaced by the sinusoidal current, which is more pleasant for the patient and more effectual in action. The sinusoidal current can only be obtained from the alternating current main, or from a small dynamo installed for the purpose. Therapeutically, it is one of the most valuable currents we possess.

(*b*) *The Secondary Induced Current.*—If we now move the switch already referred to to the side marked S, we get the "secondary induced current." This comes from the secondary coil, which is not connected directly to the primary coil in any way, but is

wound on a bobbin, the hole through the centre of which is large enough to allow it to slide over the primary. By so doing, the secondary is brought more or less into the magnetic field set up by the primary coil, and the electro-motive forces in it are thereby adjusted. The secondary coil has from five to fifteen times the number of turns of wire as the primary. The effect of the large number of turns is to give sufficient electro-motive force at "make" to produce a perceptible current; at the same time the impedance of this large number of turns prevents the current at "break" rising to a proportionate degree, though it still exceeds the current at "make." The result is, we get a current alternating in direction but not symmetrical.

By inserting the iron core these waves are prolonged and made less symmetrical than before. Also the strength of the current is increased, and it is less agreeable to the patient.

In using this current the iron core is first withdrawn—or the metal tube pushed over it, as the case may be—and the secondary coil is moved clear of the primary. The electrodes being in position, the secondary is pushed gradually over the primary until the desired strength is reached. If insufficient when pushed right home, then the iron core is inserted.

It will be seen that the feature common to both these coil currents is that they are constantly varying in a more or less regular manner. They differ from one another in that the primary or self-induction current is always flowing in the same direction, while the secondary current is an alternating one. The alternate waves of the latter are, however, not of equal magnitude.

In either case, the strength or amount of current flowing is very small, and while with the primary current there may be some slight chemical action on the tissues, we may say that, for all practical purposes, the chemical and electrolytic effects of both coil currents are negligible.

The chief value of induction coil currents depends on their stimulating action on living tissues. All tissues and cells are influenced more or less, that of muscle being the most obvious and easily demonstrated. They act as a tonic, which may be local or general, according as the method of application employed is local or general. If the patient be put in a bath and the current passed through, it acts in many instances as a most efficient tonic, and is most useful in anæmia, debility, delayed convalescence, etc. The same method may be employed locally, in the treatment of atrophied and paralyzed muscles, and in faulty local circulation. Their action is considerably modified according to the rapidity of the interruptions. These, when slow, produce more painful and powerful contractions than when fast. If the rapidity is very high, anæsthesia can be produced.

IV.—ELECTRO-SURGERY.

Those surgical applications of electricity which can be carried out with the combined portable battery as the only source of energy, are not very numerous. It is not wise to use such a battery for treating a large nævus, for instance. The large current required would quickly exhaust the small cells composing it, and the current might fail for this reason before the operation was completed. There are certain cases, however, occasionally met with in general practice, which can be dealt with quite satisfactorily, and the operations are easy to perform.

Removal of Superfluous Hairs.—For this, a good light is essential. The indifferent electrode—anode—is held in the patient's hand, or placed anywhere convenient. The other pole is connected to a fine platinum needle, mounted in a handle to which the conducting cord is attached. Each hair has to be treated separately, and when a large surface has to be done, it is better to remove hairs from every part, and not from one spot. About twenty is the largest number that can be treated at a single sitting, and if these were removed from one spot, a troublesome ulcer would very likely result.

Besides the epilation needle, a pair of forceps is required (*Fig.* 13), and four cells are placed in circuit. The hair is grasped by the forceps, and gentle traction made in its normal direction. The needle is then introduced into the

follicle alongside the hair for a distance of about $\frac{1}{8}$ inch. In a few seconds a slight effervescence is seen at the orifice, and the needle is withdrawn. The hair should come out very easily; if not, the needle may be inserted again, perhaps a little deeper, for a couple of seconds.

The success of this little operation requires practice, patience, and skill. The needle should not be too sharp; a rather dull point finds its way along the follicle more surely and easily. Platinum or platinum-iridium needles should always be employed, and should be sterilized in the flame of a spirit-lamp before use. There is a stinging pain while the needle is in the follicle, but it is never so severe as to require a local or general anæsthetic. Under the most favourable conditions, a few of the hairs return, and have to be removed at a future time.

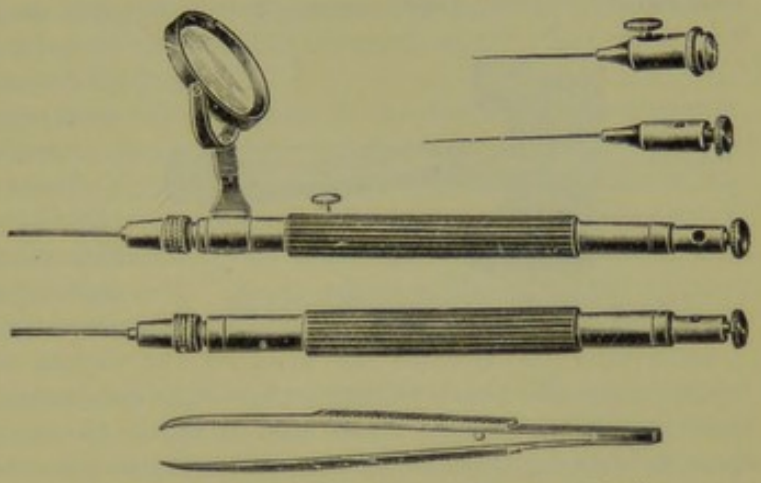

Fig. 13—Epilation Needle and Forceps (Schall).

Moles.—These, when occurring on the face, constitute a disfigurement which the possessors are usually glad enough to be rid of, if it can be done easily and without severe pain. If small in size and hairy, epilation as above may be all that is necessary. After the hairs are removed, the pigmentation disappears to a large extent, if not altogether, and the mole shrinks in size. If large and highly pigmented, it had better be treated as an ordinary nævus.

Nævi.—These are sometimes met with in general practice, especially in infants, and when under an inch in diameter can be successfully treated with small battery cells. Such work tends to exhaust the latter rather rapidly, but it is generally worth doing, and the cells are easily replaced. The object is to break up the blood-vessels and coagulate the blood therein, without causing general necrosis of the mass, and consequent sloughing. It is important to know when to stop. If the growth is subcutaneous, the skin is not to be interfered with, except for the minute openings where the needles are inserted; but if the skin is also involved in the growth, some scarring is unavoidable. The pain is severe, and an anæsthetic is always necessary with children, and also in many cases occurring in adults.

For very small nævi, or prominent blood-vessels in the skin of the face, the epilation needle and pad, as used for the removal of superfluous hairs, are all that is necessary. If desired, a somewhat stouter needle may be employed with advantage. When using a single needle as the active electrode, it must always be the kathode if the best results are to be obtained.

Occasionally nævi of a stellate form are met with, where all the vessels composing it seem to radiate from a common point. If the needle is inserted at this point for a few minutes, the whole will probably disappear. The indifferent electrode is placed on the sternum or other convenient part, and from four to six cells are put into circuit. The needle is then gently pressed in at the desired place, and soon dissolves its way through. The current in such cases should not exceed 10 milliampères, and probably half that amount will be sufficient. It should be kept in place until the dark discoloured area surrounding the needle where it has entered the skin is from $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter. When

finished, the cells should be very slowly cut out one by one, and the needle withdrawn.

For anything over ¼ inch in diameter, and especially if it is thick as well, it will be found more satisfactory to employ the bipolar method. For this we require the special bipolar needle devised by Dr. Lewis Jones (*Fig.* 14). In this, the two wires from the battery are joined to the two terminals on the holder, and the internal connections are such that the needles are positive and negative alternately. Two, three, four, or five needles may be employed, according to the size of the mass to be treated. Three are about as many as can be used when working from the cells of a portable battery.

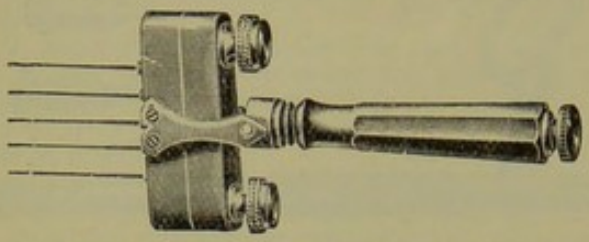

Fig. 14.—Bipolar Needle-holder (Schall).

From four to six cells are put in circuit, and the needles pushed into the mass. To be quite safe, the current should not exceed 20 milliampères per inch of *positive* needle.

Soon after the needles are inserted the tissues around them begin to change colour. At the positive needle there is hardening and pallor, and the needle itself tends to become fixed and difficult to withdraw. Round the negative there is frothing from evolution of hydrogen gas, and the needle gets quite loose The tissues become dark, livid, and boggy, and when this occurs they should be partially withdrawn, and re-inserted in different directions from time to time, until the whole mass is broken up, and the blood in the vessels more or less completely coagulated. The aim should be to destroy the growth as far as possible at the first operation. This is easy enough when the nævus is not more than ¼ in. diameter. If larger than this, two or more will be necessary.

The after-treatment is quite simple. In most cases, a piece of antiseptic gauze is secured over the punctures by means of flexible collodion. If sloughing should occur, an antiseptic poultice is applied until the slough separates, and the ulcer is treated on general principles.

It should be remembered that the treatment of large nævi requires currents which will exhaust small dry cells very quickly, so that the cells so used may have to be renewed before the rest of the battery is used up. For treating these large nævi, it is better to use a battery of large cells, but the method is described here, since it is possible to use the smaller cells found in portable batteries.

The treatment of *aneurysm* and *strictures* by electrolysis is beyond the scope of this paper, and will be found fully described in the standard works on medical electricity.

The electric cautery is of course not an instrument for electric treatment. The part played by electricity is merely that of a convenient means of heating the burner. The large currents required for this purpose are far beyond the capacity of a battery such as we are treating of.

V.—GENERAL ELECTROTHERAPEUTICS.

Rockwell, in his excellent book, describes the action of electricity in the treatment of disease as a stimulating, sedative tonic. It is important to remember that electricity is not a stimulant in the ordinary sense of the term—that is to say, an agent which will temporarily rouse the system quickly to increased activity. Surprisingly rapid results may sometimes be obtained from a local application in certain cases, but the effects of electrical treatment do not appear so rapidly as a rule. Like other tonics and alteratives, its effects are produced gradually, but it differs from them in possessing valuable properties peculiar to itself. It is a stimulant, in that it corrects and intensifies or economizes

the forces of the system ; a sedative, because it tends to relieve irritability and pain, and encourage natural repose. It is a tonic, because it improves nutrition, restores enfeebled functions, and so improves the capacity of the system for labour.

Electricity acts as a stimulus to nervous structures, through which the vaso-motor system and all the tissues are brought under its favourable influence. This is shown in the treatment of general debilitated conditions such as anæmia and rickets. After a course of some form of general electrization, these conditions are very often improved in a remarkable manner—sleep, digestion, and general appearance being greatly benefited.

Locally, electricity is of the greatest value in cases of injured or diseased nerves, atrophied and paralyzed muscles, in the removal of inflammatory products, and the relief of pain. The particular form of electricity used will depend on the nature of the condition we wish to treat and the particular effects desired. If we want the stimulating effect, we shall employ a rapidly varying current, and this is obtainable from the induction coil. As a sedative, the constant current is used, always placing the anode over the seat of pain, and employing a relatively high current density.

For treating deeply-seated organs with the coil, it is best to set the interruption to work as slowly as possible, and have the electrodes far apart. If the constant current is preferred for any reason, one electrode should be kept slowly moving to and fro over the affected area.

Dosage.—It should be an invariable rule in electrical treatment never to turn the current on or off suddenly. Anything which would cause a sudden variation in the magnitude of the current flowing, will produce a shock, especially with the constant current. Apparatus of this kind should be most carefully made, and kept in perfect order. A loose connection, for instance, may give rise to severe shocks if the battery receives a knock or jar during the application of strong currents. If the head or neck formed part of the circuit at such a time, the most serious or even fatal results might occur. Here it may be as well to say a word to the wise. Apart from any question of danger, many patients are extremely intolerant of even the slightest shocks, and carelessness in this respect will inevitably lose the confidence of the patient, which means the loss of the patient as well. The strength of current for local applications varies from 5 to 10 milliampères as a rule. In certain cases much larger currents are employed.

From ten to fifteen minutes is long enough for each application, and they may be repeated two or three times a week under ordinary conditions. Treatment should in most cases be persisted in for at least one month, when it will be possible to judge of the value of the method in any given case.

Mode of Application.—While under certain special conditions, special electrodes are used, the great majority of electrical applications are made with ordinary electrodes. The indifferent electrode, whatever form it takes, is first adjusted. Where metal plates are used, care must be taken to see that they are properly adapted to the contour of the part. The active electrode is then applied to the part it is desired to treat, and the current gradually turned on. Always begin an electrical application with the adjustments at zero. The active electrode is kept in one place—stabile method—or moved about over the affected area—labile method—according to the requirements of the case. For instance, in treating facial neuralgia, the active electrode would be the anode used stabile ; while for a case of facial paralysis we would employ the kathode labile—the effect of the latter method being, so far as any particular part of the area is concerned, that of a slowly but constantly varying current. Under all circumstances keep the electrodes well wetted, particularly when used labile ; a little soap on the surface is an advantage.

If muscular contractions are desired, the current may be interrupted by means of a key in the handle, or it may be reversed with the reversing switch of the battery. The latter is the more powerful, and is particularly useful in stimulating unstriped muscle.

It has already been stated that water forms a most valuable medium through which to apply electricity, and it will be found that there are few instances where it cannot be made use of with advantage, more often as a large, perfectly fitting, indifferent electrode, but sometimes as an active electrode as well. Arm and leg baths of paper, pulp or earthenware, are easily obtainable. The current is brought to the water by means of a strip or plate of metal hung over the side so as to dip well into the water, but away from the part of the body immersed. These plates are provided with a binding screw, to which the wire from the battery is attached. Where only one plate is immersed, the arrangement is called the monopolar bath, which is largely used in hospital practice. If both electrodes are put in one bath or trough, we have what is called the dipolar bath. This latter may be of such a size as to treat one limb only, such as the forearm, or hands, or it may be large enough to take in the whole body.

One advantage of the monopolar bath is, that all the current flowing through passes also through the patient, so that we know exactly the dose the latter is getting. With the dipolar arrangement, part of the current passes through the water without touching the patient, so that the dose is more a matter of guess-work.

It is seldom, if ever, necessary to add salt or other substances to the water to increase its conductivity. It may be an advantage sometimes in the monopolar bath, if the battery power available is weak, but it must not be done in the dipolar arrangement. The success of this depends on the resistance of the water being greater than that of the patient, and if we reduce the resistance of the former, the result is to allow more current to pass around the patient, and so use up our battery to no purpose. A course of galvanic full baths is rather beyond the scope of a portable battery, but it may be used for the faradic bath if desired—the cells supplying the latter being larger in size, and the drain on them not so severe.

A full description of the electric bath is beyond the scope of this paper; a book on medical electricity should be referred to for information on the subject. As a means of "general electrization," it is probably the most valuable, and the one most often employed in this country.

General Electrization.—This term is applied to any method which has for its object the placing of the whole body under the influence of electricity in one or other of its forms. It may be carried out in several ways, such as by the use of static electricity, high-frequency currents, and by any one of the currents employed in the hydro-electric bath—faradic, galvanic, or sinusoidal. Practically, all of these are beyond the scope of a portable combined battery, the one exception being the faradic bath, which has been referred to already. Modification of this latter is known as "general faradization," and is one that can be carried out very efficiently by any good portable battery containing an induction coil. It is a very popular method in America, and is much practised by specialists there. In the United Kingdom the most popular form is the sinusoidal bath, thus indicating a striking difference in the general practice of the two countries.

General Faradization is carried out as follows. The patient stands or sits on a large metal plate, which is covered by moist flannel, and if necessary kept warm by a hot-water bottle. One of the conducting cords from the coil is attached to this plate, and the other cord to the active electrode, which may be one of the ordinary circular discs, covered and wetted in the usual way. This latter is sometimes held by the operator in one hand, while he uses his other

hand as the active electrode. It is worked over the head, neck, back, abdomen, arms, and legs, in this order, giving from two to four or five minutes to each. It is not necessary to remove the underclothing, and the current should not be so strong as to give discomfort to the patient. The immediate effect is a comfortable sense of well-being, with relief of fatigue. With a course of this treatment, both appetite and sleep improve, and there is a general return to normal condition, It acts truly as a stimulating, sedative tonic, and is indicated in all those disorders which experience has shown to be benefited by an agent of this kind.

Central Galvanization is also a favourite mode of electrical application in America. The object is to bring the whole central nervous system—the brain, cord, sympathetic, and vagus—under the influence of the constant or galvanic current. One pole—usually the negative—is placed at the epigastrium, while the other is passed over the forehead and vertex, along the inner border of the sternomastoid muscle, and along the whole length of the spine.

In applying the current to the head, it must be turned on and off while the electrode is in position, and the application may be from two to three minutes. The hair must be well wetted before placing the electrode over the vertex.

The duration of the application along the border of the sternomastoid may be from one to five minutes each side, about three minutes to the nape of the neck, and five minutes along the rest of the spine. The strength of the current to the head will be from 5 to 10 milliampères, and to the spine from 10 to 30.

This method is useful in those diseases which would seem to be due to a state of exhaustion and irritability of the central nervous system, such as hysteria, chorea, neurasthenia, epilepsy, neuralgia, and even some forms of insanity. It has not been employed very much in this country, but it is certainly worthy of further trial.

It will be seen that with only a portable battery at our disposal, some of the chief modes of applying electricity to the body as a whole can be carried out quite as efficiently as with more elaborate apparatus. These can always be tried with a reasonable prospect of success in cases where they would seem to be indicated. When these fail, it will be time enough to refer the case to the electromedical specialist.

Local Electrotherapeutics.

It is in special regions and localized conditions that the portable battery finds its greatest field of usefulness. For a local application of any kind, the total current permissible is quite within the capacity of this instrument. This, in fact, may be said to be the particular work for which it is designed.

Diseases of the Brain.—Electrical treatment here has been rather neglected of late years, partly because it was not believed to be capable of doing any good, and partly from a fear of unpleasant effects during the application. As a matter of fact, the application of electricity to the brain is, in skilled hands, unattended by either pain or discomfort, and in the constant current we have a powerful means of controlling the circulation within the skull. Induction coil currents are of practically no use in cerebral conditions.

If we apply the constant current to the head, placing the kathode on the forehead and the anode on the nape of the neck, the flow of blood in the head is increased. This is indicated in combating the effects of mental overwork and to stimulate mental activity.

If, on the other hand, we wish to relieve congestion, the position of the electrodes is reversed. In all cases, the current must be turned on and off most gradually ; the average dose will be about 5 milliampères. It has been more or less successfully employed in **Mental Apathy,** associated with, or preceding, insanity.

The **Melancholia of Adolescents** has been greatly benefited by a course of sinusoidal baths, and no doubt a course of general faradization would do nearly the same amount of good. These cases are very often accompanied by a failure of general nutrition. By improving the latter, the brain benefits indirectly. (See also MENTAL DISEASES.)

Insomnia.—A tendency to fall asleep on the part of a patient undergoing some form of general electrization is a common occurrence, and it is only natural that it should be made use of in the effort to relieve this troublesome condition. General faradization, or the faradic full bath, should be tried. If the results are not entirely satisfactory, a course of sinusoidal baths, high-frequency, or static electricity, may be more useful. Most cases are influenced favourably by electrical treatment. (See also INSOMNIA.)

Exophthalmic Goitre.—The use of electricity here is quite empirical, but a considerable number of cases do very well. The method of procedure is essentially the same as has been described by some writers under the term "subaural galvanization," or "galvanization of the cervical sympathetic." The constant current is to be used; the anode—a large indifferent electrode—to be placed over the lower cervical and upper dorsal vertebræ, while the kathode is moved slowly up and down the anterior border of the sternomastoid muscle from the mastoid process to the clavicle. The current is from 2 to 3 milliampères, and each side should be treated for six minutes, two or three times a day at first, and always when palpitation comes on. The patient should be instructed to carry out the treatment for herself, and it should be persisted in for at least two months. Small dry-cell batteries specially made for this purpose are now obtainable, and are quite inexpensive. (See also GOITRE, EXOPHTHALMIC.)

Hemiplegia.—Nothing in the way of electrical treatment should be attempted for quite a month from the onset. There is always a chance that some good may be done, particularly in the milder cases, and while complete restoration is impossible, a certain amount of improvement is the rule, and this the patient should have the benefit of.

Constant current is applied to the head — taking care to observe all the precautions necessary in such applications which have been stated already—in such a way as to bring the seat of the lesion into a straight line between the electrodes. The object of this is to improve the circulation, and also to promote the absorption and removal of effused products. For the limbs, the metallic brush is used to apply the coil current over anæsthetic areas. The full length of the secondary coil—or the fine wire secondary where two are provided—is to be used, so as to attain the maximum of sensory effect. The paralyzed limbs are to be treated with the short, or coarse wire, secondary coil, and the current is best applied through the medium of water. Most cases are more or less benefited for a time, after which further improvement is impossible. (See also HEMIPLEGIA.)

Paralysis.—Probably no symptom is more often present than this, in the cases one is called upon to treat by electrical methods. In treating a case where paralysis is present, we must attack every part that is in any way affected by the disease. The seat of the lesion causing the paralysis should be treated as indicated above for hemiplegia. The paralyzed muscles are also to receive applications of constant or coil currents, as may seem best to employ. Their nutrition is improved, and by acting on the sensory nerves, reflex impulses are sent along the nerve trunks to the affected muscles.

In treating paralyzed muscles, a general rule is to use the coil current if the muscle will contract to it, but if not the constant current will be found preferable. As the muscle improves under this, the coil can be brought into use to complete the cure, so far as such a result is possible. A further point worthy of attention

is, that the kathode, or stimulating pole, should be the active electrode in treating paralysis with the constant current, the anode being placed over the nerve trunk or cord, according to the seat of the lesion. All forms of electrical stimulation are of use in the treatment of paralytic conditions, and as the induction coil in some form is everywhere obtainable, there is no excuse for not using it.

An important aid to recovery is daily massage of the affected muscles. This should be done for about fifteen minutes, using a little vaselin or lanolin to lubricate the skin. Another matter to be attended to is that of warmth. Paralyzed limbs are nearly always cold, from poor local circulation, and they should have extra covering, especially in the cold weather, and it should be worn at night if necessary. The strict observance of all these details, which make for the good of both the local and general condition of the patient, is necessary in every case. Carelessness in these matters may make all the difference between partial or complete success and absolute failure.

Infantile Paralysis.—This is a condition for which much can be done by steady, persistent treatment. While the more severe cases will tax to the utmost the patience of all concerned, the result is nearly always worth striving for. Without electrical treatment the recovery is slower and less complete. In severe cases it is an advantage to use the constant current at first; but if this is not convenient, induction coil currents will answer almost as well.

The method of application will vary with the seat of the paralysis. If in the legs, or even one leg, they are immersed one in each of two basins or buckets, which have a metallic plate hung over the edge so as to dip into the water, connected to the terminals of the coil or battery. Or, the child may be placed in a wooden or porcelain bath, in which is put enough warm water to cover the legs. In this case, one electrode is placed at each end of the bath. The current is turned on very slowly, and must never be so strong as to make any muscles rigid. With fretful children, it is a good plan to arrange everything in the proper way, but not to turn on any current at all at the first sitting By gradually increasing the strength at subsequent sittings, the desired end is attained.

Peripheral Nerves.—Electricity may be said to hold a recognized position in the treatment of those symptoms which result from injury or disease of the peripheral nervous system. In any such case, the condition to be treated may be stated in the general term neuritis, and the method of treatment will depend a great deal on the severity of the symptoms. If pain is a prominent feature, the constant current is indicated, using the positive pole, or anode, over the painful area. In the absence of pain, the coil may be used with good results. Whatever current is selected, it should be applied through the medium of water, where possible, and the water should always be as hot as the patient can bear with comfort. (See also NERVES, PERIPHERAL.)

Facial Paralysis is a very common form, in hospital practice at least, and fortunately is one that generally does well. One reason for this is, that patients will take more trouble to restore the symmetry of the face than they would about any other part which did not cause obvious disfigurement.

The indifferent electrode—anode—is placed at the nape of the neck, while the kathode is moved about over the affected side. It should be remembered that the skin of the face is thin, and the muscles close to the surface; consequently strong currents are unnecessary and even undesirable. The principles underlying the treatment of any of the other forms of paralysis of peripheral origin are essentially the same, and need not be described in detail.

Neuralgia.—The electrical treatment of neuralgia follows one or other of two main principles: that of counter-irritation, or the production of a state of anelectrotonus in the painful area. If it is a referred pain, counter-irritation is

indicated, applying the current from a long, fine wire secondary with the metallic brush, the surface of the skin being quite dry. If the pain is due to a local neuritis, this method would probably make it worse. In such a case we must employ the constant current, placing the anode over the painful area and passing a relatively large current.

The method of dealing with a severe case of facial neuralgia will fairly indicate the course of procedure in any given case. An electrode of sheet lead is cut roughly to the shape of the letter E. From six to ten thicknesses of lint are cut to the same shape and well moistened. The upright part of the E is placed along the side of the face, and the horizontal parts along the forehead, cheek, and chin respectively, the lint being, of course, between the metal and the skin; while the former is connected to the positive pole of the battery. The negative is connected to a plate which hangs in a foot-bath filled with warm water, into which the patient's feet are immersed. The current is to be turned on very gradually, until from 30 to 50 milliampères are passing, and continued from twenty to thirty minutes. The current is then turned off in the same gradual way, and the whole process repeated daily until the tendency to the paroxysms disappears.

In some cases it has been found advantageous to soak the lint with a 1 per cent solution of hydrochlorate of quinine. The latter is introduced locally, and has succeeded in cases which resisted all other methods. (See also NEURALGIA.)

Localized Inflammations.—In the later stages, when there is slowness of recovery, with passive congestion and accumulation of inflammatory products, electricity in the form of the constant current acts very beneficially. The method of application possesses no special features beyond that of concentrating the current on the part as much as possible. Ordinary electrodes are sufficient in most cases, and the method is applicable to all cases where there is an accumulation of adventitious products, such as joint injury, and pain of gouty or rheumatic origin.

Raynaud's Disease — Chilblains.—The electrical treatment of these two conditions is often very successful, especially in the case of chilblains. This is a very annoying and obstinate condition, and the electric bath is very often the only remedy which has the least influence on it. The induction coil answers very well in the milder cases. The two electrodes are placed at opposite ends of a foot-bath, and a fairly strong current turned on. The patient puts his feet or hands in the middle of the bath, and then gradually separates them, until the current is as strong as can be borne comfortably.

The more severe cases of chilblains, as also those of Raynaud's disease, will be found to do best with the constant current applied exactly in the same way. If there are any cracks in the skin, they must be covered over with rubber adhesive plaster before the parts are immersed. (See also CHILBLAINS, and RAYNAUD'S DISEASE.)

Disorders of Digestion.—In the treatment of some of these conditions, electricity is gradually coming to take a more important place. It is in those which are accompanied by an atonic state of the muscular coats that it finds its greatest field of usefulness. Atonic dyspepsia and constipation are examples.

Large currents and large electrodes are to be used. One large electrode is placed under the lumbar region as the patient reclines, and connected to the positive terminal. The kathode or active electrode is a disc about 4 inches in diameter, and applied with firm pressure over the front abdominal wall, working it to and fro over the stomach area in the case of dyspepsia, or slowly along the colon from the cæcum to the sigmoid flexure, where it is allowed to rest for from two to five minutes, for obstinate constipation. This should be done every other day for three or four weeks. The duration of each application

may be from twenty to thirty minutes, and the current strength from 30 to 60 milliampères. As the case improves, the coil may be substituted, especially if the latter is arranged to give slow interruptions. The usual result of such treatment is for the bowels to become more regular of their own accord, and to remain so afterwards.

Incontinence of Urine.—In those cases which are due to want of tone in the sphincter, where urine is expelled involuntarily during any muscular effort, a good deal can be done by the judicious application of a mild current from the induction coil. A bare metal sound is passed as far as, but not into, the bladder, which forms one electrode, while the other is an ordinary covered plate placed over the abdomen.

True nocturnal incontinence is due to the persistence of the infantile mechanism of micturition, and to be of any use the current must be strong enough to produce painful impressions. The method of application is essentially the same as given above.

Electricity is of no use in those cases of irritability of the bladder, occurring most often in females, where the urine is expelled at frequent intervals, accompanied by pain and spasm. (See also ENURESIS.)

* * * *

There are many other conditions in which electricity, in one or other of its forms, is of great value as a therapeutic agent. For these a special work should be consulted, and fortunately there are several excellent ones to select from.

Reginald Morton.

ELEPHANTIASIS.—(See FILARIASIS.)

EMBOLISM, CEREBRAL.—(See APOPLEXY.)

EMPHYSEMA.—This is a slowly progressive disease, due partly to congenital weakness of the elastic tissue of the lung, partly to undue strain thrown on the elastic tissue by occupation, continued cough, etc. The first or congenital factor is incapable of treatment.

Preventive Measures.—Every laborious occupation, by the pressure induced in alveoli during exertion, increases emphysema in a predisposed person. Such patients, as far as is possible, should keep to light work.

Seeing that recurrent attacks of bronchitis increase the dilatation of alveoli, they should be specially careful in avoiding these by proper attention to clothing, caution in sudden passage from warm into cold air, by keeping away from crowded and ill-ventilated rooms, theatres, etc., and, when the conditions are favourable, by getting as much fresh air as possible.

For those able to winter where they please, something can be done by *climate*. The essentials are: absence of wind, warmth, and occasionally (emphysematous patients differ in this respect) some moisture. Not only the locality, but the position of the house must be carefully chosen. In this country many spots on the south-west coast are quite suitable for such patients. Abroad, Egypt suits many, especially Assouan, which is relatively free from dust, and the desert itself for those who can afford to camp out. Luxor is often intolerably dusty, and the powdered Nile mud unpleasant, both to lungs and smell. Cairo is not a health resort, and is unsuitable. Algiers, both at Mustapha, and on the desert edge at Biskra, is fit for cases that are not very advanced.

The Riviera, at any rate, the French Riviera, is not in favour as it once was. In appearance the most beautiful, it is, in fact, one of the most treacherous of climates, and the cold wind from the hills and the hot sun make it dangerous. The Italian Riviera—Nervi, Rapallo, Santa Margarita—has a much more equable climate, and is beginning to have good hotels. In Sicily, Taormina and Palermo

are both good wintering places. For those who need a little moisture in the air, Madeira, Teneriffe, Las Palmas, are to be recommended.

General Treatment.—It is doubtful how any drug treatment can have actual influence on the changes which take place in the elastic tissue. Yet long experience makes it certain, empirically, that patients are better while taking certain combinations of drugs. At both the Royal Chest Hospital and the Brompton Hospital, in pure emphysema, the following have proved of use :—

R	Potass. Iod.		Potass. Bicarb.	gr xv
	Ammon. Carb.	āā gr iij	Aq. Camph.	ad ℥j

Three times daily;

To this add either liquor arsenicalis 3 min., or tincture of belladonna 5 min., or both of these. As a regular prescription this is probably the most useful.

In debilitated patients, either :—

R	Quin. Sulph.	gr j	Acid. Sulph. dil.	♏j
	Potass. Iod.	gr ij	Aq. Destill.	ad ℥j

Three times daily;

or, if there is some anæmia :—

R	Potass. Iod.	gr iij	Potass. Bicarb.	gr xv
	Ferri et Ammon. Cit.	gr xv	Aq. Piment.	ad ℥j

Three times daily,

are of service, taken for two or three weeks, then stopped for a week, and again resumed.

It is well sometimes to separate the potassium iodide and the iron in the last prescription, and to give the iodide before food, and the iron after food.

The consequences of the lung changes are more amenable to treatment. The two types of emphysematous patient, the stout and the thin, are well recognized.

The *stout* emphysematous patient puts on weight, and suffers much from flatulence and constipation. If the kidneys are sound, and there is no albumin in urine, a diet in which nitrogenous foods predominate, with some fats, and much diminished carbohydrate, is advisable ; much water, or its equivalent as tea or coffee, should be taken at the same time. This is only to be done if circulation and kidneys are healthy. The patient loses some weight, and the flatulence diminishes. It is not always possible to give these patients a sufficiency of fruit and green vegetables to relieve their constipation, and they are helped most by some saline purgative with a little nux vomica, e.g. :—

R	Tinct. Nucis Vom.	♏v	Magnes. Sulph.	gr xxx
	Magnes. Carb.	gr xv	Aq. Menth. Pip.	ad ℥j

Three times daily;

or, if nux vomica is not indicated, a draught of Hunyadi, Friedrichshall, or Apenta water in the morning. They are lethargic folk, and should be encouraged to take a little exercise daily and regularly.

The *thin* patient should be treated on very much the same lines as the tuberculous. He should take a full diet. They are sometimes helped by being given cod-liver oil, 2 dr. at bedtime. This type of emphysema is sometimes accompanied by both vomiting and diarrhœa, and the feeding of these patients becomes a matter of great difficulty. In such cases rest in bed for a few days from time to time is advisable.

Cardiac Failure.—The destruction of capillaries in alveoli throws extra work on the right heart. The right ventricle hypertrophies, and compensation is established which often lasts for many years. Ultimately this breaks down, and there develop cyanosis, sometimes extreme in degree, and all the signs of

cardiac failure. In a marked case, the best treatment is to *bleed* freely, twenty to twenty-five ounces, either from the median basilic vein or the external jugular vein. The former is preferable. In these cases invariably, on cutting the vein, the blood, very dark in colour, oozes forth most slowly, and much patience is needed to extract any useful quantity. The benefit to the patient is striking; and he makes a temporary improvement which may last for many months. If venesection is objected to, six to ten leeches may be applied to the thorax. The bleeding should be followed by a strong digitalis mixture, e.g. :—

R	Tinct. Digit.	℥xv	Liq. Ammon. Acet.	℥ij
	Inf. Digit.	℥ij	Aq. Chlorof.	ad ℥j

Every four hours for six doses, and then three or four times a day, as is deemed best.

In the slighter cases of cardiac failure, with some anasarca, a milder digitalis mixture may be used, with or without nux vomica, or such a pill as :—

R	Pulv. Digit.	gr j	Pil. Hydrarg.	gr ss
	Pulv. Scill.	gr j	Ext. Hyoscyam.	q.s.

the mercury being omitted if there be any albuminuria.

Compressed Air.—Emphysematous patients are in some cases undoubtedly benefited by the use of the so-called "compressed-air bath." There are, unfortunately, very few available in this country. On the Continent they are in considerable use. There is such a compressed-air chamber at the Brompton Hospital. In this the patient is shut up in a small iron room so arranged that the air pressure in the room, with an abundant supply of fresh air, can be gradually raised or lessened, the pressure on the patient's skin, and in his lungs, naturally being raised or depressed simultaneously. The increase of air-pressure appears to benefit the patient, either because the air enters the lungs better, or because the interchange of gases in the alveoli is more thorough. It takes twenty minutes to raise the pressure; the patient remains at the increased pressure about an hour, and it takes another twenty minutes slowly to lower the pressure.

Emphysematous patients working in the high pressure of the "shield" in boring works have felt much better while at work.

The small portable apparatus for the inhalation of air under pressure and exhalation into rarefied air are toys, and, in my experience, useless.

Gustave Schorstein.

EMPYEMA.—Three procedures are adopted in the treatment of empyema: (1) Aspiration; (2) Incision; (3) Resection of a rib.

1. *Aspiration.*—Although an empyema has undoubtedly been cured on a few rare occasions by one or more aspirations, the chances of cure in any given case are so remote, and the importance of freeing the lung as soon as possible from compression by the fluid is so great, that it is unwise to aspirate except as a preliminary to some form of drainage.

If the empyema is a large one and the patient much distressed, and especially if the heart is displaced, aspiration should be performed forty-eight hours before the chest is opened. The general condition of the patient is by this means greatly improved, so that an anæsthetic may be given and the chest opened without anxiety. Moreover, where the heart is displaced, the danger of sudden and fatal syncope, resulting from the too rapid withdrawal of a large amount of fluid, is greatly diminished.

2. *Incision* is suitable in certain cases, namely (*a*) Those in which the patient is so ill that it is important to do what is necessary as quickly as possible, and without disturbing the patient more than is absolutely necessary; (*b*) Those in

which a general anæsthetic cannot be given or is not available ; and (*c*) Where the character of the assistance available, and the circumstances of the case, necessitate the adoption by the practitioner of the simplest and quickest method of treatment that is likely to be successful.

The patient should lie on the back or to a slight extent rolled on to the sound side, with the side to be operated upon projecting well over the edge of the bed or table. The skin of the chest wall having been carefully cleansed, and all necessary precautions having been taken to preserve strict asepsis, the site of the incision must be decided upon. If the empyema involves the whole chest, the incision should be made in the seventh intercostal space immediately in front of the posterior axillary fold, i.e., at the anterior border of the latissimus dorsi. If the empyema is a small localized one, the presence of pus at the dullest spot must be verified with an exploring syringe, and the incision made at this spot. The upper edge of the rib bounding the space below is now fixed with the finger nail, and the point of the knife having been placed upon the skin immediately above the finger nail, it is quickly pushed into the chest and rapidly carried along the upper border of the rib for about two inches, and then withdrawn. The opening is now widely dilated with dressing forceps and the pus allowed to escape.

The great disadvantage of this operation is, that owing to the closeness of the ribs to one another, the tube is liable to be compressed, and the drainage, therefore, unsatisfactory. In order to combat this tendency as far as possible, a thick-walled drainage tube should be used, of as large a calibre as the intercostal space will admit, and further, two tubes should be inserted side by side.

Dressings are now applied, and the patient is returned to bed. For details of after treatment see below.

3. *Resection of a Rib.*—This is the operation of choice, and should be adopted in all cases save those mentioned above. The operation is more difficult than incision and takes longer to perform, and is therefore a greater tax upon the patient's strength. In addition, a general anæsthetic is usually necessary. On the other hand, it has many great advantages over incision ; the chief being that (*a*) The size of the opening ensures free and continuous drainage ; (*b*) The large masses of breaking-down lymph so often present can be scooped out, and the time of healing thereby curtailed ; (*c*) A finger can be introduced into the cavity, and its size and shape and the condition of the lung ascertained. In some cases, moreover, adhesions between lung and pleura may be gently separated, and a more rapid expansion of the lung thus secured.

The anæsthetic, preferably chloroform, having been carefully administered, the patient is placed in the position already described, the skin cleansed, and all other preparations made. In a general empyema a portion of the seventh or eighth rib immediately in front of the edge of the latissimus dorsi should be removed, and in a localized one a portion of rib over the dullest part should be chosen. The incision, about three inches in length, is made midway between the borders of the rib, and divides everything down to the bone, including the periosteum. With a rugine the periosteum is now carefully separated, first from the outer and then from the inner surface of the portion of rib exposed, great care being taken not to open the pleura prematurely, and to avoid tearing the periosteum lining the subcostal groove, and so possibly wounding the intercostal vessels and causing troublesome hæmorrhage. About one and a half inches of the rib, thus stripped of periosteum, are now removed by rib shears or cutting forceps.

The intercostal vessels remain imbedded in the periosteum that lined the subcostal groove, and must be carefully avoided in opening the pleura. This is best done by pushing a director into the chest through that part of the exposed

periosteum that corresponds to the upper border of the rib, a pair of dressing forceps being then passed along the groove of the director and withdrawn widely opened. Through the opening thus made the cavity may be explored, its size and the condition of the lung ascertained, and any large masses of lymph hooked out with the finger, or with the finger and a lithotomy scoop combined. If the quantity of pus is large, and especially should displacement of the heart be present, it is important not to allow the cavity to empty very quickly, in order to prevent, as far as possible, the danger of sudden syncope.

Hæmorrhage is, as a rule, slight, and quickly ceases; should, however, troublesome bleeding take place from a vessel deep in the wound where ligature is impossible, a pair of Spencer Wells' forceps may be applied and left in position for twenty-four hours. If an intercostal vessel be found to be bleeding, sufficient rib should be rapidly removed to enable the vessel to be under-run and ligatured on either side of the bleeding point.

The cavity being emptied and all masses of lymph removed as much as possible, the drainage tube should be inserted. This should be a short tube of very wide calibre and should be pushed in only far enough to ensure its inner extremity being flush with the surface of the parietal pleura. The tube may be fixed for the first few days by means of two silkworm-gut sutures passing on either side through the wall of the tube and the superficial tissues. Later, when the sutures cut out, the tube may be replaced by a flanged one held in position by tapes passing round the chest. Abundant *antiseptic* dressings must now be applied and the patient returned to bed.

Should an empyema be present on both sides, the larger collection should be drained, and the opposite side aspirated as a preliminary to opening and draining a few days later.

Treatment after Operation.—Dressings for the first few days, while the discharge is large in amount, should be changed frequently; later, daily dressing will be sufficient. At the dressings the greatest care must be taken, by strict attention to all the details of surgical cleanliness, to prevent infection of the wound, for only by so doing can rapid convalescence be established and complications avoided.

Every means must be adopted to increase the patient's strength, and as soon as possible he must be got out of bed, then out of doors, and later if possible to the seaside.

In order to help the lung to expand, deep breathing exercises must be encouraged, and in children the use of blowing toys will be found helpful.

The tube must be kept in position as long as any discharge continues; the length of time depending largely upon the duration of the empyema before draining, this determining the degree and density of the adhesions which bind down the lung and prevent its expansion.

In very chronic cases in which, some weeks after the chest has been opened, it is found that the lung will not expand owing to dense adhesions, some further operation, such as Estlander's operation and its modifications, will become necessary in order to allow the chest wall to fall in and the cavity thus to become obliterated.

F. J. Steward.

ENDOCARDITIS.—(See Rheumatism, Acute.)

ENDOMETRITIS, CHRONIC.—This term is applied to conditions where the glandular or interstitial tissue of the corporeal endometrium is thickened as the result of septic or gonococcal infection. It is often applied also to cases where the endometrium is thickened as the result of a diffuse adenomatous growth. The endometrial condition, whether the result of germ infection or

adenomatous growth, may be associated with a general thickening of the substance of the uterus. The cervical mucosa may or may not be affected. Hæmorrhage and discharge are the two chief symptoms. The hæmorrhage is generally of the menorrhagic type. The discharge may be clear mucus or mucus streaked with pus.

Iron, ergot, hot vaginal douches and time may cure some of the cases which are due to septic or gonorrhœal infection. When menorrhagia is pronounced, and does not yield to this treatment, curettage may be tried. If a discharge is the chief symptom, curettage does not offer so good a prospect of relief. In cases where thickening of the uterine substance is highly marked, the curette often fails to give relief.

The operation of curettage is carried out as follows : The instruments required are a duckbill speculum, two pairs of volsella forceps, a uterine sound, a set of Hegar's dilators, a sharp curette, a pair of uterine dressing forceps, and some swabs of sterilized cotton wool. All these instruments must be carefully boiled, and then placed in a tray or basin of carbolic lotion.

The patient is anæsthetized, placed in the lithotomy position, and kept there by means of a Clover's crutch. The external parts are then well washed with soap and water and swabbed over with a solution of corrosive sublimate 1–1000. A douche of the same antiseptic is then given, to thoroughly disinfect the vagina. A careful bimanual examination should then be made, to determine accurately the condition of the pelvic organs. The cervix is exposed by means of the duckbill speculum, and the anterior lip seized with a volsella, so as to draw it down and at the same time to fix it. The uterine sound is then passed to determine the direction and length of the uterine cavity. The traction with the volsella will have caused an apparent lengthening of about half an inch. A No. 4 or 5 Hegar's dilator is then introduced into the uterine cavity. Firm steady pressure will overcome the resistance of the os internum. The rapidity with which dilatation can be carried out will depend on the rigidity or otherwise of the os internum. If much resistance is met with at this point, dilatation must be carried out slowly, each dilator being left in position for a minute or longer. Often, by the time No. 12 is reached much of the resistance originally met with has passed away, and the remaining dilators can be passed without difficulty. Unless it is desirable to introduce the finger into the uterus, dilatation may stop after No. 14 has been passed. The curette is now used—a sharp looped one is the best. It should be employed firmly and thoroughly, so as to scrape the whole of both the anterior and posterior surfaces of the uterus. Sometimes the other hand may be placed with advantage on the abdomen, to steady the fundus of the uterus during this procedure. Thick flakes of mucous membrane generally come away with the curette. There need be no fear that the curette will perforate the uterus. In some rare cases, where the tissues above the os internum are very thin, or where the fundal tissues are very soft, the uterus may be perforated; but this always takes place during the process of dilatation, and not during the curetting. If such an accident should occur, the dilatation must be stopped. If proper antiseptic precautions have been taken, and the interior of the uterus is not actively septic, no untoward symptoms will result.

After the curettage is completed the vagina should be swabbed out with an antiseptic solution, but it is not necessary to pack it with gauze. As a rule there is little or no discomfort after this operation if the vagina be not plugged. A douche may be given about the third or fourth day after the operation, and repeated once or twice.

W. J. Gow.

ENTERIC FEVER.—(See TYPHOID FEVER.)

ENTERITIS.

1. **Acute.**—The treatment of acute catarrh involves, in severe cases, rest in bed, especially if there is any fever or great weakness. The simplest diet is the best, such as equal parts of milk and lime-water, or milk whey. If the stomach is very irritable, only small quantities (½ to 1 oz.) should be given, and if a stimulant is needed iced champagne should be tried. After the diarrhœa and pain have disappeared, small quantities of solid food can be added; but hot drinks should be cautiously administered, as they may bring back the purging. Bland animal food is often better tolerated than starchy food; for example, cold chicken broth or chicken jelly, and baked or boiled custard puddings, are preferable to gruels and invalid food made from cereals. But as convalescence progresses, ordinary simple diet may be allowed, taking care that it is bland and well cooked; but if the teeth are defective, it must be minced or pounded.

With respect to drugs, some prefer to commence treatment by administering ½ oz. to 1 oz. of castor oil, but frequently when the case comes under notice the whole of the original contents of the intestine have been evacuated, and the indication is to check peristalsis and relieve pain. For this purpose we may employ bismuth, with alkalies and opium or morphine, as in the following mixture:—

℞	Bismuth. Carb.		Muc. Tragacanth.	℥xv
	Sod. Bicarb.	āā gr. x	Aq.	ad ℥j
	Tinct. Opii	℥x		

Two tablespoonfuls every four hours.

In many cases the opium may be dispensed with, and simple mistura cretæ (B.P.) is all that is required.

In infectious diarrhœa, dilute sulphuric acid is useful in the treatment of adults, but it should be given freely, 10 or 15 min. in 1 oz. of water every four hours.

In cases of poisoning, severe pain often calls for the local application of fomentations to the abdomen, and the use of morphine by hypodermic injection in sufficient doses to relieve the pain.

Where collapse occurs and the pulse is thready, ½ pint to 1 pint of sterilized normal salt solution (0·75 per cent), at the temperature of the body, may be introduced under the skin of the flank.

Small iced water enemata (1 to 2 oz.) are useful in the treatment of infantile diarrhœa, but should be repeated after each movement of the bowel.

2. **Chronic.**—Treatment should be by remedying, as far as possible, the primary condition. Where there is abuse of alcohol, or when curable gastritis exists, much may be hoped from judicious treatment; but if the condition depends upon advanced organic disease in heart, liver, or kidneys, not much can be expected from our available means, except by way of controlling diarrhœa and relieving pain. It is seldom that these cases require treatment in bed, or the strictness of absolute diet. The patients are generally anxious to continue their usual mode of life so far as is possible, and this may generally be permitted, provided they will submit to certain restrictions. As many cases in elderly people are due to swallowing imperfectly masticated food, it is in the first instance necessary to look to the teeth; if these are defective, until their place can be supplied efficiently, all solid food must be minced or pounded, to prevent irritating lumps reaching the stomach and bowel. Enquiry must be made carefully into the question of alcohol, and only light wines, well diluted with mineral water, or very weak whisky and water, allowed. In any case, it is necessary to forbid all uncooked fruit, uncooked vegetables, brown bread, porridge, pastry, pickles; and the less digestible meats, such as pork, veal, goose, duck, salmon, and salted and smoked or preserved meat and fish.

The day should be begun by sipping slowly 4 to 5 oz. of hot water, containing 20 to 30 gr. of sulphate of soda. This quantity of salt may be diminished or increased according to the state of the bowels, it being desirable never to allow constipation to occur, but rather to maintain a moderate degree of freedom in the stools. These cases derive benefit from a course of treatment at Vichy, Royat, Châtel-Guyon, Neuenahr, or Carlsbad.

Should there be troublesome diarrhœa, it may be necessary to have recourse for a time to astringents, such as the following :—

℞	Bismuth. Carb.		Muc. Tragacanth.	℥ xv
	Sod. Bicarb.	āā gr. x	Aq.	ad ℥ j
	Tinct. Opii	℥ x		

Two tablespoonfuls every four hours.

Robert Saundby.

ENTEROPTOSIS.—The proper treatment is to endeavour to improve the general health, especially by a course of Weir-Mitchell treatment ; and local measures should be restricted to the use of a comfortable but efficient abdominal belt.

Robert Saundby

ENTROPION.—(See EYELIDS, DISEASES OF.)

ENURESIS (in Childhood).—Enuresis as a neurosis seems to be the result of hypersensitiveness of the lumbar centres of micturition, and of deficient inhibitory control on the part of the higher cerebral cortex over the lower centres in the spinal cord. It is one of the indications of general nervous instability. It may be hereditary, congenital, or acquired. Sometimes it is a familial affection. When nocturnal only, enuresis may be due to epilepsy.

Cases in which nervous instability is the sole cause are the most intractable ; but in the great majority some exciting cause is present as well.

In a few, want of proper training may keep up the habits of infancy. Every child has to be taught to control its bladder and make known its desire to empty it. It usually learns to do so before the age of two. If incontinence is habitual after the age of three, it is a morbid manifestation. It is most serious when it is constant, day and night, and is usually then associated with some form of mental enfeeblement, or with spina bifida occulta, in which case it is incurable. Sometimes it is due to pressure on the cord by tuberculous or other lesion of the vertebræ.

The chief exciting causes of enuresis are : (1) Adenoid vegetations ; (2) Local conditions, both within and without the bladder, which render it and the spinal centres irritable ; (3) Constitutional defects, such as anæmia and general debility, and, far more rarely, (4) Chronic interstitial nephritis.

Adenoid Vegetations.—These are a most potent cause of nocturnal enuresis, but probably they never give rise to diurnal incontinence. Enuresis may be part of, or the result of, night terrors, which are also common in the subjects of adenoid vegetations. But night terrors in these cases are probably set up by partial asphyxia, which stimulates the respiratory centres and perhaps also the vasomotor centres in the medulla. Thus an increased flow of urine may occur into the bladder, which empties itself because the cerebral centres of control are inhibited by fright.

Causes of Irritation within the Bladder.—Stone, cystitis from tuberculous disease, and new growth need only be mentioned here. Vesical irritability may also be caused by hyperacidity of the urine, and by bacteriuria, and sometimes by polyuria.

Hyperacidity of Urine.—Doubts have been recently cast on the reality of this cause of enuresis ; but certainly, enuresis is associated at times with highly acid urine, depositing urates in large amount, uric acid, or oxalates. The enuresis

in such cases is diurnal and nocturnal too. It is usually readily cured for the time being by a few doses of citrate of potash, especially if tinct. hyoscyami be added. Many believe that excessive meat diet is the cause, and certainly, in some cases, restriction in nitrogenous diet is efficacious.

Bacteriuria.—Here, the urine on passing is rendered cloudy by swarms of bacteria, which evidently come from the kidneys and bladder. The condition is common after enteric and other fevers. Urotropin is perhaps the best drug in such cases. It should be given in 5–10-gr. doses, well diluted with water. Benzoate of soda or ammonium is useful in larger doses.

Alkalinity of the Urine without cystitis is also associated with enuresis. The urine may be alkaline from triple phosphates, sometimes it is neutral. It may be of low specific gravity—1002–1005 ; it may contain a trace of albumin, and it is always marked by increase in quantity ; in fact, polyuria is the condition present. A characteristic is, that the child, on being waked at night to pass water, does so in considerable quantities, but after a short interval is found to have passed as much again in bed.

In some instances the complaint may be traced to excess of farinaceous and saccharine food, for it may be cured by supplying a rigid antidiabetic diet for a few days (Percy Lewis).

It must be borne in mind, however, that enuresis and polyuria, with a precisely similar condition of urine, are strongly suggestive of *chronic interstitial nephritis* in children. Polyuria in itself is sufficient to cause enuresis.

Causes of Irritation outside the Bladder.—Of these may be mentioned phimosis, balanitis, and vulvitis ; but in such cases the incontinence may be the cause, not the consequence, of the irritation.

Oxyurides and constipation sometimes give rise to enuresis.

Irritability of the bladder may still produce incontinence, night and day, when the original cause of irritation has been treated or removed. The presence of very small quantities of normal urine in the bladder is sufficient to excite it to contract. At short intervals there is a sudden call to micturate, which must be obeyed at once.

Atony of the Sphincter is not a common condition, but occasionally gives rise to incontinence. The urine drips or trickles away without frequent and distressing desire to pass it. Such cases, in both sexes, may sometimes be cured by the passage of a sound.

Electricity, in the form of faradism, one pole being placed in the urethra or in the perineum, and the other to the back or suprapubic region, is sometimes of service when the sphincter is weak.

Direct massage of the neck of the bladder by a finger introduced into the rectum has been recommended ; but the method is obviously objectionable, and should not be employed except as a last resource.

The treatment of an irritable bladder which will only contain small quantities of urine, consists in training it to hold more. The child should be kept in bed, and instructed to micturate at gradually increased intervals. The diet should be bland, without excess of starchy, farinaceous, saccharine, or nitrogenous articles. Water or barley-water may be given freely. It is a mistake to restrict fluids, except shortly before bed-time, in any case of enuresis. Tea and coffee should of course be prohibited.

Tincture of hyoscyamus, in doses of 10–30 min. or more, is a valuable vesical sedative. It may be given with citrate of potash and infusion of buchu.

In inveterate cases of irritable contracted bladder, gradual expansion of the organ by injections of weak boracic lotion is said to be successful, combined with local application of electricity.

Treatment by Epidural Injection has been advocated in France and America.

It consists in injecting normal sterilized saline solution in quantities of one and a half to five and a half or more drachms into the sacral epidural space. It is supposed to act by irritating the cauda equina, and thus conveying impulses to the lumbar centres, which are thought to be incited thereby to exert tonic or inhibitory influences over the bladder. The injections are made with an ordinary syringe, having a needle of a length of 1½ inches. The patient stands, or lies on his side with thighs flexed. The site of injection is the membrane closing the lower end of the sacral canal, which is indicated by a triangular depression situated at the posterior termination of the intragluteal fossa, and between the posterior and inferior processes of the last sacral vertebræ. The needle is inserted at this point, and thrust forwards and upwards into the sacral canal. No anæsthetic is used. The operation is said to be free from danger if ordinary precautions to ensure surgical cleanliness are adopted. Success is claimed in a sufficiently large number of cases to warrant employment of the method when other means have failed. It is admitted that it is by no means uniformly curative.

General Treatment.—Whatever may be the cause, the inconvenience occasioned by nocturnal enuresis may be lessened by waking the child at set intervals, to pass water. Accidents commonly happen when the child lies on his back. Therefore he should be taught to sleep on one side. A "bobbin" or some hard object strapped to the small of the back will wake him should he turn over.

Restriction in fluids just before bed-time, and in stimulant diuretics such as tea, coffee, mustard, pepper, spices, meat, meat juices, sugar and starch (in some cases), should be enjoined.

Any of the mental and physical conditions which excite night terrors may cause enuresis, and therefore require similar treatment. Punishment of any kind is rightly condemned in any case of enuresis occurring in a child upwards of three years. But few can have escaped a slapping in infancy for this particular crime, and the nurse's palm has taught many of us to control our bladders by night. Medical men only see cases in which such primitive treatment has failed.

Constipation should be relieved. Evacuation of the bowels in the evening before bedtime, will sometimes cure nocturnal enuresis.

Treatment by Drugs.—The utility of some has already been mentioned. It would be impossible to enumerate all the drugs which have been found invaluable by some, and useless by other, practitioners. Consideration of the various causes of the complaint will suggest appropriate remedies.

Atropine and belladonna should not be given by routine in every case. Children who wet the bed occasionally should not be poisoned indiscriminately with belladonna for months together. The physiological action of belladonna in full doses is to cause temporary paralysis of the bladder and to lessen secretion of urine. In some cases such results are beneficial, in others not. Belladonna is useless when sphincter control is weak, also in cases in which the tendency to enuresis is kept up by local and constitutional conditions. It is seldom useful in cases of both diurnal and nocturnal enuresis.

It is most valuable in cases of habitual nocturnal enuresis. The drug should then be pushed to full doses (10–40 min. of the tincture for a child of 10–12) and given at night only, with 10 gr. of one of the bromides. Or, atropine may be given in 1 min. doses of the liq. atropinæ sulph., 4 gr. to 1oz., gradually increased until the physiological effect is produced. If no good effects follow a few weeks of belladonna treatment, the utility of its continuance is doubtful. The disadvantage of keeping a child for months in a state of chronic belladonna intoxication is obvious. Few parents can be induced to persevere with the

treatment after one or two experiences of children rendered half blind, staggering, delirious, and unable to swallow, in consequence. The ill effects can, however, be reduced by giving belladonna or atropine at night only.

The writer has found better results from giving hyoscyamus, citrate of potash, and buchu, than from the belladonna treatment alone.

Cantharides has been recommended when there is weakness of the sphincter. Lycopodium, in doses up to a drachm of the tincture, may be useful as a bladder sedative. Ergot in atony of the bladder; antipyrine as a general nerve sedative; rhus aromatica in doses of 10–15 min. of the liquid extract, as a stimulant, diuretic and tonic, may all be useful when the conditions which indicate their use are present. Arsenic, strychnine, and nux vomica and iron may be required.

Nervous Retention of Urine is not uncommon in boys. The writer has known it to occur in father and son. The father, throughout his life, could never use a public urinal, nor pass water if anyone was by. The son suffered much at school from the thoughtless teasing and practical jokes to which he was subjected by his schoolfellows on account of a similar failing. Fortunately, no further ill consequences ensued; but in such cases, as the affection cannot be overcome by drugs or strength of will, common sense instruction should be given, in order to enable the patient to conceal it.

Hysterical retention of urine in young girls never needs active treatment by passage of a catheter. (See also ELECTROTHERAPEUTICS.) *Leonard G. Guthrie.*

EPICANTHUS.—(See EYELIDS, DISEASES OF.)

EPIDIDYMITIS, ACUTE.—(See GONORRHŒA.)

EPIDIDYMITIS, TUBERCULOUS.—Tuberculous disease affects the epididymis in two forms—an acute and a chronic.

Acute tuberculous epididymitis is a not infrequent preliminary stage of the chronic form. The symptoms are slightly less severe, the pain less intense, than in acute gonorrhœal epididymitis. (See GONORRHŒA.) A urethral discharge not infrequently accompanies the epididymitis and increases the resemblance to the gonorrhœal affection. The discharge is, however, less creamy and copious, and the diplo-coccus is absent. There is frequently a strong tubercular inheritance, and in many cases the discharge cannot be referred to any recent or remote connection.

In acute tuberculosis the treatment should be directed to relieving the symptoms. The patient is confined to bed, and the swollen testicle supported upon a cushion. Equal parts of extract of belladonna and glycerin are smeared over the scrotum, and hot fomentations applied. A brisk saline purge is administered. Urethral injections should be avoided. The acute inflammation usually subsides in a week or ten days, and gradually passes into the chronic form of tuberculous inflammation.

The treatment of chronic tuberculous epididymitis is non-operative or operative. The question of operation is much discussed, and a final conclusion has not been reached. In the opinion of the writer, operation should be reserved for cases where other measures have failed after a fair trial, and the operative measures should be of a conservative nature.

There are several types of cases: (1) A solitary tuberculous focus in one epididymis; (2) Tuberculous disease of the epididymis with foci in other parts of the genital system (seminal vesicles, prostate); (3) Disease of the epididymis with tuberculous infection of the urinary system (bladder, kidneys); (4) Disease of the epididymis with or without urinary tubercle, and with active tuberculous foci in other parts of the body (joints, spine, lungs).

A solitary focus in an epididymis may heal spontaneously, and will frequently be cured by non-operative treatment. Climatic and general treatment are more important than local interference. A genial, sunny climate with an even temperature, nourishing food, with plenty of rich milk, should be prescribed. Cod-liver oil, creosote, iodide of iron, are useful tonics. Care should be exercised in protecting the diseased testicle from injuries, even of the most trivial kind. The scrotum is packed in a layer of cotton-wool, and slung in a well-fitting suspensory bandage. Sexual intercourse is absolutely interdicted. If the nodule softens and breaks down, the skin of the scrotum should be cleansed and the abscess opened. A sharp spoon may be used and the cavity packed with a pledget of iodoform gauze, but no attempt need be made to eradicate the whole disease by this means. The cavity heals readily, but there is a tendency to recurrence of the "abscess," and this is treated in the same way.

Treatment with tuberculin (Tuberculin R.—Allen and Hanburys) is effective in some of these cases. Improvement may be delayed with this treatment for six months, or even a year, but unpromising cases may clear up in a remarkable manner. The treatment consists in the hypodermic injection of very small doses of tuberculin. Before commencing the injection the opsonic index should be estimated, and this is repeated from time to time during the course. Injections commence with $\frac{1}{1000}$ mgram, and should no reaction follow, another injection of similar strength is given at the end of a week. These are repeated each week for several weeks before increasing the dose. Should the patient complain of malaise, pain in the back, or increased local tenderness after the injection, an interval of a fortnight should be allowed to elapse before the next injection. The dose is gradually raised to $\frac{1}{800}$, $\frac{1}{600}$, $\frac{1}{500}$, $\frac{1}{400}$, and so on up to $\frac{1}{100}$ or $\frac{1}{50}$ mgram. The duration of the treatment must vary with the progress of the case. The writer has seen improvement begin eighteen months after the commencement of the treatment. The progress is usually slow.

The question of radical operative measures will arise where other methods of treatment have failed. The choice lies between castration and epididymectomy, and the latter operation is to be preferred wherever possible. If the disease has penetrated the testicle and spread extensively in its substance, castration is indicated; but this may only become evident during the operation.

When other of the genital organs are affected, a similar course of treatment should be adopted. Operation, if it become necessary in such a case, will involve the removal of one or perhaps both epididymes, with the vas deferens as far as the internal abdominal ring, and the dissection and removal of the affected seminal vesicle or portion of the prostate. The retention of the testicles, even when the patient is aware of the abolition of their sexual function, has an important mental effect.

When the urinary system is involved in the tuberculous infection, operation upon the genital tubercle is contra-indicated, and the same attitude must be adopted towards a case where tuberculous disease is present in other parts of the body. While this may be taken as the rule, there are exceptional cases where a more radical method of treatment may be considered advisable. The writer has performed nephro-ureterectomy and orchidectomy upon a patient for tuberculosis confined to one kidney, ureter and epididymis with most fortunate result. *J. W. Thomson Walker.*

EPILEPSY.—An epileptic attack is a *symptom*, which may depend on a variety of different causes, the detection of which affords the necessary indications for the treatment of the case.

Epilepsy proper is a *disease* characterized by a tendency to the recurrence of epileptic attacks. The fits may be severe (*grand mal*) or slight (*petit mal*).

Most epileptics have both major and minor attacks; when the former are met with alone, the outlook is distinctly more favourable than when both forms occur; cases, in which there are minor attacks only, are usually the most intractable.

It is customary to subdivide cases of epilepsy into two groups—*idiopathic* and *organic*. The first includes those cases in which no obvious cerebral lesion exists, while to the second belong those in which gross intracranial disease is present.

Epileptiform or Jacksonian attacks are synonymous terms applied to localized convulsive fits, which begin in a certain muscular group, have a deliberate spread, are usually unattended with impairment of consciousness, and are followed by a degree of temporary paralysis in the parts convulsed. It is important to remember that the occurrence of Jacksonian fits does not necessarily imply the existence of gross cerebral disease.

Reflex epilepsy is a term sometimes used to denote those uncommon cases in which the disease is apparently dependent on an extracerebral cause.

TREATMENT may be considered under the following headings: (1) The means by which it is possible, in some cases, to arrest an attack; (2) The treatment of an epileptic attack; (3) Status Epilepticus; (4) General measures and method in the treatment of the disease; (5) Drug treatment; (6) Surgical treatment, with special reference to organic epilepsy; (7) The colony system.

1. **Arrest of an Attack.**—When there is a distinct aura, it is, in very exceptional cases, possible to avert an impending attack. Thus, a powerful mental or muscular effort is, in rare instances, effective. The inhalation of amyl nitrite, immediately the warning is felt, is sometimes successful; and where this is found to be so, the patient should carry with him a box of capsules. Strong smelling-salts occasionally act in a similar way.

When the aura is localized to one hand, the fit may sometimes be arrested by firmly grasping the wrist of the affected side. If it is found that a fit can be thus averted, the patient may wear a strap or tape fastened conveniently round the wrist, which he can immediately tighten on the first sensation of the aura. This procedure may only result in a postponement of the attack, which, when it does occur, may be of unusual severity.

2. **Treatment of an Attack.**—The physician, if present at the onset, should, first, place the patient in the recumbent posture; secondly, loosen the clothes about the neck and chest; and, thirdly, insert between the teeth a tongue depressor, cork, or some such object, in order to prevent tongue-biting. Little advantage is to be gained by attempting to cut short the attack; but should the tonic phase be unduly prolonged, or should a second attack follow immediately upon the first, a few whiffs of chloroform, or an inhalation of nitrite of amyl, may be administered.

The patient's friends may be told that there is practically no danger, for an epileptic fit is in itself an extremely uncommon cause of death.

Vomiting occasionally occurs towards the end of a fit. If any tendency to this is observed, the patient should be turned on his side, in order that the risk of regurgitation of the vomited matter into the respiratory passages may be avoided, an accident which has been known to be attended with fatal results.

Post-epileptic Phenomena.—After the termination of the fit, the patient often falls into a deep sleep, in which it is well to leave him undisturbed. Severe headache, often frontal, is an almost constant sequel, and is usually relieved by a 10-gr. dose of phenacetin. Hysterical seizures sometimes follow. Since it is especially in association with *petit mal* that these phenomena are prone to occur, their true nature is apt to escape recognition. The immediate treatment is that of a true hysterical fit, while a therapeutic course, appropriate to the

epileptic condition, must be instituted. Among other post-epileptic states to which reference may be made, are the outbursts of maniacal excitement which sometimes follow a fit, and may constitute a source of danger to the community. For such a case, if it is beyond the control of a responsible attendant, an asylum is the proper place.

When post-epileptic automatism is a feature of the case, it is hardly necessary to say that the patient's relatives and fellow-workmen should be instructed to keep a close watch upon his movements.

3. **Status Epilepticus.**—This grave, and often fatal condition, is fortunately rare. Inhalations of chloroform, or nitrite of amyl, may check the attacks, but their effect is often only temporary. Bromides are usually ineffectual. Chloral hydrate is generally the most effective drug in these cases. It should be given in a dose of 30 to 60 gr. by the rectum, the dose being repeated, if necessary, in the course of an hour. Hypodermic injections of hydrobromate of hyoscine have been strongly recommended by Sir William Gowers, in doses of from $\frac{1}{150}$ to $\frac{1}{60}$ gr., and may be given, should the last-named drug prove a failure. Morphia, administered hypodermically, in doses of $\frac{1}{4}$ to $\frac{1}{2}$ gr., has met with the approval of some authorities. Strychnine is undoubtedly most valuable, especially when the attacks have continued for some time, and when there are signs of increasing general and cardiac weakness. If the drugs already mentioned have proved unsuccessful, $\frac{1}{60}$ gr. may be given hypodermically, and repeated, if necessary, according to the effect produced.

Respiratory embarrassment, due to falling back of the tongue, may prove fatal during the status epilepticus. If there is reason to suspect this accident, the patient should be turned on his side, and the tongue drawn forward with forceps.

4. **General Measures and Method in the Treatment of the Disease.**—The first necessity is a correct diagnosis, a matter by no means always easy, since the account given by the patient, or his friends, often constitutes the only positive evidence bearing upon the diagnostic problem.

Having made his diagnosis, the physician's next duty is to conduct an *exhaustive enquiry into the patient's habits and general health*, in relation to the occurrence of fits ; hoping, thereby, to detect evidence as to possible immediate exciting causes. Thus dietetic irregularities, constipation, unnecessary excitement, may in different cases appear to be of causal import, requiring special attention when regulations as to treatment are laid down.

Anæmia, if present, calls for correction, as does any other intercurrent departure from the normal state of health. A careful examination as to the existence of any *peripheral source of irritation* is necessary. Thus, the presence of intestinal worms, adenoids, an adherent prepuce, aural or nasal polypus, bad teeth, or an error of refraction, may play a part in determining the occurrence of convulsions ; but the tendency to regard them as of causal import is commonly exaggerated. The indiscriminate operative treatment of local conditions, such as the practice of tenotomy in cases of so-called eye-strain, is, in the light of our present knowledge, to be condemned. Unless the local abnormality is so pronounced as of itself to demand local treatment, or unless there appears to be very strong reason for relating it directly with the incidence of the attacks, it is advisable to delay any operative measures until the patient has undergone a thorough and prolonged therapeutic course, after which, if the fits still persist, the operative treatment of the local condition, with the hope of relieving the epilepsy, may be undertaken as a *dernier ressort*.

The general treatment of epilepsy is almost as important as the drug treatment. Precise instructions should be laid down, adapted to meet the requirements of each case. Regularity and moderation are to be the guiding principles. The

benefit which ensues from these general measures has been amply demonstrated by the colony system, to which special reference will be made later.

The *diet* best suited for epileptics has been the subject of considerable discussion; but beyond the advisability of limiting the quantity of red meat, which should be taken not more than once a day, cutting off articles known to be indigestible, with special reference to the individual case, and avoidance of over-eating, it is unnecessary to lay down further directions.

A chlorine-free diet has been lately recommended, and its efficacy confirmed by a number of observers. The principle involved is the substitution of the bromides for the common salt of everyday use. There is, as yet, however, no conclusive evidence to show that the results so obtained are superior to those seen when the bromide salts are administered in the usual way, and any little advantage so derived is counterbalanced by the inconvenience involved in the preparation of a special diet, since this practically places the method only within the reach of the wealthier classes, or of special institutions.

The patient must take his food leisurely. The time of meals should be adhered to with strict punctuality, and the last meal of the day should be arranged to allow of completion of digestion before the patient goes to bed.

Alcohol should be forbidden. Tobacco may be allowed in moderation. Sexual excess is to be avoided.

Attention to the bowels cannot be too strongly insisted upon, for constipation is a common exciting cause of the attacks. Where there is this tendency, a small dose of cascara (5 to 10 min.) may be given in combination with the bromides or other drugs which the patient is taking, the dose being gradually reduced as occasion demands.

Outdoor exercise is to be encouraged, although any form of exercise necessitating strenuous physical effort, or in which the occurrence of an attack might be attended with special danger, e.g., swimming, boating, etc., must be vetoed, unless the patient has with him companions who clearly understand the responsibilities which devolve upon them.

The *education* of epileptic children is a question regarding which the physician's advice is often sought. No doubt it is better, when the attacks occur frequently and are severe, to keep the child away from school; indeed, it often happens that the teacher's attitude permits of no option in the matter. It is, however, highly desirable that the epileptic's time should be fully occupied, although all work involving mental strain, such as that required in preparation for an examination, is to be deprecated. Among the lower middle classes the defective education which absence from school implies, constitutes a serious handicap in after life. Irregular attendance at school, in association it may be with a degree of mental deficiency, dependent on the disease from which he suffers, often brings the epileptic child into competition with his juniors, and this cannot but have a depressing effect upon a sensitive nature. In addition, the undue irritability and passionate tempers often exhibited by these children, may prove incompatible with the requisite discipline of a mixed class. It is to be hoped that the time is not far distant when, in the larger towns, special schools, or classes, will be set apart for sufferers from this malady.

The *selection of a profession or trade* requires careful consideration, and must be decided on general principles. An outdoor occupation is advisable in confirmed cases. Employments which are fraught with danger must be avoided. The admission of epilepsy is, in itself, often sufficient to debar selection, altogether apart from the individual's capabilities for the post he seeks.

Regarding the *question of marriage*, it may be said that matrimony will probably, produce little alteration in the frequency, or severity, of the attacks. In cases of the *idiopathic* variety, particularly when there is a history of

hereditary transmission, the physician's duty is to urge his patient to avoid matrimony, by emphasizing the probable consequences of procreation. In cases of idiopathic epilepsy, with evidence of inheritance, Gowers remarks that "consideration of the facts suggests that, if there are six children, the chances are against the escape of all from epilepsy, insanity, or imbecility."

5. **Drug Treatment.**—In order to obtain the best result, it is essential that the physician should have a definite plan on which his line of action is to be conducted. In every case the question arises, what drug, or combination of drugs, will give the best results, without, at the same time, affecting the patient's mental or general health. A solution of the problem can only be arrived at by experiment, while it must at the same time be remembered that frequent haphazard alterations in treatment cannot be too strongly condemned. When it has been determined from, it may be, special features of the case, to commence by giving a particular drug or combination of drugs, this should be given a thorough trial before any change is made.

In every case a record of the fits should be registered. A book should be kept by the patient for this purpose, in which are noted the day and hour at which every fit occurs, and any special exciting cause which may be thought to have produced it. In this book, all changes in treatment are to be entered by the physician. Epileptic patients are often taken from one physician to another—how much to the advantage of both, if the patient could produce a record of his previous treatment, and its effects.

The *salts of bromine* stand out pre-eminently as the most efficacious drugs. True, in some cases the bromides are of little benefit, and in a minority of these, other drugs are occasionally of value. These instances are, however, exceptional. In most cases the bromides, either alone or in combination with other remedies, produce a beneficial effect both on the severity and frequency of the fits.

The bromides of potassium, sodium, and ammonium, are the salts upon which most reliance is placed, authorities differing as to the most effective form; a combination of all three is regarded by some as the most potent method of administration. The bromides of strontium and of camphor are also used to a limited extent, but appear to have no special advantage. Bromide of lithium has been commended where gout is a prominent feature of the case. So far as we are aware, no general superiority of one form over another has been demonstrated, but individual cases are undoubtedly met with in which the exhibition of one combination appears to be associated with special benefit. Perhaps the bromide of potassium is that most generally used, and it is this form we usually prescribe, in the first instance at least.

Dosage.—The amount of bromide and time of day when it should be given must vary in different cases. The treatment should be commenced by giving 10 to 15 gr. twice a day twenty minutes after food, with a double dose at bedtime. It is not advisable to begin at once with a larger dose than this, unless the patient has previously taken the drug, or is under close observation; for occasionally individuals are met with who are peculiarly susceptible to the action of these salts. When nocturnal attacks alone occur, 25 gr., shortly before bedtime, is sometimes sufficient to produce arrest. A very common time for the occurrence of fits is in the morning, immediately after the patient rises. When this peculiarity is pronounced, a dose of bromide may be given with advantage soon after the patient wakens. The quantity of the drug should be gradually increased until the maximum dose is attained which the patient can take without deteriorating his general or mental health. Most authorities are agreed, however, that there is little advantage in increasing the dose to more than 90 gr. in the twenty-four hours.

There are two *disadvantages associated with the bromide salts.* An acne rash is apt to be produced. It has been claimed that bromide of strontium possesses special virtues in avoiding this complication, but the evidence adduced does not appear to be convincing. Experience has shown that the addition of 2 min. of liquor arsenicalis to a 20-gr. dose of bromide is usually effective in preventing the development of acne. Arsenic taken over a long period of time, even in very small doses, unfortunately tends to cause pigmentation of the skin. A 10-gr. dose of salol at bedtime is also said to lessen the tendency to bromide acne. Another disadvantage of the bromides is their blunting effect on the mental faculties. This, however, is seldom seen unless very large doses are given, and the dulling of the intellect so common in epilepsy is more often a direct consequence of the disease than of the remedy.

If complete cessation of the fits follows the exhibition of the bromides, the treatment should be on no account altered; on the other hand, where no improvement follows, other remedies must be tested. When there is distinct improvement up to a certain point, as shown by diminution in the frequency and severity of the attacks, a corresponding dose of sodium, ammonium, or strontium bromide may be substituted, in the hope of producing still further benefit.

Having obtained the maximum effect of the bromides, if the fits still continue, it may be found that the addition of some of the other remedies, to which we shall presently refer, is beneficial. The dose of the new remedy may be increased, or, if there is no noticeable improvement, another drug may be substituted, the quantity of bromide remaining unchanged. In this way it is often possible to arrive at some opinion as to the drug or combination of drugs, and their dosage, most suitable in any given case, although it must be admitted that relapses due to undetected causes are frequent sources of difficulty in arriving at definite conclusions.

Amongst the numerous *drugs other than the bromides* which have been recommended, the writer agrees with those who attribute a high place to borax. Biborate of soda was first introduced by Sir William Gowers in the treatment of this disease. Occasionally, when the bromides fail, borax is of the greatest value, particularly perhaps where *petit mal* occupies a prominent place in the clinical picture. Borax may be given alone or in combination with the bromides, in doses beginning at 5 to 10 gr., three times a day, and gradually increased. Gastro-intestinal symptoms are occasionally set up by borax, and its prolonged administration may be followed by psoriasis.

Digitalis, when given with the bromides, is sometimes attended by benefit distinctly in excess of that obtained from the latter salts alone, especially, it is affirmed, when there is any cardiac complication.

Zinc oxide is of undoubted value in certain cases, more especially in the treatment of *petit mal.* The drug is best administered in pill form in doses of 2½ gr. two or three times a day. The dose may be increased to 5 gr. or even more, but is to be reduced if it produces sickness.

Belladonna (5 to 10 min. of the tincture) and the nitrites, given in the form of liquor trinitrini (1 to 2 min.), appear occasionally to be of some use when added to the bromides.

Potassium iodide may be of the greatest service where the disease is dependent on syphilis, and is of occasional use in the epilepsies of later life associated with cerebral arteriosclerosis, which so rarely yield to bromide treatment.

A host of other remedies, to which we need not refer, have been from time to time recommended. A serum treatment has recently been introduced by Ceni, but its value is still *sub judice.*

Finally, if treatment is to be attended with success, the *remedies prescribed*

must be administered with punctilious regularity and over an extended period. Failure to carry out these essentials is one of the chief reasons why disappointing results are so common. The patient should be most emphatically given to understand that unless he adheres rigorously to these particulars, the prospect of cure is minimized. Indeed it is advisable in the majority of cases to throw this responsibility upon his relatives. The treatment must be continued until at least two years have elapsed during which time no fit has occurred, although during the second twelve months the dose may be greatly reduced. No intercurrent illness must interfere with the administration of the remedies unless under most exceptional circumstances.

Whenever there is an increase in the number or severity of the attacks, a most careful examination should be undertaken with the object of ascertaining, if possible, the cause of the relapse. Indeed it is advisable in every case to make a very thorough study of the case at definite intervals, in order to make sure that no therapeutic indications have escaped detection.

With regard to the *" cure " of idiopathic epilepsy*, it is interesting to note that Dr. Aldren Turner found among 147 cases which had been under observation for at least nine years after the disease had become definitely established, 15 (10·2 per cent) in which the fits had been arrested for 9 years or more, and that in 50 per cent of the cases in which the disease was arrested, the arrest took place within one year of the commencement of systematic treatment.

6. **Surgical Treatment.**—The surgeon's aid is seldom required in the treatment of idiopathic epilepsy. In rare cases, it is true, his help may be solicited to perform a circumcision, or to remove a polypus or foreign body from the aural or nasal cavities. Very exceptionally, the involvement of a nerve in the scar of an old wound has been shown to be directly related to the epileptic state, excision of the scar or a portion of the nerve resulting in cure. To such operations as ocular tenotomies, castration, and ligature of the vertebral arteries, it is unnecessary to refer. Division of the sympathetic trunks in the neck is unjustifiable. Opening the skull with the hypothetical object of relieving intracranial pressure in cases of idiopathic epilepsy, is an operative procedure which now has few, if any, adherents. The removal of a small area of cortex, in cases in which the fits commence with a localized motor aura, has not been followed by permanent results. It is to be remembered in this connection, that any operation may be temporarily followed by cessation of the fits, just as after an acute illness, after an injury, or during pregnancy, the attacks sometimes remain in abeyance for many months. This circumstance must always be borne in mind in judging of the effects of surgical intervention.

The above remarks do not apply with equal force to those cases in which the *epilepsy is of traumatic origin.* For instance, when there is a scar over the motor cortex corresponding in situation to the area from which a localized spasm initiating the fit proceeds, and particularly when there is a depression in the bone, operation is clearly indicated. But it must be remembered that the removal of the local source of irritation is not always synonymous with cure; for in cases of long standing the cerebral cortex may acquire the epileptic habit of spontaneous discharge.

In a case in which there has been a definite injury to the head, and in which the initial discharge does not correspond to the site of the wound, the prospect of cure by operation is much more gloomy. If the local discharge remains constant, the fits obstinately resist medicinal treatment, and the patient's mental condition is deteriorating, an operation over the discharging area may be undertaken. When the fits do not commence with a constant local spasm, even if there is definite evidence of cranial injury, the outlook is still worse. Worst of all are those cases in which the attacks are general and have persisted

over a long period; in these cases the hope of permanent benefit by local operation is almost nil.

The operative treatment of Jacksonian attacks associated with intracranial new growths and meningeal hæmorrhage will be referred to in the section dealing with these subjects.

7. **The Colony System.**—The purpose of the epileptic colony or township is to provide education and employment for the sane epileptic. The child receives an education according to his mental capacity. Later, he learns some trade or occupation which may prove of use in after life if his condition improves, and which serves at least to keep him employed and interested. His self-respect is raised and his interest in life aroused when he sees that he is capable of leading a useful existence and is no longer a burden on his relatives; and, lastly, he is living a regular life in the open air, free from excitement and worry, a life which is specially adapted to the treatment of his affection.

A study of the results of treatment shows the advantage of this method. In the majority of cases the fits are reduced in number and severity, and the mental state is improved, while a small percentage of cases is discharged cured.

The following is a list of epileptic colonies and homes in this country, with some details as to rates, application for admission, etc.:—

The Chalfont Colony, St. Peter's, Bucks, the property of the National Society for Employment of Epileptics. Secretary, G. Penn Gaskell, Esq., Denison House, Vauxhall Bridge Road, Westminster, S.W. Approved male or female patients are admitted at a charge of 10s. a week (subject under special circumstances to reduction at the discretion of the Committee.) The Society also has a Convalescent Home for male epileptics convalescing after illness or accident, or for other reasons requiring temporary admission; charge 12s. 6d. per week.

David Lewis Manchester Epileptic Colony, Sandlebridge, Alderley Edge. Director, Alan McDougall, Esq., M.D., Barton Arcade, Manchester. Men, women, and children (200 beds); some patients free.

County of London Colony for Epileptics, Ewell, Surrey. Medical Superintendent, C. Hubert Bond, Esq., M.D. Charges: for those claiming settlement in County of London, 18s. 1d. per week; outside County, £1 1s. per week.

Home for Epileptics, Maghull, near Liverpool. Hon. Sec., William Grisewood, Esq., 2, Exchange Street, E., Liverpool. 212 beds, of which 144 pay 7s. 6d. per week, the remainder from £1 1s. to £2 2s. per week.

Meath House of Comfort for Epileptics, Westbrook, Godalming. Applications to Lady Superintendent. 78 beds. For epileptic women and girls, 12s. 6d. per week; for children under 12, 8s. per week; a few beds for ladies, £1 1s. to £2 2s. per week.

Christian Union for Social Service. Director, Rev. J. L. Brooks, Training Colony, Lingfield, Surrey. Children of both sexes admitted. Charge, 12s: 6d. to 15s. per week.

St. Luke's Home, 36, Parkwood Road, Bournemouth, and Carisbrooke, Isle of Wight (26 beds). Application to Deaconess. For women and girls over 16 who are members of Church of England. Vegetarian diet. 12s. 6d. per week.

St. Elizabeth School for Epileptics, Much Hadham, Herts, for defective and epileptic children. Applications to Sister Superior. Charges: 12s. 6d. per week for boys aged from 7 to 16; 12s. 6d. and 21s. for girls over 7. *Edwin Bramwell.*

EPIPHORA.—(See LACHRYMAL APPARATUS.)

EPISCLERITIS.—This disease is peculiarly prone to recur, and is met with most frequently in patients with a rheumatic or gouty diathesis.

TREATMENT must be both local and general.

Local Treatment.—Protection of the eye, hot boracic bathing and atropine, 2 gr. to the ounce, are especially indicated. Pain is often extremely severe, and is best relieved by two or three leeches to the temple. In the more chronic cases with little pain, massage through the lid with ung. hydrarg. oxid. flav. dil. may be useful. Application of the constant current and scarification of the nodule have been advocated.

General Treatment.—A brisk purge should be given at the commencement of the attack, and care taken to procure a free daily action of the bowels.

Diaphoresis induced by the hot pack, fortified if necessary by an injection of pilocarpine nitrate $\frac{1}{15}$–$\frac{1}{3}$ gr. will be found invaluable, cutting short the attack and relieving pain. Internally aspirin, salicylate of soda, and iodides often prove beneficial.

Occasionally the pain is so intense that it may be necessary to give subcutaneous injections of morphia.

Ilbert Hancock.

EPISTAXIS.—Bleeding at the nose may be due to general or local causes, and before attempting to arrest it, it is necessary to determine the cause of the trouble and its point of origin.

When due to some *constitutional disturbance* or severe organic disease, epistaxis is probably beneficial, and if it ceases before excessive loss has occurred no attempt should be made to stop it. Thus bleeding may be beneficial in some chronic diseases of the heart and lungs; also in certain acute diseases, such as acute bronchitis. Again, it may relieve the strain of excessively high blood-pressure resulting from over-exertion, excitement, anger, or other emotional causes, and may possibly ward off an attack of apoplexy or prevent heart-strain. If, however, the bleeding is excessive, simple measures may be adopted to stop it. The patient should lie down quietly, and the face should be sponged with cold water, or a handkerchief dipped in cold water should be laid across the nose. The water should be iced if possible, and the patient may be encouraged to suck ice. If the bleeding is arrested, the patient should remain quiet for a few hours, avoid exertion, and take all food cold, with no stimulants. If the bleeding continues and is not checked by the application of cold, it will generally be necessary to pack the nose. If it is found that the bleeding comes from the anterior part of the nasal septum, it is sufficient to pack the anterior part of the nose with a plug of wool or gauze, and thus to bring direct pressure to bear upon the part. If then the exact source of the bleeding can be determined, cocaine and adrenalin should be applied, and the bleeding spots sealed by the application of the electric cautery at a dull red heat. If there is no indication of the source of the bleeding, but it appears to be coming from far back or high up in the nose, the entire nasal cavity should be packed. The best method is as follows: The left forefinger is passed through the mouth into the posterior nares, a strip of gauze is passed through the anterior nares until it impinges on the finger, and successive strips are introduced until the whole nose is packed tightly from behind forward, the finger in the post-nasal space preventing the gauze escaping from the posterior nares. A more comfortable method, when available, is to introduce into the nose a thin rubber bag, such as a Howard's nasal bag, and to inflate it when in position. The packing, or rubber bag, should be removed within twenty-four hours, and the patient must remain quiet, avoid blowing the nose, take all food cold, and avoid stimulants for the following twenty-four hours.

When hæmorrhage from the nose is the result of a *gross lesion* such as ulceration or malignant or other tumour, and the bleeding is not arrested by the local application of cold, it will generally be necessary to pack the nose.

In the commonest form of epistaxis, in which the bleeding takes place from small vessels on the anterior part of the septum, and is due entirely to local causes, local treatment alone should be adopted. The trouble is due to the so-called *anterior rhinitis sicca*, and the bleeding is the result of forcibly detaching the small crusts, which adhere closely to the nasal mucous membrane, by picking or violently blowing the nose. The first essential is to remove the cause. The local condition should be treated by the frequent application of a mild ointment, such as weak boracic ointment or plain lanolin. Picking the nose should be prohibited. These measures alone frequently effect a cure. If they fail, a

solution of cocaine and suprarenal extract should be applied, and the bleeding vessel sealed by a touch with the red-hot cautery, and subsequently the small varicose vessels should be obliterated. The affected part of the septum should be frequently smeared with ointment to prevent crusts forming until healing is complete. If at any time severe hæmorrhage occurs, it may be immediately arrested by passing a strip of gauze or wool into the affected nostril, and bringing direct pressure to bear upon the part by compressing the nostrils with the finger.

In a few rare cases where the mucous membrane of the anterior part of the septum, and more rarely of other parts of the nose, is red, velvety, almost nævoid in appearance, and readily bleeds on touching, it is necessary to excise the whole of the affected part. *H. Lambert Lack.*

EPULIS.—(See JAW, TUMOURS OF.)

EQUINO-VARUS.—(See TALIPES, ACQUIRED.)

ERUCTATION, NERVOUS, is not altogether under the control of the patient, but is temporarily stopped by swallowing anything, such as a little water, and no doubt much can be effected by the patient if she will do her best to break the habit. Pressure upon the epigastrium sometimes relieves it. The treatment is for the general neurotic condition: change of air, general massage, isolation, and a Weir-Mitchell course. Medicinal remedies may be tried, such as the following mixture:—

℞	Potass. Brom.	gr. x	Aq. Camphor.	ad ℥j
	Tinct. Valerian. Ammon.	℥xxx		

Two tablespoonfuls three times a day.

Robert Saundby.

ERYSIPELAS is an infective condition of the skin or subcutaneous tissues, due to a peculiar variety of streptococcus. It is customary to consider certain special varieties.

1. **Erysipelas proper,** the infection being confined to the lymphatic spaces immediately beneath the epidermis, a form usually unaccompanied by swelling of the tissues except in such situations as the scrotum or eyelids.

2. **Cellulo-cutaneous Erysipelas**—a superficial form of cellulitis, indicated by swelling and redness of the part.

3. **Deep Cellulitis,** which is an infection of the subfascial layers. Only as the process tracks towards the surface does the skin become red. There is, however, considerable pain and swelling, and the whole part has a brawny, indurated feeling.

The last two varieties may be associated with a large amount of tissue destruction, owing to the sloughing of the skin stretched over the inflammatory exudate.

TREATMENT.—As these infections are more liable to occur in patients whose constitution is unsound, either from glycosuria or albuminuria, a careful examination of the urine must be made. As a routine the bowels should be opened by a brisk purge; subsequently, stimulants and tonics may be administered, quinine and iron being most useful. A rigor is often the first symptom of the superficial variety, and in many cases—especially in children—the constitutional symptoms are most severe. The temperature may rise to 104° or 105°.

Local treatment consists in applying lotions or protective dressings, leaving the disease to run its course, a form of treatment suited to mild cases; but any unhealthy focus from which the infection has arisen should be actively treated with pure carbolic acid. One of the best applications in mild forms of the disease

is the lotio plumbi c. opio, or, if preferred, gauze wrung out of 1–60 carbolic may be substituted. Ichthyol has been used in the form of a paint with much success.

If the attack is a severe one, and if the part affected is suitable for more active treatment, the tincture of iodine or strong solutions of silver nitrate may be painted ½ to 1 inch away from the red, sharply-defined edge. The object of this treatment is to excite a protective leucocytosis which will be able to destroy the organisms or the infection as they reach this protected zone. Kraske scarifies the area round the erysipelatous rash with a fine knife in order to produce the same effect, and it is said that a more energetic and satisfactory reaction is produced by this method.

Incisions are not required as a rule in this variety; but when the scrotum or the eyelids are attacked, the loose cellular tissues become swollen and œdematous, and the knife may be used with advantage. Minute punctures only should be made. In alcoholics, erysipelas may attack the mouth and pharynx, an exceedingly dangerous situation, since there is considerable risk of œdema of the glottis supervening. Erysipelas of the face and scalp may give rise to serious intracranial complications, since the infective process may spread along the numerous channels of communication into the cranial cavity.

Treatment of the other cellulitic varieties must be conducted along more rigorous lines. In a few cases it may be advisable to try the effects of rest and moist antiseptic dressings for twenty-four hours, but with this exception, the sooner incisions are made into the inflamed area the better. If active treatment is delayed, the inflammatory process tends to burrow along the fascial planes, and deep-seated abscesses will form. The incisions should be free and numerous, with a due regard to the position of important structures, and they should extend, in the case of the deep cellulitis, right through the deep fascia. Drainage tubes must be employed in those cases where there is a localization of the pus.

After-treatment will consist in supporting the patient's strength, so that he may be able to neutralize the toxins elaborated in the affected region. Alcohol may be required, and iron, quinine, nux vomica, and arsenic will be of service. The part should be dressed with moist antiseptic dressing. In many cases constant irrigation with weak carbolic (1–200) or boracic acid is indicated, or as an alternative, if a limb is affected, it may be immersed in a bath of the same antiseptic. It is very essential to see that only a very weak solution is used, as the continued application of strong antiseptics is very injurious to the tissues, and may lead to poisoning. As soon as the acute inflammatory phenomena have subsided, massage and passive movements should be cautiously undertaken, so as to prevent undue fixation.

The greatest care must be taken that the infection from these cases is not conveyed to others, especially to surgical or midwifery patients. Cases of erysipelas and cellulitis should be isolated. *W. H. Clayton-Greene.*

ERYTHEMA.

Erythema Induratum Scrofulosorum.—The characteristic lesions of this disease on the lower part of the leg posteriorly have, in the past, generally been treated by rest and strapping, along with general tonics. These latter will probably maintain their place. But since the time the writer first used X rays in this disease, he has never found it necessary to insist upon the lying-up previously required. Under repeated exposures to the rays, the ulcers heal up and the induration disappears, even although the patient continues at work so obviously unsuited to rest as that of a message girl. In some cases nodules break down under the treatment, but this should not be taken as a contra-indication, for the healing process soon sets in, and goes on satisfactorily.

Erythema Iris.—There is no very satisfactory routine treatment for this disease. Indeed its invariable tendency to recurrence shows this. The lesions should be protected from further injury by some harmless application such as zinc ointment. The favourite boric ointment should be avoided, as it often causes great pain. The salicyl compounds are occasionally useful, but not often, and general tonics, such as quinine and the like, are more useful. Most, however, can be done by keeping the patient in the best of health, and encouraging him by telling him that the attacks will eventually cease to reappear.

Erythema Multiforme.—It is quite impossible to indicate with any definiteness how this protean condition can be successfully treated. The manifestations in the skin may be produced by a whole series of different causes, each of which must be sought for and eradicated. It may, however, be said generally that erythema multiforme is the expression of some form of intoxication, and that the search for some toxin should be thorough. In many cases it is obvious some dietetic poison can be held directly answerable for the eruption, in others it is probable that putrefactive changes in the intestines are the source of the poison; and very strict attention to diet, and the administration of intestinal antiseptics, will often result in the disappearance of the eruption.

Empirically, certain drugs are given. Ichthyol, quinine, sulphur, iodide of potassium, and ergot have been recommended.

Erythema Nodosum.—(See RHEUMATISM, ACUTE.) *Norman Walker.*

ETHMOIDAL CELLS, SUPPURATION IN.—(See NOSE, ACCESSORY SINUSES.)

EUSTACHIAN CATHETERIZATION.—(See EAR, AFFECTIONS OF.)

EYE, INJURIES OF.—We shall consider the treatment of ocular injuries under two main headings: (I). Injuries without perforation of the globe; (II). Injuries with perforation.

I.—INJURIES WITHOUT PERFORATION.

In this group will be included :—(1) Contusions, with consequent internal injuries : (*a*) Iridodialysis, and paralysis or rupture of the sphincter of the iris ; (*b*) Paralysis of the ciliary muscle ; (*c*) Iritis and cyclitis (see article) ; (*d*) Dislocation of the lens, and cataract ; (*e*) Hæmorrhage into the anterior chamber or vitreous ; (*f*) Rupture of the sclerotic ; (*g*) Detachment of the retina and retinitis (see ophthalmic text-book). (2) Abrasions of the cornea. (3) Foreign bodies in cornea or sclerotic. (4) Wounds of cornea, conjunctiva, or sclerotic.

1. **Contusions of the Eye** may cause a great variety of intra-ocular changes, many of them very severe. A guarded prognosis should be given till a complete examination (both with the ophthalmoscope and by testing the sight) can be made.

The patient must be kept at rest, and the eyes protected from the light with dark glasses. If there be pain or hæmorrhage, cold compresses should be used for the first twenty-four hours, but after the risk of further hæmorrhage taking place is over (generally in forty-eight hours), hot applications should be substituted to help the absorption of the blood. Weak atropine drops (1 or 2 gr. to the ounce) should be used till all danger of inflammation has passed. If iritis or cyclitis supervenes, it must be treated energetically (see IRITIS).

Iridodialysis :—Nothing further than the above treatment is necessary.

Paralysis or Rupture of the Sphincter Iridis, or *Paralysis of the Ciliary Muscle.*—In none of these conditions is atropine advisable unless indicated by other complications. Some recommend atropine to be used in the other eye to prevent consensual action.

Dislocation of Lens.—With dislocation of the lens the refraction is always changed. If the eye quiets down and the lens remains behind the pupil, the eye as a rule becomes myopic, and a correcting lens may be of service; after dislocation into the vitreous, a strong convex lens may improve vision. A lens dislocated into the anterior chamber should be removed. *Secondary Glaucoma* may occur (see GLAUCOMA), or *Cataract* may supervene (see CATARACT).

Intra-ocular Hæmorrhages.—Rest, dark glasses, cold compresses for twenty-four hours, followed by hot applications, weak atropine drops (1 or 2 gr. to the ounce) three times a day.

If the hæmorrhage causes rise of tension, the patient must be kept in bed, two leeches be applied to the temple, and a brisk purge given; eserine should not be used, and weak atropine may be tried tentatively, but if the tension does not come down, atropine should be withheld.

Rupture of the Sclerotic.—(*a*) Without laceration of the conjunctiva. The above treatment is all that can be given—rest, leeches, atropine, etc.—the main indication being the treatment of the consequent traumatic iridocyclitis. If the lens be dislocated under the conjunctiva, it should be left alone, when it will probably become absorbed; (*b*) If laceration of the conjunctiva has occurred, in addition to the above treatment the eye should be carefully washed out and dressed regularly with the strictest antiseptic precautions. In either case, if the eye is not quieting down in a fortnight's time, or has become a useless organ, it should be removed. In cases where the eye is clearly destroyed at the time of the injury, it should be enucleated at once.

2. **Abrasions of the Cornea.***—The conjunctival sac should be washed out with warm boracic lotion, a little atropine ointment (1 gr. to the ounce) inserted between the lids, and the eye kept tied up till the surface has healed. If there is photophobia, a shade may be worn over the good eye, or dark glasses be used, a pad of wool being placed between the glass and the bad eye sufficiently thick to keep the lid shut.

3. **Foreign Body in the Cornea or Sclerotic.**—After anæsthetizing the surface with a 5 per cent solution of cocaine, the foreign body is removed with a sterilized needle or spud, care being taken to injure the surrounding tissue as little as possible. (If pieces of hot iron from an emery wheel are embedded in the cornea, the ring of brown stain usually met with should also be removed.)

When the foreign body is so deeply embedded in the cornea that there is danger of its being pushed into the anterior chamber, a broad needle is passed into the cornea behind the foreign body, and the latter can then be removed without risk. If it is projecting into the anterior chamber, the broad needle must be passed into the chamber behind the foreign body, and kept pressed up against the back of the cornea till it is removed.

After-treatment.—The conjunctival sac should be well washed out with warm boracic lotion, atropine drops (2 gr. to the ounce) are instilled, and a pad (cyanide gamgee) and bandage worn until the eye is quiet and the surface healed. If irritation persists, and if any signs of iritis occur, the use of atropine must be continued till the eye has completely quieted down.

Should the cornea become infiltrated, see CORNEA DISEASES OF.

4. **Wounds (without Penetration) of Cornea, Conjunctiva, or Sclerotic.**—Uncomplicated wounds of the cornea are treated like abrasions, viz., by washing out the conjunctival sac, and the instillation of atropine, the eye being kept bandaged till the surface has healed. Wounds of the conjunctiva heal readily. If laceration

* The detection of an abrasion is greatly facilitated by the use of a solution of fluorescein 8 gr., sodium bicarbonate 12 gr., to the ounce. One drop is instilled into the eye, followed by a few drops of boracic lotion or solution of cocaine. The abraded surface stains *green*.

has taken place, the cut edges should be sutured with fine sterilized silk, and the eye tied up till healing is complete. Wounds of sclerotic.—If the wound gapes, the edges should be sutured (*vide infra*).

II.—Injuries with Perforation.

Penetrating Wounds are always of extreme importance, not only from damage done by the injury itself and by the consequent inflammation, but from the possible danger to the other eye by sympathetic ophthalmitis. In treating penetrating wounds, therefore, we have to find out: (1) How far the injured eye is likely to be a useful visual organ; and (2) How far it is a menace to its fellow. In answering these questions five considerations are very important.

(i.) *Does the Eye contain a Foreign Body?*—If so, it not only will almost certainly be lost from iridocyclitis, but it is a danger to its fellow. Therefore, as a general rule, such an eye must have the foreign body removed, or be itself removed. (N.B.—A foreign body is tolerated best in the lens. Of foreign substances found in eyes, glass seems to be the least irritating; while of metals, iron and copper, especially the latter, are very irritating).

(ii.) *Has Septic Matter been introduced?*—If so, the eye will in all probability be lost from iridocyclitis or panophthalmitis. Chronic iridocyclitis following a penetrating injury is very liable to cause sympathetic trouble in the other eye. Panophthalmitis, while causing complete loss of the eye, does not as a rule cause any sympathetic mischief.

(iii.) *Is the Lens injured?*—This is discovered on careful examination by oblique illumination and with the ophthalmoscope after dilatation of the pupil.

Traumatic cataract will almost certainly follow, and hence binocular vision will be lost: for however well the eye quiets down, and the opaque lens is absorbed or artificially removed, an eye supplemented by a strong convex glass, in place of its own lens, will practically never work with its uninjured fellow. On the other hand, though binocular vision is lost, an eye without a lens is very useful, in that it enlarges the field of vision on a side which would otherwise be blind, and thus gives invaluable assistance in crossing streets, driving, etc.

If the wound in both lens and cornea is large, the lens capsule is very likely to be entangled in the corneal wound, and as this cannot be recognized directly after the injury because of the transparency of the capsule, it cannot be removed. It is now generally accepted that entanglement of the lens capsule in the wound is nearly as dangerous in its liability to cause sympathetic ophthalmitis as entanglement of uveal tissue (*vide infra*).

An eye whose lens has been injured takes a long time to quiet down, since it has the double work of recovery from the trauma, and the absorption of the lens.

From these three considerations we see that though a reasonable attempt should be made to save an eye with an injured lens, yet it is not justifiable to run the same risk as in trying to save one with an uninjured lens.

(iv.) *Is there Prolapse of Iris, Ciliary Body, or Choroid?*—A protrusion of any part of the uveal tract on the surface of the eye, since it is liable to direct infection from without, is very dangerous from the point of view both of sympathetic ophthalmitis and panophthalmitis. The more completely these protrusions can be removed the greater is the chance of recovery. Hence, prolapse of the iris, being more easily separated and excised, is less serious than prolapse of the ciliary body, where freeing of the wound from all entanglements is seldom possible. A wound in the ciliary region with prolapse of the ciliary body is the most dangerous of all penetrating injuries. A prolapse which cannot be removed, even if the eye quiets down after the injury, is always a possible source of danger, and must be looked upon as a serious condition.

(v.) *Is there Internal Displacement of the Contents of the Eye?*—When there is displacement or loss of the lens, prolapse of retina, etc., in addition to the external wound, enucleation should be performed at once; but if there appears any chance of retaining a useful organ, tentative treatment may be tried (*vide infra*).

Having given the main indications for forming an opinion as to whether the injured eye is likely to be useful or useless, safe or dangerous, we will consider the treatment of these various complications.

Foreign Body in the Eye.—The presence of a foreign body may be surmised from :—

(*a*) *The History.* What struck the eye? What was the patient doing when the eye was struck? (e.g., If the patient was hammering or chopping, and something small struck the eye which was not afterwards found, it is very possible a small chip of metal entered the eye.)

(*b*) *The Appearance of the Eye.*—By careful oblique illumination a minute track may be discovered through the cornea or lens, or a small gap seen in the iris; or again, the ophthalmoscope may reveal a track through the lens or vitreous, a scar on the retina, or even the foreign body itself.

(*c*) *X-ray Photograph.*—This may show the presence of a foreign body.

(*d*) *Use of Haab's Magnet.* If pain is experienced on bringing the eye close to one of these powerful magnets, there is strong evidence of the presence of a piece of iron.

If a foreign body is visible it must be removed, either with the magnet or forceps, according to its nature. If invisible, it must be carefully localized by means of X-ray photographs. If it is a chip of iron it should be removed with a strong electro-magnet; if of some non-magnetic material, its removal with forceps should be attempted, though the chance of success is small.

For after-treatment, *vide infra.*

Septic Wounds.—Here little can be done to save the eye. If panophthalmitis has set in, evisceration of the globe should be performed without delay. The cornea is first removed, and the contents of the globe are then completely scooped out, the sclerotic being left to shrink up. This is a tedious process, lasting fourteen days or more, so that some prefer enucleation of the globe. But the danger of meningitis is a very real one after enucleating a suppurating eye, being brought about by infection of the vaginal sheath of the nerve by the scissors, with pus which has escaped from the eye. If enucleation is preferred, evisceration is first done, followed by very thorough irrigation of the empty sclerotic and conjunctival sac; the sclerotic is then stuffed with gauze in order to make its enucleation more easy, which, after a second irrigation of the conjunctival sac, is then performed. A drainage tube should be used, and inserted right to the back of the orbit, to prevent any discharge collecting round the cut end of the optic nerve.

When only the anterior chamber is infected and contains pus, and there is no sign of pus in the vitreous, an attempt may be made to disinfect the eye by washing out the anterior chamber with normal saline, chlorine water, or hydrogen peroxide. (For after-treatment, *vide infra.*) It is, however, seldom successful in preventing panophthalmitis, and the eye has usually to be excised or eviscerated.

If chronic iridocyclitis occurs, and does not subside at the end of ten days or a fortnight, the eye should be excised, especially if the cornea has become hazy, the iris muddy, and spots of keratitis punctata are seen on the back of the cornea.

In cases where there is no entanglement of uveal tissue or lens capsule, and the cornea and iris remain bright, we may wait a little longer; but three weeks must be taken as a limit, beyond which it is unsafe to temporize.

Wounds of the Lens.—*Clean Punctured Wounds* of the lens often give rise to

no trouble beyond the traumatic cataract which almost invariably follows any injury of the lens capsule.

Atropine drops should be given to keep the pupil dilated, to allow soft lens matter to come forward into the anterior chamber, and to prevent the formation of posterior synechiæ. If iridocyclitis sets in, it must be treated in the ordinary way, with rest, atropine, hot bathing, etc. If soft lens matter collects in the anterior chamber and causes increased tension, it must be let out by a curette evacuation.

Large Wounds of both Cornea and Lens as a rule do badly; the eye usually does not quiet down and has to be removed. The wound must be freed from all entanglements or prolapse of uveal tissue or lens capsule as far as possible, any soft lens matter which has collected in the anterior chamber should be let out, and an attempt made to save the eye. For after treatment *vide infra.*

In all wounds of the lens the danger of entanglements of lens capsule must not be forgotten (see above), and if the inflammation is not subsiding in two weeks' time, enucleation is the safest course. At times the eye does well up to a certain point, the cornea and iris remaining bright, but still some irritability and congestion remain; in these cases, if a tag of capsule is seen adherent to the wound, division of this will sometimes allow the eye to recover completely.

Prolapse of Uveal Tissue.—The chief danger being infection of the uveal tract from without, through the prolapse itself, our main object must be—(1) Either to remove the prolapse so completely that no trace of uveal tissue remains, either on the surface, included in the wound, or even adherent to the back of the wound (the first is the most, the last is the least, dangerous condition); or (2) If it is impossible to remove the prolapse, we must endeavour to separate that portion of the uveal tissue incarcerated in the wound from the rest of the uveal tract.

Prolapse of Iris.—(*a*) In cases seen directly after the injury, cocaine is instilled, or a general anæsthetic given, according to the character of the patient; the conjunctival sac is carefully washed out with boracic lotion, all particles adherent to the wound being thoroughly removed; the prolapse is picked up with forceps, gently freed all round from the lips of the wound with the repositor, and then drawn out as far as it will come, and cut off close to the cornea. We hope by this means that the iris, after being cut, will retract free from the wound. (In drawing out the iris a second pair of forceps is often of great use to grasp the iris close to the cornea and pull it out still further, after the first pair have done all they can.) Any remaining tags of iris are removed or replaced.

If forceps have to be introduced into the anterior chamber to remove tags of iris, and the lens is not already injured, great care must be exercised lest the lens capsule be divided accidentally with the forceps, and a traumatic cataract supervene—a most disastrous accident.

(*b*) Four days after an injury such firm adhesions will have taken place that a prolapse cannot be freed. If the adhesion is small and not close to the periphery, it may be divided by a cutting needle introduced into the anterior chamber. If near the periphery a linear knife may be passed across the anterior chamber and the base of the prolapse cut across, followed by an iridectomy, so as to free the adherent portion of the iris from its attachments. For after treatment, *vide infra.*

Entanglements of Iris.—Where the iris is only entangled in, or adherent to, the wound, and there is no prolapse on the surface, there is no direct communication from the surface to the uveal tract after the wound has healed. These cases are therefore much less serious than cases of prolapse. On the other hand, it is well known that though wounds with entanglements often quiet down well, yet they do not do this so quickly as wounds with no entanglements or where

these have been freed. Hence, as a guiding rule, if at the time of the injury the entanglement can be easily freed, this should be done, either with a cutting needle introduced into the anterior chamber, or by an iridectomy through the wound. If this is impossible, the eye should be treated in the ordinary way with rest, a pad and bandage, atropine, etc. (*vide infra*), and be given a chance of quieting down. If it does not do this in a fortnight's time, and the pulling of the iris appears to be the only cause of irritation, division of the synechia should be undertaken.

Prolapse of the Ciliary Body and Choroid.—These cases are more dangerous than those with prolapse of iris, because of the difficulty of freeing the prolapse. A prolapse of the ciliary body or choroid, which is not infected or lacerated, should in recent cases be pushed back and the sclerotic brought together with sutures (*vide infra*). If, however, laceration has taken place, or infection is probable, the prolapse should be drawn out with forceps and excised as in the case of the iris, and the sclerotic sutured. When four or five days have elapsed since the injury, the prolapse cannot be removed, and must therefore be left.

In either case, whether the prolapse has been removed or not, we must fully recognize that we are dealing with a condition the most dangerous of all in its liability to cause sympathetic ophthalmitis. If the other eye is sound, we are not justified in running any serious risk in trying to save its injured fellow, lest in our endeavour to save the one we lose both. Should the eye, therefore, not begin to improve in a week or ten days, it had better be excised.

Wounds of the Sclerotic.—Where it is thought desirable to try to save an eye with a gaping wound of the sclerotic, with prolapse of ciliary body, choroid, or vitreous, after anæsthetizing either locally or generally, the conjunctival sac should be washed out, the uveal tissue pushed back or excised, the vitreous snipped off, and the sclerotic brought together with sutures. These are passed in the following way: we use a double-needled suture of fine sterilized silk, and having grasped the sclerotic firmly with toothed forceps to prevent further loss of vitreous, we pass each needle from within outwards, not quite through the whole thickness of the sclerotic, and then through the cut edge of the conjunctiva, taking great care not to include any uveal tissue in the suture or in the lips of the wound. In this way the whole wound is brought firmly together with as many stitches as are necessary.

After-treatment of Penetrating Wounds.—The conjunctival sac is carefully washed out both before and after any operation that may have been done. Sterilized atropine drops are instilled, or atropine ointment inserted between the lids. Strict asepsis is observed throughout. A pad of cyanide gamgee tissue is used as dressing, and the eye is bandaged. Two leeches are applied to the temple, a purge is given, and absolute rest in bed is enjoined. The eye is dressed daily, and the use of atropine continued till all danger of inflammation is over.

If iridocyclitis supervenes, more energetic treatment must be adopted, viz., atropine three times a day, hot applications, further leeching, light diet, etc. (See Iritis.)

If the eye quiets down in a fortnight or three weeks, it may be saved; but if after the first week the eye gets steadily more red, and especially if the cornea becomes hazy, the iris muddy, and spots of keratitis punctata appear on the back of the cornea, it should then be excised without further delay.

It is usually considered that we are safe from sympathetic mischief for about three weeks after an injury, but symptoms have occurred within ten days, which points to the process having begun even earlier; so that unless there appears to be a good chance of saving a useful eye, we are not justified in postponing excision beyond ten days or a fortnight. Too great a risk must not be run, lest blindness in both eyes be the result. *W. Tindall Lister.*

EYELIDS, DISEASES OF.

Meibomian or Tarsal Cyst (Chalazion) is a benign neoplasm identical in structure with granulation tissue. In the earliest stages of these little growths, hot boracic bathing and the use of ung. hydrarg. oxid. flav., 4 gr. to the ounce, will sometimes lead to their absorption. Failing this, should the tumour prove disfiguring, or cause discomfort, it should be removed by incising and scraping. After a few drops of 2 per cent sol. cocaine have been instilled into the conjunctival sac, the lid must be everted and a few crystals of solid cocaine applied to the conjunctiva immediately over the swelling. Using a Beer's knife, a free vertical incision should now be made, and the granulation tissue removed by a thorough scraping with a small scoop until, on manipulation, no tumour can be felt. It is most important that all this tissue be removed, otherwise the swelling will most certainly recur. Sometimes these growths are exceedingly hard and fibrous, and quite impossible to remove by scraping. They should then be dissected out through the skin of the lid after a subcutaneous injection of eucaine and adrenalin.

The small marginal chalazia which occur at the border of the lid should be shaved off level with the surface, and scraped.

Hordeolum (Stye) is an inflammation of the ciliary follicle, and is frequently associated with a lowered state of health or some error of refraction. In its treatment, therefore, the health of the patient must be inquired into, and suitable tonics given. The refraction must also be carefully investigated, and glasses ordered if necessary.

Locally, in the early stages, epilation of the eyelash corresponding to the inflamed follicle, followed by hot boracic bathing and the application of ung. hydrarg. oxid. flav., 4 gr. to the ounce, will often cut short the attack. If pus develops, a small incision must be made, and hot fomentations be applied until all swelling has subsided.

Ptosis, or drooping of the upper lid, may be congenital, paralytic (third nerve or sympathetic), or the result of long-standing inflammation, e.g., trachoma.

Congenital Ptosis.—Slight cases of this condition require no treatment, but if more than half of the pupil is covered by the lid, an operation is indicated. Of the many plans devised to rectify the deformity, those of Hess, Mules, and Panas give the best results.

Paralytic Psosis.—When resulting from paralysis of the third nerve, a course of general treatment directed against the constitutional cause should be carried out. In the slight form resulting from sympathetic paralysis, no local treatment is necessary, as the drooping of the lid is never sufficient to interfere with sight.

Inflammatory Ptosis.—In these cases we must, of course, treat the disease which is giving rise to the deformity.

Epicanthus.—Only in extreme degrees of this congenital abnormality is operative interference justified, for the deformity tends to lessen or disappear with the development of the bridge of the nose. In such cases a vertical ellipse of skin should be excised from the dorsum of the nose.

Blepharitis.—Clinically we meet with two well-defined groups of cases.

1. *Blepharitis Squamosa.*—Characterized by the presence of branny scales along the margin of the lid which, when removed, expose a hyperæmic but not ulcerated surface.

Very frequently some refractive error which causes congestion of the lids is the chief etiological factor, and this should be corrected by suitable glasses; at the same time, the general health must be inquired into, and treatment adopted when necessary.

Locally, strict cleanliness, the removal of the scales by the frequent use of

an alkaline lotion, e.g., sod. bicarb., 10 gr. to the ounce, and anointing the lid margins night and morning with a mercurial ointment, e.g., ung. hydrarg. oxid. flav., 4 gr. to the ounce, or ung. hydrarg. nit. dil., is all that is necessary.

2. *Blepharitis Ulcerosa*, in which the lid margin is covered by firmly adherent yellow crusts which, on removal, expose an ulcerated surface. This is a much more severe form of blepharitis, and may lead to permanent malformation of the lid, or destruction of the ciliary follicles. As in blepharitis squamosa, the general health and refraction must first be carefully investigated. In the severer forms of this disease it is a good plan to commence treatment by epilating the lashes in the affected areas, and after a thorough cleansing and removal of the scales, to paint the lid margin with silver nitrate, 10 gr. to the ounce, or protargol, 25 gr. to the ounce. Subsequently, frequent bathing with an alkaline lotion and anointing the lid borders with a weak mercurial ointment must be energetically persevered with.

In the worst forms of this disease, when the lids are thickened and rounded, and epiphora from stenosis or eversion of the puncta is a marked symptom, it becomes necessary to slit up the lower canaliculus for the outer two-thirds of its extent.

Entropion, or Inversion of the Eyelids.—*Spasmodic Entropion* of the lower lid is met with most frequently in old people, and is particularly liable to occur if the eye has been bandaged. In the slight cases, it is generally sufficient, after dispensing with the bandage, to evert the lid into its normal position, and fix it by means of strapping. Equally good results may be obtained by painting the skin of the lower lid with collodion, or pinching up a horizontal fold of skin and transfixing it with two or three vertical sutures, which are tied and allowed to remain until they cut their way out.

In the severer forms of this condition, the above methods are insufficient, and it becomes necessary to remove a narrow strip of skin and orbicularis muscle. After a subcutaneous injection of eucaine and adrenalin, a horizontal fold of skin as near the lid margin as possible is picked up with forceps and excised with a pair of scissors. A fold of the underlying orbicularis muscle is then removed in a similar manner. After taking care to arrest all hæmorrhage, a few sutures are inserted and the wound is dressed with gauze.

Cicatricial Entropion.—The most common etiological factors in this form of entropion are trachoma and the cicatrization following burns. An operation is necessary to correct the deformity, and one of three procedures is commonly adopted. (1) Restoring the incurved tarsal cartilage to its normal position —Streatfeild's or Burow's operation. (2) Transplantation of the lash-bearing portion of the lid—Arlt-Jaesche. (3) Removal of the lash-bearing portion of the lid.

Ectropion, or Eversion of the Lid.—*Senile Ectropion.*—In the milder cases of this condition, it is important to direct the patient, when wiping his eye, always to pass the handkerchief from below upwards, and so avoid the lid being still further dragged away from the eyeball. The conjunctiva must be carefully treated with astringents (e.g., guttæ zinci sulph., 1 gr. to the ounce), and the application of silver nitrate, 10 gr. to the ounce, twice weekly. Failing this, an effort may be made to replace the everted lid by the cauterization of the conjunctiva with the actual cautery and slitting the outer two-thirds of the canaliculus. In the severer forms, when the lid is much everted and the exposed conjunctiva redundant and thickened, a more extensive operation is indicated, as Snellen's suture, or Argyll Robertson's or Tweedy's operations.

In *Paralytic Ectropion*, from paralysis of the orbicularis palpebrarum muscle, slitting the canaliculus should first be tried, but will probably prove insufficient; it then becomes necessary to shorten the lower lid by a suitable operation.

Cicatricial Ectropion is the most intractable form of ectropion with which we have to deal, and may result from cicatrization following burns, wounds, cellulitis, lupus, etc.

An operation is always necessary, and the procedure to be adopted must of necessity vary with the amount of destruction of the parts, and often requires much thought and ingenuity. *Ilbert Hancock.*

FACIAL PARALYSIS (Bell's Palsy).—Treatment varies according to the cause. In syphilitic cases we administer mercury and iodide of potassium. Cases due to suppurative conditions of the middle ear, implicating the nerve within the Fallopian aqueduct, must have the area of suppuration promptly treated, if we are to prevent total destruction of the nerve. In wounds of the face or neck, which have divided the nerve after its exit from the stylomastoid foramen, primary suture of the nerve-trunk must be performed.

By far the commonest, however, is the so-called "rheumatic" variety. In such a case, a fly-blister should be applied over the front of the mastoid process, as nearly as possible over the site of the stylomastoid foramen. We also, at the start, give diaphoretic medicines and a smart purge, meanwhile protecting the patient against chills. Sometimes there is considerable pain at the onset of these "rheumatic" cases. This can usually be allayed by antipyrin in 10-gr. doses, repeated if necessary. The time of reappearance of motor power varies according to the severity of the inflammation of the nerve. In any case, until motor power begins to reappear, the paralyzed muscles must be stimulated several times a day with the continuous current, for about a quarter of an hour at a time, in order to maintain their nutrition. This the patient should be taught to do for himself, sitting in front of a mirror, so as to see that the muscles actually contract. The negative pole is stroked gently along the muscles, radiating in different directions forwards from the ear, whilst the positive pole is placed on the back of the neck or some other "indifferent" spot. The galvanic current should be moderate in strength, just enough to produce distinct muscular contraction. The patient must persevere scrupulously with this treatment daily, until voluntary power begins to return. Gentle massage, especially vibratory massage, of the paralyzed muscles, should also be practised every day. Under this régime most cases of "rheumatic" facial palsy gradually recover, more or less completely.

But there remains a certain proportion of cases which, in spite of massage and electrical treatment, show no signs of recovery. These are chiefly cases secondary to otitis media, or traumatic cases following operation, injuries, or fractures of the base of the skull. Until recently, such cases were regarded as incurable; but within the past year or two, a number have been recorded in which the operation of nerve-anastomosis has yielded encouraging results.

I have elsewhere, in conjunction with Messrs. C. A. and H. A. Ballance, and also with Mr. G. L. Cheatle, recorded cases where the following procedure was carried out.

The facial and hypoglossal nerves are exposed, the facial nerve is cut across as high as possible, close to the stylomastoid foramen, and its distal segment is turned down and united by sutures to the hypoglossal, either to its side (end-to-side) or the hypoglossal is divided and its central segment united (end-to-end) to the distal segment of the paralyzed facial. The result of this procedure is that, within a few weeks, the facial nerve begins to regain voluntary motor power. At first this is only manifested when the patient tries to move his tongue, but later, the patient learns to perform dissociated facial movements independent of the tongue, and finally even emotional movements, such as smiling, can be accomplished by the face through the new channel of the hypoglossal. The

corresponding half of the tongue, of course, undergoes atrophy, but this causes the patient no appreciable inconvenience. The original cases by Mr. Ballance and myself were done by facio-accessory anastomosis, but later results, where the hypoglossal was selected instead of the spinal accessory, have convinced us that facio-hypoglossal anastomosis is the better operation of the two.

There remains a further question: In what cases are we justified in recommending treatment by nerve-anastomosis? In other words, how long are we to wait before regarding a case as incurable without operation? I believe a good rule is to persevere faithfully with electrical treatment and massage for at least six months. If, after that period, no signs of return of voluntary motor power have appeared, we should recommend operation. Of course, in cases where, from traumatism, we know that the nerve has been definitely cut across, and where it is impossible to join the upper and lower segments by primary suture, we should not wait, but should perform facio-hypoglossal anastomosis without further delay. (See also ELECTROTHERAPEUTICS, and NERVES, PERIPHERAL.)

Purves Stewart.

FACIAL SPASM (Facial Tic or Histrionic Spasm).—This disfiguring malady consists of clonic spasm of the facial muscles, and may be confined to one of its branches, to one group of muscles, or may involve the whole of those of the affected side of the face. It is due to central causes, but perhaps also to irritation of branches of the fifth nerve.

General tonic treatment, massage, nerve tonics, and sedatives have been tried before the patient is brought to the care of the surgeon. All peripheral irritation must be eliminated before resorting to operation.

Nerve stretching has been tried, but without lasting success in the majority of the cases. In a severe case, division of the nerve at the stylomastoid foramen, followed by anastomosis to the hypoglossal, is the only treatment which holds out hope of success. Before proceeding to this, a trial may be given to the injection of alcohol around the nerve at its exit from the stylomastoid foramen. (See also NERVES, PERIPHERAL.)

James Sherren.

FAVUS.—It is a very easy matter to lay down the principles of treatment for this disease, for they are summed up in two words—epilation and antiseptics. Until recently, however, practice lagged long behind principle, and the cure of a wide-spread case of favus was rare. The barbarous pitch-cap of the Middle Ages was replaced by more humane but less efficacious methods, and it was not until the value of the X rays as a depilatory began to be recognized and taken advantage of, that one undertook with any confidence the treatment of favus. With their assistance one may hope to cure the most extensive case in not more than six months. The only essential is, that the application be sufficient without being overdone. The method of affection of the hair makes epilation more thorough and much easier than in ringworm, and in a month the scalp should be absolutely bald. During this month, and even more after it, energetic local antiseptic treatment should be employed, so that the fragments of fungus still lurking in the empty and now open follicles, may be destroyed before the new hair, which very soon begins to grow, becomes affected. Resorcin is strongly recommended by many, while various copper salts, such as the oleate and the sulphate, and white precipitate and other mercurial ointments also have their advocates. Whichever be selected, the essential condition for success is that they be thoroughly massaged into the scalp, and thus into the empty follicles.

Norman Walker.

FEVERS, ACUTE INFECTIOUS.—General Treatment.—To avoid repetition it is proposed to deal in this section with such matters of treatment as are common to all the acute infections.

The patient who presents symptoms of one of these diseases, should at once be confined in a room by himself, and if necessary ordered to bed. It is hardly possible to insist too strongly upon these measures, in the interests not of the patient only, but of those around him. When the symptoms are inconclusive, a few days will, in the majority of cases, determine the nature of the illness and the necessity for further isolation.

The room should be airy, with free ventilation and ample windows, and have preferably a southern aspect. If it is situated on the ground floor or provided with a balcony, so much the better, for in fine weather the patient can be wheeled or carried into the open air long before he is able to get up and walk. The upper sash of the window should be kept constantly more or less open, according to the state of the weather, care being taken so to place the bed that the patient does not feel a draught. The temperature of the room should not, if possible, be below 55° or above 65° F., but should be equable. Even in warm weather a small fire will be required, not only for heating food or drink, but for burning articles that have been used in the treatment, especially in cases of diphtheria, scarlet fever, chicken-pox, small-pox, and erysipelas.

Before the patient is moved into the room, all valuable and unnecessary articles of furniture or ornament should be taken out, to avoid the risk of damage afterwards by disinfection. In these days of cheapness a small expenditure will make a room look cheerful with objects that can be destroyed when they are no longer required. Plants and cut flowers may be allowed, but the latter should be removed at night and renewed daily.

If circumstances permit, two rooms should be allotted to the patient, to be occupied and thoroughly aired alternately day and night. In diphtheria and typhoid fever, however, it is usually undesirable to move the patient more than is absolutely necessary, and one room must suffice.

During the febrile stage the patient requires but slight bed-covering—a single sheet, or a sheet and light counterpane. When convalescence is reached, blankets may be added. For children, and for adults when there is a risk of soiling the bed, as in delirium or coma, a mackintosh sheet should be placed beneath that on which the patient lies. In prolonged cases of fever a draw-sheet and mackintosh draw-sheet should also be used. The nurse should be particularly enjoined to be careful that there are no creases in the sheets beneath the patient.

In typhoid and other prolonged fever cases in adults, it is very convenient to use nightgowns that can be opened front and back, or better still at each side. This arrangement facilitates the daily washing by the nurse and examination by the medical attendant. During the period of fever a single linen garment only is necessary.

Those in actual attendance upon the patient should not mix with other members of the household or with the outside world, without taking precautions against the spread of infection by wearing a washable outer garment or overall in the sick-room, and by thoroughly cleansing the hands on leaving it. To hang outside the door a sheet soaked in some disinfectant is not necessary, but is useful as a warning to unauthorized visitors. Visitors to the patient must take the same precautions to prevent the spread of infection as those in attendance upon him. Dirty clothing and bed-linen should be placed in a metal receptacle and removed for disinfection by the sanitary authority every day. Soiled linen should, if possible, be steeped in antiseptic liquid before removal ; this is especially desirable in typhoid fever.

At the end of the illness the room and its contents must undergo thorough disinfection, which is best carried out by the sanitary authority under the direction of the Medical Officer of Health. The floor and woodwork should be scrubbed, first with soap and water, and afterwards with some disinfectant. The

walls should be submitted to the same process, unless they have been covered with paper that washing will destroy, in which case they must be re-papered. The ceiling must be re-whitened. Bedding, clothing, carpets, and books must be submitted to the heat of steam under pressure. Articles made of leather, skin, or fur are ruined by this form of heat; for them dry heat will in most instances be sufficient. Metal and wooden articles must be washed with a disinfecting solution. The nurse should be directed to mix some strong liquid disinfectant with the excreta before throwing them into the drain.

The best diet during the febrile stage is milk diluted with water, one part to three of milk. Two to four pints of milk can be taken in the twenty-four hours. Most patients do very well on this diet; but in prolonged fever, when they are not too ill to appreciate taste, they tire of milk alone. Then the milk may be flavoured with tea, coffee, cocoa, or chocolate, or a cup of these beverages may be given two or three times a day. Now and again an egg may be beaten up in the milk; custard, junket, and milk jelly are agreeable variations. When milk is undigested it should be peptonized. In severe cases whey is an excellent substitute for milk. Albumen water may also be given.* Thirst is a very common complaint in fever, and there is no objection to letting the patient drink as much water as he likes. The juice of two lemons should be taken with the water daily. In severe cases of fever it is rare to find the patient hungry, so that it is unnecessary to consider the question of giving solid food till the stage of convalescence is approached. The patient's appetite is then the best guide, and in short stages the usual diet of health is soon reached. Some cases of typhoid fever form exceptions to this rule; more will be said on the subject in the article dealing with that disease. In all the other infectious diseases, when the attack is mild, there is no objection to a fish diet (fish, bread and butter, potato, rice pudding, etc.), during the earliest period.

Beef-tea, gravy, and meat soups are undesirable during the febrile stage, except as a change, and then only in small quantities and not concentrated. The extractives they contain throw too much work on the kidneys.

In serious cases of fever stimulation of the heart will almost certainly be required sooner or later; and the answer to the question, What is the best stimulant? largely depends upon the disease and the patient. In adults suffering from typhoid or typhus fever, for instance, the application of cold water to the skin is an excellent stimulant; but in children this measure should be used with caution. The cause of the cardiac failure in toxic diphtheria is fatty degeneration of the heart-muscle, often extreme; and in many cases stimulants are absolutely useless because there are not enough healthy muscle-fibres left to respond. But, subject to some observations as to the use of cold water to be made below, the writer is of the opinion that the most valuable cardiac stimulants are strychnine, quinine, and wines and spirits. Camphor, also, is by no means to be despised. If, in a prolonged case of fever, the medical attendant finds signs of slowly increasing failure of the heart, he will prescribe liquor strychninæ, 3–5 min., or sulphate of quinine, 1–3 gr., or spirits of camphor, 5–10 min., every three or four hours. The disagreeable taste of the camphor may be disguised in port wine. Brandy, up to 4 oz. in the twenty-four hours, is also very useful. With these drugs tincture of digitalis, or strophanthus, or citrate of caffeine may be prescribed with advantage. In desperate cases, good champagne (3 or 4 oz. every two or three hours) is preferable to brandy. But, when cardiac failure comes on suddenly, the best stimulant is strychnine hypodermically, in doses of $\frac{1}{60}$–$\frac{1}{15}$ gr. of the hydrochloride. Hot coffee, with brandy,

* There are many excellent patent foods on the market, which are suitable in cases of fever. They are known to most practitioners, and, being freely advertised in proper places, are not mentioned here.

should be injected into the rectum. Hot applications to the præcordial region, and flapping this region with a corner of a wet towel, are also efficacious measures at times. It is not necessary to give alcoholic beverages in a routine way; but if the patient has been accustomed to take wine, spirits, or beer, he may be allowed to have them in moderation during his illness, especially during the convalescent stage.

It is sound treatment at the beginning of an attack of fever, even though at the time the symptoms are doubtful, to give a purge; castor oil and calomel (up to 5 gr.) are the most suitable.

An abnormally high temperature frequently requires treatment. Before discussing the various methods which may be employed, it may be well to point out that a rise of temperature is not the only sign of fever, and that there is wide variation in the symptoms accompanying a rise of temperature. For a reason which has never appeared very clear to the writer, 102·5° F. has been fixed as the limit, below which it is usually not needful to have recourse to antipyretic remedies. But in some patients restlessness and delirium are as troublesome with a temperature of 101°–102° as they are in others with a temperature of 103°–104°; and the writer believes that in diseases like typhoid and typhus fevers, in which the temperature is raised for many days together, the best results are not obtained by waiting till the temperature rises to 102·5° before employing such measures as baths, packs, and the like. The application of cold water to the skin in cases of fever was in use long before the invention of the clinical thermometer. When, therefore, sleeplessness, restlessness, delirium, dryness of the mouth and tongue, sordes on the gums and teeth, and a dry skin, are present, one or other of the following methods of hydrotherapy will certainly be beneficial.

Sponging.—The patient being loosely wrapped in a blanket, his trunk and limbs should be successively exposed and sponged for about five minutes each, with a sponge partly wrung out of water. He should be left another half-hour in the blanket before being put between the sheets.

Wet Pack.—The patient's trunk and limbs are enveloped in a sheet wrung out of water. He is then laid on the bed between two blankets. At the end of the time specified, usually fifteen to thirty minutes, the sheet is taken off, the skin quickly and lightly dried with a towel, and the patient placed between warm blankets.

In the continuous wet pack, the patient's trunk and limbs, only so far as elbows and knees, are wrapped in a sheet wrung out of tepid or warm water. The extremities of the limbs should be wrapped in wool. The patient may be kept in the pack between blankets for several hours or days. The sheet, when it becomes dry, and if it is undesirable to move the patient in order to apply a fresh sheet, may be made wet again by squeezing water on it from a sponge. When it is soiled it must be changed.

Baths.—The patient is immersed, in the recumbent position, up to his neck in water. In this he is kept for five to twenty minutes. The baths should be repeated every three or four hours. It must be admitted that in a private house it is not always easy to give a bath to a patient who is very ill with fever, especially with typhoid fever. It is seldom that the bath available is sufficiently large. But it can be managed if pillows or pads are placed along the bottom and sides of the bath, and the patient is lowered into it with a sheet. To accomplish this safely in the case of an adult of average weight, three persons will be required. But the apparatus, devised by Dr. Bull, of Auckland, New Zealand, a description of which follows, may be used (*Fig.* 15). "A piece of mackintosh sheeting, 8 feet by 4 feet, is taken; the sides are looped to receive stretcher poles; the latter should be at least 8 feet long, and 1½ inches in diameter.

In order to apply the bath . . . . the patient is gently semi-rotated so that he lies, say, on his left side and near the edge of the bed ; the mackintosh sheeting, half rolled up, is introduced under him in the same way as a draw-sheet ; he is now moved again on to his back, and thus lies in the centre of the sheeting. The stretcher poles are now run through the looped sides of the sheeting, and secured to the ends of the bed, if rounded, by a simple sling ; if square they rest on them. If the head and foot of the bed are not raised, a simple support of wood for the stretcher poles to rest on, is all that is necessary. A pillow is now introduced under the patient's head, beneath the mackintosh, and the sheeting at the foot is secured by a safety-pin. The bath is now ready, and water of the required temperature can be introduced, in sufficient quantity, if necessary, to cover the patient's body entirely. When the bath is over, one of the stretcher poles is drawn out, and the water allowed to flow into a receptacle at the side of the bed ; this it does very readily if the bed be slightly tilted. The second stretcher pole is now drawn out, and the mackintosh sheeting removed in the reverse way to that in which it was placed beneath the patient."

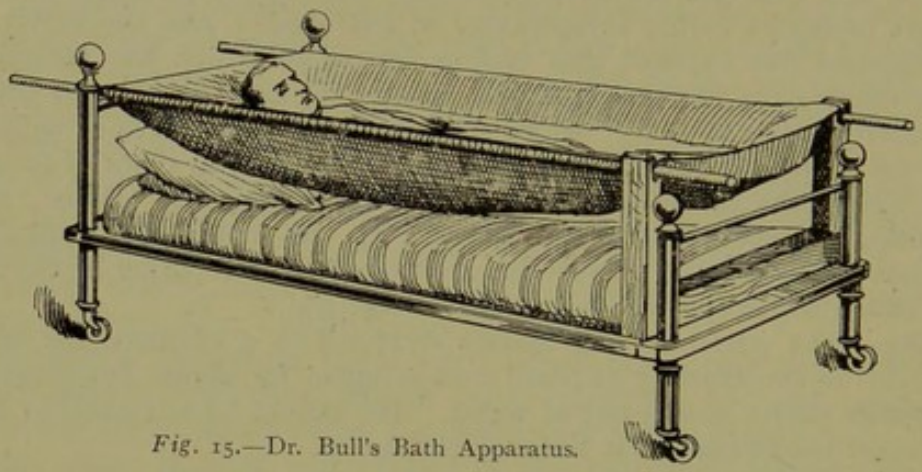

Fig. 15.—Dr. Bull's Bath Apparatus.

This apparatus can be made cheaply and quickly. It can be applied easily by two persons, and even by one.

In hospital practice a tank on wheels is very convenient for carrying out the bath treatment. The tank, 6 ft. 4 in. long, 1 ft. 8 in. wide, and 1½ ft. deep (inside measurements), is made of wood lined with zinc. It is supported on an iron frame, beneath which are four small, rubber-tyred wheels ; the two wheels at one end move on a pivot, so that by means of a handle at that end the tank is easily moved in any direction. In the bottom of the tank is a hole (with a plug) leading to a pipe, and the hole and the pipe should be large, to allow the tank to be emptied rapidly. A stretcher must be provided of such a size as to be placed easily within the tank. It should consist of an oak or teak frame on which is stretched a piece of stout waterproof canvas with a few openings cut in it, so that the water can run quickly through when the patient is lifted from the tank. A head-rest of iron rod and canvas is fixed to one end of the stretcher. A stout piece of plank about a foot longer than the width of the tank is also required. The patient, covered with a single sheet, having been moved gently to one side of the bed, the stretcher is laid upon the other. It is then very easy to shift the patient on to the stretcher with very little movement. The stout piece of plank is laid across one end of the tank. The stretcher is lifted, and placed with one extremity resting on the free end of the tank, and the other on the piece of plank. The patient's face, neck, and shoulders are then sponged for a few minutes with the water in the tank, into which, after the plank has been removed, he is gently let down. On removing him from the bath, the stretcher is placed for three or

four minutes on the end of the tank and on the plank, to allow the water to run off, and a dry sheet to be substituted for the wet one ; meanwhile the patient's face and hair are lightly rubbed dry with a towel. He is then, without drying the trunk and limbs, put to bed between warm blankets, the bath-sheet being removed, with a hot water-bottle to his feet, and allowed to remain half an hour or so before the bed is properly made.

The temperature of the water used in sponging, packing, or bathing depends upon the circumstances of the case. In warm summer weather patients will enjoy a bath at a temperature of 80° F., yet they will object most strongly to the same bath in the winter time, even though the temperature of the ward is 60° to 65° F. Cold baths are not borne well by children, old persons, and those with feeble circulation, acute or chronic. For such patients tepid or warm baths should be employed. For sponging, water at 65° to 70° should be used ; but in severe cases, colder, and even iced, water may be necessary. For cold packs the water should be 75° to 80° ; but in the continuous pack it should be 90° to 98°. In the strict Brand's bath-treatment the temperature of the water is 65° to 70°. But in the writer's opinion this is unnecessarily low, and he prefers a temperature of 80° to 90°, except in cases of hyperpyrexia, when iced water may be essential for baths or packs. If water at a temperature of below 80° is used, it is advisable to give the patient a stimulant just before the bath, and to administer vigorous friction to the extremities while he is in it in order to keep up a free circulation. If a bath at a lower temperature than 65° is to be given, it is best to lower the temperature from about 70° by putting in ice while the patient is in the bath. In the *continuous bath* the patient is continually immersed for a period of several days or even weeks. The temperature of the water must be 90° to 98° F. In order to carry out this form of bath in a manner agreeable to the patient and those nursing him, there must be arrangements for maintaining the water always at the same temperature, and for letting water dirtied by excreta rapidly out of the bath through a large funnel placed beneath an opening in the bed-ticking on which the patient rests. This opening is opposite the buttocks, between which and the ticking should be placed a ring-shaped air-cushion. The patient's body is wrapped in a blanket, and the tank should be covered with blankets except at the patient's head.

Cold and even tepid water, applied to the skin, acts as a cardiac stimulant. In cases where this stimulant is not required, warm baths at about 104° F. are decidedly beneficial. Whenever the use of water is prolonged, careful observation should be kept for collapse, which not infrequently occurs.

Cold may also be applied to the skin by means of a Leiter's coil made of aluminium placed upon the abdomen, chest, or head. A continuous stream of water at the requisite temperature is allowed to run through the coil. Or ice may be applied to the abdomen ; it should be broken up into small fragments and laid upon a layer of lint, the ends of which are wrapped lightly round absorbent wool at the sides of the abdomen, so that the water from the melting ice may not run into the bed. Lastly, the air round the patient may be cooled by suspending above him, from a cradle, a tray containing ice. The ice must be frequently renewed, and there must be a drain for the water from the melting ice.

The writer is of opinion that the methods described above are more suitable for the reduction of temperature and the alleviation of other symptoms of fever than drugs, and that of these methods, baths and wet packs are the best. But in cases where drugs must be used in preference to these measures, quinine in 3–10-gr. doses, antipyrin up to 10 gr., and antifebrin (acetanilide) 2½–5 gr., may be given, being repeated at intervals of four hours when necessary ; antifebrin is the safest of the two last drugs.

In cases of delirium, where the hydrotherapeutic methods just described are contra-indicated or have proved unavailing, restraint may have to be applied: Padded side-boards, or a sheet passing over the patient's body, may be fastened to the sides of the bed. In such active delirium as occurs in small-pox and typhus fever, an attendant must be constantly at the bedside. Opium, chloral hydrate, potassium bromide, chloralamide, sulphonal, and trional are all useful drugs in cases where other measures fail.

Headache may be relieved by the application of cold compresses, a Leiter's coil, or an evaporating lotion, with a dose of potassium bromide or antipyrin.

The mouth should be kept moist and clean. This may be effected by frequently washing or swabbing it out with lemon juice and water, or the following solution :—

℞	Glycerin. Borac.	℥j	Aq.	ad ℥xij
	Tinct. Myrrh.	℥ij		

Or,

℞	Liq. Potass.		Water	80 parts, or more
	Pure Carbolic Acid,	āā 1 part		

or the compound alkaline lotion mentioned in the article on DIPHTHERIA.

In all cases of continued fever, bedsores are likely to form, often with rapidity. To prevent their occurrence, the patient must not be allowed to remain too long in one position, and the skin of the back and of bony prominences must be rubbed three times a day, or whenever the sheets are soiled, with equal parts of methylated spirit and water, and dusted with starch and zinc powder. A water-bed or water-pillows are also most useful.

Retention of urine is not uncommon in cases of continued fever; hence daily examination should be made of the bladder, and if necessary, a catheter passed.

The nurses in attendance should be warned to look out for special symptoms, according to the nature of the disease. During convalescence, sunshine and fresh air are the best medicines, and in fine weather the patient should be wheeled or carried into the open air as soon as he is strong enough to bear the removal. As anæmia often results from a severe attack of an infectious disease, iron is frequently indicated.

A case of infectious disease having occurred in a family or institution and having been promptly removed, the question may be asked, When can it be said that no fresh cases will arise? The answer depends upon the nature of the disease and the thoroughness with which disinfection after the removal of the first case has been carried out. Suppose a case of measles, for example, has occurred in a school; none of the scholars who have not had the disease before, can be considered safe till the longest incubation period of measles has passed, that is, three weeks. No new scholars should be admitted to the school, nor should those exposed to the first infection be sent home (in the case of a boarding-school) till three weeks have elapsed. The longest incubation period of an infectious disease may be called the "quarantine period," and will be found mentioned in connection with each disease. The necessity for enforcing a quarantine will vary according to circumstances. In some diseases (e.g., typhoid fever), it will rarely be necessary. (See ANTHRAX, CHICKEN-POX, DIPHTHERIA, GLANDERS, INFLUENZA, MEASLES, MENINGITIS, MUMPS, SCARLET FEVER, SMALL-POX, TYPHOID, TYPHUS.) *E. W. Goodall.*

FIBROIDS OF UTERUS.—Treatment may be general or operative. The most common symptom caused by fibroids is menorrhagia. The periods are unduly profuse and last unduly long. In other cases pain or pressure symptoms may be complained of, with or without menorrhagia.

The general treatment of fibroids is especially directed to shortening the

duration and lessening the amount of the menstrual flow. For this purpose the patient should be advised to adopt a simple, non-stimulating diet. Meat should only be taken once a day, and all alcohol be forbidden. The bowels should be carefully regulated, and the patient recommended to lie in bed during the first two or three days of the period. Liquid extract of ergot in ½-dr. doses, or ergotin in 2-gr. doses, should be administered three times a day for six or eight weeks. After this time the ergot should be omitted for a week after each period has stopped, during which some preparation of iron should be substituted for it. If the excessive flow is held in check by this treatment, the patient may continue taking ergot with an interval of a week in every month, as above described, for an indefinite period, especially if she be near the menopause, and the fibroids are not of great size and are not causing any other symptom than menorrhagia.

The indications for operative treatment are (1) Severe menorrhagia, unrelieved by general treatment; (2) Severe pain, or pressure symptoms; (3) Great size, or evidence of rapid growth.

The younger the patient the more reason is there to operate, as in such cases, long before the menopause, the symptoms will probably become unendurable. The best operation is abdominal hysterectomy, partial or complete. In partial or sub-total abdominal hysterectomy, the body of the uterus with the fibroids is removed, but the cervix is left: in complete or total hysterectomy, the body and cervix are both removed. One or both ovaries should be left.

In rare cases it is possible to enucleate a fibroid, if it is submucous, through the previously dilated cervix.

W. J. Gow.

FILARIASIS.—The only important series of diseases in this class are those due to lymphatic obstruction caused by *Filaria bancroftii*. In the case of patients in tropical countries who harbour the parasite, whether there be any symptoms or not, it is of the utmost importance, by the careful use of mosquito nets, to prevent the possibility of the patient reinfecting himself by the mosquitoes which have fed on him ten or more days previously. No drugs have any effect on the worm, once it is introduced into the body. For the effects of lymphatic obstruction, elephantiasis, etc., something can be done by careful bandaging and massage, but as a rule, surgical operations are necessary if the removal of the deformity be desired.

Every care as regards cleanliness, avoidance of injury and exposure, should be taken, as the vitality of elephantoid masses is low, and lymphangitis, ulceration, and suppuration readily occur. Cooling lotions, such as lotio plumbi cum opio, and perfect rest, usually readily relieve the spurious erysipelatoid attacks that are so common in the disease.

In chyluria and hæmatochyluria, improvement rapidly results from rest, free purgation and bland diuretics, such as boracic acid solution or alkaline carbonates, citrates, etc.

C. W. Daniels.

FISTULA IN ANO.—(See ABSCESS, ISCHIORECTAL and ANUS, SURGICAL DISEASES OF.)

FLATULENCE.—Flatulence may be divided, according to its seat, into gastric and intestinal.

Gastric Flatulence is recognized by being associated with gaseous eructations by which it is dispelled. The commonest cause of flatulent distention of the stomach is swallowing air with imperfectiy masticated food, so that it is often met with in patients who have lost their teeth, who are supplied with inefficient artificial ones, or who eat their food too quickly. It is also probable that atony of the œsophagus and of the cardiac sphincter favours the entrance of air with

the food, flatulence being commonly complained of by neurasthenic patients with atonic conditions (myasthenia) of the digestive organs. Gas formed from fermentation rarely occurs in the stomach, because the food does not remain there sufficiently long for such processes to take place ; but where there is pyloric obstruction with food stasis, fermentations, with the production of carbonic acid, sulphuretted hydrogen, and marsh gas, may take place.

The rational treatment of stomach flatulence is not the use of anti-fermentative drugs, but of means to secure that the food is well masticated before being swallowed ; where flatulence is present, it may be got rid of by the use of remedies, such as ginger and other so-called carminatives, which stimulate the stomach peristalsis to expel the gas out through the mouth or downwards into the bowel. The much-lauded creosote perles probably act, not by any anti-fermentative action, but by the irritating effect of the carbolic acid contained in them on the mucous lining of the stomach. Where there is stasis from pyloric obstruction, the proper treatment is gastro-enterostomy or the use of the stomach tube (lavage). (See also ERUCTATION, NERVOUS.)

Intestinal Flatulence is caused to some extent by the passage into the intestine of swallowed air, but is more commonly than stomach flatulence the direct result of the fermentation of cellulose, forming carbonic acid gas and sulphuretted hydrogen. It can be recognized by the absence of eructation and the localization of the tympanites in the bowels, which can be determined by abdominal examination. The main condition that favours intestinal fermentation is fæcal stasis, so that constipation must be looked upon as the real cause to which our treatment should be directed. It is desirable to exclude from the diet vegetables containing much cellulose, such as cabbage, especially where the constipation is of the spasmodic type.

Successful treatment depends on overcoming constipation rather than on preventing fermentation, especially as articles of food containing cellulose, which ferment, are those which favour peristalsis. In that form of constipation which is associated with spasmodic contraction of the colon, it is necessary to avoid giving stimulating food, and we must endeavour to overcome the spasm by the use of sedatives. Enemata of warm olive oil (½ pint) are, perhaps, the best means of dealing with constipation due to spasm. Belladonna is invariably recommended because of its physiological effect, but is disappointing ; still the menthol and belladonna pill may be tried. (See also CONSTIPATION.)

℞ Menthol gr. iss | Ext. Bellad. gr ⅛

Ft. pil. Mitte xx. A pill three times a day.

Robert Saundby

FRACTURES.

I.—GENERAL PRINCIPLES.

The changes which have taken place in recent years in the treatment of fractures may be traced : — (1) *To the use of the Röntgen ray shadow* for revealing more or less accurately the position of the broken ends of a fractured bone before and after treatment ; (2) *To the introduction of the antiseptic method* of treating wounds, whereby when efficiently carried out, the injured parts can be exposed to view and directly dealt with, without undue risk to the patient ; (3) *To the adaptation of massage and movement* to the treatment of fractures, a method which has been worked out by Professor Lucas-Championnière in Paris.

1. The *Röntgen rays* when employed to examine injured bones and joints have shown many points of much interest and value. Besides establishing or refuting a diagnosis of fracture in doubtful cases, they have revealed the presence of fracture where it was not supposed to exist. They have, moreover, taught

us that the ends of the broken bones are seldom in accurate apposition even in cases where the functional results have been considered satisfactory; while in cases where these results have been unsatisfactory, they have shown why it has been so. Although surgeons were at first shocked to find that their efforts at reduction and retention were less effectual than they had supposed, they have learned, and are still learning, to distinguish between imperfect union which is functionally important and may require operation, and imperfect union which is functionally unimportant and which may be ignored.

2. In like manner, the *open method* of dealing with simple fractures has led to a clearer knowledge of the relation of parts in certain cases of fracture, and thus has enabled us better to distinguish the few cases that require operation from the many that do not.

For the majority of the members of the medical profession who are engaged in general practice, the use of a Röntgen ray apparatus is not easily obtained. Comparatively few, moreover, have sufficient time or suitable opportunity to enable them to practise antiseptic surgery with that certainty of success which alone would justify their opening up simple fractures. It is, however, none the less important for the general practitioner to be able to recognize the cases that are likely to require these special procedures for diagnosis or treatment: he can then call in the help that he needs. Fortunately, such cases are comparatively rare, and we shall try, when indicating what seems to be the best method of dealing with the various fractures of individual bones, to point out those cases for which the services of a Röntgen ray specialist, or hospital surgeon, are likely to be required.

3. With regard, however, to the *massage and movement method* of treating fractures, the case is different. With very few exceptions, every fracture in the body can have this method applied to it with much benefit to the patient, the principles of the method can be easily understood, and the practice can be learned by any member of the medical profession without going through a special course of study. Medical men in busy practice may not be able to give the full amount of time required, but when they understand the advantages their patients will gain in shortened time off work, and in improved functional results afterwards, they will find ways of securing for their patients at least a large proportion of the full possible benefit.

The methods of treating bones of the extremities which were universally accepted twenty years ago, and are still practised by perhaps the majority of surgeons, were based upon the supposed necessity of absolute immobility of the broken ends of the bone until the callus was well formed. This supposed necessity for immobility was looked upon as the first principle, and as a corollary to it there stood the rule that the apparatus which fixed the broken ends of the bone should at the same time fix the joint above and the joint below.

The period during which this immobility was maintained varied from about three weeks to three months or longer, depending upon the bone broken, and the age and healing power of the patient. After the bones had united, the return of the limb to functional usefulness was taken into consideration, but not before. It was then found that the weakness and stiffness of the muscles, and the limited range of movements of the neighbouring joints, often more than doubled the period of functional disability of the injured limb which the treatment of the fracture had already involved. In many cases, the functional disability was permanent. These troubles, were however, considered to be inevitable consequences of the fracture—evils indeed, but less than those associated with the non-union which would have resulted from too early release from splints. Now we know from the experience of Professors Lucas-Championnière and Guermonprez and others in France, and from that of Sir William

Bennett, Mr. Wharton Hood, and others in this country, that the supposed axiom of the necessity for absolute immobility to insure bony union was not an axiom at all. It was only an erroneous opinion, and we now have other opinions which seem to be more securely founded, and on which is based a practice which gives better results. In formulating these opinions, we shall not follow the exact views of any one of the surgeons to whom we owe them, since they differ from one another in detail. We shall try, however, to state briefly the general conclusions to which we have arrived after studying the most important published works upon the subject, and after having had personal experience of the methods in hospital and private practice.

These may be briefly stated as follows :—

1. Absolute immobility of the broken ends of bone is not essential to bony union. The ribs unite in spite of the movements of respiration, and wide experience has shown that the slight amount of movement necessarily involved in the daily massage of a fractured limb, and in the daily active and passive movement for a few minutes, at least, of the adjacent joints, seems to hasten rather than hinder the formation and the solidification of the callus.

2. Extravasated blood in joints and among muscles and synovial sheaths, leads to adhesions in its neighbourhood, as if it were in itself a source of irritation.

3. The use of massage in the form of stroking and gentle kneading, combined with occasional movements, is in several ways beneficial in the treatment of fractures. These measures not only aid the actual union of the bones, but help in the absorption of effused blood and serum, restrain if not prevent the formation of adhesions among the soft parts, and maintain the nutrition of the muscles. They therefore simultaneously hasten union and prepare the limb to return to functional use almost as soon as the bones are united.

4. Splints, and other retentive apparatus, including extension, are required more to prevent mal-union than non-union ; and hence are called for especially where the weight of the limb or muscular action is likely to lead to a bad position during healing.

5. On this account, retentive apparatus should, as far as is consistent with its main object, not restrain the movement of the adjacent joints, or impede the circulation of the limb, and it should be dispensed with as soon as possible.

6. The manipulations necessary for the massage and movement treatment of fractures can be successfully carried out by anyone who will take the trouble to understand the object of the manipulations, and who will be sufficiently gentle and careful in handling an injured and very delicate part, without causing pain.

As massage and movement are, for the reasons just given, so important in the treatment of fractures, it seems advisable that we should explain their use in a general way before we discuss the diagnosis and treatment of particular fractures.

Objects of Massage.—In a recent fracture, say from a few hours to a few days after the accident, the object of massage is to diminish the swelling, to allay muscular spasm, and to soothe pain. After acute symptoms have subsided, the object of massage is to stimulate the circulation of the limb, to disperse accumulation of blood and serum—one or both—and to maintain the nutrition of the muscles, nerves, and soft parts generally. That massage has the power of fulfilling these objects after recent and old-standing injuries to the soft parts has been proved by clinical experience, and by experiments made upon animals.

Methods of performing Massage after Fracture.—In recent cases, after the patient has been put to bed, or otherwise placed in the most comfortable position which the circumstances permit, the affected limb must also be made comfortable.

It should be laid on a pillow, on the operator's knee or merely on the bed, and arranged so that the operator can have easy access to it. The injured limb must be steadied by an assistant or by the operator with one hand while he massages with the other.

Where there is much pain, and especially where there is great spasm of the muscles which pass over the broken bone, a small hypodermic injection of morphia will be an advantage. Many patients are much relieved by fomentation of the limb with hot water. After this has been done, the skin must be dried gently with a soft towel, and then dusted over with some fine powder to facilitate the rubbing. Finely powdered talc is recommended by Dr. Dagron, but finely powdered boracic acid or starch, or ordinary flour, will serve the purpose as well. The operator begins by gently stroking the limb, beginning on the proximal side of the injury and following the course of the veins towards the heart. In doing this he will employ as broad a surface of his hand and fingers as he can, and he will be guided as to the amount of pressure he uses by the sensations of the patient. *He must not cause the patient pain.* He will find that after a little he can extend the area of his rubbing, and press a little more firmly without causing pain, than he could at first. He will not be able to press over the seat of fracture itself, but may with advantage stroke towards it from below upwards. Where there is great tenderness of the injured limb, the massage should take the form of a series of pressures successively applied from below upwards, and regulated as to strength by the sensations of the patient as before. Attention should next be turned to the muscles, and as the object at this stage of the work is to soothe and allay spasm, the simple rule is to massage all the muscles which pass over the seat of fracture or which act upon the broken bone. According to the degree of tenderness, the massage of the muscles will vary as before, from a series of caress-like touches to more firm pressures, or even very gentle kneading. Each muscle, or group of muscles, is taken by itself, and its fibres are followed as nearly as possible in the direction of the venous return. This should be succeeded by a repetition of the upward strokes, or light surface pressures, with which the process began. The length of time required varies from ten to twenty minutes, according to the circumstances. It will often be found that the sufferings of the patient have been so much relieved, and the muscular spasms so much reduced by the massage that it will be possible to dispense with a general anæsthetic in order to complete the diagnosis or set the fracture. Even, however, when a general anæsthetic is required, this preliminary massage should be employed to reduce effusion, before splints are applied. If movements are permissible they are often performed, and after that the retentive apparatus should be applied.

In some cases these procedures should be repeated daily at first, in others at intervals of one or more days, the splints being taken down for the purpose, and afterwards reapplied. The limb should be steadied as at first, but with less precision, as the muscular spasm becomes less and the ensheathing callus more solid.

After the acute symptoms have passed off, the stroking movements are firmer and more extensive in their sweep ; their object being, as before, to empty the veins and lymphatics, and so to stimulate circulation, and to get rid of any swelling which may remain. Where definite collections of blood or serum are present, the pressure may be applied to them more energetically so long as no pain is caused, either by a kneading or a circular " milling " movement of the hand or fingers. The stroking movements should be repeated from time to time to empty the vessels. Attention should then be paid to the muscles. The object should be to gently stimulate the muscular fibre by pressure and kneading movements carried along from one end to the other. The sitting will be brought to a close in every case by a number of stroking movements.

When the fracture involves a joint or passes close to it, special attention should be paid to the ligaments, synovial membrane, and synovial sheaths, while stimulus to the seat of fracture itself should be avoided. The object is to get rid of effusion and prevent adhesions. Where cancellous tissue, well supplied with blood from both sides, is broken, we do not fear non-union. There is, however, risk of excess of callus, especially in a young subject. Hence the advisability of avoiding any stimulation to the seat of fracture by massage. This would increase the amount of callus and so embarrass the movements of the joint. When the broken part of the bone is within the capsule of a joint, one of the broken portions may have a very poor blood-supply, and then of course non-union will be the risk, but this seldom occurs except in the hip joint, and not often there.

Movement as part of the Treatment.—Some surgeons have asserted that it is practically impossible in the treatment of recent fractures to restrict passive movement within limits that do no harm. The extensive experience, however, of Professor Lucas-Championnière and others, has proved that this assertion has no foundation in fact. Passive movement should, however, be understood to mean movement produced by the surgeon's muscles, and not resisted by those of the patient. It will be of interest to contrast the effects of the two kinds of movement, in order that we may to the best advantage make use of each in the treatment of recent fractures. Active movement can hardly fail to be the more effective agent in maintaining the nutrition of the muscle and of the limb generally. In so far, however, as the action upon the joint is brought about by a strain along the line of the tendons, and not by a force applied from the outside, there will be a greater tendency to displacement of the broken ends of bone in active than in passive movement. For this reason passive movements will often be permissible at an earlier stage, and their range of movement will be relatively greater until well on in the treatment. Passive movements will therefore be especially useful in preventing the formation of adhesions between muscles and nerves, and the bones at the seat of fracture, also within joints and synovial sheaths. Each kind of movement, however, will have some of the special therapeutic action of the other; thus, active movements will help to prevent stiffness, and passive movements will help to maintain nutrition. Moreover, many patients who are afraid to move a joint in the neighbourhood of a fracture will yet permit of gentle passive movement, and will be encouraged to make voluntary efforts when they find that passive movement does not cause pain. Both forms of movement require to be used with care, so as to avoid displacement of the broken ends of the bone, and pain or serious discomfort to the patient.

One object of active movement in the treatment of fracture I have not seen noticed, namely, the use of the patient's voluntary effort in the reduction of displacement due to muscular contraction. After the muscles have been soothed by massage, the patient can sometimes voluntarily replace a displaced bone. This use of voluntary action may perhaps be best illustrated in a case of Pott's fracture with marked displacement outwards of the foot by action of the peronei so as to stretch the skin over the internal malleolus. If the surgeon tries to pull the foot into position, the antagonistic muscles will start up in opposition and prevent him from doing so, while the patient will be caused very severe pain. If instead of this the surgeon gently steadies the foot and encourages the patient to lift the foot inwards, he will be surprised to find how much ground will be gained. The surgeon may then cautiously supplement the active movement with a little pressure in the same direction. Apparently the voluntary effort ensures relaxation of the displacing muscles along with the contraction of those that are helpful. The same method may be applied in

other cases, working on the principle that when one set of muscles in spasm causes displacement, a relaxation of these contracted muscles will be induced by a voluntary contraction of the opposing set.

Is there any need for a Trained Masseur?—Professor Lucas-Championnière finds that almost any intelligent person can be taught to carry out the manipulations requisite for his method of treatment. In the wards of the infirmary I have had many cases treated entirely by second and third-year students, with quite satisfactory results. There seems, therefore, no reason why every medical man should not at least be able to practise Professor Lucas-Championnière's method, either directly or indirectly through assistants to whom he has given a few lessons. If the treatment be applied first to a Colles's fracture, it can afterwards be extended to others.

THE USE OF SPLINTS.—When the massage and movement treatment is applied to fractures, splints are used, not so much to ensure immobility as (1) To prevent deformity, and, while pain on movement lasts; (2) To give support to the seat of fracture and adjacent parts.

1. *To prevent Deformity.*—An injurious degree of deformity, although not liable to occur in every case of fracture treated without splints, is still to be feared in two groups of cases: (*a*) In the fracture of the shafts of long bones where the skeleton of the limb—either one or two bones—is broken in the middle two-fourths; or (*b*) Near the articular ends of long bones, when the short fragment is considerably displaced by muscles.

(*a*) In the first group are fractures of the shaft of the femur and humerus, or of both bones of the leg or forearm. In these injuries the joints above and below the broken bone may with advantage be supported for the first few days in order to relieve muscular spasm and consequent pain; but after that the joints should be left free, so that the patient may make occasional voluntary movements.

It follows from this view of the function of splints when used along with massage and movement, that so long as deformity is prevented the splints should not constrict the limb and thus hinder circulation, and should not fix the neighbouring joints and thus hinder occasional voluntary movements.

(*b*) In the second group are fractures of the surgical neck of the humerus high up, fracture of the femur just below the small trochanter or just above the condyles. In cases such as these the fragment which can be controlled must, by the aid of splints, be kept in line with the other fragment which cannot be so controlled. In such cases the splint must fix the joint nearest to the seat of fracture, but it should, with due precaution, be loosened from time to time for massage and movement, beginning as soon as the parts are sufficiently united to make that safe.

2. The other use of splints, still of value, is to *give support.* There are many fractures in which there is little or no fear of deformity should splints not be used, but yet in which there is great pain and discomfort if the injured part be not adequately supported for the first few days. Colles's fracture is a case in point. If by extension and manipulation the deformity can be reduced, there is not much likelihood of its returning; yet the patient generally welcomes the support of a splint to the wrist and hand for some days at least, and for this purpose a splint is of service.

THE USE OF EXTENSION.—However valuable massage may be in soothing a spasm, and voluntary effort in relaxing it; or however useful splints may be in maintaining a good position, obtained under anæsthesia or otherwise, there are cases in which continuous extension, by weights or elastic cord, is indispensable to obtaining the best possible apposition of broken ends of bone. These cases are those in which powerful muscles are involved, and in which it is possible to antagonize the displacement by a direct pull. The best example is the displace-

ment of over-riding caused by the muscles of the thigh in an oblique fracture of the femur. The steady, continuous pull of a well-adjusted weight tires out the muscles, and diminishes, if not completely overcomes, the over-riding. It is seldom necessary, however, to keep up the extension for more than a fortnight, although the splints may be required for much longer. More will be said about extension, in connection with the fractures of bones of the lower limb.

The Diagnosis of Fractures. — Although the well-recognized signs and symptoms of fracture—deformity, unnatural mobility, crepitus, want of power, great swelling, irregularity palpable in subcutaneous bones—are sufficiently well known to every student of medicine, the relative importance of the various signs and symptoms in the diagnosis of individual fractures is perhaps not sufficiently appreciated.

The surgeon should, if possible, investigate every case of fracture systematically, employing successively his "ears, eyes, and fingers." By so doing, he will often spare the patient much pain, and at the same time be able to make a more accurate diagnosis than by the common method of beginning with the fingers and following or not with the eyes and ears.

History of the Accident.—It is important to obtain as minute details as possible of the way in which the accident has happened. Care should be taken, for instance, to find out if the patient fell because the bone had given way, or if the bone had been broken because the patient fell. If any direct injury or strain were the cause of the fracture, an effort should be made to ascertain as exactly as possible how the force was applied to the bone.

Inspection.—The shape and attitude of the limb will often be pathognomonic. This is especially seen when the shaft of the femur or humerus is broken, or both bones of the forearm or leg. Moreover, very valuable information will often be obtained by asking the patient to cautiously move the affected limb. As the result of such an effort we can sometimes exclude fracture by seeing what the patient can do, as well as confirm the probability of a fracture by seeing what he cannot do.

By *Manipulation and Measurement* the points we can make out are: irregularity of outline (including separation of portions of bone, and change and shape of impaction); mobility, presence of crepitus, shortening, and the presence of tenderness when the injured spot is pressed upon or moved by pressure at a distance. It is not necessary that we should obtain all the characteristic signs in every case; one sign is often sufficient, and in the discussion of the different fractures, attention will be drawn to the signs which are of most value in each case. Sometimes the swelling and muscular spasm may make the diagnosis difficult. If it remains difficult after diminution of swelling and spasm by massage, a general anæsthetic should be given. If even then the nature of the injury be obscure, a Röntgen-ray photograph should be taken.

Choice of Apparatus.—The changes which are coming over the treatment of fractures are not so much in the direction of new forms of apparatus as in modifications of the apparatus which have been in use for some time. Almost every hospital or school of surgery has its own form of retention apparatus with which good results have been obtained. In the pages which follow, an effort will be made to indicate the forms of apparatus which seem to be the most applicable to general practice, and the best adapted to the application of massage and movement. Under the heading "Massage and Movement" we shall follow for the most part the directions given by Professor Lucas-Championnière and his pupil Dr. Dagron.

Delayed Union.—This term is applied to a slow development of callus, and

is due sometimes to deficiency in the general health of the patient, sometimes to want of active circulation at the seat of fracture. It is less likely to be met with under the massage and movement treatment than when the circulation of the parts is interfered with by prolonged fixation in splints. The indication for treatment is to stimulate the circulation at the seat of fracture, and this may be done in several ways. One of the best and simplest is to produce passive congestion by applying round the limb above the fracture an elastic bandage tight enough to retard the venous return and cause some swelling and bluish discoloration of the limb below. Formerly the parts below the fracture were supported with a bandage, but this is not necessary. The bandage may be kept on for about twelve hours out of the twenty-four, preferably at night. This method was introduced by the late Owen Thomas under the title of "damming" in 1878, but was not much used until it was independently discovered and advocated some years later by Professor Helferich. Another method which Owen Thomas practised with success is described by him as "hammering." It may be performed at intervals of about a week under an anæsthetic by wrapping the seat of fracture in a towel and beating it with a hammer or mallet, or without an anæsthetic by daily percussion for a few minutes as firmly as the patient can bear. "Hammering" can be best applied to subcutaneous bones, but it may be also to those that are clothed with muscle, care being taken not to damage nerves or large blood-vessels. "Hammering" and "damming" may be used with advantage together. Forcible rubbing of the ends of the bones against one another, with or without an anæsthetic, may be used independently, or to supplement the "hammering" or percussion. When these movements fail, operative methods will have to be employed.

II.—TREATMENT OF PARTICULAR FRACTURES.

Fractures of the Clavicle.*

The Middle Third is the most common situation. The break is caused occasionally by direct, but more frequently by indirect, violence. A fall on the shoulder or outstretched arm seems to act upon the clavicle through the conoid and trapezoid ligaments, and so twist it.

The history of this form of injury, with subsequent pain about the clavicle, and inability to use the arm, is important. The attitude of the patient in a recent case is characteristic. The elbow of the affected arm is supported with the other hand, and the patient inclines his head towards the broken bone. If in a suspected case the patient can easily abduct his arm, there will probably be no fracture. Fracture is probable if there be great swelling over the centre of the clavicle, although the patient had fallen on the tip of the shoulder. If swelling be slight, the irregularity of the subcutaneous aspect of the bone may be visible. If the swelling masks the condition of the bone even to the touch, the surgeon should move the outer end either directly or through the medium of the shoulder, while with his other hand he steadies the inner part of the bone. In so doing, he will elicit crepitus or abnormal mobility.

Treatment.—Should it be important to avoid deformity, the patient must be kept in bed, lying upon a firm mattress with a pillow between the shoulders, the arm being supported against the side by a bandage or sling. In this position the trapezius is relaxed, and the weight of the arm brings the broken ends into apposition. None of the appliances which have been devised to prevent the over-riding of the broken ends during ambulant treatment have succeeded in

* The views given as to causation are those of Professor Bennett, of Dublin.

their object. They have all given good results as regards function, but imperfect as regards apposition. The results are no better than those which have been obtained without apparatus. These remarks apply to forms of apparatus in which an axillary pad is used to keep out the arm, to the Sayer plaster method and its modifications, in which the upper part of the humerus is erroneously supposed to be so firmly fixed that it can be used as a fulcrum to lever the shoulder backwards, and to the various more or less complicated bandage methods. In a recent case the pain will be soothed by hot fomentations and by massage. The weight of the arm should be supported by a sling tied over the opposite shoulder.

Massage and movement should be employed daily for the first week, every second day for another week, and at longer intervals for the third week. The sittings should take about twenty minutes at first; afterwards a little longer. Massage the muscles acting upon the broken bone, i.e., trapezius, sterno-mastoid, pectoralis major, and deltoid; also the soft parts near the bone, and the bone itself, to soothe it. Passive movement of fingers, wrist, elbow and—gently—of shoulder at the beginning of the earlier sittings. On the second day and onwards allow active movement. At first this should be limited, as regards the shoulder, to a gentle swinging movement, and to gentle movements of the other joints. About the fifth day active movements of the shoulder may be permitted in all directions.

The sling which supports the arm should be worn under the shirt for the first week, after that over the clothes. It will probably not be required after three weeks.

Fracture of the Outer End.—

(*a*) *Beyond the Conoid and Trapezoid Ligaments.* Caused by a blow upon the back of the shoulder, due to a fall or otherwise. Diagnosis is from the history, pain on movement, and crepitus.

Treatment.—There is no downward displacement, but the shoulder tends to rotate forwards, hence the figure-of-8 bandage should be applied to keep the shoulder back where appearance is of importance. Massage and movement as for fracture of the middle third, except that there will be less massage and more movement.

(*b*) *Between the Conoid and Trapezoid Ligaments.* Caused by a downward blow upon the outer end of the clavicle. The clavicle is thought thereby to be broken across the coracoid process. Diagnosis as in (*a*).

Treatment.—There is no tendency to displacement; treat as for fracture of the middle third.

Fracture of the Inner Third.—Caused by force applied along the line of the bone. Diagnosis is based upon the history, pain on movement, swelling of the soft parts, irregularity of the outline, and crepitus.

Treatment as for fracture of the middle third.

Fractures of the Scapula.

These are caused by severe crushing of the thorax, and are generally accompanied by fracture of the ribs. There is dyspnœa and much pain on account of the large muscles which are involved and which are thrown into spasm at first. Diagnose from the history of the injury, spasm of the muscles of the shoulder, irregularity of the subcutaneous parts of the bone, and crepitus on movement.

Treatment.—Massage the swelling and the muscles of the shoulder and upper part of thorax. In the interval support the scapula by a bandage round the chest, and steady the arm with a sling. Fractured ribs are no contra-indication to massage. Adhesive plaster, if applied to the chest on account of the broken ribs, will support the scapula also, and massage can be carried out over the plaster.

Massage should be daily at first, and at longer intervals afterwards. Passive movements of the shoulder while the scapula is steadied should be begun as soon as spasm has passed off. Active movements of the fingers and elbow should be encouraged early, and of the shoulder as soon as the patient can perform them without pain.

Fracture of the Acromion Process.—Caused by direct violence, a blow, or a fall upon the shoulder. Diagnosed by the history of the injury, drooping of the arm, and inability to use the deltoid ; local tenderness and crepitus.

TREATMENT.—The elbow should be supported in a sling, the shoulder massaged daily at first, and passive and active movements on the same general principles as in fracture of the bone.

Fracture of the Coracoid Process is very rare, and is due to direct violence. The diagnosis is difficult. It may be suspected owing to pain on movement which involves the coraco-brachialis and biceps muscles, and may sometimes be established by crepitus and pressure over the coracoid process. An X-ray photograph is advisable in this and all other injuries about the shoulder where the diagnosis is doubtful.

TREATMENT as for fracture of the acromion process.

Fracture through the Neck of the Bone.—This is a very rare injury, and is important because the symptoms resemble those of downward dislocation of the humerus. It is caused by direct injury. The symptoms are like those of a downward dislocation of the humerus, with the difference that the flattening of the shoulder and lengthening of the arm can be overcome by gently drawing away the arm from the side and then lifting the whole arm upwards. Crepitus will be felt as the parts return into position.

TREATMENT as for fracture of the acromion process.

FRACTURES OF THE HUMERUS.

General Remarks.—After a severe injury to the shoulder, the exact diagnosis may be a matter of great difficulty. Besides fracture or dislocation of the upper end of the humerus, or both, there may be present fracture or dislocation of the outer end of the clavicle, or fracture of the acromion process.

A history of the accident must be obtained if possible. Then the various methods of procedure already mentioned should be carefully followed out. If, after the muscles have been soothed by massage, the diagnosis is uncertain, it is better to give a general anæsthetic. By the relaxation of muscles thus produced, and by the more free handling which is then made possible, the diagnosis may be established, and at the same time the treatment may be begun by the reduction of a dislocation or the setting of a fracture as the case may be. If, as may sometimes happen, a diagnosis should not be possible under a general anæsthetic, two courses are open : to have an X-ray photograph taken, or to reduce the swelling rapidly by massage, and to repeat the effort at diagnosis again in a day or two ; or perhaps to employ both methods.

There are two main reasons why, after fracture to the upper end of the humerus, the patient may never regain a proper functional use of the shoulder. (1) The upper fragment is in some cases tilted upwards and outwards (abduction) by the action of the supra-spinatus muscle ; this occurs in separation of the upper epiphysis, and in high transverse fractures of the surgical neck. It will be evident that if union takes place with the upper fragment abducted and the lower fragment in the position of adduction against the side of the body, abduction of the arm as a whole will afterwards be impossible at the shoulder joint. In order to obviate this form of vicious union, there are two possible ways of treating such injuries : an operation may be performed, and the ends of the bone brought together and held in position by

wires or pins ; or, if under an anæsthetic the lower fragment can be brought up to the upper one, the broken limb may be treated in the abducted position. (2) The shoulder joint and the surrounding muscles may be matted by adhesions. This is apt to occur in all fractures at the upper end of the humerus as the result of prolonged immobilization, and is the commoner cause of the functional disability; but fortunately it is one which can be obviated by massage and movement. Where the muscles can be kept functionally active and the joint free from adhesions by this treatment, good functional results will be obtained, even although there may be considerable over-riding of the broken ends or a medium amount of angular deformity. In the latter case, an increased mobility of the scapula will compensate for the restricted movements at the shoulder.

Fractures at the Upper End.—The injury may be (*a*) *Of the Anatomical Neck ;* (*b*) *Of the Greater Tuberosity ;* (*c*) *Of the Surgical Neck ;* (*d*) *Separation of the Epiphysis.*

(*a*) *Fracture of the Anatomical Neck.* — This is usually caused by direct violence, as in a fall upon the shoulder, and is often accompanied by comminution of the tuberosities. Should the upper fragment be separated from the rest of the bone, non-union is likely to occur ; but if there be impaction, union will probably take place.

Treatment.—Massage should be begun at once (see general instructions), and should be continued daily for about a month. Passive movement of the shoulder should also be employed from the first, very cautiously of course to begin with, and gradually increased. Active movements of the shoulder may begin about the fourth day ; at first only slight movements of abduction, then movements forwards and backwards, and last of all movements of rotation,

The only apparatus required is a simple sling to support the forearm, the hand being left free so that active movements of the wrist and fingers may be made from the first. For the first day or two, if there is much pain, the patient will be easier in bed with the arm bound to the side. After the pain and spasm have subsided, he can go about with the sling beneath the clothes until after the fourth day ; the sling may then be worn outside the clothes. All movements are to be controlled by pain and fatigue. Union is generally complete in a month, but treatment should be kept up until the movements are quite free.

(*b*). *Fracture of the Greater Tuberosity.*—This may sometimes be recognized by the presence of crepitus and of increased breadth of the shoulder, while by a finger in the axilla the head of the bone can be felt to move with the lower end of the shaft. In doubtful cases an X-ray photograph should be taken.

The Treatment is much the same as for fracture of the anatomical neck, with this difference, that the massage must chiefly be applied to the supra- and infra-spinatus and teres minor muscles at first, that movements of rotation must be carefully watched, and that the joint must be kept at first from the formation of adhesions chiefly by swinging movements, others being added by degrees. A sling is needed as for the fracture of the anatomical neck.

(*c*) *Fracture of the Surgical Neck.*—This is caused most frequently by a fall upon the shoulder ; sometimes by a fall upon the hand or elbow. The diagnosis is based upon the tilting outwards of the lower end of the humerus, the head of the bone being in position ; increased mobility with crepitus, at the upper end of the bone. A general anæsthetic may be necessary to establish the diagnosis and allow the fracture to be set, should massage fail to ensure the necessary relaxation of spasm.

Treatment.—The upper fragment cannot be controlled by splints ; hence, if it is tilted outwards, the lower fragment must if possible be brought to it

by being placed in the position of abduction. Middledorph's abduction splint in the form of a triangle can easily be made of wood, perforated zinc, or tin. The base of the triangle rests against the patient's trunk, while the other sides of the triangle support the upper and forearms respectively. Should the abducted position fail to keep the ends in apposition, the question of operation must be considered.

The abduction splint may have to be employed for two or three weeks; but during that time the shoulder should be massaged every few days, and movements of the elbow and fingers encouraged. On the removal of the splint, a cushion should be employed as in the next case. This in turn should be dispensed with as soon as possible, probably in a week or two.

In cases where the upper end is not much tilted outwards, but in which the lower fragment is drawn inwards by the action of the muscles inserted into the bicipital groove, the broken ends can be kept in position by laying the arm upon a wedge-shaped cushion which has its apex in the axilla. This cushion may be conveniently formed of a piece of cardboard bent upon itself, filled up with cotton-wool, and padded on the outside. The arm is then laid upon this cushion and bandaged to the side. After four or five days the bandages are loosened, the parts massaged and gently moved, and the arm again fixed up as before. This massage and movement are repeated in a few days, and generally at the end of about ten or twelve days the cushion can be dispensed with and only a sling employed.

In cases in which the tendency to displacement is not distinct, a sling only is necessary from the beginning, and daily massage should be used as for a fracture of the anatomical neck.

(*d*) *Separation of the Upper Epiphysis.*—This injury occurs in persons under 20 years of age, usually from direct, but sometimes from indirect, violence; in fact it is often the result of an injury which would have caused a dislocation of the shoulder in an older person.

The symptoms resemble those of subcoracoid dislocation as regards the axis of the humerus and the presence of a prominence under the coracoid process. If the swelling is not too great, however, the head of the bone may be recognized in the glenoid cavity.

TREATMENT.—Under a general anæsthetic an effort should be made to restore the separated parts, and it will be advisable to hold the arm in the position of abduction. In this and in other particulars the case is to be treated as for a transverse fracture of the surgical neck, high up, with abduction of the upper fragments (*vide supra*).

Fractures of the Shaft.—These are caused usually by direct violence, but sometimes by a fall upon the hand or wrist, or by a twist.

Diagnosis is generally easy on account of the deformity and increased mobility; non-union is common, but this does not seem to be due, as was formerly supposed, to movement of the fracture during the course of treatment, but to interposition of soft parts, or to the imperfect blood-supply of the lower fragment owing to tearing of the nutrient artery.

TREATMENT.—It will be necessary to make sure that the musculo-spiral nerve has not been torn at the time of fracture, or nipped between the fragments when the bones were being set. If the nerve has been torn, the ends must be sutured at once by operation. After massage, the ends of the bone can generally be brought into apposition. Although some cases can be treated with a sling only, without splints, combined with massage and movement, it will generally be advisable to encircle the limb with supporting splints, one at the outer and back part of the arm with an excavation over the outer condyle, and another shorter splint for the front and inner side. These may be made of Gooch's splint,

poroplastic felt, or pasteboard. They must be well padded, and fixed tight enough to prevent angular deformity, but not to interfere with the circulation of the limb. The arm should be kept in a sling. The fingers and wrist should be moved voluntarily from time to time by the patient, and passive movement of the elbow and shoulder should be made at the massage sittings every few days. At first the support of the splints should be maintained during the passive movements. The splints may be required for about three weeks. Union generally takes place in about four weeks.

If signs of involvement of the musculospiral nerve should appear during the formation of the callus, time should be given for the callus to consolidate and contract. If the nerve seems to be permanently involved, an operation to free it will be necessary. Massage should not be applied to the seat of fracture in such a case, as the callus will be thereby increased.

Delayed Union.—Should union be delayed, the activity of the healing process may be hastened by the measures already indicated for that condition (*vide supra*).

Fractures near and into the Elbow-joint.—(*a*) Transverse fracture at the olecranon and coronoid fossæ; (*b*) T-shaped fracture; (*c*) Separation of the epiphysis; (*d*) Fracture of either condyle; (*e*) Fracture of either epicondyle.

These fractures are often very complicated and difficult to diagnose. The swelling is often great, and one or more of the fragments may be very small. After the history has been obtained and the aspect of the limb and possible voluntary movements observed, the following method of examination will be found useful, even when the swelling is great. Begin by massaging above the elbow, and try to reduce the swelling round the joint as much as possible; then follow with the fingers the subcutaneous ridge of the ulna from the forearm to the olecranon process, and see if the olecranon is fixed or transversely moveable. Then compare the relations of the inner condyle and olecranon on the two sides of the body. Grasp the lower end of the humerus by the condyles, and see if it is continuous with the shaft or not by making a movement in the transverse direction. Take each condyle separately between the finger and thumb, and try to move it antero-posteriorly. The bony points, although obscured by the swelling, can generally be made out by steady pressure over the place where they should be. In children, a transverse fracture through the olecranon fossa often occurs, even although the epiphysis has not united. A general anæsthetic and X-ray photograph should be employed where there is any doubt as to the diagnosis.

Treatment.—If displacement be slight or absent, keep the arm in a sling, and treat by massage and movements only. If displacement be well marked, reduce (under chloroform if necessary), and bandage the arm into a posterior gutter-splint of metal, poroplastic felt, or plaster. If displacement be very great, reduce as before, but fix the elbow in acute flexion. A small pad is placed in the bend of the elbow, and a figure-of-8 bandage put round the joint. Operation will be necessary if the symptoms point to the involvement of the ulnar nerve, or if the fragments cannot be properly moulded into position and retained there.

Massage and movement are of especial value in all fractures into the elbow joint. Unless there is great tendency for the fragments to be displaced, this treatment should be carried out daily at first. In addition to the general indications already given, the following points should be attended to. While the effusion should be dispersed as soon as possible, care must be taken not to stimulate the formation of callus by massaging the seat of fracture itself, especially in young children. The broken bone must be steadied during massage, and especially also during active and passive movements. The masseur must make sure that any movement that takes place does so at the joint and not at

the seat of fracture. The amount of movement must be regulated by the pain. Where pain restricts movement, there will be no gain in forcing the movement, which only calls forth contraction of the antagonistic muscles.

Where displacement tends to recur, the splints may be left undisturbed for two or three days. After about a week, the tendency to displacement will be very slight. On the other hand, if displaced fragments have not been replaced for ten to fourteen days, it will be difficult to rectify the position, even under an anæsthetic. Improvement in range of movements sometimes goes on for many months after the fracture has united, the patient's own voluntary efforts being of much assistance.

Fracture of the Olecranon.

This injury is generally caused by direct violence, sometimes by the action of the triceps. Diagnosis is generally easy by manipulation (see method of examining for fractures of the lower end of the humerus). The patient's power of extension should be tested when the forearm is allowed to hang vertically from the abducted upper arm, i.e., in extension against gravity.

Treatment.—Formerly an apparatus was applied to keep the elbow extended and to draw down the upper fragment of the olecranon. This method, however, Lucas-Championnière finds quite unnecessary if the massage and movement treatment be carried out. The only appliance required is a sling, in which the arm rests at first at an angle of 135°, i.e., midway between full extension and a right-angled position, while round the elbow a bandage may be lightly applied, partly to support the parts and partly to meet the patient's desire to have some form of apparatus.

For the first day or two the patient may be more comfortable in bed with the arm lying on a pillow in a semi-extended position. In a day or two he will be able to get up and go about with the arm in a sling. The massage should be carried out with the limb in the most comfortable position, which is generally that of slight flexion, the limb lying on a cushion. After the use of the stroking movements already described for soothing the muscles, gentle passive movements may be made, and so long as they do not excite muscular spasm they will not lead to separation of the detached fragments. The massage sittings are repeated daily, but for several days passive movement only is allowed at the elbow; gentle active as well as passive movements of the wrist and fingers are encouraged.

As the tenderness subsides, the massage is applied more deeply round the elbow joint, and the range of movement is extended. It should be remembered that active flexion and passive extension movements are least likely to do harm. Usually complete flexion is possible in about three weeks, but full extension is often delayed; sometimes it is never quite regained. For many weeks after the movements of the joint are free, the patient must abstain from any violent muscular exercise, especially such as will bring the triceps into strong action, lest the uniting callus should be stretched or torn.

Professor Lucas-Championnière finds that operation is not required in fracture of the olecranon treated by his method, and he refers to a case in which the injury was not recognized at first, where the result was excellent and where the patient kept moving the limb as freely as the pain would allow, without any form of intentional treatment.

Fracture of the Bones of the Forearm.

Fracture of Ulna and Radius is caused most frequently by direct injury. Diagnosis is easy from the deformity and increased mobility.

Treatment. — The fracture, if below the middle of the arm, must be

set after relaxation of the muscles by massage or by a general anæsthetic. Splints must be employed to prevent recurrence of deformity. They must be broader than the forearm, and rigid, so that the broken ends of the radius and ulna are not pressed together. Union in this position would prevent pronation and supination. The most convenient material is Gooch's splinting, applied with the wood towards the limb and the leather outside. The posterior splint should extend from the olecranon, and the anterior splints from the bend of the elbow, to the wrist. This will allow free movement of the fingers and of slight movement of the wrist.

After the first soothing massage the splints may be left undisturbed for four or five days. They will then be taken down and the limb massaged while the bones are steadied by an assistant. Slight movements of the elbow are possible with the splints in position, and hence do not need to be carried out at the massage sitting. Pronation and supination must be passive only at first, but even that must be delayed until all muscular spasm has subsided and the parts are beginning to solidify. While the patient is going about, the limb is laid in a sling in the supine position as much as possible.

Fracture of the Ulna alone, and fracture of the *Radius alone* between the insertion of the pronator teres and the lower end of the bone, are to be treated as for fracture of both bones.

Fracture of the Radius above the insertion of the Pronator Radii Teres, i.e., in the upper half of the bone, with or without simultaneous fracture of the ulna, is caused by direct violence. The importance of this fracture is that the upper fragment of the radius carries both supinator muscles—biceps and supinator brevis—while the lower fragment has both pronators. The upper fragment rotates on its own axis, and cannot be prevented from remaining in supination. The lower fragment can, however, be controlled. Hence it is necessary to maintain the forearm in the position of full supination and flexion for two or three weeks, the massage and movement being carried out in other ways as if both bones were broken below the middle. The position of full supination cannot be voluntarily maintained by the patient without mechanical aid. Besides lateral splints, therefore, as for fracture of both bones, an additional splint is necessary to keep up supination. An angular elbow splint bandaged to the forearm splints will serve the purpose, or a straight piece of Gooch splint about three inches broad, laid across the angle formed by the upper arm and the forearm splints, and fixed there with a firm bandage.

Fracture at the Lower End of the Radius (Colles's Fracture).—So much has been written about this, the commonest fracture in the body, that there is no need to do more than dwell on the points which seem to be of most importance in regard to treatment.

Two unfortunate possible sequences of this accident have to be obviated as much as possible by the treatment. One is a deformity which results if the fracture be not reduced. The other, and more important, is stiffness of the wrist and fingers which results from immobilization. There is no necessary connection between these two. Many unrecognized cases of Colles's fracture have left a perfectly good functional result along with great deformity, because the patient has kept on using the wrist, although no attempt had been made to reduce the deformity.

Treatment.—As soon as the fracture has been recognized, the displacement should be reduced. A few minutes' massage of the arm, above the fracture, is of service as a preliminary. An anæsthetic is generally necessary, but as the obstacle to reduction is osseous rather than muscular, gas and ether, or ethyl chloride, may be employed. The best way to reduce is to grasp the hand firmly, and begin by over-extending the wrist, which should be steadied by an assistant ;

then try to separate the fragments, while keeping up this position, and afterwards while maintaining the strain, gradually and strongly flex the wrist and simultaneously force forward the lower fragments with the thumb of the disengaged hand. It may be necessary to repeat this manœuvre once or twice before the osseous deformity is rectified or materially improved. Some deformity will remain, due to effusion in the soft parts, but will gradually disappear.

After reduction, the limb should again be massaged, and then the question of apparatus has to be considered. Deformity does not easily recur after reduction, hence some surgeons recommend that no splints be employed at all. There are, however, two reasons why a simple splint may often be advisable. If there is muscular spasm, a certain amount of deformity may be reproduced by the action of the muscles; while the tenderness of the wrist often makes it very painful for the patient to steady his wrist if it is allowed free play. In severe cases it is therefore better to lay the hand and forearm on a well-padded anterior splint reaching to the knuckles. To this the hand and forearm should be lightly bandaged, either with or without the additional support of a dorsal splint. Massage of the forearm and wrist should be performed, daily at first, on the general principles already laid down. After the first week the sittings may be less frequent.

Passive movements should at first be confined to the fingers. As the pain becomes less, the movements may extend to the wrist. Pain should be taken as the guide to the extent of the movements. Active movements of the fingers generally begin about the third day, and should be followed by slight active movements of the wrist as soon as the pain permits. Pronation and supination come last of all.

In cases where the displacement is slight and the pain not great, after reduction the wrist should be supported with a strip of plaster or a bandage, and the forearm laid in a sling with the hand hanging over the edge.

Fracture of a Metacarpal Bone.

The commonest fracture of the metacarpal bone is that of the base of the metacarpal bone of the thumb — "Bennet's fracture." It is caused by a blow in the long axis of the thumb (on the point), whereby the anterior portion of the surface which articulates with the trapezium is split off. A partial dislocation backwards results.

Treatment.—Extension; and replace the metacarpal bone, and prevent it from passing backwards again by the pressure of a firm pad held in position with a splint which reaches from the radius to the end of the thumb. Several forms of splint have been recommended. The most useful is a piece of Gooch splinting, a little wider than the thumb and of the requisite length.

Massage for a few days should be carried out, and passive and active movements while the proximal end of the bone is steadied by the grasp of a finger and thumb. Bennet advised the use of a splint for four weeks, but with massage and movement this time should be considerably diminished.

Fracture of one of the four Inner Metacarpal Bones.—This may be caused by direct violence. An important point in diagnosis is the shortening. The patient should be made to close both hands, and the level of the heads of the metacarpal bones should be compared on the two sides.

Treatment.—Bandage the forearm and hand to an anterior splint, with a good pad for the palm, or bandage the closed fist with a pad in the palm, and support the forearm in a sling. Massage the hand and forearm, at first daily; after the first week, at intervals of a few days. Passive movements of the fingers should be employed from the first. In a few days encourage active movements. Union takes place in about three weeks.

Fractures of the Ribs.

Treated by the usual methods of strapping and firm bandage.

Fractures of the Pelvis.

The general principles which have been laid down for the treatment of fractures elsewhere, should be applied to the pelvis, i.e., massage to the neighbourhood of the fracture, gentle passive movements to prevent stiffness of the hip joint, and active movements cautiously increased.

The patient should be in bed for from six to eight weeks; a bandage round the pelvis will be found a comfort for the first two or three weeks.

Fractures of the Bones of the Lower Limb.

Fractures of the Neck of the Femur.—A good deal of the difficulty in diagnosing the intra- from the extra-capsular fractures may be traced to an imperfect understanding of what it is that really makes the difference between the two forms of fracture. The mechanism which produces it is different in each case. The intra-capsular fracture is caused by a twist or strain which acts transversely, or obliquely to the long axis of the neck. The bone is not likely to give way from this form of injury unless it has been previously weakened by disease or senile atrophy. The extra-capsular fracture results from violence applied to the great trochanter—almost without exception from a fall upon it—and which therefore acts more or less directly along the axis of the neck. Aged and fragile persons, just as much as those who are younger, will suffer from this form of fracture, and not from the intra-capsular form, if they happen to fall upon the great trochanter. The intra-capsular fracture is a mere transverse break of the neck of the bone; it is very seldom impacted, but when this does occur the lower fragment—neck—is driven into the upper—head. The extra-capsular fracture is really a break between the neck and the great trochanter. It is always impacted—at first at least—and as the result of this impaction, in severe cases the trochanter is split up into several fragments.

The history of the nature of the accident is therefore of great importance in diagnosis. In extra-capsular fracture, the history of a fall upon the trochanter, and the presence of thickening when it is grasped between the finger and the thumb, are generally sufficient to establish the diagnosis. *Raising of the trochanter* accompanies either form, although in the intra-capsular form, until the ligament softens, the raising may be very slight. *Crepitus* should not be looked for, lest impaction should be undone in the one case, or some reflected portions of the capsule which carried blood-vessels should be torn in the other. *Eversion* occurs in both forms of fracture as well as in a mere bruise of the hip.

In intra-capsular fracture there will be the history of a twist or jerk of the neck of the bone, often the sound of something giving way; then sudden inability to use the limb, and the patient falls to the ground. The diagnosis is often best arrived at by exclusion.

Extra-Capsular Fracture.—This is much the commoner form of the two. Bony union with eversion and some shortening takes place almost invariably; but the patient is crippled, not from this, but from the ankylosis of the hip joint which results from the long period of immobilization which is usually enforced.

Lucas-Championnière trusts to early movement in these cases more than to massage. He fears that massage over the large veins in old people might set free a clot, and so he confines the massage chiefly to the posterior aspect of the hip. If there is much muscular spasm, and especially if the impaction has become loosened, extension of the limb with weight and pulley is advisable, but it need not be continued for more than ten to fourteen days. No splint should

be used, only sandbags to steady the limb. Massage of the posterior and outer aspects of the hip may be employed daily or every few days. After a period varying from five to fifteen days, the patient should get out of bed and should move about a little on crutches, with an assistant on each side, at first at least. The sound foot should be raised with a high heel. Gentle swinging movements of the thigh should be encouraged, the range being increased as strength returns. Active movements of the foot, ankle, and knee should be made after the first day or two. The patient cannot bear weight upon the injured limb until eight to ten weeks have elapsed.

Intra-Capsular Fracture.—Professor Lucas-Championnière does not discriminate this from the extra-capsular form in his account of the treatment. In view of the progressive shortening which takes place after the capsular ligament has given way, extension with weight and pulley is advisable for three or four weeks, if the patient's health permits recumbency for so long. A Thomas's hip splint should be worn in bed for about the same time and the limb should be steadied with sandbags. Massage, as indicated already for the extra-capsular form of fracture, should be applied for a few days at least. The patient may be raised up in bed almost from the first, although the bed will be tilted up at the foot in order to provide counter-extension. The stages in the progress should be similar to those of the extra-capsular form, but from two to four weeks later.

If there is no union at the end of ten or twelve weeks, the patient must depend on bearing his weight upon ligaments which will grow stronger as time elapses. A firm belt round the pelvis, extending below the trochanters, will be helpful.

Fracture of the Shaft just below the Lesser Trochanter.—This generally occurs in old people as the result of a twist, and the line of fracture is often oblique. Fortunately the injury is a rare one, for it is probably without exception the most difficult fracture in the body to treat satisfactorily. The upper fragment, short and sharp-pointed, is forced forward by the powerful psoas and iliacus muscles, while the lower fragment is drawn up behind it by the hamstrings and adductors. An immediate operation to wire the ends together would be the best treatment if the circumstances permit.

As regards apparatus, a double inclined plane is advisable to keep the hip and knee joint flexed, while traction with weight and pulley is applied to the thigh. The surgeon will be fortunate if he can keep the ends of the bones in apposition, even with considerable over-riding. The muscles for which the soothing effect of massage is most needed (psoas and iliacus) are out of reach.

Fracture of the Shaft of the Femur is caused both by direct and by indirect violence. Diagnosis is generally easy from the distortion and unnatural mobility. The patient is not able to lift his leg on account of the pain so produced, which is due to the distortion at the seat of the fracture.

TREATMENT.—The limb should be steadied and extended by an assistant, while massage is applied to the upper part of the thigh. If the broken ends do not come into good apposition, chloroform should be administered, but while the patient is going under, the seat of fracture should be supported with splints. Extension plasters should be applied to the lower part of the thigh, extending down to the ankle if the fracture is near the knee-joint. The amount of weight will depend upon the muscular development of the individual.

The shaft of the bone must be supported by local splints. The most convenient material for this is Gooch splint, cut in the form of two or more pieces, so as to surround the thigh. Sand-bags should be used to steady the limb and to prevent rotation outward of the lower fragment.

After three or four days the splint should be taken down, and while the limb

is steadied and extended by an assistant, the thigh should be massaged and the knee-joint gently flexed. Massage should be repeated every three or four days, or oftener if there is much pain. One great cause of after-trouble is stiffness of the knee resulting from adhesions between the quadriceps extensor and the seat of fracture. For this reason, passive movement of the knee is begun early, and after about fourteen days the patient may move his knee voluntarily from time to time during the day.

Dagron finds that union takes place in about eight weeks. When the patient begins to use his limb, the thigh should be supported by splints, the knee and hip-joint being free. A slight amount of weight put upon the bone hastens solidification, but the strain should be cautiously increased. Crutches should be used at the end of eight weeks if the union is solid, and as the patient gains confidence he may dispense with one, then both crutches, and afterwards use only a stick, until he can walk unaided.

Fracture of the Femur above the Condyles.—The diagnosis may be made from the unnatural lateral mobility and crepitus a little above the knee, on attempted movement. Distortion may be masked by the swelling at the knee. A general anæsthetic should be administered, and if the position of the fragments is doubtful an X-ray photograph should be taken.

TREATMENT.—The special difficulty in treatment in this fracture is due to the backward displacement of the lower fragment by the gastrocnemius muscle; but the hamstrings also tend to cause over-riding. Fix thigh, knee, and leg in the flexed position upon a MacIntyre or similar splint. Should this method fail to ensure a good position, the tendo Achillis should be divided and the limb treated in the straight position. Extension of the leg by weight and pulley would also be useful. Massage of the muscles of the thigh and of the knee-joint should be carried out daily. Passive movement must be reserved until pain and tendency to spasm has passed off. In about a week it may be cautiously begun, while the seat of fracture is steadied, care being taken that any movement produced takes place at the joint and not at the seat of fracture.

Fracture of the Femur into the Knee-joint.—This is the result of direct injury; either condyle may be broken off, or the fracture may be T-shaped. The diagnosis is as in the last case.

TREATMENT.—Careful massage of the thigh and knee-joint; then the joint should be steadied with splints in a slightly flexed position, while extension with weight and pulley overcomes the disturbing influence of the muscles which act upon the knee-joint. Passive and active movements must be used as soon as the pain and muscular spasm have sufficiently subsided, probably about the fourth or fifth day. Afterwards the sittings for massage and movement may be continued, at first daily, and then at longer intervals, the range of movements being gradually increased. Traction should be discarded as soon as the fragments will remain in position without it, generally in from fourteen to twenty-one days.

Fracture of the Patella. — Caused most frequently by muscular action; sometimes by direct violence. The *diagnosis* is made from the history, from the great swelling without adequate cause other than that of a fracture, from the patient's inability to lift the leg from the bed, and from the presence of two separate parts of the patella, probably without crepitus, as blood-clot generally covers the broken surfaces.

TREATMENT.—The most rapid and the most complete return to functional usefulness is given by immediate operation, clearing out clots from the joint, and wiring the broken surfaces of bone together. On the other hand, there is probably no fracture in the body in which the risks to the patient's life and limb are greater than in that of the patella, if the wound should become septic. For

this reason the majority of surgeons prefer non-operative measures, and those who do operate upon vigorous patients, decline to do so when the patient is old or unhealthy. Fibrous union, which is all that can be counted upon without operation, gives in most cases a good useful limb, and a fibrous union about one and a half or two inches, or even longer, is preferred by some to a shorter, or a partially bony union which is apt to give way. The most serious obstacles to functional usefulness are adhesions in the joint and between the upper fragment and the surrounding parts. These can be obviated to a large extent by massage and early movement. Wharton Hood after three or four days' massage applied a strip of adhesive plaster three inches wide round the lower third of the thigh, and made his patient get up and walk about with the aid of a stick, renewing the plaster as it became loose. Tilanus advises the patient to walk in from six to twelve days, and Lucas-Championnière agrees with him. All advocates of the massage and movement method unite in condemning the older appliances, in which the joint was rigidly fixed in an extended position for several weeks, and they have abandoned the various devices which are intended to bring the broken surfaces together.

For the first few days the limb should be steadied in a splint with the knee in the most comfortable position, probably that of slight flexion in a Mackintyre splint, or a gutter splint made of Gooch splinting or pasteboard. The splint may be steadied with sand-bags. When pain has subsided, the limb may be left free in the bed. From the first, the muscles of the thigh and the knee should be well massaged daily, to reduce the swelling and subdue spasm. When the massage is finished, the knee should be gently flexed. Lucas-Championnière finds that a very slight range of movement suffices to keep the joint supple, and he thinks it an advantage, therefore, to allow the leg to lie free in bed as soon as the patient can comfortably do without support. While the foot rests on the bed, the patient may flex the thigh, and this flexes the knee. Dagron advises that semi-flexion should not be exceeded before the fifteenth day. The upper fragment should be steadied by the surgeon's hand, while passive movements are being carried out, and the range of movement should be cautiously increased. As soon as possible the patient should be encouraged to walk on his leg. A light posterior splint to support the joint in the efforts to walk would give security against the knee giving way. Although the range of passive movements can be extended by degrees, the weight of the patient's body must not be thrown upon the uniting structures for several months.

Fracture of both Bones of the Leg.—If the displacement cannot be reduced after the muscles have been soothed by massage, the patient should be anæsthetized in order to facilitate free manipulation of the broken ends of bone while the muscles are relaxed. Only in a small proportion of cases will operation be required on account of the entanglement of soft parts or of great displacement of the broken ends, not otherwise remediable. When mere over-riding from obliquity in the line of fracture is the cause of marked deformity or endangers the skin, extension upon the foot by weight and pulley for a week or two should be employed.

At first, while the muscles are inclined to contract in spasm, the patient will be relieved if the foot, as well as the seat of fracture, be supported. After a few days there will be an advantage in allowing free play to the ankle, so that the patient may spontaneously move the foot from time to time between the surgeon's application of massage and movements. Hence, a supporting splint which can be employed with or without a support to the foot will be best, but one with a fixed foot-piece which can be easily taken down for massage will serve the purpose very well. In about three weeks there is generally so little tendency to displacement that the limb may be allowed to lie in bed unsupported,

or steadied only by lateral sand-bags. At this stage the patient may be allowed out, going about on crutches with lateral pasteboard or poroplastic splints which do not confine the knee or ankle joints. In favourable cases weight can be borne on the fractured leg in about six weeks.

Pott's Fracture of the Fibula.—

Treatment.—Where there is not much displacement, the limb should be well massaged, especially along the outside, to soothe the spasm of the peronei muscles. The patient should then by voluntary effort try to assist the surgeon in restoring the foot into position. The limb should then be again massaged and steadied with a Dupuytren's or a "box" splint, or any of the forms of leg splint which have a foot piece. The splint should be removed for massage and movement daily, and at each sitting the foot should be brought nearer to its proper position, if it has not retained its position since it was replaced on the previous day. If the restoration is not complete on the first day, it will be better the second, and so on until it remains in position without difficulty. After about a week to ten days, the tendency to displacement will have passed off, and the patient will be able to move the ankle in all directions, with only a steadying hand placed over the malleoli. In from fourteen to eighteen days, if there is continued progress, the patient may be allowed to rest in bed with his foot tied in a pillow or quite free, and in about three weeks a supporting splint of plaster of Paris, poroplastic material, or pasteboard should be bandaged to the outside (or on both sides if required), and the patient should walk about with the aid of a stick. The surgeon must watch the effect of the patient bearing weight on the injured foot. If there is outward displacement, the treatment in bed must be continued, and the parts allowed to become more secure in their normal position before walking is attempted.

In cases in which the displacement outwards and backwards is very marked, the ligaments are more extensively torn and the muscular spasm is sometimes so great as to endanger the vitality of the skin over the inner malleolus. If careful massage, aided by the patient as before, does not suffice to obtain a marked improvement in position, a general anæsthetic should be given and the deformity reduced. The leg should be fixed in a Dupuytren's splint and laid on its outside with the knee flexed ; or preferably the foot and leg may be laid on an outside straight or gutter splint (Cline's) with thick padding under the outside of the foot, and steadied there with a bandage. Massage should be performed daily, and after the muscles have been soothed the foot should be guided into position until it can be inverted by the patient's own efforts, supplemented by gentle traction by the surgeon. The subsequent treatment is similar to that described for cases with slight displacement, with the difference that the stages are more prolonged. When the tendency to displacement remains after six or seven weeks of treatment, the patient should have the inside of the boot raised so as to throw the foot on its outer edge, while the foot is strapped to a steel carried along the inner side of the leg and fixed into the heel. The steel must be bowed opposite the inner malleolus if the skin there is tender. To the steel are fixed straps which draw the foot and ankle inwards when the patient bears weight on the foot. Sometimes the posterior lip of the lower articular surface of the tibia is broken off. The foot will then slip backwards very easily. Extension of the foot with a weight should be tried, and failing success with that, an operation will have to be considered. *Charles W. Cathcart.*

FRACTURES OF THE JAW.—(See Jaw.)

FRACTURES OF THE SKULL.—(See Skull.)

FRAMBŒSIA TROPICA.—(See Yaws.)

FRECKLES.—As freckles give rise to no symptoms, they call for treatment only when they are very numerous on exposed parts, and give rise to disfigurement. On the face they may be prevented by the wearing of a brown or red veil, as they are produced by the actinic and not by the heat rays of the light.

There are numerous methods for removing them, and the object of most of these is exfoliation of the epithelium containing the pigment. By far the best agent is corrosive sublimate in one or other form. Other remedies are certain acids, e.g., nitric, hydrochloric, or lactic acid, caustic alkalies, borax, bismuth compounds, and peroxide of hydrogen. A simple application is 1 per cent solution of $HgCl_2$ in alcohol, applied daily until irritation is produced. Unna recommends the application of a peeling paste of resorcin (50 per cent in zinc paste). This necessitates the patient staying in the house. He also recommends the following ointment :—

℞	Ung. Zinc.	30 parts	Adip. Lanæ	5 parts
	Bismuth Subnitrat.	1 part	Hydrarg. Ammoniat.	2½ parts
	Ol. Oliv.	5 parts	Sol. Hydrog. Perox (10%)	20 parts

The following is recommended in Vienna :—

℞	Hydrarg. Ammoniat.		Barii Sulph.	āā 1 part
	Bismuth Subnitrat.		Vaselin	30 parts

Norman Walker.

FRONTAL SINUS, SUPPURATION IN.—(See NOSE, ACCESSORY SINUSES OF.)

GALL-BLADDER, INFLAMMATION OF.—(See CHOLECYSTITIS.)

GALL-STONES.—Treatment based on the fact that gall-stones may be dissolved out of the body by various solvents is sometimes recommended; but solvents of sufficient strength cannot be administered without seriously injuring the mucous membrane of the alimentary tract. In weak solutions none of the so-called saline cholagogues have any solvent effect. Dr. Brockbank found that a 1 per cent solution of salicylate, phosphate, benzoate, bicarbonate or sulphate of soda, failed to produce any loss of weight in biliary calculi allowed to stand in them for fourteen days.

Olive oil has been recommended as a solvent for gall-stones, and experiment shows that if a gall-stone be placed in olive oil it gradually loses a large percentage of its weight, and may break up into small pieces. The same result is produced by oleic acid and by animal soaps. Doubts, however, are expressed as to whether administration of olive oil can have any influence on gall-stones in the biliary passages, as the oil cannot as such enter into these tracts. But, as Brockbank points out, oils and fats become disintegrated in the alimentary canal, and pass into the blood as an unchangeable fat, a fatty acid, and as soap, all three of which dissolve cholesterin readily and break up a gall-stone. It is possible, then, that the substances resulting from the digestion of the oil so reduce or soften gall-stones in the biliary channels that they pass into the intestine, or even short of that, may become less angular and produce less discomfort.

Certainly, many authors have found that administration of olive oil gives more relief than any other medicinal measures to patients suffering from symptoms of cholelithiasis. The oil should be given in 3- or 4-oz. doses in the early morning, or at any rate on an empty stomach. Oleate of soda is sometimes given instead of olive oil.

Massage was recommended by the late Dr. G. Harley, with the object of expelling gall-stones from the gall-bladder, but seems likely to produce injury to the biliary passages, and is not to be recommended.

Turpentine has been stated to bring about expulsion of calculi, but Prevost's and Benet's experiments show that it can only enter the bile in very small

amount, and though turpentine does bring about expulsion of some renal calculi, the author has not found any such result in cases of biliary calculi.

Although gall-stones cannot be dissolved in the biliary passages, treatment may lessen the formation of fresh ones and the enlargement of others.

Various diets are recommended. All food, and more especially proteid food, is found to increase the secretion of bile acids which dissolve cholesterin ; hence free meat-eating has been advised, but this tends to digestive disturbances which should be avoided, and a mixed meal produces the best effect on account of the active chymification to which it gives rise (Ritter). Fatty food is often ill digested (though olive oil may be well borne), and rich and highly spiced food is to be avoided ; but cholelithiasis does not call for any further restriction in diet (Naunyn), and the best diet for a patient with tendency to gall-stones is a plain roast and boiled, without excess of meat. Free drinking of liquid is to be encouraged, though water is not a cholagogue ; alcohol is unnecessary or injurious, but Vichy and Seltzer water are useful.

Exercise—walking, gymnastics and swimming—are very necessary ; gentle abdominal massage is recommended. No tight corsets or other tight clothing should be worn.

Constipation is to be met by occasional 1-gr. doses of calomel, and if aperients are needed more often, phosphate or sulphate of soda or Carlsbad salts.

Among cholagogues there is none comparable in effect to that of a full meal (Naunyn), but salicylate of soda increases and renders the bile more liquid and the bile acids are also good cholagogues.

There is a very general experience in favour of warm sodium waters such as Vichy (temp. 110° F.), Carlsbad (158° F.), Neuenhar (95° F.) ; and Naunyn testifies to the favourable results of Carlsbad treatment in long standing and unfavourable cases of cholelithiasis.

When biliary calculi pass into the bile-ducts and jaundice results, or when they pass into the cystic duct without the production of jaundice, biliary colic may arise. This is of every degree of severity, in the worst cases the exhaustion and collapse becoming dangerous. Unless there be any contra-indication, a hypodermic injection of morphia of $\frac{1}{4}$ gr. should be given at once. There seems no reason why this, the most effective measure, should be kept as a last resort, but a hot bath, hot fomentations with or without belladonna, and chloroform inhalation are also recommended. The drinking of hot weak solutions of bicarbonate of soda was recommended by Prout to relieve the retching on an empty stomach.

In many cases stone in the gall-bladder is accompanied by symptoms so slight as to be neglected or ignored, and the question of operation will not arise, though even in these cases serious results may ultimately ensue. But where the symptoms render it fairly certain that gall-stones are present in the biliary canals, the question of operation arises. No doubt the symptoms may eventually entirely subside, after or without repeated attacks of colic, the stone passing onwards or subsiding into quiescence in the gall-bladder. But, on the other hand, the dangers of gall-stones are many ; abscess, sloughing, or gangrene of gall-bladder, ulceration through the bile-ducts, infective or suppurative cholangitis, and intestinal obstruction being among the number. Not less important is the fact that a large proportion of cases of cancer of the pancreas and of the bile ducts, and to a less degree of the liver, are preceded by gall-stones in the biliary passages.

In the author's opinion, if there is fair ground for believing calculi to be present in the gall-bladder or bile-ducts, and the symptoms do not clear up after medical treatment, and where possible a course of waters at Carlsbad, operative procedure for their removal should be advised. (See following ARTICLE.)

When a gall-stone remains impacted in the bile-duct, persistent jaundice may add a danger which cannot be ignored; and if the jaundice does not subside after three or four weeks, operation should be performed.

Stone in the cystic duct produces no jaundice; nevertheless it leads to great distention of the gall-bladder, sometimes purulent, with little pyrexia, and operation is required. *Sidney Phillips.*

GALL-STONES (Surgical Treatment).—When the presence of gall-stones has been diagnosed, the question at once arises whether the case is suitable for palliative treatment or whether operation should be advised. The following are the main points to be considered :—

1. Palliative treatment gives relief in mild cases, but can never cure the patient; there is no known drug which can cause any absorption of gall-stones; some of the stones may pass down the ducts into the intestine, but most will remain in the gall-bladder.

2. Whilst stones are in the gall-bladder, there is always the risk of their setting up an acute inflammatory condition, or of one becoming impacted in the common duct; operation will then have to be undertaken under very serious conditions, involving grave risk; on the other hand, the operation for stones confined to the gall-bladder and the cystic duct is one of the simplest and safest in abdominal surgery.

3. It has been clearly proved that there is a very close relationship between gall-stones and carcinoma of the gall-bladder and ducts, and further, it seems that malignant disease arises far more frequently from stones which have caused trouble during life than from latent stones. Dr. Rolleston states that carcinoma of the gall-bladder and ducts occurs in from 4 to 14 per cent of all persons with gall-stones. This is a strong argument in favour of operation in the earlier stages.

4. The age and general condition of the patient must be considered. It may be laid down as an absolute rule that in all young healthy subjects with definite signs of gall-stone disease operation should be urged; but many of the subjects are elderly and feeble, and in some of these operation should not be advised unless the indications are urgent.

Palliative Treatment is justifiable in the following cases: (1) Those in which there are mild attacks, the patient being quite free from symptoms in the intervals, there being no tenderness or swelling in the gall-bladder region; (2) Cases of patients who are old, feeble, and obviously in bad general condition: operation would then not be advised unless the local condition were seriously threatening life; (3) Palliative treatment is indicated in the early stage of impaction of the stone in the cystic or common duct, unless there are also signs of local peritonitis or septic infection; some of these impacted stones pass into the bowel after a few days' palliative treatment, and then, if an operation upon the gall-bladder or duct is thought advisable, it can be performed under favourable circumstances later. Jaundice due to stone impaction and lasting more than three weeks, is unlikely to be relieved by medical treatment; in a few cases the stone ultimately passes into the bowel, and this involves a serious and often long illness, which could be avoided by operation at a much smaller risk.

Operative Treatment is indicated under the following circumstances: (1) Attacks of marked biliary colic recurring in spite of medical treatment; there are many women who suffer for years from the pains and discomforts of gall-stones who would at once be relieved by operation; medicine is usually powerless to check recurrence of the attacks in these cases, whilst complete relief is the rule after operation, recurrence being very exceptional; (2) Peritonitis is always a clear indication for operation; mild localized peritonitis may often be allowed to

subside under palliative treatment, but when this has occurred, operation should be insisted upon; any more severe degree of peritonitis demands immediate laparotomy; (3) Septic infection involving the gall-bladder or ducts, showing itself by fever, rigors, etc.; (4) Definite and persistent swelling of or around the gall-bladder; (5) Jaundice of more than three weeks' duration.

OPERATIONS.—

Cholecystostomy is the operation most often performed for gall-stone disease. The gall-bladder is exposed by an incision through the outer part of the rectus muscle; it is then incised, the stones are removed, and the opening in the gall-bladder is sutured to the peritoneum and the posterior sheath of the rectus muscle. The cystic and common bile-ducts must always be carefully examined, for it is essential that they should be clear. Free drainage usually occurs for from two to four weeks, and the wound then closes, provided of course that the ducts are patent.

Cholecystotomy is the operation in which the opening made in the gall-bladder is closed by suture after removal of the stones. This operation is seldom practised, for the risks of leakage are great, and moreover it is recognized that drainage of the gall-bladder is essential for the cure of the chronic inflammation which is almost always found in association with gall-stones.

Cholecystectomy is undoubtedly the best operation for certain cases of gall-stone disease, and it is probable that in the future it will be performed more frequently than is at present the custom. In this operation the gall-bladder with its stones is completely removed, and the cystic duct is closed by suture and a peritoneal flap. The operation is at least as safe as cholecystostomy; it is a radical measure, corresponding closely to the removal of the diseased appendix; recurrence of stones and the possibility of malignant disease starting in the damaged gall-bladder are prevented; the convalescence is shorter. The loss of the gall-bladder causes no inconvenience whatever to the patient; digestion is in no way affected.

Choledochotomy is the operation by which stones impacted in the common bile-duct are removed by incision of the duct; if, however, the stone is situated in the terminal portion of the duct, and it is impossible to manipulate it into the upper part, the stone is best removed by incision through the anterior wall of the duodenum. *T. Crisp English.*

GANGLION—Is a peculiar myxomatous degeneration of the cells in a hernial protrusion of the synovial membrane, either of a tendon sheath or joint cavity. The following methods of treatment may be adopted :—

1. *Counter-irritation with Pressure.*—The swelling should be painted with iodine liniment and firmly bandaged or strapped. In a certain number of cases this will be successful.

2. *Puncture.*—A tenotome is inserted beneath the skin, with due regard to the anatomy of the part, and the swelling is freely incised, a valvular opening being made. Pressure is then exerted over the swelling, so that its contents are extruded. A collodion dressing is applied with firm pressure, so that the walls of the cavity are brought into apposition. It is better to allow the gelatinous contents of the ganglion to escape externally than into the cellular tissues, and the whole proceeding must be conducted under the most careful asepsis, or very serious, even disastrous, results may occur.

3. *Excision.*—When a ganglion resists the above methods of treatment, or when the surgeon and patient both desire a speedy cure, the ganglion may be exposed by a free incision and dissected out The tendon sheath, or sometimes a joint cavity, may be opened, but if absolute asepsis is maintained there is no danger. Subsequently, early movement of the part must be undertaken to prevent the tendon from becoming fixed by adhesions. *W. H. Clayton-Greene.*

GANGRENE.—Death of the soft tissues, together with the bones, is a condition brought about primarily by some interference with the blood supply of the part. The various causes of gangrene are not considered in this article, but mention must be made of the close association of diabetes and Bright's disease with this condition. Senile gangrene is the result of an obliterative arteritis ; the supply of blood to the limb is cut off by blocking of the main artery, the collateral circulation being unable to compensate.

TREATMENT.—There are two main forms of gangrene: dry and moist.

In the *dry* variety the arterial flow is checked, but the return of blood and fluids along the veins and lymphatics is not interfered with. As the result of this the tissues die and shrivel up, undergoing a process of mummification without the occurrence of any septic changes. If untreated, in the course of time, the dead material is cast off by the action of the granulation tissue which springs from the living parts at the *line of demarcation* between the living and the dead. This line of demarcation is not immediately defined, and even when amputation is considered necessary, it is advisable to wait until this limitation is established before deciding on the actual operation which is to be performed.

As a rule it may be said that the treatment of dry gangrene is amputation—in such a situation that the flaps may be nourished adequately, and since the blood supply of a limb is richest in anastomosis in the neighbourhood of the joints, these localities are usually selected.

In certain cases where constitutional disease is advanced, or where the arterial degeneration is very marked, no radical treatment should be attempted. The gangrenous parts should be cleaned and dressed antiseptically, and the natural separation assisted by the division of tendons and other resistant structures. Such treatment is not satisfactory, while the process of separation is often productive of very great pain.

In some cases of diabetic gangrene, excellent results have been obtained by amputation, and the amount of sugar in the urine has been found to diminish after the removal of a gangrenous extremity.

In *moist* gangrene, on the other hand, we meet with a condition where the return of the fluids, blood, and lymph has been prevented. In this variety the tissues remain sodden with their contained fluids, and form a suitable medium for the development of micro-organisms. Moist gangrene is not necessarily septic, but the conditions are so favourable to micro-organisms that septic changes are almost inevitable. In cases where this variety of gangrene is feared—that is, when there has been interference with the venous return from a limb—every care should be taken to keep the parts aseptic, and a thorough toilet of the skin should be undertaken. The hairs should be shaved off, the limb should be well washed with ether soap, turpentine, and spirit, special attention being directed to the limb folds and the regions of the nails, and a large antiseptic dressing should be applied. If as the result of these precautions no septic complications arise, it is right to wait until a line of demarcation is defined before proceeding to amputation; but should the appearance of the limb, and the condition of the patient, suggest a septic state, no time must be lost in performing an amputation well above the gangrenous area.

In brief, the treatment of moist gangrene is amputation, and only in a very few cases where sepsis does not supervene should the operation be delayed.

Spreading Traumatic Gangrene belongs to an entirely different category. It is a form of gangrene following wounds contaminated with earth, into which the bacillus of malignant œdema finds its way. This deadly disease should be suspected in cases of lacerated wounds and compound fractures, when the limb becomes swollen and œdematous very shortly after the infliction of the injury, and when an emphysematous crackling can be felt on examining the tissues.

Once established, the process spreads with fearful rapidity, and nothing short of immediate amputation can give the patient the barest chance. In cases where this condition is suspected, cultures should be made from the wound and the patient very closely watched ; if the bacillus is found, or if the process spreads, the limb must be removed as near the trunk as possible. In spite of prompt treatment death is the usual result.

W. H. Clayton-Greene.

GASTRALGIA.—For the type of gastralgia which is relieved by food or alcoholic stimulants, and is made worse by tea or hot water, the most efficient treatment undoubtedly is morphine or heroin in small doses. Fifteen or twenty minims of the B.P. solution of morphine, or an equivalent solution of heroin diluted in water, and coloured or covered by the addition of a few drops of compound tincture of cardamoms, give immediate relief. Small doses of chloral hydrate and antipyrine have been recommended, and may be tried where the patient is intolerant of morphine or heroin.

In the type of gastralgia where the pain comes on immediately after food and is relieved by vomiting, the treatment should be rest in bed, and the administration of iron. Food should be given at first in small quantities, such as 1 oz. of milk every hour, to coax the stomach to bear ordinary diet by easy stages, much as in the case of gastric ulcer. The aperient iron mixture given in cases of gastric ulcer should be supplemented by pil. ferri or Oppenheimer's bipalatinoids of ferrous carbonate, of which two should be given three times a day.

Robert Saundby.

GASTRIC CRISES.—Treatment consists in withholding all food and drink by the mouth, and the hypodermic injection of morphia. If necessary, rectal feeding may be employed.

Robert Saundby.

GASTRIC ULCER should always be treated in bed, and indeed it may be said that frequent vomiting is in itself a sufficient indication for sending the patient to bed. In nine cases out of ten, the pain and vomiting stop after the patient is placed in bed, and the stomach tolerates diluted milk, e.g., 1 oz. of equal parts of milk and lime-water every hour.

Where there has been hæmatemesis within forty-eight hours, it is advisable to rest the stomach completely, and feed by the rectum. A nutrient enema is composed of one or two eggs beaten up with 4 or 5 oz. of milk, and a pinch of salt added ; it should be injected slowly into the rectum. The bowel should always be previously cleared out by a simple enema or an irrigation of normal saline solution. Such enemata should be repeated every four hours, and may be continued for three or four days. Many authorities recommend that the rectal feeding should be kept up longer, in order to permit the stomach ulcer to heal ; but most admit that the time should not exceed ten days. As the main factor which prevents the healing of the ulcer is the depressed general health, and as the amount of nutriment absorbed from the rectum is small, continued rectal feeding does not seem likely to promote recovery, and more harm than good results from prolonging it beyond what is needed for safety. On the other hand, suitable stomach feeding never in my experience does harm, and if it should cause pain, the rectal feeding can always be resumed for another day or two.

During the first week the food must be liquid, and the quantity of milk and lime-water should not exceed 4 oz. each hour, a point to which it should be gradually raised from the initial 1 oz. In the second week, if there has been no return of symptoms, bread and milk, made with soft roll, may be added at morning and evening, and custard pudding given in the middle of the day, the milk being continued. The patient should not be roused from sleep in order to

take the milk at night during this course of treatment. In the third week the patient may have 4 oz. of chicken, minced, with a little mashed potato and cocoa or milk tea (tea infused with milk) for breakfast, with soft roll and butter. In the fourth week he should be able to take ordinary food, so long as it is soft and well cooked; but if the teeth are defective, it must be minced or pounded.

The most useful medicinal treatment is iron combined with sulphate of magnesia, the latter being given in sufficient doses to keep the bowels open, constipation being generally present.

℞	Ferri Sulph.	gr. ij	Ac. Sulph. dil.	℥iij
	Magnes. Sulph.	gr. xl	Aq. Menth. Pip. dest.	ad ℥j

Two tablespoonfuls three times a day.

No other medicine is ordinarily required, but if there is pain we may give the antacid mixture or the olive oil mixture.

℞	Sod. Bicarb.		Muc. Tragacanth.	℥xv
	Bismuth. Carb.		Aq. Menth. Pip. dest.	ad ℥j
	Magnes. Carb.	āā gr. x		

Two tablespoonfuls three times a day or before each meal.

℞	Ol. Oliv.	℥j	Aq.	ad ℥j
	Pulv. Tragacanth.	gr. xx		

Two tablespoonfuls before food.

The administration of nitrate of silver in pills in the hope of stimulating the healing of the ulcer is futile, for the probability is that the pill does not dissolve in the stomach, and in any case the chances are greatly against the remedy coming in contact with the ulcer. Washing out the stomach with a solution of nitrate of silver, or the administration of teaspoonful doses of a ½ per cent solution by the mouth, seems not warranted by our experience of the treatment of deep ulcers elsewhere. I have forborne to employ these remedies for a long time, and I have not found any sensible delay in the progress of my cases from their omission.

Recurrence of hæmorrhage indicates resumption of rectal feeding, stoppage of all medicine by the mouth, the application of an ice-bag to the epigastrium, and a hypodermic injection of morphia (⅙ gr.). (See HÆMATEMESIS.)

Frequently recurring hæmorrhage suggests the propriety of surgical interference, but it is rarely needed. When the stomach has been opened it has often been difficult to find the bleeding point, and few surgeons are anxious tp interfere in these cases.

I have never known perforation to occur while the patient was under treatment in bed; but, whenever it does take place, it indicates surgical intervention without delay.

Perigastric adhesions, stenosis of the pylorus, and hourglass stomach can only be remedied by surgical means. Klemperer strongly advocates a trial of the hypodermic injection of thiosinamine, which is said to soften and remove fibrous bands; it might be tried for a time in the absence of urgent symptoms. The formula used by him is thiosinamine 10, glycerin 20, distilled water 70 parts, of which half to a whole syringeful should be injected under the skin of the back, three times a week. Ulcer of the duodenum should be treated surgically by means of gastro-enterostomy. During the time the patient is kept in bed it is desirable to aid recovery by general massage.

The diet should be brought up to something like the normal standard before the patient is allowed to leave her bed, and after getting up, no variation should be made for some weeks. If possible, a change to some bracing health resort should follow, and the aperient iron mixture should be continued until the anæmia has completely disappeared.

Robert Saundby.

GASTRIC ULCER, PERFORATED.—In dealing with the treatment of perforation of ulcers of the stomach, it is necessary to bear in mind the different ways in which the ulcer may perforate. These differences are caused mainly by the acuteness with which the actual physical perforation takes place. For example, we have to deal—

1. With cases where an ulcer may progress so very slowly that at a given moment germs can reach and travel between the adjacent serous surfaces without any of the stomach contents escaping. In this way the perforation generally leads to a localized abscess of greater or less extent, and as this bacterial invasion is not accompanied by any sudden change of condition, its exact time of onset is unknown. These cases really come under the heading of subphrenic abscess (see PERITONITIS, ACUTE GENERAL). Sometimes, however, the germs spread rapidly to the peritoneal surface of the adjacent coils of intestine, and finally give rise to a general suppurative peritonitis without the complication of escape of intestinal contents. The result of operative treatment then depends largely upon the nature of the germ. When the *Bacillus coli communis* is the dominant germ, the patient nearly always recovers ; if, on the other hand, it is a streptococcus, the mortality is great, and midway between these extremes is the staphylococcus.

2. Cases in which there is a definite perforation, but so small that a very slight amount of the stomach contents escapes, and then only intermittently, either with some peristaltic wave, or when the amount of the contents raises the endogastric pressure above a certain point ; possibly movements of the body as a whole may also influence the intermittent escape. These may be termed *leaking ulcers*, and with care one is often able to diagnose them with considerable certainty.

3. The next group is the ordinary acute perforation, in which a considerable aperture is formed, varying in size from one large enough to admit a small lead pencil, up to one allowing the hand to be introduced into the stomach.

TREATMENT, especially the detailed operative procedures, varies according to the position and extent of the ulcer ; for example, a small perforation on the anterior aspect of the stomach about half an inch in diameter is a simple matter compared with a huge rent in the posterior wall, nearly the whole of which may be in a state of active ulceration. Authorities are agreed that if a definite perforation of the stomach takes place, there is no treatment other than by operation. Any case that might recover spontaneously would also almost certainly recover with operative treatment, and all the risks that delay brings are prevented. Having therefore made the diagnosis of perforation of a gastric ulcer, with or without extravasation of the stomach contents, operation is imperative. It is obvious that the detailed operative treatment must vary according to the wide range of conditions that are met with. Each case will have some feature which necessitates a special treatment not altogether covered by a routine description. Bearing in mind, therefore, this warning, I think the following arrangement of the operative procedures may be found useful :—

1. *Shock.*—In the majority of cases, to which, however, there are remarkable exceptions, shock is the most important factor militating against recovery. How far this may be complicated by a toxæmia caused by a rapid absorption of poisons it is difficult to estimate : in any case the circulation and respiration are profoundly affected. All the recognized means for diminishing the shock caused by the operation must be taken. I am sure that intracellular injection of hot saline fluid, commenced as soon as possible after the perforation and continued right up to the moment of operation, is a most valuable proceeding. In nearly all cases some time must intervene between the decision to operate and the commencement of the operation. Although this interval should be as a rule

quite a short one, the immediate effect of the perforation may be so profound that it is imperative to wait for the patient to rally, and in these cases the rallying power is much assisted by the intracellular transfusion. If this is not possible, rectal injections of hot saline fluid should be given, about three-quarters of a pint every twenty minutes or half an hour. The raising of the foot of the bed, hot bottles, etc., in fact, all the recognized means for treating shock, must be employed.

2. *The Incision* should always be made above the umbilicus, in the middle line or just on one side of it; the object of the latter incision is to enable one to enter the abdomen through the rectus muscle, so that there may be little or no tendency to a ventral hernia afterwards. As a matter of fact, unless the incision is very long, ventral herniæ above the umbilicus are quite exceptional, and if they do occur, are generally harmless.

3. *The Search for the Perforation.*—This does not often give much trouble. Occasionally one may be delayed a few minutes by the search, perhaps for a small perforation high up towards the cardiac end of the stomach; or sometimes a small perforation towards the pyloric end of the stomach in the line of the lesser curve just behind the small omentum is found with difficulty. Usually some flakes of lymph will direct one towards the spot when it is situated on the anterior aspect of the stomach: when the perforation is through the posterior surface, it is necessary to lift up the stomach and colon in order to find it.

4. *The Treatment of the Perforated Ulcer.*—The first step is to try and repair the stomach wall at the site of the perforation. When the ulcer is small it is quite easy to excise it completely and to bring together the resulting wound in the ordinary way; the excision renders it possible to ascertain fairly satisfactorily the condition of the mucous membrane in the region of the perforation. If the ulcer is too large to excise, the edges of the perforation may be trimmed up a little and the aperture closed by folding in the stomach wall with Lembert's sutures. These should be so placed that a considerable area of the serous surface of the stomach is infolded, and this is sometimes a difficult proceeding owing to the brittleness of the stomach wall, the stitches tending to break away on the least strain. The aperture may be so extensive that it is practically impossible to close it. I refer to cases of extensive ulceration of the posterior wall of the stomach, where nearly the whole of it may be involved. The wall becomes adherent to the spine and prevertebral structures, and the perforation tends to follow the outer limit of the adherent area. I once found a somewhat crescentic slit about five inches long, admitting the whole of the hand. In such a case one can only shorten the slit as much as possible, insert a drainage tube into the stomach, and well plug the region around with gauze.

Gastro-jejunostomy.—Some authorities advise this as a routine practice in all cases of perforated gastric ulcer. It is especially recommended when it is obvious that the ulcers are multiple or when the ulcer is an extensive one. I quite admit the value of this measure in the ultimate cure of the patient, but in the cases we are considering the patient's condition is so grave that the additional time and manipulation needed for this operation render it unjustifiable. If the stomach is in such a condition of ulceration that ultimate recovery is unlikely, I would be in favour of performing gastro-enterostomy later, say at the end of two weeks, or even before if the patient's condition is quite satisfactory. If the ulceration is so extensive and the perforation so situated that there is danger of the stomach perforating again at the same spot in a day or two, it is obviously imperative to perform this operation.

The Treatment of the Peritoneum.—If no appreciable amount of the stomach contents has escaped, and there is no extensive and copious purulent peritonitis a careful sponging of the peritoneum in the upper abdomen is alone necessary

Unless one is quite certain that the repaired stomach wall will hold, it is advisable to plug the region around the repaired spot with gauze arranged to secure good drainage if leakage should occur. When a definite amount of the stomach contents has escaped, it is advisable to make another incision in the middle line just above the pubes, to flush out the abdomen from one aperture to the other, and to leave a large drainage tube in the lower incision leading down to the bottom of the pelvis, so that any accumulation of stomach contents or inflammatory products can drain away. When there has been very extensive escape of stomach contents, it is often difficult to thoroughly clean the posterior and upper parts of the abdomen, especially in the region of the spleen and at the back of the liver. Every endeavour, therefore, should be made to remove débris in these regions.

After-treatment.—Here again the treatment of shock must be carried out fully, and rectal injections of hot saline should be given, intracellular transfusion being resumed if necessary. With hot coffee and brandy per rectum, and hypodermic injections of strychnine, even considerable shock may be successfully met.

Results of Operative Treatment.—At the present day the success of operative treatment of perforated gastric ulcer is highly satisfactory. Only a short time ago five cases of ruptured gastric ulcer were admitted to the London Hospital during a short period, and all of them recovered. Two of these were operated upon by one visiting surgeon, two by another, and one by a third.

H. P. Dean.

GASTRITIS, ACUTE AND CHRONIC.—The dietetic treatment should, as far as possible, involve rest to the stomach, and abstinence from all food which is irritating, from its chemical composition or its mechanical state. A quite recent attack, of only a few hours' duration, may be successfully treated by drinking 20 or 30 oz. of warm water, so as to dilute the gastric contents, and if the pain does not subside, by emptying the stomach, either by tickling the pharynx, or giving a sulphate of zinc emetic (20 gr.); the food should be hot water, or milk diluted with two parts water, for the rest of the day, and on the following day only the blandest food should be taken.

The following articles of diet are forbidden to persons suffering from gastritis in any form:—All fats, including butter, which should at most be taken very sparingly, pork, smoked and salted meats, ham, bacon, veal, salmon, mackerel, eels, lobsters, and crab; all fried and greasy dishes; porridge, brown bread, pastry, uncooked fruit; all fruit containing seeds and skins, or until these have been removed; nuts of all kinds; raw vegetables, salads, radishes, cresses, mushrooms, carrots, turnips, parsnips; pickles, sauces, pepper; cheese, cream cheese; malt liquors, spirits, port, madeira, sherry, Indian and Ceylon teas, iced water and iced creams.

During convalescence from an acute attack, or in chronic cases, the diet should be something like the following:—

Breakfast.—Toasted white bread; white fish, boiled or broiled; cocoa coffee, or China tea infused with milk; no butter.

Luncheon.—A slice of mutton, or a mutton chop without fat; mashed potatoes; milk pudding; claret and soda water.

Tea.—China tea, infused with milk; Madeira cake.

Dinner.—No soup; white fish, boiled or broiled; lean beef or mutton; fowl or game lightly cooked; mashed potatoes or any tender green vegetable; baked custard or stewed fruit, without cream; claret or still moselle and mineral water.

The following course of treatment will be found useful. Two 5-gr. blue pills should be ordered, of which the first should be taken at bed-time, and

the second two nights later, the patient being told not to repeat these pills. Either the rhubarb and bismuth mixture, or the compound bismuth powder, should be given before each meal.

℞	Sod. Bicarb.		Muc. Tragacanth.	℥xv
	Bismuth. Carb.	āā gr. x	Aq. Menth. Pip.	ad ℥j
	Pulv. Rhei	gr. iiss		

Two tablespoonfuls to be taken before each meal.

℞	Sod. Bicarb.		Pulv. Rhei	gr. iiss
	Bismuth. Carb.	āā gr. x	Pulv. Cinnamom. Co.	gr. v

M. Ft. pulv. Mitte xii. A powder to be taken in a little milk before each meal.

Half a tumbler of hot water should be sipped slowly the first thing in the morning, and to this may be added a teaspoonful or more of the effervescing sulphate of soda, if the bowels need assistance.

Chronic Catarrh of the Stomach.—In regulating the diet, those articles already enumerated which may cause irritation must be eliminated, and for a time a stricter regimen may be necessary. The two main lines of dietetic treatment are: (1) *Milk*, which should be diluted with barley-water or soda-water, and is preferably sterilized; (2) *Minced lean meat*, which should be prepared in the same way as the Scottish national dish called collops. This minced meat is eaten without condiments, bread, or vegetables, but hot water *ad libitum* may be allowed between meals. Many cases which resist milk diet improve rapidly upon minced meat, and it is, perhaps, most useful in cases where there is hypersecretion of gastric juice.

The most useful drugs are bicarbonate of soda, sulphate of soda, bismuth, magnesia, and mercury, the last in the form of calomel or blue pill. The treatment should commence by a course quite similar to that given in subacute gastritis; but when the gastric irritability has been allayed, the following acid mixture may be usefully continued for some time:—

℞	Ac. Nitrohydrochl. dil.		Succ. Taraxac.	℥j
	Tinct. Nucis Vom.	āā ℥x	Aq.	ad ℥j

Two tablespoonfuls three times a day directly after meals.

This seems indicated where the urine deposits amorphous alkaline phosphates. If the patient is troubled by acid eructations, one of the following mixtures should be given:—

℞	Sod. Bicarb.		Muc. Tragacanth.	℥xv
	Bismuth. Carb.		Aq. Menth. Pip. dest.	ad ℥j
	Magnes. Carb.	āā gr. x		

Two tablespoonfuls three times a day or before each meal.

℞	Ol. Oliv.	℥j	Aq.	ad ℥j
	Pulv. Tragacanth.	gr. xx		

Two tablespoonfuls before each meal.

If the appetite is bad, give the following:—

℞	Sod. Bicarb.	gr. x	Tinct. Zingib. fort.	℥v
	Tinct. Rhei	℥xv	Inf. Gent. Co.	ad ℥j

Two tablespoonfuls before each meal.

The bowels must be kept freely open, by the use of aperients if necessary, such as effervescing sulphate of soda or Rubinat water; or in patients of spare and nervous habit, a pill of aloes or cascara.

Such cases are treated successfully at many mineral water-cure places, notably at Carlsbad, Homburg, Kissingen, Neuenahr, Vichy, and Châtel-Guyon.

Robert Saundby

GENU VALGUM.—(See KNOCK-KNEE.)

GIDDINESS.—(See VERTIGO.)

GLANDERS.—In the *acute* form of the disease all that can be done is to deal with symptoms as they arise. Abscesses must be opened and drained, and treated antiseptically. The patient should be isolated, and those in attendance upon him should be very careful not to inoculate themselves with the disease.

In the *chronic* form every effort should be made to get rid of the local lesions by excision and antiseptic applications. The nasal passages, if affected, should be washed out freely and frequently with antiseptic solution. Bendall recommends the internal administration of benzoate of soda at frequent intervals. Babes advises the subcutaneous injection of $\frac{1}{20}$ to $\frac{1}{15}$ cc. of mallein, at intervals of two or three days, for two months or so. After the early injections a reaction, local and general, follows; but after a time this does not occur. (See also BACTERIOTHERAPEUTICS.)

E. W. Goodall.

GLAUCOMA.—This is a condition of increased intra-ocular tension, and before we can treat it correctly we must ascertain the cause of the tension; for the treatment in different cases may vary diametrically with the cause: thus, in primary glaucoma, atropine may cause disastrous results, while eserine may at once relieve: on the other hand, in glaucoma secondary to iritis, with the pupil completely bound down to the anterior surface of the lens, atropine is strongly indicated, with the object of breaking down the adhesions, while eserine, by increasing the congestion of the iris, will make matters worse.

Primary Glaucoma (i.e., where there is no evidence of previous disease to account for the glaucoma).

DIAGNOSIS.—The chief difficulty in diagnosis occurs in distinguishing acute or subacute glaucoma from iritis.

In *glaucoma* there is increased tension. In *iritis* the tension is usually normal; but for those who cannot rely on their estimation of tension, there are other valuable points on which to base the diagnosis. In both these conditions there may be severe pain, coming on more or less suddenly, both in the eye and radiating over the brow, some failure of sight, circumcorneal injection, and discoloration of the iris. But apart from the tension, it is the *pupil* which will in most cases give us the necessary clue.

In glaucoma the pupil is dilated—often pear-shaped. In iritis the pupil is contracted.

Other distinguishing points are the following:—

In *glaucoma* the congestion is a dusky purple, the anterior chamber is as a rule shallow, there are no spots of exudation on the back of the cornea, the iris is not bound down to the lens, there is generally a history of previous attacks of misty vision, with the appearance of coloured rings or halos round lights, possibly with some pain, which lasted a few *hours* and then passed off. In *iritis* the congestion is bright red, the anterior chamber is normal or deep, there are often spots of exudation to be made out (with a bright light and a magnifying glass) on the back of the cornea, or the pupil is in places bound down to the lens. If there have been any previous attacks of iritis, the failure in sight due to vitreous opacities, etc., will have lasted for *weeks*, not hours, and there will not have been halos. Halos are rarely seen except in glaucoma and in conjunctivitis; in this latter condition when they are due to a film of mucus over the cornea.

TREATMENT differs only in degree, according to whether the disease is acute, subacute, or chronic. In each, the cause of the increased tension is the blocking of the exit of the fluids of the eye at the angle of the anterior chamber by the apposition of the iris to the back of the cornea; *our aim must therefore be to open up the angle.* The two main methods we have at our disposal are instillation of myotics (eserine or pilocarpine) and the performance of an iridectomy. Myotics may reduce the tension for a time, but an iridectomy is the only known procedure which will permanently keep down the tension.

In addition to local treatment, it is very important to attend to the general health of the patient. Diet should be restricted, especially in regard to meat

and stimulants, the latter being avoided altogether when practicable. All kinds of mental anxiety should, whenever possible, be relieved; constipation avoided; only moderate use of the eyes allowed, and this with properly correcting glasses.

1. *Threatened Glaucoma.*—In the early stages of glaucoma—when only attacks of misty vision and halos have occurred—even though the vision be $\frac{6}{6}$, and there is no contraction of the field, as soon as the diagnosis is certain, an iridectomy should be done at once. One never knows how severe the attack may be when it occurs, and how much it may impair the sight. Cases operated on early do exceedingly well. It is a great mistake to postpone operation till the vision has definitely begun to deteriorate. This is especially true where one eye has had an acute attack, or is blind from glaucoma, and the good eye has begun to show symptoms. The good eye should be operated on without delay. Some surgeons regularly advise operation in both eyes, even though the symptoms have only occurred in one.

Until the operation takes place, the pupil must be kept contracted with eserine, 1 or 2 grs. to the ounce, instilled three times a day. The weakest eserine that will keep the pupil contracted should be used, and it may be combined with cocaine, in the proportion of 1 of eserine to 3 of cocaine.

2. *In an Acute or Subacute Attack*, treatment must be prompt and energetic; every hour of increased tension may cause irreparable damage to the retina and optic nerve. On the other hand, the reduction of tension must not be too sudden. It is much better to reduce the tension by eserine and leeching before operating, so that the fall of tension at the time of incision may be as little as possible, otherwise some retinal or choroidal vessel may give way, and an intra-ocular hæmorrhage occur, which will cause complete loss of the eye.

The patient should be in bed, two leeches applied to the temple, and eserine drops (3 or 4 gr. to the ounce*) instilled every quarter of an hour for the first hour, and later every hour, until the tension falls.

A purgative should be administered, and, if necessary and not otherwise contra-indicated, an injection of morphia—to give the patient some much-needed sleep. Stimulants should be avoided as far as possible, unless there is much collapse, when they must be given. If the tension comes down, it is better to postpone operating for at least twenty-four hours, to allow the patient and the eye to recover from the shock of the acute attack, the eye meanwhile being kept under the influence of eserine. The iridectomy is then performed under the most favourable conditions. If, however, in spite of the above treatment, the tension has not come down after six hours, an iridectomy must be performed forthwith.

Patients who have had one acute attack and have got over it, should have an iridectomy performed without delay; since, if this is not done, a return of the tension is bound to occur, and may possibly happen at a time when the patient has no eserine to use, and is away from skilled aid, with the result that the vision may be seriously impaired, or even lost. The risk of the operation in skilled hands is less than that of leaving the eye alone. (*Vide infra.*)

3. *Chronic Glaucoma.*—Here, again, iridectomy is the only permanent means of cure in most cases, especially those in which there are occasional attacks of misty vision and halos.

In the most chronic cases (glaucoma simplex), in which the tension may never be found to be definitely raised, and no attacks of mists or halos are complained of, iridectomy, though it sometimes succeeds, does not hold out the same satisfactory chances of success as it does in the more acute forms. There are

* Sometimes eserine drops, 4 gr. to the ounce, cause very severe pain; if this persists, weaker drops (2 gr.) must be substituted.

certainly cases where myotics alone (eserine or pilocarpine) have kept the field and acuity of vision practically unimpaired for years; but on the other hand, many treated in this way are seen in which either the drops are not used regularly, or a very troublesome eserine irritation is set up, or again, the myotic does not keep the disease in check, and the sight goes from bad to worse: so that in most cases it is safer to perform an iridectomy as soon as possible.

Warning.—Before an iridectomy is performed, it should be explained to the patient in most cases: (*a*) That there is a certain amount of risk in the operation. (Eyes have been lost from an intra-ocular hæmorrhage—to mention only one unavoidable accident); (*b*) Glasses will have to be worn after operation, to correct the astigmatism; (*c*) Vision, except in the acute cases, will probably not be improved—*it may be slightly worse*, owing to the astigmatism, and the dazzling due to the irregular pupil. But these considerations are quite overbalanced by the fact that, if left alone, the eye will go blind; whereas the operation will probably save the sight for the rest of the patient's life.

Iridectomy for glaucoma is a highly specialized operation. When the anterior chamber is very shallow, the incision becomes one of the most difficult procedures in ophthalmic surgery. If the knife goes too deep, it may easily pass through the iris and prick the lens, causing traumatic cataract, and generally loss of the eye; if it does not go deep enough, the cornea is tunnelled, and the anterior chamber is not reached. Again, the cutting of the iris does not consist in simply cutting off any portion of iris that may be grasped in the forceps; unless the iris is properly and freely torn away from its root, and the angles carefully replaced, the probability is that the operation will fail. Hence the importance of the operation being undertaken only by a surgeon skilled in ophthalmic practice. For details of the operation, see ophthalmic text-books.

Management of a case of Iridectomy.—There must be complete rest in bed for from five to six days, with strict nursing, the patient not being allowed to sit up till after the fourth day. Both eyes are bandaged for three days; after this the unoperated eye may be freed. A drop of eserine solution (2 gr. to the ounce) is dropped into the unoperated eye both at the time of the operation, and daily for at least a week afterwards, to prevent an attack of glaucoma being induced in this eye.

The operated eye is dressed every day; warm boracic lotion is used to wash away any discharge from the lashes and lids, and a little allowed to pass into the conjunctival sac; great gentleness and strict antiseptic precautions must be exercised.

If no pain is complained of, no extensive examination of the wound is made until the fourth day. If the wound is flat, and the anterior chamber has reformed, the bandage may be dispensed with during the day at the end of the week, dark glasses being worn; but a pad and bandage must be used at night for at least another week.

Complications.—If the anterior chamber does not reform, the patient must be kept longer in bed. If the wound tends to gape, the bandage must be worn for longer than a week. If iritis or cyclitis supervenes, leeching to the temple and hot bathing should be used. If the wound bulges, and the lens presents, the lens must be removed.

When iridectomy fails to relieve the tension, eserine drops (2 gr. to the ounce) are given. If the tension still remains too high, a sclerotomy should be performed, and this can be repeated if unsuccessful at the first attempt. Very gentle massage of the eye by the patient himself, for three or four minutes twice a day, is effective in some cases.

If eserine causes irritation (conjunctivitis and eczema of the lids), nitrate of pilocarpine (2 to 4 gr. to the ounce) should be substituted: pilocarpine is less

powerful but not so irritating as eserine. The skin of the lids should be treated with zinc oxide or calamine ointment, and the conjunctiva with a lotion of boracic acid (10 gr.) and zinc sulphate ($\frac{1}{2}$ or 1 gr. to the ounce).

Blind and painful glaucomatous eyes should be excised.

Secondary Glaucoma (i.e., where the glaucoma is secondary to some other disease).

1. *Iritis* is occasionally complicated with glaucoma (see IRITIS) :—

(*a*). When the margin of the pupil is completely bound down to the lens (complete annular synechia), the fluid secreted by the ciliary body, being unable to pass through the pupil, collects behind the iris and balloons this forwards (Bombé iris). Our object in treatment must be to restore the circulation of fluid, either by breaking down the adhesions with atropine, or, failing this, by making some opening in the iris by iridectomy or quadruple puncture.

Atropine ointment (4 gr., or, if not strong enough, 8 gr. to the ounce) is used every half hour for the first three hours, and later, four to six times a day, combined with leeching to the temple, hot applications to the eye, and a brisk purge. If atropine fails to break down the adhesions and thus reduce the tension, some operation must be performed. When there is severe iritis a quadruple puncture is indicated,* to be followed later, when the eye is quiet, by an iridectomy. In the more chronic cases, iridectomy may be performed with a good chance of success.

(*b*). When the pupil is not bound down to the lens, and the anterior chamber is deep, the increased tension being due to the blocking of the filtration area by inflammatory exudates, the tension must be met with leeching, purging, and atropine (but atropine in these cases must be used sparingly, just sufficient to keep the pupil moderately dilated). If this fails, paracentesis of the anterior chamber must be performed, and this can be repeated several times, if necessary.

2. *Glaucoma frequently follows Wounds of the Cornea, or Perforation of a Corneal Ulcer*, when the pupillary margin of the iris becomes included in the corneal opening. An iridectomy must be performed as soon as the conjunctival sac is clean.

3. *Wounds of, or Operations on, the Lens* may cause glaucoma, quite apart from any iritis which the trauma may have produced. After needling the lens, or after accidental wounds, the soft lens matter may either block the pupil or collect in the anterior chamber. The treatment consists in keeping the pupil dilated with atropine, and letting out the soft lens matter by a curette evacuation. Sometimes a tag of lens capsule becomes adherent to the corneal wound after needling, or after extraction of cataract, which by dragging on the iris causes glaucoma. Eserine should be tried first; but if this fails, the capsule should be divided with a cutting needle.

4. *Dislocation of the Lens* may cause glaucoma. (*a*) Dislocation into the anterior chamber. Eserine must not be given, but the lens should be extracted. (*b*) Lateral dislocation. Eserine should be tried, and if it fails, iridectomy and removal of the lens with the scoop should be carried out. If this fails, it may be followed later by sclerotomy. (*c*) Dislocation into the vitreous. In this case the lens cannot be removed. If eserine fails, iridectomy, followed later if necessary by sclerotomy, affords the best chance of saving the eye in this very hopeless condition.

5. *Glaucoma associated with Detachment of the Retina.*—Whenever this occurs we must examine carefully for evidence of *intra-ocular new growth*. Even in doubtful cases the eye should be excised without delay.

* If iridectomy is performed in the presence of acute iritis, the coloboma will probably be filled up with lymph.

. 6. *Glaucomatous Eyes associated with Cataract, and no Perception of Light*, should be suspected, of new growth and excised.

Buphthalmos (Glaucoma occurring in childhood, causing enlargement of the whole globe). The glaucoma may be primary or secondary. Where primary, iridectomy or sclerotomy holds out the best chance of retaining vision, and should be done as early as possible. Where secondary, cases should be treated on the lines mentioned above. *W. Tindall Lister.*

GLOSSITIS.—(See TONGUE.)

GLYCOSURIA.—(See also DIABETES MELLITUS.) Transient glycosuria requires no treatment other than that which is indicated for the disease with which it is associated. Permanent glycosuria such as is met with in elderly, gouty, obese, or alcoholic subjects, cannot be clearly distinguished from true diabetes, and must be treated on the same lines as the latter (q.v.). In the majority of instances it will be found that such cases belong to the alimentary type, and have some tolerance for carbohydrates ; they should, therefore, be dieted in the same way as mild cases of true diabetes. Seeing, however, that alcohol undoubtedly plays a part in the production of some cases of glycosuria, it should always be banished from the diet. Spa treatment agrees well with such patients : Carlsbad, Vichy, and Neuenahr being the most suitable places. The same drugs may be tried as in true diabetes.

For the treatment of the most common complications (ECZEMA, CARBUNCLE, GANGRENE, CATARACT, etc.), see special articles. *Robert Hutchison.*

GOITRE, SIMPLE PARENCHYMATOUS.—In certain cases of simple parenchymatous goitre occurring in young adults, much may be done by medical treatment in the early stages. In cases of long standing, and in those in which much fibrous tissue has developed, medical treatment has little if any effect, and if the goitre is large or causes inconvenience by pressure, a portion of it should be removed by operation. The favourable cases for medical treatment are those of simple parenchymatous goitre, which not infrequently occur in adolescents and young adults. There is a uniform general enlargement of the gland, which develops gradually and painlessly ; at first there is merely a slight fullness of the front of the neck, which may cause no inconvenience. As the goitre increases, it attracts attention by its size and the increasing tightness of the collar. If it grows still further, it may cause dyspnœa by compressing the trachea. It is probable that this growth of the gland is a true hypertrophy which occurs in response to some demand for an increased supply of its secretion. In some cases, however, it appears as if the hypertrophy, once started, goes on increasing until it surpasses physiological limits, becomes pathological, and does not subside without special treatment, If, in these cases, we give thyroid extract, we satisfy the demand for an increased supply of thyroidal secretion from an external source, so that the gland is able to rest and undergo a partial atrophy, with a corresponding diminution in size. This course of events is analogous to that which takes place in the hypertrophied mammary gland during lactation, where, as soon as the demand for its secretion ceases, when the child is weaned, the gland returns to a resting condition and decreases in size.

In selecting cases for this treatment, it is important to make sure that no symptoms of exophthalmic goitre are present, such as frequent pulse, tremor, or nervousness, which would only be aggravated by thyroid treatment. In carrying out the treatment, it is advisable to begin with small doses. One or two grains of dry thyroid (thyroideum siccum B.P.) may be given each night at bed-time, either as a powder or tablet. In many cases this daily dose has

proved quite sufficient, in others it is necessary to increase it to 3 gr. once, twice, or even thrice a day. As long as the pulse is not accelerated more than fifteen or twenty beats a minute, this dose may be continued. In a favourable case, the diminution in the goitre takes place rapidly; thus in one of my cases the circumference of the neck at the commencement of the treatment on March 21st was 16½ inches, on April 4th it was 14 inches, and on June 9th, 13 inches, a diminution of 3½ inches in less than three months. By this treatment the goitre may be reduced to two-thirds, one-half, or one-third of its former size, or it may entirely disappear, and the symptoms caused by its presence are relieved, or removed altogether. In some cases the goitre may develop again when the treatment has been discontinued for a few weeks or months. When this occurs the size can be readily reduced again by a second course of treatment.

If the patient is living in a goitrous district, he should leave it, if possible, for a time. If this is not possible, careful attention must be paid to the character of the drinking water. Endemic goitre, as is well known, is due to some impurity in the water. The nature of the active agent in the production of goitre is still unknown. It is, however, either destroyed, or at any rate rendered harmless, by boiling or distilling the water. It is therefore most important in all cases which arise in a district in which the disease is endemic, that the patient should only drink water which has been either boiled or distilled. It has been recommended, and I think is advisable, that this precaution should be adopted in all cases of goitre, wherever they may occur.

Iodine, in one form or another, has long been used with success in the treatment of simple goitre. Thyroidal secretion contains iodine in an organic combination described as thyroidin by Baumann; so that the action of iodine in these cases is probably supplemental, like that of thyroid extract itself. Thus, potassium iodide 5–10 gr., tincture of iodine 5 min., or a pill containing ½–2 gr. of iodoform, may be given three times a day. Hydrofluoric acid has been recommended by Woakes, who advised that 10 min. of ½ per cent solution of the re-distilled fluoric acid in an ounce of water should be given twice a day, and the dose gradually increased.

In the simple form of parenchymatous goitre, the application of a blister, by painting the skin over the goitre with liquor epispasticus, is often useful. In most cases, however, counter-irritation by the inunction of the red iodide of mercury ointment is more suitable. Sometimes this ointment is too strong; it should then be used from a quarter to half the usual strength, that is to say, 5–10 gr. red iodide of mercury to 1 oz. benzoated lard, applied in small quantity each night, or even every other night. Tincture of iodine, iodine ointment, or a mixture of one part of it with two of potassium iodide ointment, may be applied instead. The efficiency of the red iodide of mercury ointment is increased by exposing the skin to the rays of the sun after its application; especially is this so in a tropical country, such as India. It has been suggested that the efficacy of this treatment may be due to the greater ease with which heat, and possibly other rays of the sun, pass through the skin after treatment with preparations of iodine.

At one time injections of iodine into the goitre were employed, it being assumed that this direct introduction of the iodine into the substance of the gland would be more efficient than the other modes of administration. It is to be hoped, however, that this treatment has now been finally abandoned; it is dangerous and uncertain, no less than sixteen cases in which death had occurred in consequence of the injections, having been collected by Heymann. Sir Victor Horsley has shown by experiment that death, in such cases, is due to the iodine being injected directly into a large blood-vessel, an accident which it is difficult to avoid on all occasions in the case of such a vascular structure as a goitre.

In goitres in which adenomata or cysts are present, some diminution in size may follow a course of thryoid treatment, not of course owing to a decrease in the size of the adenomata or cysts themselves, but as a result of atrophic changes in the gland substance in which they are embedded. In such cases, the operation for removal of an adenoma or cyst is simplified by a previous course of treatment with thyroid extract.

George R. Murray.

GOITRE, EXOPHTHALMIC.—In exophthalmic goitre we have to deal with the effects produced by a continued over-action or hypersecretion of the thyroid gland. The secretion, instead of passing into the lymphatics and so into the blood-stream, in just sufficient quantity to maintain the normal rate of metabolism, is continually poured into the blood-stream in an excessive amount, producing the toxic effects which are shown by the familiar nervous and cardiovascular derangement. It is now an easy matter to supplement the formation of thyroid secretion when this is deficient; it is unfortunately as yet a much more difficult matter to reduce the supply when it is superabundant. Furthermore, owing to the natural variations in the course of the disease, it is difficult to trace the exact influence of treatment, and to estimate its effects at their true value. The best results are to be obtained by a judicious combination of hygienic measures with electrical and medicinal treatment.

The hygienic treatment consists mainly in regulating the amount of rest, exercise, feeding, and fresh air suitable for each case. In very severe cases, at the commencement of the treatment of cases of moderate severity, and during the acute exacerbations which may occur in any case, complete rest in bed is essential, and may be continued for from two to six weeks, according to the severity of the symptoms and the progress made. The rest should be combined with feeding on a generous diet and milk, regulated in amount by the degree of emaciation which has taken place. The quantity of milk to be taken in different cases may thus vary from 2 to 6 pints in the twenty-four hours. In carrying out this modified "rest-cure," it is not generally advisable to isolate the patient.

With patients who are able to go about, and who have already been treated by complete rest, it is most important to regulate the mode of life. Twelve hours' rest in bed at night is required, from ten to ten being a convenient time. In some cases, an additional rest for half-an-hour to an hour after lunch, and before dinner in the evening, is advisable. A quiet life in the country is most suitable, and should be recommended when possible. It is a great advantage if the greater part of the day can be spent out of doors or in an open-air shelter. In fact, the open-air life such as is practised in the treatment of pulmonary tuberculosis at a sanatorium is extremely beneficial in many cases. All undue excitement, and over-exertion, must be sedulously avoided. As exophthalmic goitre not infrequently occurs in young women of much natural ability, who are leading an active and useful life, it is necessary in each case to give exact directions as to what may or may not be undertaken. Walking is the most suitable form of exercise. The more active movements entailed by cycling, riding, or playing tennis, are unsuitable, and quicken the pulse far too much. Uncongenial social duties, concerts, theatres, and large gatherings of people, are all unsuitable for these cases.

Electrical Treatment.—One of the most useful methods of treatment is by the prolonged daily application of a moderate faradic current to the neck. Two flexible electrodes, some four inches long and two wide, are applied, the one over the goitre in front and the other at the back of the neck, and fixed in position by means of straps and buckles at the sides. These are connected with the secondary circuit of a dry-cell faradic battery, a water rheostat being included in the circuit, so that the strength of the current can be modified as desired.

The current, which should be just strong enough to produce a prickling sensation in the skin, may be applied from one to two hours morning and evening. This treatment should be continued steadily for two or three months at a stretch. The patient readily learns how to use the battery, and is then able to carry out the treatment without difficulty in her own home. (See also ELECTRO-THERAPEUTICS.)

Medicinal Treatment.—A large number of drugs have been employed in the treatment of exophthalmic goitre; only a certain number of these have been of any real service, some in the routine treatment of the malady, others in the alleviation of the special symptoms.

One of the most useful drugs is arsenic, which may be given in nearly all cases with advantage. The best results are obtained by small doses continued over a long period with regular intermissions. As a rule 5 min. of liquor arsenicalis given thrice daily after food will suffice. It is a good plan to omit the arsenic for one week in each month, but to continue the treatment in this manner for from six to twelve months. Belladonna has been found to do good by many, but I find that patients often object to taking it continuously in sufficiently large doses, owing to the discomfort produced when its physiological effects are felt. It seems probable, though actual proof is lacking, that its beneficial effect is due to a diminution in the hypersecretion of the thyroid gland, so that it should be given in increasing doses until well-marked dryness of the mouth is produced. Sodium phosphate has been strongly recommended by some observers, in doses of from 15–30 gr. three times a day. I have not myself noticed any marked benefit produced by its use. In cases in whch the pulse-rate is high, tincture of convallaria may be given in combination with one or other of the above drugs, in 10–15-min. doses, as it appears to have a better effect in reducing the frequency of the pulse than the other cardiac tonics. Where there is marked dilatation of the left ventricle and relative mitral incompetence, digitalis or strophanthus may be used with, or instead of, the convallaria. When nervousness is a specially marked feature, potassium bromide may be given in 10–15 gr. doses for a time. Potassium iodide is unsuitable for internal administration, as it not infrequently aggravates the symptoms. Thyroid extract should, of course, never be given. Suprarenal and thymus tablets (5-gr.) have appeared to do good in some cases, and in one of my cases all the symptoms of the disease, with the exception of the exophthalmos, disappeared while the patient was taking thymus tablets over a period of many months. Inunction of a small quantity of the red iodide of mercury ointment over the goitre, is useful when the electrical treatment is not being employed. The ointment is best used of about half the official strength.

Urgent special symptoms at times require treatment. Sudden attacks of diarrhœa should be treated by rest in bed, a milk diet, and the administration of laudanum (5 min.) with dilute sulphuric acid (15 min.) in a mixture, three or four times a day. Vomiting is a serious symptom, and sometimes persists, in spite of all treatment, until the patient dies from exhaustion. Morphine, given either hypodermically or in a suppository, is the most efficient drug in the treatment of this kind of vomiting. In severe cases, saline infusions might be of service, as the vomiting is probably due to a toxæmia. Very severe attacks of palpitation are most promptly relieved by the application of cold, in the form of an ice-bag to the præcordium.

Serum Treatment.—Recently various endeavours have been made to prepase an antitoxic serum which would neutralize the toxæmic condition due to the excessive thyroidal secretion. In one direction it was assumed that, after removal of the thyroid gland, certain substances, which would normally have been destroyed by the thyroid secretion, accumulated in the blood, and that this

blood, or a serum prepared from it, might be used conversely, as an antidote to the excess of secretion present in exophthalmic goitre. Ballet and Enriquez employed the serum of dogs from which the thyroid gland had previously been removed. Moebius, working on the same lines, made use of a serum obtained from the sheep several weeks after thyroidectomy, and reported favourably upon the results obtained by giving it in 5-min. doses three times a day. This serum, as prepared by Merck, can now be obtained under the name of "Antithyroidine." Some observers have reported favourable results from its use. I have not been able to trace any special effect in the cases in which I have employed it, and Dr. Hector Mackenzie, after a more extended trial, came to a similar conclusion. Lanz, following up the same idea, has advocated the use of the fresh milk of a goat from which the thyroid gland had previously been removed. He obtained good results in six cases. The whole of the milk of one goat should be consumed by the patient in the twenty-four hours. This treatment is somewhat difficult to carry out, and some patients take a dislike to the goat's milk. When it cannot be obtained fresh, the dried milk, which is sold under the name of "rodagen," may be used instead, and very good results have been reported after taking it in ½-dr. doses three times a day, and I have seen marked improvement take place. In one case, however, the patient developed a pulse as slow as 32 to 44, associated with periods of asystole and convulsions, while taking 1 dr. three times a day; so that in using this preparation, it is advisable to give doses not exceeding ½ dr. three times a day. Attempts have also been made to produce a serum which is thyrotoxic; that is to say, capable of bringing about destructive changes in the hypertrophied thyroid gland by a process of cytolysis. To this end, preparations of the thyroid gland of one animal have been injected into another animal, in the hope that in this way specific cytolysins might be produced in the serum of the second animal. So far no special effect has been obtained. It has appeared to me, as it did to Lepine, that an antithyroid serum might be prepared, owing to the formation of antibodies in the serum of the second animal. I have thus prepared a serum in rabbits by feeding with thyroid extract, and in the goat by injecting and feeding with the extract, followed by bleeding. Patients improved while taking this serum, but the results did not appear to be in any way better than those usually obtained by the use of older and simpler means of treatment.

In conclusion, it may be stated that at the present time the best results are obtained by a combination of general hygienic treatment with the use of electricity and certain drugs as described above, and that as yet no serum or other animal product has been found to give uniformly better results than these

George R. Murray.

GONORRHŒA.—The efficient treatment of gonorrhœa is quite as important as that of syphilis; and, as in the latter disease the principal object of treatment is to modify the intensity of the syphilitic virus as early as possible, and thus prevent the appearance of tertiary lesions, so in gonorrhœa our aim should be to minimize its ill effects, and to prevent the supervention of complications. Gonorrhœa is an infective disease due to a specific micro-organism, the gonococcus, which is capable of rapid extension and proliferation, and which consequently will ultimately involve the whole of the urethral mucous membrane. Not only does it affect the urethra locally, but ultimately it gives rise to a general infection of the blood by means of a toxin, the gonotoxin, which is the direct cause of many of the later phenomena of the disease. The majority of the serious complications of this disease do not present themselves until the prostatic portion of the urethra is involved; consequently the primary aim of

treatment is to prevent the gonococcus from reaching that part of the urethral mucous membrane.

The one agent which is destructive to the gonococcus is nitrate of silver, but even in weak solutions this sets up such an irritation of the urethral mucous membrane as to preclude its use. But of late years various modifications of nitrate of silver have been devised, which whilst destructive to the gonococcus are only slightly irritating to the urethral mucous membrane, and are capable of penetrating into its deeper layers. Amongst these may be mentioned protargol, nargol, argyrol, argentamin, albargin, ichthargol, and argonin, of which the first two have yielded the best results in the experience of the writer. Solutions of these substances of 1 to 2 per cent strength are applied to the urethral mucous membrane by injections introduced by means of a urethral syringe in the following manner:—The patient should first empty his bladder, and should introduce the nozzle of the urethral syringe into the meatus, and inject a sufficient quantity of the solution to distend the urethra gently (about 2 to 3 dr.). The syringe is then withdrawn, and the solution is retained in the urethra for a gradually increasing period of time, starting at two minutes, but ultimately extending to twenty minutes, in proportion to the severity of the case and the tolerance of the individual; the injections should be used three or four times daily. The injections may at first cause some increase in the amount of the discharge and of the ardor urinæ, but they will shortly modify the purulence of the discharge, and will be productive of little if any pain. In exceptionally acute cases, owing to the extreme tumefaction of the mucous membrane, and to the intense pain, it may be necessary to postpone the use of injections for a few days.

Formerly, the treatment of the early stage of gonorrhœa was simply a palliative one, by means of alkalies and sedatives, and consequently the gonococcus was given a free scope, and was rather encouraged to make its way to the posterior urethra; but now that the pathology of the disease is better understood, the treatment is commenced at the earliest possible opportunity with the view of repelling and exterminating the invading germ. During the decline of the disease, the injections of the nitrate of silver compounds should be continued until no gonococci can be discovered in the discharge on careful microscopical examination. Then recourse may be had to an astringent injection, such as a solution of the sulphate, permanganate, or chloride of zinc, and this treatment should be continued for a week after the final disappearance of the discharge. As a substitute for injections, treatment by irrigation of the urethra with weak solutions of permanganate of potash or ichthyol solutions has been recommended, and as a modification of this, Janet's treatment by forcible irrigation into the bladder has met with lukewarm approbation. At the commencement of the attack, a brisk purgative should be administered, and subsequently a saline aperient may be taken every other morning. As aids to the local treatment, the so-called balsamic remedies, copaiba, cubebs, sandalwood oil, or gonosan, should be given, preferably in the form of capsules, but should not be persevered with if they give rise to any disturbance of the digestive functions, or if they set up a dermatitis. A light diet is an essential factor in the treatment, and abstinence from all alcoholic drink, from highly seasoned dishes, shell-fish, asparagus, and coffee should be enjoined; at the same time any sexual excitement must be absolutely prohibited, and any violent exercise should be forbidden. Large quantities of bland, demulcent fluid, such as barley-water, will, by diluting the urine, considerably lessen the pain experienced on micturition. A certain proportion of cases will yield to treatment carried out on the above lines, but not infrequently the discharge persists in spite of all efforts to check its progress, and the condition

of chronic gonorrhœa, or gleet ensues. Here the discharge may proceed from the anterior part of the urethra, and is then caused by involvement of some of the urethral follicles, by stricture of the urethra, or by granular patches or papillomata of the urethral mucous membrane. If the cause is situated anteriorly to the compressor urethræ muscle, it can be discovered by urethroscopic examination, and will usually require treatment applied locally down the urethroscopic tube; thus, any granular patches and papillomata, or the orifices of any of the urethral lacunæ which might be affected, may be touched with a solution of nitrate of silver 5–20 gr. to 1 oz. water, and if any constriction of the urethra or any peri-urethral thickening is present, it should be treated by the passage of bougies in increasing sizes up to 25 or 28 F. If the gonococcus has reached the prostatic urethra, a region inaccessible to the ordinary injection, it is advisable to apply a few drops of the nitrate of silver solutions by means of a Guyon's syringe.

The complications of gonorrhœa are manifold, and often of vital importance, but the majority of them do not occur until the prostatic portion of the urethra has been infected. Gonorrhœa of the anterior urethra may be complicated by acute lymphangitis, peri-urethral abscess, inflammation and suppuration of Cowper's glands, and chordee. In acute gonorrhœa the lymphatics of the penis and the inguinal glands may be the seat of inflammatory changes, causing phimosis, a cord-like enlargement of the dorsal lymphatics of the penis, and swelling and tenderness of the inguinal glands. This condition seldom proceeds as far as suppuration, and usually yields to treatment by rest, purgatives, and hot fomentations.

Peri-urethral Abscess may occur in connection with the urethral follicles, and is met with at any portion of the urethra from the meatus to the bulb; the pus may make its way into the urethra, or towards the skin, and its escape externally is preferable to its bursting into the urethra, since in the latter case recurrence is frequent; these abscesses should be opened by skin incision directly fluctuation can be detected.

Abscess of Cowper's Glands will form a perineal swelling which will also require to be opened and drained.

The pain of *Chordee* may be relieved by the application of cold, or simply by the act of micturition, and the tendency to erection may be treated by opium and belladonna suppositories, or by a mixture of bromide of sodium and ext. salic. nigri liq.

In gonorrhœa of the posterior urethra the following complications may be met with: acute and chronic prostatitis and prostatic abscess, epididymitis and orchitis, seminal vesiculitis, cystitis possibly extending up the ureter and giving rise to pyelitis.

Acute Prostatitis.—The pain may be relieved by suppositories of opium and belladonna, by immersing the patient in a hot hip-bath, by leeches to the perineum, and if an abscess has formed it may be opened by a perineal incision. *Chronic Prostatitis* is a common cause of chronic urethral discharge, and is a condition requiring prolonged treatment; from its chronicity and its tendency to recurrence it is accompanied by considerable depression, both mental and bodily, and is a fruitful cause of sexual hypochondriasis. The treatment consists of instillations into the affected portion of the urethra of a few drops of the nitrate of silver solutions; suppositories of opium, belladonna, and ichthyol, cold hip-baths, cold rectal and perineal douches, careful regulation of the bowels, restricted diet, and the avoidance of violent exercise and sexual excitement.

Epididymitis is one of the most frequent complications of gonorrhœa, and at the same time one of the greatest gravity, since it is liable to cause sterility

by obliterating the tube of the epididymis and so causing azoospermia. The essential point in the treatment is to suspend the testicles, and at the same time to apply heat and pressure. This is best effected by a " Jullien's " suspensory bandage, the bag of which is large and made of thick waterproof tissue ; this is evenly padded with cotton-wool, and is applied to the scrotum and exerts pressure on the testicles when the lateral tapes are adjusted ; it is retained in position by abdominal and perineal straps. The effect of this is to give almost instantaneous relief from the severe pain which is inseparable from this condition, and also to promote the absorption of the inflammatory effusion. At the same time, the prostatic urethra should be treated by small instillations of nitrate of silver solutions, with the view of preventing the spread of the disease to the other testicle. As adjuncts to the local treatment, rest, light diet, and aperients may be prescribed.

Seminal Vesiculitis, if acute, should be treated by rest, cold or hot rectal irrigations, leeches to the perineum, and opium and belladonna suppositories ; if an abscess forms in the vesicles a perineal incision should be made, and the abscess approached and evacuated by dissection between the bladder and rectum. If chronic, the distended vesicles should be emptied of their contents by massage with the forefinger through the rectum ; this should be carried out once or twice weekly.

Cystitis is another complication frequently met with in posterior gonorrhœa, but it is usually limited to the region of the neck of the bladder, and is chronic in degree. In this condition rest is necessary, the diet should be light, and large quantities of barley-water should be administered ; to counteract the vesical spasm and consequent frequency of micturition, opium and belladonna suppositories should be introduced, and the patient should be placed in a hot hip-bath. A very valuable remedy in cystitis is helmitol or anhydromethylene citrate of hexamethylenetetramine ; this, in consequence of the ample liberation of formaldehyde, acts as a powerful disinfectant upon the urine, and also imparts to it an acid reaction ; it should be given in doses of 10–15 gr., three or four times a day, administered with large quantities of water or soda-water. Gentle irrigation of the bladder with warm solutions of boracic acid, salicylate of soda, or nitrate of silver and its modifications, is indicated in the subacute and chronic forms of cystitis.

Gonorrhœal Rheumatism is another complication of a posterior gonorrhœa, and is caused by a generalized infection of the blood by means of the gonorrhœal toxin ; it may affect the joints or peri-articular structures, the sheaths of tendons, fasciæ, and bursæ. Treatment should be directed firstly towards the urethral affection, and instillations of nitrate of silver solutions may be made into the prostatic or any other portion of the urethra affected. The joints or other structures involved in the process may first be treated with cold applications by means of an ice-bag, spirit lotion, or Leiter's tubes, and must be kept at complete rest ; later, counter-irritants may be prescribed, such as iodine liniment, blistering, and the actual cautery ; pressure by means of Scott's dressing and strapping, or by elastic bandages, may relieve this condition, and also the hot-air bath and massage may be employed. If the affected joint is greatly distended, it may be necessary to relieve it by aspiration and by the injection of some weak astringent lotion. Internally, large doses of alkalies may be administered, or the salicylates of soda and quinine, iodides, salol, or aspirin.

Gonorrhœal Ophthalmia is caused by inoculation of the conjunctiva with gonorrhœal pus, and may be met with in adults and in newly-born children infected with pus from the maternal vagina ; its progress is characterized by its rapidity and destructiveness ; the condition is thus one calling for prompt

and energetic measures. Locally, solutions of nitrate of silver 10 gr. to the ounce, of protargol or argyrol, should be applied daily to the whole conjunctival surface by means of a camel's-hair brush, and the superfluous lotion should be washed from the eye with warm water or weak boracic lotion. Any accumulation of discharge must be prevented by the frequent application of astringent and antiseptic lotions such as boric acid, alum, perchloride of mercury, or sulphate of zinc. Cold-water compresses will considerably relieve the pain, as also will the application of one or two leeches above the outer angle of the orbit. The greatest care must be taken to avoid inoculation of the sound eye, and this is best effected by securing a watch-glass over it with strips of strapping. The treatment internally should consist of a brisk purgative at the commencement, and later of tonics, anodynes, and even stimulants in cases where much bodily and mental depression is present. In ophthalmia neonatorum, local treatment with weaker nitrate of silver solutions and antiseptics is indicated, and its success and the recovery of the patient will mainly depend on the skill and assiduity with which the prescribed treatment is carried out by the nurse.

Gonorrhœal Iritis is an occasional complication of gonorrhœal rheumatism, and is characterized by its subsequent tendency to recurrence. Locally, atropine and cocaine lotion should be applied three or four times a day, and mercurial ointment with iodine and belladonna may be rubbed into the temporal region ; internally, salicylate of soda, iodide of sodium or ammonium, aspirin or quinine will be productive of benefit. In rare instances gonorrhœa is complicated by peritonitis, pericarditis, endocarditis, and spinal meningitis, the treatment of which should be carried out on general surgical and medical principles.

Gonorrhœa in the Female may primarily affect either the vagina, the vulva, or the urethra, whence it may spread to adjacent organs of importance. *Vaginal Gonorrhœa* in the acute stage should be treated by vaginal douches of hot water if the patient can submit to them, and on the subsidence of the acute symptoms a vaginal speculum may be passed, and the vaginal mucous membrane may be thoroughly swabbed out with a strong solution of nitrate of silver, 10 gr. to the ounce, or with a 5 per cent solution of protargol or nargol, and after this a glycerin tampon be introduced. The more chronic forms of vaginal discharge may be treated by astringent injections given three or four times daily ; the solutions usually employed are sulphate of zinc, sulpho-carbolate of zinc, permanganate of zinc, chloride of zinc, and alum. *Gonorrhœal Vulvitis* may be treated by hot-water applications at first, and subsequently by painting over the inflamed surface with a strong solution of nitrate of silver, 20 gr. to the ounce, after which the parts should be dressed with pledgets of lint soaked in lead and opium lotion. *Gonorrhœal Urethritis* should first be treated by alkalies and hyoscyamus taken internally, and also large quantities of barley-water ; if there be much pain and difficulty in micturition, immersion in a hot hip-bath, and the introduction of a few drops of cocaine solution into the urethra, will afford relief. On the subsidence of the acute stage, the balsamic remedies above mentioned may be prescribed internally, and the urethra may be painted over with a solution of nitrate of silver 2 gr. to the ounce.

A frequent complication of gonorrhœa in women is *Abscess of Bartholin's Glands*, which should be treated by early incision, and plugging the cavity with antiseptic gauze ; if the abscess recurs, the whole of the gland should be dissected out.

Gonorrhœal Warts or vegetations may be met with in both sexes, but attain far greater magnitude in women than in men ; as their progress appears to be encouraged by moisture, the principal indication for treatment is to keep the region dry by applying a dusting powder of starch, oxide of zinc, or savin powder. The more exuberant form of warts will require severer methods, such as the

application of caustics, as carbolic acid or acid nitrate of mercury, or removal with the knife or the thermo-cautery.

From the vagina the disease may extend up the cervix uteri to the body of the uterus, thence along the Fallopian tubes to the ovaries, and possibly to the peritoneal cavity; but the treatment of these conditions belongs rather to gynæcology than to genito-urinary surgery. *J. Ernest Lane.*

GONORRHŒAL CONJUNCTIVITIS.—(See CONJUNCTIVA, DISEASES OF.)

GOUT.—No routine treatment can be adopted which is suitable to all cases of gout. The nutritional condition of the patient, his habits, surroundings, and mode of life, constitute factors that necessarily modify the treatment of individual cases; and with gout, as with so many other diseases, it will be found that each case requires separate study and frequently special treatment. Quite apart from the treatment of an attack, which is a comparatively simple and easy matter, must be considered the condition or conditions which led up to it. The gouty individual is one whose general metabolism is unstable, and this instability may be present in one or more of the great physiological systems—digestive, nervous, circulatory, etc. Which of these is primarily and mainly at fault should always be a question for patient investigation, and one must then endeavour to improve the metabolism of that system by suitable medicinal, dietetic, and hygienic measures.

The treatment of gout should have for its aim the following objects: (1) *The gouty paroxysm* in acute cases, and the relief of the pain as speedily as possible; (2) *The subacute or chronic condition*, and the prevention of recurrence; and (3) *The affected joints*, with the object of removing the uratic deposits and of preventing permanent deformity.

1. **Acute Gout.**—*The Treatment of the Gouty Paroxysm.* The limb should be placed in the horizontal position, or slightly elevated above the level of the body, and a cradle should be arranged to remove the weight of the bed-clothes off the affected part. To alleviate the severe pain in the joint, warm packs should be arranged round it, consisting of cotton-wool saturated with a soothing lotion, and then lightly covered with oiled silk. I have found the following lotion most useful in relieving the local pain:—

℞	Sod. Carb.	ʒiv	Tinct. Opii	ʒij
	Lin. Bellad.	ʒij	Aq.	ad ʒviij

A small portion of the lotion should be mixed with an equal quantity of hot water, and then poured on cotton-wool previously arranged round the joint. The pack should be changed every four hours. In connection with the acute paroxysm no attempt at local depletion—such as the application of leeches to the inflamed joint, blistering, or incisions—should on any account be made, owing to the great liability of thereby extending the inflammatory condition, and so producing subsequent ankylosis or deformity.

For the internal treatment, colchicum is one of the most valuable drugs we possess. It should be used especially for acute gout, and for subacute attacks supervening on chronic gout. If employed continuously, tolerance may be acquired, and then the drug ceases to act. At the commencement, a large dose, 30 to 40 min. of colchicum wine should be given, followed by a mixture containing in each dose 15 to 20 min. of the wine, with from 40 to 60 gr. of citrate of potassium, which should be administered three times a day. The citrate of potassium is given for its combined properties of acting as a diuretic and of diminishing the acidity of the urine, and may, if desired, be used as an effervescing mixture, 30 gr. of potassium bicarbonate to 20 gr. of citric acid. Colchicum reduces the gouty inflammation, relieves pain, and shortens the

attack. It should only be taken under medical advice, and never in such doses as to produce extreme depression; after the inflammation of an acute attack has subsided, the colchicum should be gradually diminished until it is discontinued.

A very useful method of administering colchicum is in the form of its active principle, colchicine, which may be given in doses of $\frac{1}{80}$ to $\frac{1}{50}$ gr., three or four times a day immediately after food. Only a few patients will tolerate the larger doses, the contra-indications being the production of diarrhœa and intestinal griping. The following constitutes a very useful pill :—

R	Colchicin.	gr $\frac{1}{60}$	Ext. Hyoscyam.	gr $\frac{1}{2}$
	Ext. Nucis Vom.	gr $\frac{1}{4}$	Ext. Gentian.	gr j

Three to four grains of blue pill should be given the first night of an acute attack, followed by a dose of Epsom salts in the morning. Mercury should be given only in sufficient doses to produce its cholagogue effect, as, owing to the possibly defective action of the kidneys, the mercury absorbed into the general system may be eliminated with difficulty. In the employment of purgatives for gouty patients the great object is not to produce powerful purgation, but to relieve portal congestion and intestinal catarrh. A pill containing either euonymin 2 gr. or podophyllin $\frac{1}{4}$ gr., combined with extract of hyoscyamus 1 gr. and compound extract of colocynth $1\frac{1}{2}$ gr., will, in many cases, be found very useful.

If the pain of an acute attack of gout is so severe as to prevent sleep, veronal or trional may be given, or a full dose of extract of hyoscyamus with blue pill at night will, in some cases, act as a very useful anodyne. The administration of opium or morphine should, if possible, be avoided, owing to the risk of its deficient elimination, and also on account of its diminishing the amount of urine, and its tendency to derange digestion and check hepatic metabolism.

2. **Subacute and Chronic Gout.**—*Means of checking the Excessive Formation of the Toxic Agents of Gout.* These consist in careful attention to diet and regimen, in the promotion of the metabolism of the liver, and the relief of congestion of the portal system, which can be effected by keeping the bowels open at least once a day. In addition to colchicum, in small doses, guaiacum may usefully be administered as an alterative which stimulates the metabolism of the liver, and also affords relief to the portal system. From 5 to 10 grains of guaiacum resin should be given in cachets two or three times a day, according to the effect on the bowels, since guaiacum sometimes acts as a laxative. The powdered guaiacum resin given in cachets is far preferable to the tincture of guaiacum in a mixture, as in the latter form a nauseous medicine is produced, and the precipitated resin may cling obstinately to the tongue and fauces. In cases of chronic gout the colchicum may very conveniently be administered in the form of the colchicine pill, three times a day. Colchicine, however, should not be given in cases of marked interstitial nephritis, as in such cases a fatal result has been known to follow its administration in medicinal doses. If constipation occur, a sulphur-and-guaiacum tablet, or compound liquorice powder, should be administered at night. An occasional dose of blue pill and euonymin, followed by a purge of Epsom salts, will be found useful. If the patient is suffering from atony and debility of the stomach, nux vomica or strychnine may be given with potassium citrate. Iron preparations are not as a rule well tolerated by the gouty; but if anæmia is present, the citrate of iron and ammonium, or the carbonate of iron, will be the best to administer.

Means of promoting the Elimination of the Toxic Agents of Gout.—This may be effected by medicinal treatment, and by diet and regimen. Citrate or bicarbonate of potassium should be employed as a diuretic which increases the

volume of the urine while it diminishes its acidity. The use of the potassium salt may with advantage be pushed until moderate alkalinity of the urine is produced ; by such means the quadriurates are rendered more soluble and stable than they are in acid urine, and the tendency to the deposition of uric acid or sodium biurate in the kidney tissues is removed. Free diuresis should also be encouraged by the drinking of sufficient quantities of water. A gouty patient should avoid the excessive use of common salt at table, owing to its power in diminishing the solubility of sodium biurate, and thereby hastening the precipitation of that body.

The use of Alkalies and the Salts of Alkalies.—Of the potassium salts the citrate and the bicarbonate are the two most commonly employed. I am fully assured as to the beneficial effects of employing a potassium salt in conjunction with colchicum in the treatment of acute and subacute gout, and in my experience the citrate is the most useful. If given in sufficiently large doses it tends, by its conversion into the carbonate within the kidneys, to diminish the acidity of the urine (which is generally high in connection with the gouty paroxysm), while at the same time it increases the solvent power of the urine for the uric acid salts, and so assists their elimination. In cases of sluggish action of the liver, of gastro-intestinal catarrh and torpor, of gouty dyspepsia, and of other forms of irregular gout where there are no appreciable uratic deposits in the joints, mineral waters containing sodium salts are undoubtedly beneficial, owing to the action of those salts as hepatic and gastro-intestinal stimulants.

The lithium salts, in my opinion, are not so useful as the potassium and sodium salts. The chief objection to their use is their greater toxicity and depressing action on the heart as compared with the potassium salts. They consequently have to be given in such small doses that I am doubtful whether they possess any remedial effect. On the other hand, I constantly meet with patients suffering from cardiac depression as the result of the excessive and continued consumption of lithia tablets, which are so persistently, speciously, and wrongly vaunted as curative of gout.

In gouty conditions associated with disturbance of the functions of the liver, the most important consideration is the restoration of that organ to its normal activity, and here the alkaline sodium salts are especially useful. There is no better treatment at the outset than a dose of blue pill or calomel at night, followed by Epsom or Carlsbad salts in the morning. Subsequently, a pill containing a small dose of blue pill or calomel combined with euonymin and colocynth will be found most useful. In such cases a mixture which I have found most beneficial in stimulating the liver, and also the gastro-intestinal tract, is one containing sodium bicarbonate, gentian, and nux vomica, taken a quarter of an hour before meals.

Further Treatment of Chronic Gout. — The enlargement and tenderness of the gouty joints is due to two causes—the deposition of sodium biurate in the cartilages and fibrous structures, and a chronic inflammatory thickening of the fibrous tissues. For the reduction of this last-mentioned thickening, as well as for painful gout of the sole of the foot, and for gouty neuralgic affections, iodide of potassium given internally is a useful remedy. This drug should not, however, be regarded as a solvent of gouty deposits, and it is contra-indicated if advanced kidney disease exists. It should be given in doses of 5 to 10 gr. three times a day, and may usefully be combined with from 5 to 10 min. of tincture of iodine.

3. **The Local Treatment of Gouty Joints.**—If there is much persistent swelling, the limb should be elevated as much as possible, and a light flannel bandage applied to the joint. If the œdema continues, the hot douche, followed by sponging with a cold strong solution of common salt, will be found serviceable. The application of the so-called solvents of uric acid externally is useless, as they

are not solvents of sodium biurate. Careful massage and gentle exercise of the stiffened joints should be employed, but only when convalescence is fairly established. The Scotch douche is very useful when the conditions are chronic. A good-sized stream is thrown with considerable force upon the affected joint, employing first cold water for half a minute and then hot ; the latter should be as hot as the patient can bear, and should be continued for one minute. This process is repeated for fifteen or twenty minutes. The repeated alternations of temperature produce a stimulating effect upon the circulation about the joint, and so increase tissue change and favour absorption. Massage of the joint should be resorted to immediately after the douching, as the tissues are then in a relaxed condition.

In many cases of chronic articular gout, the salt pack is efficacious. It consists of flannel soaked in a warm saturated solution of common salt, which is wrapped round the part, covered with oiled silk and a bandage, and kept on all night. It should be repeated nightly as necessary. For the stiffness and thickening of joints, careful rubbing with iodide of potassium and soap liniment may also be employed. The thermal baths of Bath, Buxton, Harrogate, Strathpeffer, Llandrindod Wells, Aix-les-Bains, and other spas, and mud baths, are useful in the treatment of these cases. Treatment by baths should, however, be avoided by patients suffering from acute gout, by very old people, and by those suffering from any serious cardiac affection.

Massage, Electricity, and Baths.—A sedentary life and deficient exercise conduce to gout, owing to a lowering of general metabolism, to depressed vigour of blood-circulation, and to impairment of movement in the lymph-channels. Since the lymph-circulation is mainly carried on by muscular movements and respiration, the beneficial influence of massage and muscular movements on many gouty subjects becomes readily intelligible. Massage should never be resorted to in cases of acute gout, as it not only aggravates the disease at that stage, but also causes severe pain ; it should be reserved for the more chronic cases. Massage produces an increase in the amount of blood and lymph passing through the tissues concerned, at the time and afterwards. This improves the nutrition of the affected tissues, promotes absorption of deposits, and restores physiological activity. In subacute or chronic cases, where the joints remain swollen and œdematous, and are the seat of considerable deposits, much benefit is frequently derived from massage and galvanism. Each of the affected joints should be massaged for a few minutes, and then galvanism (5 to 10 milliampères) applied for a few minutes with the negative pole over the affected region, to be again followed by massage. Under this combined treatment the œdema and deposits frequently disappear rapidly. Probably the beneficial effects are due mainly to the increased circulation of blood and lymph induced, and the consequent absorption that takes place. I have also found in many cases, that a decidedly beneficial influence on gouty joints is produced by electric light baths, followed by electrical treatment in the form of cataphoresis to the affected joints.

Electric-light and superheated air baths increase the oxidative processes within the body, as is shown by the increased elimination of carbon dioxide from the lungs, and also by the increased metabolism of the body in general. They also stimulate the circulation of the blood and lymph in the affected joints, and so lead to improved nutrition. This curative action undoubtedly continues after the treatment has been discontinued. Such treatment, therefore, is better given intermittently, say six baths on alternate days ; then intermit for two or three weeks, and so on. These baths improve the atrophic condition of the muscles. They cause a temporary elevation of the body-temperature, marked reddening of the skin of the part treated, profuse local or even general perspiration, quickened pulse, lowered arterial tension, and generally considerable

amelioration of the pain, and in some cases complete disappearance of it for a time. Radiant heat has a greater penetrative effect than other forms of heat, and, in my opinion, the effect is more stimulant. In cases of acute or subacute gout, the pain, as a rule, recurs at varying intervals after a bath, but usually with diminished severity; and frequently a progressive reduction of the pain occurs after the use of subsequent baths. Undoubtedly many cases of chronic gout do not show much improvement after the use of electric-light or superheated air baths, and I have frequently experienced great difficulty in selecting the patients most likely to be benefited by them. In my experience, chronic gout of long standing, with considerable deposits in the joints, is not much benefited by these baths; for such cases undoubtedly more good can be done by the employment of vapour baths, followed by massage of the affected joints, a method which is frequently most useful in producing softening and absorption of the deposits. Electric-light baths, however, seem to set up improved circulatory and trophic changes in the joints, which are maintained long after the baths have been discontinued. If only one limb is attacked, the question arises as to whether that limb should be locally treated by being placed in a small specially-constructed bath, or whether the "entire body" bath should be used. In my experience, the last is always the more useful, with, in the case of the electric-light bath, an extra localization of the heat and light rays on the affected part. That means that the more extensive the surface to which the heat and light rays are applied, the better is the result. When these baths are not obtainable, very good results may be obtained by the use of an ordinary blanket-tent with a small opening at the top to let out the hot air saturated with moisture. The hot air is supplied by a ring Bunsen gas-burner, or by a large spirit-lamp with a flue passing through an opening in the blanket at the foot of the tent.

Cataphoresis is useful in many cases of chronic gout with considerable deposits in the joints, and also in many cases of obstinate rheumatoid arthritis. It consists of the electric transfer of fluids through the joints from anode to cathode. The best fluid in cases of gout is a solution of potassium bicarbonate. The padded negative electrode should be placed on the back or chest, and the positive electrode, which should be button-shaped and padded, and is kept wet with the saturated solution, should be applied to the joint. Currents of from 10 to 30 milliampères may be employed. For the treatment of gouty neuritis, constant-current baths are usually most beneficial; electric-light or superheated-air baths, followed by the use of the constant current, generally do an equal amount of good. In the acute or subacute stage of gout, or when a slight attack has just started, the Turkish bath is most undesirable. I have known of its employment in such cases being followed by an exacerbation of the attack, and extension to joints not at the time affected. This is a point which should be borne in mind by medical men, as many patients on the first appearance of an attack are apt to have immediate recourse to the Turkish bath, and it is well that they should be warned of the danger they thereby incur.

Treatment of Irregular Forms of Gout.—*Gouty Eczema.* In this condition, special attention should be given to two details: (1) See that the bowels are freely opened, which at the outset may be secured by the administration of blue pill or calomel, followed by a saline; (2) Entire abstention from alcohol is most desirable, at all events during the persistence of the eczema. It is best that any form of alcohol should be abstained from, but more especially, in my experience, the red wines. I have met with cases occurring among gouty individuals past middle age in whom two or three glasses of claret or burgundy will, in the course of a few hours, cause the development of an eczema. During the irritative stage of dry gouty eczema, I have found the application of a lotion consisting of liquor plumbi subacetatis 1 dr., liquor carbonis detergens 1 dr., aqua

sambuci ad 1 pint, most soothing, especially if followed by the use of a simple dusting-powder, such as cimolite powder. For the acute moist type of eczema a similar lotion, but with a preparation of opium replacing the tar solution, is advisable. In cases of gouty pruritus, or, as it is sometimes termed, latent gouty eczema, the severe itching is frequently relieved by the use of carbolic acid lotion. When the eczema is in a chronic condition, much benefit is usually experienced from immersion in sulphur baths, such as those of Harrogate, Strathpeffer, Aix-les-Bains, etc. After the bath the skin should be carefully dried, and a dusting powder, such as cimolite powder, freely applied. In cases of gouty eczema and gouty pruritus, a careful dietary must be enforced, care being taken to forbid all articles which the experience of the patient has shown to produce dyspepsia. Such persons should avoid acid fruits, as strawberries, gooseberries, apples, and pineapples; rhubarb also should be excluded from the dietary. As regards the medicinal treatment, my experience is that it is not necessary to give the ordinary anti-gout remedies, such as colchicum, etc. It is much more important to treat the dyspepsia and the catarrhal condition of the gastro-intestinal tract, which are generally present as associated or causative conditions, by the administration of subcarbonate of bismuth with the bicarbonate of sodium or the bicarbonate of potassium.

Gouty Dyspepsia.—In addition to the usual remedies, such as bismuth subcarbonate, sodium bicarbonate, bitters, etc., taka-diastase is a most useful drug in this affection. It is made up in the form of tablets containing 2½ gr., and one of these should be taken immediately before each meal. The taka-diastase encourages the digestion of the carbohydrates, and so prevents the development of fatty acids, which, by their irritating effects, are so common a factor in the development of gouty dyspepsia.

Insomnia.—This is a fairly common symptom in gouty patients. Usually it is not complete, but confined to restlessness, interspersed with intervals of light or broken slumber. In such cases attention should be paid to the patient's pulse, and to the possible existence of albumin in the urine. If, as is frequently the case, the pulse is found to be of high tension, the administration of blue pill or calomel, followed by a saline purge, will probably prove most beneficial.

With regard to the use of tobacco, the majority of gouty patients may be permitted a moderate indulgence in smoking, but it should be avoided entirely by those who suffer from paroxysmal attacks of the gouty heart.

Preventive Treatment.—I have now had a considerable experience of the prophylactic effects of guaiacum resin, and I know of no drug which is more useful in the preventive treatment of gout. Its action is probably due to its stimulating effect on hepatic metabolism, thereby increasing, as it undoubtedly does, the elimination of uric acid. I prefer to give it, as explained above, in the form of the powdered resin in cachets, commencing with doses of 5 gr. three times a day after meals, and gradually increasing the dose to one of 10 to 12 gr.

Mineral Waters.—The value of a given mineral water in the treatment of gout depends greatly on the object with which it is taken. For instance, it may be given to remove gouty deposits, to stimulate the action of a sluggish liver and to relieve portal congestion, for the treatment of gouty dyspepsia, to relieve the bowels in cases of torpor and gastro-intestinal catarrh, to act on the kidneys, or to relieve gouty affections of the skin. It is manifest that any one mineral water is not likely to produce all these effects, and it is also conceivable that a water which might effect one of these purposes might prove injurious if employed to fulfil another. No doubt considerable error has arisen from indiscriminately sending gouty patients to a particular spa, without duly considering whether the water of that spa is suited to the specific gouty disorder from which the patient is suffering.

There is a tendency with some medical men to consider that the efficacy of a natural mineral water is due solely to its watery constituent : in other words, that its one therapeutic use is that of a flushing agent. On the other hand, an exaggerated importance is not infrequently attached to the particular salts contained in a mineral water as ascertained by chemical analysis. The fact is, that in judging of natural mineral waters we have been too much under the domination of analytical chemistry, and our deductions from these results have been consequently biassed and cramped. The more I consider their therapeutic effects, the more convinced I am that chemical analysis, although it can inform us what their mineral constituents are, is yet unable to determine exactly the state of the salts dissolved in them. The "ionic or electrical dissociation theory," and the existence of the mineral constituents of natural waters as "ions," are leading our thoughts to a new and, I believe, more correct appreciation of the therapeutic values of these waters. In intimate relation with this aspect of the matter is the question of radio-activity as possessed by these waters. Most, if not all, which have been subjected to examination, have been found to be distinctly radio-active, and the lower the mineralization of the water, the more intense is its radio-activity. In this, I think, lies the explanation of the fact that an artificially prepared mineral water, although identical in chemical composition with the natural one, does not possess the same therapeutic effects, since it is lacking in the property of radio-activity. A natural water at the moment of its discharge from the earth is radio-active, whereas an ordinary drinking water does not possess this property to any appreciable extent. Hence also the desirability of drinking the water at its source, since by bottling and keeping of a natural water, the radio-activity is to a great extent lost.

Useful as may be the drinking of a water at a spa, yet equally, or even more so, is the encouragement of the functions of the skin by balneological methods for therapeutic purposes. The skin is the largest organ of the body, and it possesses various and complex functions. Amongst these are : (1) The excretion of toxic bodies, the retention of which prove harmful, and ultimately fatal, to the organism ; (2) The power it possesses through its nerve endings of stimulating distant organs and tissues, and (3) Its heat-regulating power. The success of balneology, whether in the treatment of chronic joint conditions, of affections of the fibrous tissue, of certain heart and kidney affections, or of certain skin diseases, depends upon the recognition of the powerful aid which can be given by the skin in restoring the normal balance.

If the view as to the intestinal origin of the toxæmia present in gout is correct, the value of mineral waters, both as curative and preventive agents, becomes at once intelligible, from the marked influence they have on the metabolism of the intestinal tract, and their power of removing by the bowels the antecedents of the toxin causing gout.

It is especially in cases of chronic gout, of gastro-intestinal catarrh and torpor, of gouty dyspepsia, sluggish action of the liver, gouty eczema, gouty glycosuria, and of other forms of irregular gout, that mineral waters prove so valuable ; whilst the various baths, combined with massage, are so useful in producing softening and absorption of the deposits in the joints and other tissues. Patients actually suffering from acute or subacute articular gout, or who are apparently on the verge of such an attack, are better without sulphur waters, as in such cases the waters tend to accentuate or precipitate an attack in the joints.

Choice of a Spa.—In the selection of a spa, so many factors have to be considered that it is impossible, in a work of this nature, to deal fully with the subject. I wish, however, to state clearly that the high state of efficiency to which our home spas have been raised, render it no longer essential to banish our patients to foreign health resorts, and that, unless a complete change of environment is

desired by our patients or is essential to their recovery, treatment can, in the great majority of cases, be carried out as effectually in our own country.

The following table may be of some value, as being an attempt to classify the therapeutic indications of mineral waters in the treatment of gouty conditions.

CLASSIFICATION OF THE VARIOUS MINERAL WATERS ACCORDING TO THEIR THERAPEUTIC VALUE IN THE TREATMENT OF THE VARIOUS FORMS OF GOUT.

OBJECT OF TAKING THE WATER.	THE WATERS BEST SUITED TO THE PURPOSE.
Absorption of gouty deposits from the joints and tissues.	Bath, Buxton, Contrexéville, Gastein, Harrogate, Pfaefers, Strathpeffer, Teplitz, Vittel, Wildbad, Aix-les-Bains (for baths).
Treatment of gouty dyspepsia.	Brides-les-Bains, Carlsbad, Ems, Harrogate, Homburg, Kissingen, Neuenahr, Royat, Vals, Vichy, Wiesbaden.
Treatment of gouty congestion and torpor of the liver, and of gastro-intestinal catarrh and torpor.	Baden-Baden, Bourbonne, Carlsbad, Cheltenham, Contrexéville, Harrogate, Homburg, Kissingen, Leamington, Llandrindod, Marienbad, Neuenahr, Tarasp-Schuls, Vals, Vichy, Vittel, Wiesbaden.
Treatment of gouty affections of the respiratory organs.	Ems, Royat.
Treatment of gouty glycosuria and diabetes.	Carlsbad, Contrexéville, Harrogate, Kissingen, Leamington, Llandrindod, Marienbad, Neuenahr, Strathpeffer, Vals, Vichy, Vittel.
Treatment of gouty skin affections.	Aix-les-Bains, Baden, Bagnères-de-Luchon, Harrogate, Llandrindod, Schinznach, Strathpeffer.

DIET IN GOUT.

No hard and fast lines as to dietary can be laid down. Each individual must be carefully considered as regards his habit of body, his capacity for the digestion of different articles of food, the amount of exercise he is able to take, and the nature of his work. Derangements of the gastro-intestinal tract constitute a most important factor in the development of acute, chronic, and irregular gout. It is of the utmost importance to secure and maintain a healthy condition of the gastro-intestinal mucous membrane, and a normal daily evacuation, in order to guard against auto-intoxication, which is undoubtedly an early factor in the development of the gouty condition. The patient can certainly diminish the number and severity of the attacks, and in many cases prevent their recurrence, by careful attention to diet, to the quality and the quantity of fluid taken, to exercise, and to a sufficient daily action of the bowels. In advising as to diet, the personal factor is a most important one, and it is wise to gain some knowledge as to the likes and dislikes of the patient with regard to food. In this connection it is well to remember the saying of Sydenham, that " more importance is to be attached to the desires and feelings of the patient, provided they are not excessive, than to doubtful and fallacious rules of medical art."

It should be well borne in mind that great changes in diet should not be made too abruptly. The researches of Pawlow show that a habit of digesting easily any particular kind of food is acquired by the stomach, which secretes a gastric juice appropriate to it, so that, if the food is suddenly changed, time is required for the digestive organs to accommodate themselves to the altered conditions. If the change is too sweeping and too abrupt, the patient will probably suffer. It is well known that the excessive consumption of rich nitrogenous food, combined with excesses in wine and malt liquors, both induce and excite gout. The comparative immunity of females and young people is mainly explained by the absence of such determining causes, combined with (in the case of young people) the absence of predisposing cause, and also the fact that the secreting functions are in full activity. The subjects of gout are generally persons who live well and consume a large amount of animal food.

Gouty people may, for dietetic purposes, be roughly grouped into three classes : (1) Those who suffer from more or less frequent attacks of acute gout; (2) Those who have never suffered from an acute attack, but who are constantly subject to some chronic form of regular or irregular gout, especially after slight indiscretions in diet ; (3) Those who are only affected with gouty symptoms (generally of the irregular kind) when they eat or drink certain articles, and who therefore have to be specially watchful over their diet.

Animal Food.—It must be remembered on the one hand, that animal foods constitute to the majority of people the most attractive and appetizing forms of diet, and are therefore likely to be taken in excess ; hence the necessity for limiting the amount to be taken. On the other hand, it is most desirable to increase the combustion and the oxidative powers within the tissues. In my opinion, it is absolutely erroneous to exclude from the dietary of the gouty such articles as meat, fish, and tea, because they are assumed to contain uric acid. No class of food-stuff gives so great an amount of energy and produces so much heat as animal food, and no class is more easily digested by the majority of gouty people. On the whole it may be stated, that animal food such as fish, chicken, game, and meat, is best suited to the majority of cases, whilst foods of the farinaceous class are most likely to disagree. White meats, such as chicken and fish, are more digestible than red meats. The quantity of meat, and especially of red meat, must be restricted in those cases in which the kidneys are imperfectly performing their eliminatory functions, as evidenced by a pale urine, of low specific gravity, deficient in urea and purin bases.

Vegetable Food.—A fair proportion should be taken with two meals each day. The choice of vegetables will depend upon the digestive capacity of the patient ; but, excepting the potato, as a rule those that grow above ground are preferable to root vegetables. At the same time it must be borne in mind that with certain patients some of these vegetables may produce some form of dyspepsia, and I cannot too strongly urge that in the dieting of the gouty no hard and fast rules can be laid down, but the idiosyncrasy of each patient to various articles of food must be made the subject of careful observation and study. Due consideration should also be given to the patient's experience of what articles of diet disagree and agree with him.

Simplicity of Meals.—The diet should be simple, that is, the meals should not be made up of too many articles. Simplicity of food means facility of digestion. Moderation in both eating and drinking is perhaps one of the most essential points to insist on. Certainly meat, even red meat, should not be excluded. Those articles of diet that are known in the individual to favour intestinal fermentation and putrefaction should certainly be avoided, and, speaking generally, a sense of discomfort after a meal indicates that some food has been taken which is not beneficial to the individual in his present condition. If the

gouty symptoms are due to over-production of toxic material from faulty intestinal and hepatic metabolism, and if, at the same time, the kidneys are sound, then a diet which mainly consists of animal food is indicated; and in extreme cases of this class, even the so-called "Salisbury diet" may be useful. If, on the other hand, the symptoms are due to defective elimination on account of diseased kidneys, then a more vegetarian diet will be best. The value of the so-called "Salisbury diet" consists in the small amount of energy necessary for the digestion of so simple a diet, and in the fact that it contains little which can set up intestinal fermentation or putrefaction. On the other hand, a strictly vegetarian diet requires more digestive energy than a purely animal one, and a much larger quantity of vegetable food must be taken to produce an equal nutritive effect. If, during the treatment of gout, an attack of gouty dyspepsia should intervene, a milk diet should be employed until the dyspeptic symptoms have abated.

Starchy and Saccharine Foods.—Starchy foods should be especially limited in amount in those individuals who are subject to gastric hyperacidity (hyperchlorhydria). When intestinal fermentation and putrefaction occur, as evidenced by a sense of discomfort after a meal, I attach great importance to the reduction of the starchy articles of food, but not to the total exclusion of—what I believe to be comparatively harmless—the potato. Undoubtedly, amongst patients who suffer from an inability to digest starchy articles of diet—in other words, from amylaceous dyspepsia—a reduction for the time in the amount of starchy foods taken, including potatoes, is desirable; but the recognition of the existence of amylaceous dyspepsia is a fairly easy matter, and, when present, it can be suitably treated. Certainly those who are gouty and fat should be very sparing in the use of potatoes, as of other carbohydrates. I wish, however, to protest against the too general exclusion of so common and useful an article of diet as the potato.

Potatoes can best be taken by the gouty in the crisp form, which requires thorough mastication and insalivation. Boiled new potatoes should be absolutely interdicted.

Equally wrong, in my opinion, is the total exclusion of sugar from the dietary of all gouty individuals. Undoubtedly, in certain cases sugar may do harm, as in persons who are fat, who suffer from glycosuria, or who are prone to attacks of eczema; in such it should be cut off, but that is no reason for the exclusion of it from the dietary of all, and especially those who are, at the same time, gouty and thin; such subjects may also take in moderation marmalade and wholesome jams. I know of many gouty individuals who take sugar with absolute impunity. Some subjects undoubtedly digest all starchy articles of diet very badly, and, in such, fats may well take the place of starches. Fat bacon, properly cooked, is generally well digested. Bread may advantageously be given as crisp toast, in the form of rusks, or in the "zwieback" or twice-baked form, as in these conditions it requires thorough mastication and insalivation.

Fruits.—Any fruit, which from experience is known to agree with the patient, may be taken. Apples and oranges generally do best. Uncooked fruit should never be taken at a meat meal, and is best consumed fasting, fairly early in the day, as between breakfast and lunch. It should always be thoroughly masticated. Strawberries are frequently avoided owing to their producing in some subjects a certain amount of temporary irritation of the skin, but this generally passes off in a short time. In a few subjects, strawberries produce eczema or some other rash; but such cases merely represent idiosyncrasy to the special fruit, and necessarily such individuals, whether gouty or not, should not eat strawberries. I am, however, strongly of opinion that the indiscriminate banishment of strawberries from the dietary is unnecessary. Except in these

cases, they constitute a good article of diet for the gouty, on account of their delicious flavour, their antiscorbutic properties, and their richness in potassium salts. It is very necessary that they should be ripe and fresh. They quickly decompose, and in such a state aid in the development of those intestinal fermentations which are so inimical to the gouty.

Alcoholic Drinks.—Stated as a general principle, a person who is subject to gout is better without alcohol in any form. There are, however, some who require a little alcohol, either to aid digestion or to enable them to get through their work. If alcohol is necessary or desirable, the form in which it is to be taken is frequently a matter which the patient can decide better than the medical man ; but I would insist upon the importance of definitely limiting the amount to be taken, and of restricting its consumption absolutely to meals. Some patients find a little whisky or brandy suits them best, others prefer a light still Moselle, while a very few find that a light claret agrees best with them. Champagne is seldom suited to the gouty, especially if taken daily. In elderly or feeble people, a moderate amount of pure whisky undoubtedly does good, but the indiscriminate ordering of whisky is, I am sure, wrong. Port is especially unsuited to the majority of gouty subjects, its gout-producing properties, I believe, being mainly dependent upon the ethereal compounds which give the aroma or bouquet to the wine. If this view is correct, it would explain the well-known fact that old and matured ports are much more provocative of gout than comparatively new ports taken direct from the wood. The development of the ethereal compounds in the wine extends over many years, and especially progresses after the wine is laid by in bottles. In a few cases of asthenic gout, especially in old people, a moderate amount of comparatively new port, taken direct from the wood, undoubtedly does good.

In my opinion the wines which are least injurious as a rule to gouty subjects to whom it is found necessary to order a small amount of wine, are the light, still, white wines, such as Moselle, certain French and Austrian wines, hock, and a few of the lighter Australian and Californian wines. The latter, owing to their greater alcoholic strength, should be taken diluted with water or some mineral water.

Patients suffering from glycosuria or diabetes should entirely abstain from alcoholic drinks, unless marked debility and loss of appetite necessitate the restricted administration of them. Those subject to attacks of eczema are also much better without alcohol in any form.

" Rough cider," that is the completely fermented apple-juice, taken in moderation, agrees well with most gouty subjects. It contains but a small percentage of alcohol, is free from sugar, and its acidity is chiefly due to malic acid, which passes into the circulation in the form of alkaline malates, which in their turn are converted in the kidneys into alkaline carbonates and excreted as such, thereby increasing the elimination of urates. The bottled or " champagne " cider, which is imperfectly fermented, should never be used, owing to its undoubted liability to set up gastro-intestinal fermentations. Dry or " rough " cider mixed with an equal quantity of an aerated water is an excellent beverage. Dry perry is also a suitable drink for the subjects of gout.

Diet in Acute Gout.—During the attack a diet must be given which shall tend to check the abnormal metabolism of the gastro-intestinal tract and of the liver, which shall be non-irritating to the kidneys, and one that diminishes the production of the purin bodies. For the first day or two the patient should be restricted to a milk diet, which may consist of milk, bread-and-milk, and tea made with boiling milk instead of with water. Weak tea, with cold toast thinly buttered, may also be taken. The free drinking of hot or cold water Salutaris water, or of some mineral water free from sodium salts, should be

encouraged. The milk diet should be continued until the acute inflammation is subsiding, which stage is indicated by the lessening of the pain, and by the pitting, on pressure, of the affected parts. No alcohol in any form should be given during this stage, unless there are strong reasons for its administration, such as a weak action of the heart and a feeble, irregular pulse, when a little well-matured whisky or brandy, diluted with Salutaris water, will prove the best form of alcohol. Beef-tea and any of the meat extracts or essences should be avoided at all times by gouty patients, owing to their tendency to irritate the kidneys, and to introduce into the circulation waste nitrogenous bodies. With the subsidence of the acute attack the patient may return to a more liberal diet, care being taken to avoid anything indigestible.

Articles of Diet that should be Avoided by the Gouty.

Rich meat soups: ox-tail, turtle, mock turtle, kidney, mulligatawny, hare, giblet.

Salmon, mackerel, eels, lobster, crab, mussel, salted fish, smoked fish, preserved fish, tinned fish.

Duck, goose, pigeon, high game.

Meats cooked a second time, hare, venison, pork, lean ham, sweetbread, liver, kidney, salted, corned, or cured meats, pickled meats, preserved and potted meats, sausages; all articles of food pickled in vinegar; all highly seasoned dishes and rich sauces.

Tomatoes, beetroot, cucumber, rhubarb, mushrooms, truffles.

Rich pastry, rich sweets, new bread, cakes, nuts, dried fruits, ices, ice cream.

Diet Suitable in Chronic Gout and for Gouty Subjects.

Morning.—Half a pint to a pint of hot water, flavoured with a slice of lemon peel, should be slowly sipped immediately on rising.

Breakfast.—A selection may be made from the following articles of diet, according to the taste of the patient: Porridge and milk, whiting, sole, or plaice, fat bacon, eggs cooked in various ways, dry toast or "zwieback bread" thinly buttered, and tea infused for three minutes and then strained from the leaves. Fat bacon is digestible when grilled, but less so when boiled. Eggs should not be taken hard-boiled.

Lunch and Dinner.—Soups suitable for the gouty are vegetable purées, and soups made by boiling beef bones or mutton bones with vegetables, and subsequently removing the fat. which separates on cooling. These soups should not be thickened with farinaceous substances.

The varieties of fish most suitable to the gouty are whiting, sole, turbot, plaice, smelt, flounder, grey mullet, and fresh haddock.

The birds that are admissible as articles of diet are chicken, pheasant, turkey, and game (not high).

Butcher's meat—mutton, lamb, and beef—should be taken at only one meal in the day, and then in moderate quantity. Two vegetables may be taken at both lunch and dinner. Any of the ordinary vegetables may be taken, except those previously mentioned as best avoided; but those that are most likely to prove beneficial to gouty subjects are spinach, Brussels sprouts, French beans, winter cabbage, Savoy cabbage, turnip-tops, turnips, and celery. Potatoes may also be taken in moderate quantities. Stewed fruits, or baked apples or pears, may be taken every day at one meal.

Green vegetables as salads may be taken, provided oily dressings are avoided. A simple savoury may, if desired, be taken at the end of dinner, or a small quantity of cheese, if well masticated, and if free from the fungus or mould.

Night.—Half a pint to a pint of hot water, flavoured with a slice of lemon-peel, should be slowly sipped before retiring to bed.

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With regard to persons who are disposed to gout, but are not actually suffering from it, the usual mixed diet may be taken, but they should limit the starchy articles of food, and should avoid all rich sweets, rice, tapioca, and sago. Thin and ill-nourished subjects require modifications in their diet as compared with those who are stout; while those who take plenty of exercise may be allowed food forbidden to the indolent. Individuals who especially benefit by a reduction of diet, both as regards quantity and quality, are those overfed people who are past middle life. *Arthur P. Luff.*

GRAVEL.—Renal calculi, except in rare instances, consist either of uric acid or of oxalate of lime, and the dietetic treatment of the condition must be based on this fact. Uric acid has a double origin, being partly formed during the metabolism of the tissues, and being in part directly derived from certain constituents of the food. The oxalates in the urine are apparently derived entirely from the food, either directly or indirectly, owing to certain fermentations taking place in the gastro-intestinal tract, and especially in the stomach. There would seem to be but little evidence in favour of the origin of oxalic acid from the metabolism of the tissues. Thus, the origin of oxalates and of urates is somewhat different, inasmuch as dietetic treatment can produce very much greater effects in reducing the quantities of the substance present in the urine in the one case than in the other. No systemic dieting can lead to the disappearance of uric acid from the urine, although great reduction in the quantity present may be effected.

Another essential point in the treatment of calculous disease is the fact that the formation of calculi is not solely dependent on the percentage amount of the calculous ingredient in the urine. Uric acid calculi are frequently formed in urines of low specific gravity, containing but a small percentage of uric acid, while condensed, highly concentrated urines, containing much larger quantities of uric acid, may yet carry this off in the form of soluble urates, owing to the quantity of saline bases present.

The reaction of the urine plays, however, a very great part in determining the rate of deposition of such a substance as uric acid. Thus, a relatively dilute but acid urine may deposit far more uric acid than a concentrated urine, although the latter may contain a higher percentage of urates.

Inflammatory conditions of the mucous membrane of the renal pelvis, leading to the excretion of mucus, pus, or blood, may lead to the formation of calculi, owing to the proteid matter modifying the crystalline form of the urates or oxalates, and causing the production of a large abnormal crystal which may act as a nucleus for the formation of a stone.

Oxalic acid is closely allied to uric acid, and they are both of them products of the oxidation of the so-called purin bases. It is possible to order a diet practically free from purin bases, so that the uric acid formation is restricted to that derived from the metabolism of the tissues. Such a diet must consist essentially of milk, bread, cheese, eggs, rice, and vegetables generally. Under such a diet the uric acid excretion can be considerably diminished and kept constant, although the actual amounts excreted vary considerably in different individuals. Such a diet may be useful in a certain restricted number of cases, but in most it is not necessary to be so stringent, and meat and fish, although rich in purin bases, may be allowed, since the deposition of uric acid, as already mentioned, is determined more by other conditions in the urine than the mere percentage amount present.

Where it is desired to restrict the output of oxalates, care must be taken not to allow articles of diet such as rhubarb, sorrel, asparagus, many fruits, e.g., strawberries, all of which contain very appreciable quantities of oxalates. Rhubarb is so rich in oxalates that the taking of this is not uncommonly followed by the excretion of sufficient amount of oxalate of lime to cause distinct urinary irritation and even hæmaturia. Many cases of oxaluria arise as a result of excessive formation of oxalates owing to fermentation processes, especially in the stomach. Such patients require a purin-free diet, and treatment directed to prevent the gastric decomposition.

It is essential in the treatment of the uric acid diathesis to diminish the acidity of the urine, as in this way marked effects can be produced, often greater than those obtained by ordering the diet directed to diminish the quantity of uric acid.

The urine secreted the first thing in the morning is the most acid in the twenty-four hours, and that most prone to deposit uric acid. The tendency to undue acidity in the urine should be counteracted during the day by ordering a diet rich in vegetables but poor in meat, the latter containing considerable quantities of acid phosphate of soda. The vegetables are rich in the salts of the vegetable acids, which are largely excreted in the urine in the form of carbonates. A full dose of some simple alkali, such as citrate of potash, e.g., 1 or 2 dr., should be given at night, freely diluted. Alkaline mineral waters may be ordered during the day, and by simple measures of this kind the acidity of the urine may be materially diminished, and the tendency to the deposition of uric acid counteracted.

Gravel, and a tendency to deposition of uric acid and oxalates, should not only be treated by the dietetic measures described, but much may be done also by the aid of mineral waters, and the treatment carried out at certain spas. Alkaline waters are especially useful, such as those of Vichy, Contrexeville, Wittel, Martigny, Wildungen. The beneficial results obtained in cases of gravel by such treatment are in part dependent on the effects of the alkaline waters on the urine itself, but also in part on the purgative effects produced by the sulphates which many of these waters contain. The treatment at these spas is especially suitable in cases of gravel and slight pyelitis ; but where the lesions are more severe, with the presence of stone and the more severe forms of pyelitis, surgical treatment is generally indicated. It must be remembered, however, that the mere presence of a stone, even of large size, is not a necessary indication for its removal by operation, since such stones often remain in the renal pelvis for years without giving rise to any serious complication or any material discomfort. On the other hand, if profuse hæmaturia, pyelitis, or severe attacks of renal colic are present, operation is of course indicated. (See also CALCULUS.)

J. Rose Bradford.

GRAVES' DISEASE.—(See GOITRE, EXOPHTHALMIC.)

GUMBOIL.—(See TEETH, CARIES OF.)

GUMS, TUMOURS OF.—(See JAW, TUMOURS OF.)

HABIT SPASMS (in Childhood).—In *habit spasms* (simple tic) there is rapid exhibition of isolated movements, such as a series of lightning-like winks, or nods, or grunts and sniffs. In habit spasm the child simply " pulls faces " ; in true chorea, the grimaces are exaggerations of normal expressions of emotions. The more complicated movements of habit spasm are meaningless tricks, gestures, and antics ; whilst in true chorea, the movements are the normal primitive actions of flexion, extension, rotation, etc., although performed with needless vehemence and without object ; constantly changing, alternating, and clashing with each other.

In habit spasm, it is seldom that more than one trick or antic is indulged at a time, but commonly one gives way to another. For instance, after spending some days or weeks in repeating apparent efforts to twist his mouth round his nose, the child will suddenly relinquish the attempt, and take to elevating his chin, and stretching his neck as though his collar were too tight. Or he will shrug his shoulders or writhe like an eel at short intervals; or, whilst walking quietly, will suddenly execute a twirl, a hop, skip, or jump. One child under observation would, at half-minute intervals, shut her eyes tightly, show her teeth in a disagreeable snarl, and protrude her tongue with quick, vibratile, snake-like action.

Sometimes the diaphragm descends vigorously five or six times in rapid sequence, whilst the abdominal walls bulge, and a sound resembling a combination of eructation, cough, and hiccough, or that of deer during the rutting season, is emitted. Sometimes no sound is produced.

Ignorant parents in such cases are alarmed, lest the child may be harbouring a live rat, or frog, or serpent in its abdomen; anxious practitioners may suspect pressure by tuberculous glands upon the phrenic nerve. The movements usually cease as suddenly as they began.

It is impossible to imitate by voluntary effort such perverted or exaggerated diaphragmatic action, which is involuntary and cannot be controlled by will. Indeed, the term "habit spasm" does not happily describe these and other curious contortions of face and body, which are not acquired by practice, but start ready-made.

TREATMENT.—It is customary to look for local causes of habit spasms, such as refraction errors, decayed or erupting teeth, adenoids, intestinal worms, and adherent prepuces. All such conditions need treatment; but habit spasms are *suggested*, rather than caused, by local irritation. A particular form of spasm may cease for a time after removal of the supposed cause, only to recur in the same or in some other shape, after the excitement of a children's party, a pantomime, or the introduction to a new rule in arithmetic. Habit spasms are, in fact, indications of emotional over-strain produced in any manner, and are best treated by procuring freedom from all emotional excitement, and securing a quiet, natural mode of life in a healthy, open atmosphere.

In all textbooks it is very properly insisted that scolding and any form of punishment are inadmissible; but the system of exhorting the child to control itself, and offering rewards if it does so, is equally inadvisable.

To a great extent, habit spasms are uncontrollable impulses, and the more the child's attention is drawn to them, the more inveterate they become. Children often lament bitterly that they cannot overcome their "habits," and each time they acquire a new one they will mournfully announce the fact to their careworn next of kin. The less notice that is taken of them the better. They soon subside when underlying causes of mental over-strain are removed.

Protracted or Residual Chorea.—The subject of chorea is fully treated elsewhere. It is only introduced here in order to emphasize the distinction between it and habit spasm. This is an all-important distinction from the point of view of treatment. True rheumatic chorea must be treated at its onset by absolute rest in bed, on account of the imminent danger of endocarditis, whereas in habit spasm it is the mind rather than the body which is in need of rest. It should be remembered, however, that many cases of true chorea, linger on indefinitely and become habitual. Often the movements cease during rest, and are only resumed when notice is taken of the child, or they only occur in attempted voluntary actions. In the first case it is usually easy, by gentle persuasion, to teach the patient to exert his dormant powers of inhibition; in the second case, good results are obtained by drills, and exercises designed to improve powers of co-ordination. (See also CHOREA.) *Leonard G. Guthrie.*

HÆMATEMESIS.—Vomiting of blood is a symptom which occurs under various conditions, which should be differentiated as far as possible. Thus it may occur from (1) The rupture of a varicose vein in the œsophagus in cirrhosis of the liver; (2) The erosion of a vessel in ulcer of the stomach; (3) Bleeding of a cancerous growth in the stomach; (4) A simple fissure or erosion of the gastric mucous membrane, without ulcer; (5) Simple oozing from the mucous membranes, without any discoverable bleeding point, such as is seen in cirrhosis of the liver, and in so-called gouty and hysterical hæmatemesis.

The general treatment is complete rest, an ice-bag to the epigastrium, a hypodermic injection of morphia ($\frac{1}{6}$ to $\frac{1}{3}$ gr.), and the prohibition of all food by the mouth; small pieces of ice may be given to suck, but it is doubtful if this does good, and it may increase the thirst. Nutriment must be administered by rectal enemata for forty-eight hours after the hæmorrhage, but these need not be continued for more than three days after the hæmorrhage has ceased. Blood should be looked for in the stools after the vomiting has stopped, as minor degrees of bleeding may only show themselves in this way. Surgical intervention should be considered where hæmatemesis or melæna is recurrent or persistent; but owing to the difficulty of diagnosis, surgeons are often unwilling to intervene, and in the vast majority of cases where the bleeding comes from the stomach, the hæmorrhage ceases under the means above indicated. In bleeding from a duodenal ulcer (See also GASTRIC ULCER) there is much to be said for the prompt performance of gastro-enterostomy. After the bleeding has been checked, and oral feeding has been resumed, we may give iron as a hæmostatic, as well as a hæmatinic remedy.

℞	Tinct. Ferri Perchlor.	℥ x	Aq.	ad ℥ j
	Glycerini	℥ x		

Two tablespoonfuls every four hours.

Or if there be constipation:—

℞	Ferri et Alumin. Sulph.	gr. v	Acid. Sulph. dil.	℥ x
	Magnes. Sulph.	gr. xl	Aq. Menth. Pip.	ad ℥ j

Two tablespoonfuls three times a day.

The diet should be at first cold, bland, and of soft consistence, but in the course of a week the patient may revert to his former food. *Robert Saundby.*

HÆMOGLOBINURIA.—(See BLACKWATER FEVER and RAYNAUD'S DISEASE.)

HÆMOPHILIA.—In the case of a family who are known to be bleeders, prophylactic measures are of importance. Children should be protected from injury as much as possible, and no surgical operation of any kind should be undertaken, with the single exception of vaccination, which, if carefully performed, does not usually give rise to any trouble. If surgical procedure of any kind becomes absolutely necessary, the patient should be put on a course of chloride of calcium for a week or two before. It is often advised that the daughters of those families through whom the disease is transmitted should not marry, but this is a counsel of perfection which it is not always easy to carry out. Some family histories have recently been published in which the females and not the males have been affected, and in some of these, the transmission has been through the male side of the house; while in at least one case, there has been a reversal, the females having transmitted it in early generations, the males in later. As almost any injury, no matter how small, may cause fatal hæmorrhage in a bleeder, constant care and supervision may be required in cases which are known to be extreme, for all are not equally prone

to serious hæmorrhage. A blow on a joint, for example, may cause serious hæmorrhage into it; or if elsewhere on the limb, there may be a great deal of subcutaneous bleeding. Such lesions are best treated by compression and complete rest.

Actual hæmorrhage may be traumatic or spontaneous. The latter is almost always from the mucous surfaces. In the former case, the patient must be kept at rest, and pressure on the bleeding point is the most useful procedure. Styptics, such as iron and adrenalin, may be tried, but are very often only temporarily of service. The application of cold, either by ice or ethyl chloride, is sometimes useful. A solution of gelatin has been tried, both locally and by subcutaneous injection, but has rather fallen out of use. Chloride of calcium may be given internally, and applied locally also. Spontaneous hæmorrhages are very often preceded by a sensation of wellbeing, and when this sensation is experienced it seems to be worth while to let the patient take a mild saline purgative. When the hæmorrhage occurs, if the bleeding point can be reached, the same local applications should be made as in traumatic hæmorrhage. Chloride of calcium has been advocated because of its tendency to increase the coagulating power of the blood, which is so markedly deficient in hæmophilia. It may be given in large doses (15–30 gr.) by the mouth, three times a day, and this may, if necessary, be supplemented by its use per rectum in doses of 60 gr. in solution. The great disadvantages of this drug, however, are its tendency to upset the digestion, and its nauseous taste. It should, therefore, only be pushed in large doses when there is urgent need for it. When given, as it sometimes may be, in short courses to anticipate the bleeding, the dose should be much smaller. Other styptics may of course be tried, such as ergot, turpentine, hamamelis, and adrenalin, but too often they all fail in turn. After a hæmorrhage the patient is naturally very much reduced, and will usually require rest, iron, and general tonic treatment. In some cases the tendency to bleeding diminishes later in life.

G. Lovell Gulland.

HÆMOPTYSIS.—The cause of the bleeding must be first determined. In the larger proportion of cases it is an incident in the course of pulmonary tuberculosis. It also frequently occurs in other congestive conditions of lung, notably passive congestion associated with mitral stenosis. Less frequent causes are, bronchiectasis, pulmonary gangrene, malignant disease, hydatids, syphilis, pulmonary embolism or thrombosis and atheroma (aneurysm). It may occur in relation to various morbid blood conditions, and is sometimes apparently dependent upon menstrual irregularity. Vicarious menstruation—it may be supplementary menstruation—certainly occurs.

Where there is reasonable ground for doubt as to the origin of the bleeding, it is a safe rule from the point of view of treatment, to regard it as most probably a manifestation of tuberculous involvement. Occurring in pulmonary tuberculosis, it varies both in origin and clinical manifestation. Thus, in the early stage, it may simply be an expression of capillary oozing from a congested area. This is relatively unimportant. Later on, it is more likely due to ulceration of a considerable branch, or rupture of an aneurysmal dilatation of a vessel in relation to a vomica. This is more serious, and may prove fatal.

All cases of hæmoptysis do not require special treatment. Thus, in mitral stenosis, assuming that the primary condition has been attended to, e.g., by digitalis, the hæmorrhage may be actually beneficial, and is best left alone. Attempts to stay it may be positively unwise. Nature's attempt at depletion should be rather encouraged, e.g., by the application of a leech or cup over the base of the lungs. Again, in rupture of an aneurysm of the aorta, treatment is of little avail.

In slighter degrees of bleeding in pulmonary tuberculosis—mere coloration of the expectoration—little need be done beyond insistence on hyperæration and other hygienic measures. It is remarkable how seldom bleeding recurs when open-air measures are sufficiently carried out. (See PHTHISIS.)

When the bleeding is considerable, the main indications are to calm the patient, and promote clotting within the vessel by quieting the excited circulation and gently lowering pulmonary blood-pressure.

The first thing to be done in most cases is to re-assure the patient and his friends. The patient's fears will be best allayed by his knowing that the bleeding is not commonly dangerous. Thereby his disturbed circulation becomes steadied. Without fuss, he should be kept as quiet as possible. He should not be allowed to speak, and the fewer friends about him the better. The room should be as fresh and cool as possible, and the patient's clothing light. If necessary, the feet can be kept warm by hot bottles.

The recumbent posture should be maintained, with the head more or less raised. The patient commonly assumes the position which allows of freest discharge of the blood from the air passages. Theoretically, it is better that he lie on the side which is the seat of bleeding. Thereby the blood is less likely to pass into and block the bronchial passages of the other side. When the side is known, the patient's position may be arranged accordingly. It is a mistake, however, to examine him much for the determination of this.

He should not be bothered with food, which, for the first twenty-four hours, may be reduced to a minimum. He will not suffer from starvation. What food is given may take the form of milk, which may be iced, or meat jellies. Alcohol should be excluded. Thirst, which is sometimes marked, may be assuaged by the use of iced lemon and water, or dilute sulphuric acid in water. This is commonly better than sucking simple ice, which is apt to disturb the stomach.

As soon as possible an opiate should be administered—say morphine $\frac{1}{6}$ to $\frac{1}{3}$ gr. This has the double advantage of calming the patient's excitement—perhaps sending him into a gentle sleep—and restraining cough. The latter effect is most important, as repeated cough, by shaking the bleeding vessel, tends to prevent coagulation. In presence of persistent or recurrent bleeding, the regular exhibition of sedatives is on this account indicated. Except in very profuse hæmorrhage, opium may be given freely. Sometimes the addition to the morphine of atropine, $\frac{1}{100}$ gr. is of value. The combination of digitalis, $\frac{1}{4}$ to $\frac{1}{2}$ gr., with opium may be helpful, even although the significance of digitalis has been questioned because of its usual action in increasing blood-pressure.

To lower blood-pressure, the use of circulatory depressants is desirable. From this point of view ipecacuanha is most serviceable. The writer's experience is much in favour of this plan of treatment. Ipecacuanha should be given in comparatively small doses, say 5 gr., repeated every one or two hours. It is not necessary or desirable to produce emetic effects. The combination of ipecacuanha with opium, as in Dover's powder, 5 gr., repeated similarly, will be found efficient.

Small doses of mercury are of excellent service, and may be exhibited along with ipecacuanha and opium, as in the following formula, which the writer strongly recommends :—

℞ Pulv. Ipecac. Co. gr. iv | Hydrarg. c. Creta gr. j

For use every two to four hours while bleeding continues.

It is sometimes advisable to give a larger dose of calomel—say 5 gr. at once.

From the same point of view, the patient may advantageously take a saline

purge, say magnesium sulphate or sodium sulphate, either singly or combined (1 to 2 drachms). This may be repeated several times, at intervals of three hours. Where the blood-pressure is unusually high, minim doses of tincture of aconite, repeated every hour for a few doses, may prove of the greatest value. Experimental observations go to show that aconite exerts an important influence in lowering pulmonary blood-pressure. Venesection has been proposed from the same point of view, but the number of cases in which this is necessary are extremely few.

If the bleeding be severe, the application of ice to the chest by means of an ice-bag may be allowed; as a rule it is not necessary or even desirable. The application of ice to other parts, for example over the external genitals, may sometimes prove advantageous. Tight bandaging of the thighs and upper arms, e.g., by means of Esmarch's tubing, has been practised, with a view to limit the return of blood to the lungs. This may be worth trying in the graver, fulminant cases, as when an aneurysmal dilatation has given way; generally it is unnecessary.

Numerous other drugs have been from time to time proposed, and some of these have obtained considerable reputation on insufficient and even doubtful grounds. Thus, ergot, which is still too largely used both by the mouth and subcutaneously, has little to recommend it. Experimentally it has been proved to lead to a rise in pulmonary blood-pressure, and the sum of clinical experience is against its use. Nor can suprarenal extract or its active principle, adrenalin, be recommended.

Various astringents have been favoured, e.g., gallic acid, tannin, and lead. They are probably valueless. Acetate of lead has been much praised in combination with opium. The probability is that the lead has little effect on the bleeding.

With the object of hastening coagulation, certain hæmostatic drugs have been proposed, more especially chloride of calcium, 10 to 20 gr., thrice daily. The results are, however, uncertain. Dried extract of liver has been given, apparently from the same point of view, with some success.

Of other hæmostatics, turpentine, and its congeners terebene and terpene, and eucalyptol in large doses, are sometimes of service. The repeated use of small doses of such, 5 to 10 min. three times a day, seems to reduce the tendency to recurrent bleeding. Tincture of hamamelis, 30 to 60 min., has been thought worthy of trial, although it is open to the same experimental objection as ergot. The old-fashioned domestic remedy of common salt, 1 or 2 teaspoonfuls, may be used when other agents are not available.

After acuter manifestations have disappeared, the patient must be careful of himself in a number of ways. He should be kept at rest, as far as possible, till all blood-stained discharge has disappeared. The diet should continue simple and non-stimulating. Alcoholic liquors should remain excluded. Hæmatinics—iron and arsenic—should be given with caution, or not at all. The patient must avoid sudden effort and violent exercise, e.g., dancing, strained speaking, or singing. There must be no excess of any kind. Women should be especially careful in relation to the menstrual period, when sufficient physical rest should be insisted on. A mustard foot-bath may be advantageously used for a night or two before the menses are due. The bowels should be carefully regulated, so as to prevent constipation.

The treatment of the initial disease, more particularly pulmonary tuberculosis, must be carefully prosecuted on the lines discussed under the appropriate heading. (See also HEART, VALVULAR DISEASES OF.) *R. W. Philip.*

HÆMORRHAGE, CEREBRAL.—(See APOPLEXY.)

HÆMORRHAGE, INTRACRANIAL.—Hæmorrhage into the cranial cavity occurring as the result of injury may be classified according to the site of the extravasated blood. From the point of view of treatment, however, the chief question to be determined is whether the blood is between the dura mater and the bone or within the dura.

Extradural Hæmorrhage.—In the very great majority of cases the source of the blood is the anterior branch of the middle meningeal artery—occasionally it may be one of the venous sinuses or the posterior branch of the middle meningeal which bleeds. If, after the receipt of a blow on the head, the patient recovers consciousness, and then after an interval (usually less than an hour) symptoms of compression ensue—gradually increasing and steadily progressing to coma—extradural hæmorrhage may be diagnosed.

TREATMENT.—The general treatment needed is given under the heading of BRAIN, COMPRESSION OF. The chief essential, however, is the early localization of the site of the extravasation, in order that operative measures may be taken. In a patient, then, with the general symptoms of compression from extradural hæmorrhage, the following conditions are to be looked for:—

1. Where there is a scalp wound, a fissured fracture with blood welling from it may be seen crossing the line of the middle meningeal artery or of a venous sinus, and indicates injury to the vessel at that spot.

2. A hæmatoma developing in the temporal fossa suggests injury to the middle meningeal on that side.

3. Hemiplegic symptoms indicate the anterior branch of the middle meningeal artery of the opposite side as the source of the hæmorrhage.

4. Absence of hemiplegic signs suggests that one of the venous sinuses or the posterior branch of the middle meningeal artery is the source of the bleeding.

5. Protrusion of the eyeball with a widely dilated fixed pupil indicates that blood is finding its way round to the base of the skull, and that its probable origin is the anterior branch of the middle meningeal of the same side.

6. Where there is doubt, the history of the part struck and the presence of a bruise may aid the diagnosis.

If it be decided that the *anterior branch of the middle meningeal artery* is the source of the hæmorrhage, a flap is turned down; and if a fracture be found, a disc of bone is removed with a trephine where the line of fracture crosses the line of the artery. Should no fracture be detected, the pin of the trephine is placed upon a point 1½ inches behind the external angular process of the frontal bone and 1½ inches above the zygoma. The cranial cavity having been opened, the blood-clot between the bone and dura is washed away by a stream of hot sterilized saline solution. The bleeding artery is secured by passing a ligature around it, or by plugging the bony canal in which it lies with aseptic wax. A drainage tube is inserted and the wound closed.

If it be found that the blood comes from *one of the venous sinuses*, a trephine hole is made over the sinus and enlarged with Hoffmann's forceps until the bleeding point is exposed. The hæmorrhage is then controlled by packing with strips of sterilized gauze, which are removed on the third day.

Intradural Hæmorrhage.—The symptoms will be those of concussion, rapidly merging into those of compression, without any return of consciousness. The extravasation of blood may be from one of the venous sinuses, but is usually dependent upon the rupture of vessels in a laceration of the brain.

TREATMENT.—For the general treatment see BRAIN, COMPRESSION OF. If the compression be slight, and not increasing in severity, no operative measures are called for; but if the symptoms are grave at the start, or gradually become more severe, no time is to be lost before trephining. The site of the lesion may be localized by keeping a careful watch for the onset of spasm and rigidity in

muscles, of convulsions, and of paralyses. If no indication is thus given, the skull should be opened at the point struck, where a bruise will probably be present, and if no extravasation be found there, the point diametrically opposite should be exposed in a similar manner. Having turned down a flap of scalp, the skull is opened with a trephine. The dura mater, if there be bleeding beneath, will bulge into the trephine hole and present a dark blue appearance. The dura is incised, the clot is turned out, and the bleeding vessels are secured if possible with ligatures; otherwise the site of the bleeding is packed with sterilized gauze.

Hæmorrhage into the cerebral substance or the ventricles is almost always due to a cerebral laceration (see BRAIN, LACERATION OF). *S. Maynard Smith.*

HÆMORRHAGE, UTERINE.

I.—ANTE-PARTUM HÆMORRHAGE.

Severe ante-partum hæmorrhage is nearly always due to partial separation of the placenta. There are two main varieties:—(1) *Accidental Hæmorrhage*, (*a*) External, (*b*) Internal or concealed; (2) *Unavoidable Hæmorrhage*.

1. **Accidental Hæmorrhage.**—By this is meant bleeding which results from the partial detachment of a normally implanted placenta. Most commonly the blood escapes externally, though in rare cases it is retained in the uterus.

Accidental hæmorrhage sometimes follows excessive exertion, or a blow or fall, but frequently there is no obvious exciting cause. It may occur at any time during the last three months of pregnancy. If the bleeding be slight, and it is perfectly certain that the placenta is not in the lower uterine segment, the patient may be treated by rest in bed and small doses of ergot. If the hæmorrhage is profuse, or has been repeated, labour must be induced if it has not already set in. In most cases of accidental hæmorrhage where there have been one or more free losses of blood, labour comes on spontaneously, though the pains when the patient is seen may be feeble and infrequent. The object of treatment in these cases is to excite vigorous labour pains. The blood is coming from the upper active uterine segment, and the bleeding is nearly always controlled when labour properly commences. The rupture of the membranes and the application of a firm binder usually achieve this object. The introduction of a bougie into the uterus to stimulate uterine action is sometimes advantageous. When vigorous labour pains have been induced, there is little or no fear of further hæmorrhage. Firm plugging of the vagina has been advocated. The value of this method probably largely depends on the fact that this also excites labour pains. Avoid violent or hasty methods of delivery. There is no cause for hurry when labour has once set in.

In cases of extensive concealed hæmorrhage, when the cervix is sufficiently dilated, it is a good plan to perform version and bring down the half breech. If possible the blood which has accumulated in the uterus should be allowed to escape, as the presence of a large quantity of blood in the uterus interferes with vigorous contractions. Concealed accidental hæmorrhage is a very dangerous condition, and one that not infrequently proves fatal. It is fortunately rare.

2. **Unavoidable Hæmorrhage.**—By this is meant the hæmorrhage which is due to the partial detachment of a placenta situated in the lower uterine segment. When the placenta is prævia, partial separation of it, and consequently hæmorrhage, will inevitably occur with the onset of labour pains, and will be liable to continue at intervals during the whole of the first stage of labour. Labour may not set in until full term, but it is not rare for hæmorrhage to occur some weeks earlier. If in such a case nothing is done repeated floodings will occur, and the patient may be reduced to a condition of profound anæmia before labour

definitely begins. Whenever placenta prævia is diagnosed, labour must be induced, as hæmorrhage is certain to recur.

When the placenta is situated centrally over the os internum, the mother is placed in a position of grave danger. Probably, if the surroundings permitted it, delivery by Cæsarean section would be the safest and best method of treatment.

More commonly, although the placenta covers the os internum, the membranes can be reached. If labour has not set in, or the cervix is only slightly dilated, it is advisable to introduce one or more laminaria tents into the cervix, and these should be retained in position by a firm vaginal plug. At the end of six or eight hours the plug and tents may be removed. By this time the cervical canal will probably have been taken up and the os will be dilated sufficiently to admit two or more fingers. As soon as this is the case, bipolar version should be performed, and the half breech of the child drawn firmly down so as to exert continuous pressure against the lower uterine segment and bleeding area during the rest of the stage of dilatation. With the termination of the first stage, the danger of further bleeding has passed by if the presenting part descends freely. There is no necessity to hasten the extraction of the child after version has been performed. If much hæmorrhage has already occurred, there is great likelihood of the development of symptoms of shock if the child be too speedily delivered. Pressure on the bleeding area may be maintained by means of a Champetier de Ribes' bag, and this may be employed instead of version when the os is the size of half a crown. On the whole, probably the half breech of the child is a more effective means of maintaining pressure than the bag, and if a bag is used the patient is liable to bleed when it comes away unless the presenting part rapidly descends of its own accord or is brought down artificially. In cases of partial placenta prævia, where the patient is in labour and the os is already half dilated, if the tissues of the cervix are soft, manual dilatation and extraction by forceps may be employed.

In cases of placenta prævia the child is frequently still-born.

II.—Post-partum Hæmorrhage.

This term is applied to cases of excessive bleeding after child-birth. It may be more accurately defined as a loss of twenty ounces or more, or of a sufficient amount to induce symptoms of loss of blood.

In the majority of cases the bleeding occurs from the placental site, and is due to uterine inertia. In other cases the blood comes from a deep tear of some part of the genital tract. Bleeding from both these sources at the same time may sometimes be met with. Hæmorrhage from a tear may generally be readily diagnosed by the fact that under these circumstances the uterus is found to be firmly contracted.

The treatment of the two conditions is obviously different.

1. **Hæmorrhage from the Placental Site.**—The object of treatment in this case is to excite efficient contraction and retraction of the uterus. If the placenta has not yet come away, the first thing to do is to endeavour to express it, after having first excited a contraction by kneading it. If this cannot be done, the placenta must be removed by the hand introduced into the uterine cavity. When the uterus is empty, the ordinary methods of exciting contraction and retraction, and thus checking the bleeding, are: (*a*) Kneading the uterus by the hand on the abdomen; (*b*) Irrigation of the uterus with hot water; (*c*) The administration of ergot.

To knead the uterus efficiently the fingers of the left hand should be placed behind the fundus, and the thumb in front. By movements of friction and squeezing between the fingers and thumb a contraction can generally be excited. If relaxation and further bleeding occur, the uterus may be irrigated with hot

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water at a temperature of 118° F. This is best introduced into the uterine cavity by means of a long tube and irrigating apparatus. Plenty of hot water is required. If a thermometer is not to be obtained, the heat of the water may be fairly accurately ascertained by means of the hand. Water at a temperature of 118° F. feels uncomfortably hot, though not too hot to permit the hand being held in it. To avoid the mischance of scalding the patient, the water should always be tested in this manner by thrusting the hand deeply into the douche can, as in the hurry of the moment the temperature registered by the thermometer may be inaccurately read by the nurse. An injection of ergotine into the buttock should be given, provided that the placenta has come away or been removed.

These methods of treatment, separately or in combination, check nearly all cases of post-partum hæmorrhage due to uterine inertia. In exceptional cases they may prove insufficient. Under such circumstances there are two other plans of treatment that may be employed. These are :—

(*a*). Introduce the hand into the uterus and clear out all clots or fragments of retained placenta or chorion. Then clench the hand and knead the uterus over it with the other hand on the abdomen. When a contraction has been excited, express the internal hand slowly from the uterine cavity.

(*b*). Bi-manual compression. Introduce the left hand into the vagina if the patient is lying on her left side, or the right one if she is lying on her back. Clench the fingers. With the external hand, antevert the uterus and press it down on the internal hand, which generally lies in front of the cervix. Such pressure need not be very forcible, but it may be maintained if necessary for half an hour or more. Be sure that the uterus is emptied before bi-manual compression is employed.

Compression of the abdominal aorta has been advocated in some cases where the bleeding is unusually profuse and sudden.

2. **Hæmorrhage from Tears.**—Tears which cause free external bleeding are nearly always situated either in the cervix or at the vaginal orifice.

A tear of the vaginal portion of the cervix does not usually cause much bleeding. If, however, it extends deeply into the supravaginal portion, it may cause a great bleeding. Such tears almost always occur laterally.

Tears at the vaginal orifice may be either anterior or posterior. The anterior tear extends into the vestibule, a vascular area at the side of the urethra. A posterior tear (perineal tear) is very common, but only in rare instances does it lead to serious bleeding.

Bleeding from lacerations is best treated by bringing the torn surfaces into apposition by deep sutures. The cervix can be easily sutured if it be first brought down by a volsella. Bleeding from the perineum or vestibule can be stopped in a similar manner. Bleeding from the vestibule or perineum can be temporarily checked by pressing a pad of cotton-wool firmly against the bleeding area so as to compress it between the pad and an adjacent bone. If the bleeding comes from the cervix, and it is not practicable to suture it, hot vaginal injections may be tried, and if this fails the vagina may be firmly plugged. This must never be done unless the uterus is firmly contracted.

Perchloride of iron in any form should never be used to control post-partum hæmorrhage.

W. J. Gow.

HÆMORRHOIDS.

External Piles.—These small swellings at the anal margin often cause a considerable amount of pain and discomfort, especially when swollen and inflamed, and the patient is obliged to lie up. As a rule the swelling and inflammation subside in a few days, but a recurrence of the condition is common, and some

patients are very subject to these acute attacks. One of the most important factors in the treatment of external piles is to ensure cleanliness of the part. The patient should not use paper as a detergent, but wash the parts with warm water and a soft sponge, afterwards dusting them with boracic powder.

A mild aperient should be given, and if there is much swelling, the patient should remain in bed and have hot fomentations applied. The following ointment applied to the swellings on a piece of lint will often effectually allay the pain :—

℞ Morphin. Sulph. gr. x | Ung. Stramon. ℥j
Ung. Bellad. ℥j

The most effectual method of treatment, and at the same time the best if it can be carried out, is to remove these external piles at once. This immediately gets rid of the pain, and materially shortens the time before the patient is well again. The parts should be rendered as surgically clean as possible, and then each swelling rendered anæsthetic by the injection of cocaine at its base. The greater part of each swelling should then be cut away with sharp scissors, the parts dusted over with an antiseptic powder, and a pad of antiseptic dressing firmly applied with a T bandage. On no account should a ligature ever be tied round these external piles, as the results are most disastrous. Quite apart from their being inflamed, many patients suffer considerable discomfort from them, and when this is the case an operation for their removal is advisable.

Internal Piles.—The treatment may be divided into palliative and operative measures.

Palliative treatment is often all that is required in the milder cases, and if properly carried out may give most satisfactory results. This treatment consists in keeping the bowels regular, correcting the diet, and the local application of sedatives and astringents. Small doses of calomel, combined with a morning dose of salts, or the confection of senna at bedtime, are useful. Drastic purgatives are harmful. The diet should be simple, and alcohol is better avoided, as also coffee and strong tea. Moderate exercise, especially walking, is often most beneficial. Sitz baths several times a week are often of great service, and those who can afford it can have a sitz douche fitted in the bath-room, which may be used daily. Much benefit is often derived from the use of warm-water injections into the bowel night and morning. For this purpose an eight-ounce rectal bulb syringe is much better than the ordinary Higginson's syringe. The water should be as warm as can be comfortably borne, and some hazeline or alum may with advantage be added to it.

If there is any prolapse of the piles, the patient should be instructed to immediately replace them, and care should be taken to see that they do not get rubbed by the clothing.

All ointments to be used in the rectum should be prescribed in collapsible tubes to which a bone rectal nozzle can be screwed, or should be used with an ointment introducer. The following ointment is often useful :—

℞ Ung. Acid. Tannic. ℥iv | Ung. Bellad. ℥ss
Ung. Stramon. ℥ss

M. ft. ung. A little of this ointment to be squeezed into the bowel night and morning.

Hazeline ointment is also useful, and great benefit often follows the use of ointments or suppositories made up with adrenalin. It is not advisable, however, to use any adrenalin compound for long periods, recent researches having shown that they cause damage to the kidneys.

℞ Ext. Suprarenal. ℥ij | Ung. Lanolin. ℥vj
M.

℞ Acid. Tannic. gr. xxx | Adip. Benzoat. ℥j
M. ft. ung.

Suppositories are much preferred by some patients on account of their convenience. The following will be found useful :—

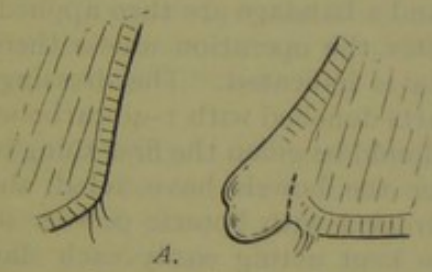
℞ Icthyol Acid. Tannic.	āā gr. v	Ext. Bellad. Ext. Stramon. Ext. Hamamel.	āā gr. ½ gr. x	
M. ft. supposit.				
℞ Ext. Suprarenal.	ʒij	Ol. Theobrom.	ʒiv	
M. ft. supposit.				

The following mixture taken internally is often useful in alleviating the pain and discomfort of bleeding and prolapsing piles.

℞ Pulv. Cret. Aromat. Tinct. Catechu	gr. xx ʒj	Decoct. Hæmatoxyl.	ad ʒj

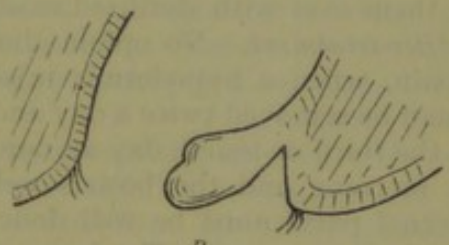
When, however, there is frequent bleeding and prolapse of the piles, palliative measures only offer temporary benefit, and a cure of the condition cannot be expected apart from operation. It is a mistake to advise such patients to try palliative treatment for long periods, as thereby they suffer much pain and discomfort, and ultimately an operation is necessary, which if performed earlier would have saved them great inconvenience.

Indications for Operation.—(1) Repeated hæmorrhages; (2) Prolapse of the piles; (3) Pain and discomfort; (4) Failure of palliative treatment; (5) Patient going to reside in a hot climate; (6) If the patient is unduly worried as to his rectal condition.



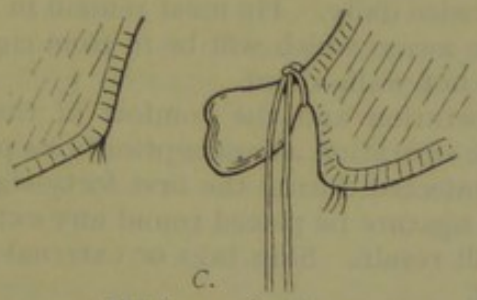
A.

Diagram of rectum with pile. The dotted line shows the direction of the cut.



B.

Shows the cut made and the pedicle formed ready for the application of the ligature.



C.

The ligature in place.

Fig. 16.—To illustrate the Ligature Operation for Internal Piles.

Operative Treatment.—*Stretching the Sphincter* is only suitable in slight cases.

Injections of Carbolic Acid into the Piles are not to be recommended except in cases where a general anæsthetic is contra-indicated. The procedure consists in injecting each pile with a 10 per cent solution of carbolic acid in glycerin and water.

The Ligature Operation still remains by far the best all-round operation for piles (*Fig.* 16), and should be the only one performed except by experts. The preparation of the patient is a most essential part of the operation, and should occupy two days. He should first be given a full dose of castor oil, and next day a dose

of salts. After the bowels have been well opened, the diet should be restricted to food which will leave little or no residue. On the night prior to operation a soap-and-water enema should be given, and at the same time a dose of catechu mixture containing 10 min. of opium or a 10-gr. Dover's powder. The next morning nothing except a cup of tea must be given, and an enema of plain water should be administered four hours before the operation. About an hour before operation 10 min. of tinct. opii or another Dover's powder should be administered. The parts should not be shaved, but should be thoroughly cleaned up in the usual way with antiseptics, preferably lysol, 2 dr. to the pint. On no account should the bowel be washed out with strong antiseptics. The anæsthetic should be ether.

The Operation.—When the patient is fully anæsthetized, the sphincters should be slowly stretched till the piles come well into view. The lower part of the rectum should then be washed out with soap and water with swabs, and lastly with weak lysol or other antiseptics. Each pile which it is proposed to remove should be seized with forceps at its tip so that it can be pulled down. Taking the lowest pile first, a cut with a pair of scissors should be made so as to separate the pile below from its attachment to the rectal wall (*Fig.* 16). Into the cut thus made a stout plaited silk ligature is inserted, and the pile being dragged down by an assistant, the ligature is firmly tied round the pedicle that is left after separating the pile. Each pile is treated in a similar manner. The piles should not be cut off—though if very large a portion can be removed. The ligatures are cut long enough to protrude from the anus, and the wounds dressed by smearing them over with sterilized vaselin. Dressings and a bandage are then applied.

After-treatment.—No opium should be given after the operation unless there is pain, when a hypodermic injection of morphia is indicated. The dressings should be removed twice a day and the external parts douched with 1–40 carbolic. On the third or fourth day an ounce of castor oil should be given the first thing in the morning and the bowels well opened. After the bowels have acted, the external parts must be well douched and then dressed with boracic powder or sterilized ointment. The bowels should then be kept acting easily each day with liquorice powder or salts.

If there is any external swelling, the patient should sit in a warm bath for twenty minutes once or twice daily. He must remain in bed till all the ligatures have separated and come away, which will be in from eight to twelve days, and for a week longer should not walk about.

The success of the operation and the comfort of the patient depend very largely on performing the operation as antiseptically as possible and preventing the wounds from being infected during the first forty-eight hours.

On no account must a ligature be placed round any external pile or portion of skin, as extreme pain will result. Skin tags or external piles should simply be cut off and not ligatured.

Excision is performed by cutting off the pile flush with the mucous membrane and sewing up the resulting wound with catgut. There are several methods of suturing the wound, but the most important factor in obtaining success by this method is to thoroughly cleanse the rectum and obtain aseptic healing in the wounds. There should be no pain after this operation.

Clamp and Cautery.—This consists in clamping each pile in turn and cauterizing the stump left by cutting off the pile in front of the clamp. This method is much inferior to the ligature operation.

Whitehead's operation, which consists in excising the last inch-and-a-half of the rectal mucous membrane, has nothing to recommend it; and in view of the serious results which may follow, it should not be performed.

J. P. Lockhart Mummery.

HALLUX RIGIDUS.—This is an affection of adolescents, and only rarely of children. It consists of a progressive stiffening and flexion at the metatarso-phalangeal joint of the big toe. The flexion may extend to 45° or 50°, and while it is sometimes accompanied by extension of the second phalanx, it is usually rigid in the straight position. Pain is at first complained of after walking or whenever forcible extension is made at the toe. The patient consequently walks with a stiff foot, and no effort is made to extend the metatarso-phalangeal range. Antero-postero pressure of the joint is usually painless, while lateral pressure is very painful. In the later stages, the joint is considerably swollen, but the bone itself rarely participates. A yielding of both the longitudinal and transverse arches is generally present. Pathological investigation reveals in many cases lipping of the head of the first metatarsal and hyperæmia of the joint.

TREATMENT.—This should consist in the early stages of rest and hyperextension of the toe. Either with or without an anæsthetic, the joint should be fixed in such a position that walking no longer strains it, and a bar should be placed across the boot posteriorly to the metatarso-phalangeal range. This bar will allow the patient to walk without straining his joint, and combines rest of the tender area with locomotion.

In certain cases accompanied by painful flat-foot the heel of the boot should be elongated and raised on the inner side. The bar across the sole should also be raised on the same side. This deviates the body weight from the inner to the outer side of the tarsus and relieves the painful area.

In a large proportion of cases, operation is the only effective procedure. The head of the metatarsal should be removed. On no account should the joint be resected, as ankylosis may result. The operation is generally most successful.

Robert Jones.

HALLUX VALGUS and BUNION.—Hallux valgus is a deformity in which the first metatarsal bone turns in and the great toe turns out. It is a partial dislocation of the phalanx upon the metatarsal. In consequence, the sharp adducted inner condyle presses upon the skin, and gives rise to the prominent joint. A bursa in consequence forms beneath the skin, often accompanied by a hard corn, and this, in common with the irritated skin, is designated a bunion. This bursa is frequently the seat of inflammation, and therefore in time becomes much thickened. Under exceptional circumstances the inflammation may resolve in suppuration accompanied by cellulitis, and an extremely serious condition may ensue.

The deflection of the great toe frequently affects the other toes harmfully, and gives rise to the hammer-toe which so often is associated with the second toe.

The head of the metatarsal is thickened by the repeated attacks of inflammation and the pressure of the boot. The cartilage is thinned. The sesamoids and tendons are displaced outwards. Exostoses often form about the condyles, and lipping occurs as in hallux rigidus.

Practically the boot is always to blame for the occurrence of this disease. It often begins in boyhood, and gives rise to no pain until in later life. Injury and diathesis, such as rheumatoid arthritis, may add to the severity of the affection.

TREATMENT.—In the early stages simple treatment will suffice. In this and in all stages suitable boots must be worn. The inner border should be straight, and the toe-piece squared. The inner border of the uppers of the boot should be sufficiently capacious to prevent pressure upon the toe joint. Manual rectification of the deformity by exercises conducted while the patient's toe is properly directed, digitated socks, and perhaps a toe-post, are all useful. The toe-post may be introduced into the boot, or form part of the boot. In the latter event a vertical piece of stout leather is placed so as to lie in the space between the first

and second toes, holding the first toe against abduction. At night a splint, reaching from the base of the metatarsal to the tip of the toe, with a large hole in the centre for the swollen bursa, and placed on the inner side of the foot, is often effective. Spring splints which can be worn in the boot are also used, but they are rarely comfortable. In more severe cases, where there is inflammation of the bunion, and pain, a bar of leather or iron may be applied so as to traverse the sole of the boot, placed posteriorly to the metatarso-phalangeal range. This proves a great comfort, and allows the patient to walk without pain.

Operative Treatment.—In the earlier cases cuneiform osteotomy is sometimes performed. This can only prove effective when the prominent and sharp inner condyle is included in the wedge. Sometimes the removal of the sharp projecting bone will suffice. The operation which we recommend, however, as being in every way satisfactory, is excision of the metatarsal head. In this care must be taken to remove enough bone to subsequently ensure good movement, or to cover the end of the bone with soft structure to ensure a movable joint. There is no occasion to exsect the sesamoids, which form an excellent protective pad for walking. Excision of the articulation, i.e., the head of the metatarsal and the base of the phalanx—is to be avoided, as the result is a stiff joint which interferes with walking. No operation should be performed while the bunion is inflamed. Rest and fomentations will usually quickly cure the inflammation. If, however, suppurative cellulitis has supervened, prompt incision should be made, and operation upon the bone postponed. *Robert Jones.*

HAMMER-TOE.—This condition is usually associated with hallux valgus, and secondary to it, and consists of the contraction of one or more toes, usually the second. The second phalanx is flexed and the third extended. It is generally due to the crowding of toes by lateral pressure supplied by ill-fitting shoes. In the early stages no complaint is made of the condition; but later, with the formation of callosities and sometimes ulceration, a very painful ailment exists, and locomotion is all but impossible. The condition is common both to childhood and to adolescence.

Treatment.—In the early stages this should consist in rectifying the hallux valgus and forcibly straightening the crooked toe. The surgeon should not be content until the toe be fixed in a splint in a hyperextended position, and so kept for fully a month. The toes should all be hyperextended on a metal splint applied to the soles, and flexed to an angle of 45° opposite the metatarso-phalangeal range. On to this splint the toes should be firmly bandaged. For many weeks the splint should be worn at night, and the patient shown how to hyperextend his toes manually.

In slightly more severe cases, tenotomy of the under portion of the capsule and division of the tendon may be necessary.

In pronounced hammer-toe with shortening of all the structures on the plantar aspect, exsection of the joint may be needed, and it is a very successful operation. A circular incision is made around the callosity, the skin is exsected, and the joint opened. A V-shaped excision of bone is made, which should include the joint. The skin wound is then stitched. The toe will then be straight and stiff, and will give no further trouble.

Amputation of the toe is never necessary, and no treatment should be adopted directed to the hammer-toe unless the hallux valgus be also treated. Well-fitting shoes should be prescribed, allowing room for the free play of the toes.

Robert Jones.

HARE-LIP.—The only treatment is by means of an operation which has for its design the formation of a lip as closely resembling a normally developed one as possible. The extent of the operation will accordingly vary with the

extent of the deformity. Many such operations have been devised, but the aim of all is to obtain a lip in which the artificial line of union between the white parts of the lip is unobtrusive, whilst the red margin appears to be uniform and uninterrupted throughout its entire length. At the same time an attempt must be made to reduce the slit-like deformity of the nostril which is so frequently present, and thus restore the symmetry of the two sides of the nose. The type of operation chosen will further vary with the individual discretion of the surgeon, but the time after birth at which the operation can be most advantageously performed is determined by other considerations. The deformity tends to increase in size as the result of mobility of the affected parts and of the growth of the child. On account of the interference with suction the deformity may also seriously impede the proper nutrition of the infant. For these reasons the condition should be rectified as soon as possible, and the most favourable time appears to be within six weeks to three months after birth. But if the malnutrition caused by the deformity cannot be checked by appropriate feeding with a spoon, even earlier operation must be resorted to. The presence of an associated deformity of the palate has no bearing upon the time at which an operation for the relief of hare-lip should be undertaken. Both conditions must be relieved as early in life as possible, and they may be treated either simultaneously or concurrently.

The immediate success of the operation depends upon the observance of strict aseptic precautions at the time, and upon the appropriate after-treatment of the patient. The best sutures are fine silk or silk-worm gut (size Ophthalmic D.).

A mattress suture with a broad base of coarse silkworm gut should be inserted to act as a tension suture between the two segments of the lip. This may be left in position for a period of from four to seven days after the operation. No dressing is to be applied to the wound, since it merely acts as a septic compress by retaining the natural discharges from the nose and mouth of the patient. The wound must be kept clean after feeding by bathing with warm boracic lotion. Above all, the child must be kept from crying for at least a week from the date of operation, and skilful nursing can be most advantageously aided towards this end by the administration at intervals of small doses of tinct. camph. co. combined with a few grains of bromide of potassium. Morphia must be given if necessary. To prevent the child picking at the wound, long cuffs of cardboard padded with wool should be applied to the flexor surfaces of the upper limb, extending from the middle of the arm to just below the middle of the forearm. The mother may continue to suckle the child immediately after the operation.

George E. Waugh.

HAY FEVER (Rose Fever, Paroxysmal Rhinorrhœa).—For the purposes of treatment, hay fever, rose fever, paroxysmal rhinorrhœa, and vasomotor rhinitis may be regarded as the same affection. The treatment must be both general and local, and, when the cause is known, prophylactic treatment may also be carried out.

PROPHYLAXIS.—In genuine hay fever, when the patient suffers from fits of severe sneezing and profuse watery discharge from the eyes and nose, together with the other symptoms of hay fever, only during the hay season or the time of the flowering of grasses—i.e., when the symptoms are presumably due to the irritation excited by the inhalation of the pollen of certain grasses—the most satisfactory treatment, if the patient can afford the necessary time and money, is to send him away to a suitable place where he is removed from the noxious influences. Thus, for example, if a patient who suffers annually from hay fever can spend the grass-flowering season in a place such as the Island of Heligoland,

where there is no vegetation, or on the sea, then he will escape from hay fever, and no other treatment will be required. Even residence at the seaside is often efficacious. In a similar way, if a patient suffers only when he is brought into contact with roses, peaches, cats, horses, or whatever the particular exciting cause may be; if the cause can be determined and the patient can be conveniently removed from its influence, no further treatment is necessary. Very often, however, the patient cannot submit to this treatment, or it may be impossible to determine the exciting cause, and then other measures must be adopted.

General Treatment.—General treatment is most important. The majority of patients who suffer from these affections are "highly-strung" or definitely neurotic individuals with a strong family history of neuroses. Others only suffer when the general health is below par, when they are overworked, run down, or depressed as the result of worry or of severe illness, and in many of these general treatment alone will effect a cure. In the first place any general disease or derangement of the health must be rectified. If suffering from general debility, the patient should be advised to rest, or to take a long holiday; he should be given a plentiful but light and nutritious diet, and, especially if thin, he may be recommended to take two or three pints of milk daily in addition to his ordinary food. In neurasthenic cases a modified form of Weir Mitchell treatment may be necessary. In addition certain drugs are often beneficial. Iron and strychnine always do good, and some patients derive decided benefit from a course of arsenic.

Local Treatment.—During the actual paroxysm immediate relief may be given by spraying the nose with cocaine. A 1 or 2 per cent solution may be used, and may be made more effective by the addition of adrenalin. These remedies, however, are extremely dangerous. The relief experienced is temporary, and is quickly followed by return of the symptoms in an aggravated form. Further recourse to the drug is required at more and more frequent intervals, and the patient may become its slave. This is especially apt to occur because these patients are almost invariably neurotic. Moreover, these remedies ultimately induce a relaxed condition of the nasal mucous membrane, and render the disease almost incurable by other treatment. Similar objections apply to the internal use of opium and belladonna, which have also been strongly recommended.

In genuine hay fever, treatment by Dunbar's serum may be tried. The serum (called pollantin) is an antitoxin obtained from horses which have been rendered immune by the injection of the toxins obtained from certain grasses. A few drops of this serum inserted into the eyes and nose will prevent, or at any rate diminish, the severity of the attacks in many people. As far as is known it has no deleterious effects. (See Bacteriotherapeutics.)

In patients suffering from hay fever, and especially from that form of it generally known as paroxysmal rhinorrhœa, nasal treatment should be carried out. In the first place any gross abnormality in the nose should be corrected. Spurs or deviations of the septum, polypus, hypertrophies of the inferior turbinates, adenoids, or other cause of nasal obstruction, should be appropriately dealt with by surgical measures. If no gross abnormality be found, the patient may be treated as for chronic rhinitis (see Rhinitis); a simple alkaline lotion should be prescribed, together with a soothing ointment, such as plain lanolin or weak boric acid or menthol ointment.

If no gross abnormality be found, and simple measures, local and general, have failed, the best treatment is the application of the galvano-cautery. This is a purely empirical treatment, but applied properly can do no harm, and frequently does good, even to the extent of effecting a cure. It seems to matter little to which part of the nasal mucous membrane the cautery is applied. In

the first instance, I should recommend that the anterior ends of the inferior turbinates should be cauterized, two, or at most three parallel lines being drawn horizontally along each turbinate. The cauterization should neither be too extensive nor too deep, and very little should be done at each sitting. After one or two weeks the posterior ends of the turbinates should be similarly dealt with. If this fails, the cautery may be applied to the tubercle of the septum; that is, to an area on the septum opposite to the anterior end of the middle turbinate. This may be repeated on two or three occasions after intervals of at least a week. The cautery may also be applied high up and far back on the septum.

When the cautery fails and the patient suffers severely, further surgical measures may be adopted, provided the general condition is good. Thus I have often strongly recommended the removal of both inferior turbinates. The greatly increased size of the air-way through the nose resulting from this operation will effectually prevent the patient from suffering again from nasal obstruction, and the removal of much glandular and secreting tissue prevents the profuse watery discharge. Even in the worst cases, where the nasal mucous membrane swells so much that the patient is unable to blow his nose, and suffers from severe headaches and constant dripping of watery discharge, the removal of the inferior turbinates will relieve the worst symptoms, even when it does not produce a complete cure. Moreover, the removal of the turbinates in this affection never results in subsequent dryness of the throat and nose, such as may follow their removal in other circumstances.

In rare cases I have even advised the removal of the middle as well as the inferior turbinates, with marked relief and without any subsequent ill effect.

H. Lambert Lack.

HEADACHE.—Headache may arise from many different causes. In treating it, therefore, we must endeavour to ascertain these causes and to obviate them. They will for the most part be found to group themselves under three heads :—(1) *Organic disease of the parts actually involved in the ache;* (2) *Irritation in other areas : "peripheral irritation" ;* (3) *Morbid states of the blood.*

1. **Organic Headache.**—This is generally taken to mean headache resulting from organic disease of some part involved in the pain, i.e., the brain, the meninges, the cranium, or overlying structures. When resulting from organic disease in other parts of the head, such as the eyes, ears, nose, throat, or mouth, the headache is not generally spoken of as organic.

Syphilis is the most common cause of organic headache, and may affect not only the brain and its coverings, but also the cranium and overlying scalp, in which case there may be great tenderness. Considerable effusion into the scalp, accompanied by pain and tenderness, is also a feature of so-called rheumatism of the scalp, such as may result from sitting in a draught.

If there be the slightest suspicion of the headache being syphilitic, prompt and vigorous treatment must be adopted, for head pain frequently heralds a serious outbreak of cerebral syphilis, such as the blocking of a cerebral artery. Iodide of potassium should be given in not less than 1-dr. doses three or four times a day. This is no doubt a large dose, but even if iodism results, what is that compared with irretrievable damage of the brain ?

For rheumatic headache, we may give 10 gr. each of potassium iodide, potassium bromide, and sodium salicylate, with glycerin and water : this thrice daily.

In headache from non-syphilitic tumour, opium still remains our sheet-anchor. In some cases of organic headache, as in abscess, tumour, or increased intracranial tension from whatever cause arising, relief may be afforded by

trephining the skull. Sir Victor Horsley has by this means also cured traumatic headaches of many years' duration.

2. **Headache from Peripheral Irritation.**—In all these cases, every possible source of the irritation must be sought for.

The scalp should be first examined. Among the poor, pediculi capitis are a frequent cause of distressing headache, and it should be remembered that in women the hair in the occipital region may conceal numerous pediculi and nits, even though on superficial examination the head may appear to be quite clean. The mere weight of the hair, by tugging on the scalp, may cause headache, as may also binding it up tightly, the wearing of a heavy headdress, or a hard rimmed hat which compresses the scalp. Fortunately, very light silk hats and "bowlers" are now on the market for men, and are greatly to be preferred to the heavier kinds, not only being less productive of headache, but also less likely to cause baldness by strangulating the vessels of the scalp.

Irritation in the region of the eyes, such as may be caused by eyestrain, or by looking at bright lights, vivid colours, or rapidly-moving objects, is a frequent and potent cause of headache. The greatest care must be taken to obviate eyestrain if present, by correcting errors of refraction, fixation, and the like. Nor must it be forgotten that glaucoma, both in the acute and chronic form, is a possible cause of headache.

Disease in the nasal passages and accessory sinuses—frontal, maxillary, ethmoidal, and sphenoidal—as well as in the nasopharynx, may cause headache. Adenoid disease is another not infrequent cause. Certain perfumes also, as those of the lily and hyacinth, may induce it. Again, affections of the pharynx and tonsils, e.g., acute pharyngitis and tonsillitis, cause headache, chiefly in the parietal and occipital regions.

The auditory apparatus may be the starting-point of the pain. Loud noise may induce it, as may also otitis media, the presence in the meatus of a mass of hardened cerumen, and indeed almost any affection of the ear. The pain may be a mere earache, or it may spread to the whole of the same side of the head, and even involve both sides.

Among the dental causes of headache must be reckoned difficulty of eruption, either of the temporary or the permanent teeth, overcrowding, caries, exostoses, buried fangs, peri-odontitis, unsuitable fillings, or imperfectly fitting plates. Let it not be forgotten that the tooth which is responsible for the headache may itself be perfectly painless. If any dental trouble exists, the services of the dentist will sooner or later be required, but in the meantime the medical man may afford temporary help. In difficult eruption, lancing the gums may relieve. In acute peri-odontitis, the overlying gum should be counter-irritated, and 2 gr. sulphide of calcium, or 5 gr. pil. saponis co., or from 3–5 gr. of calomel, may be given. In applying anodynes to a carious cavity, the latter should first be syringed with tepid water, and then thoroughly dried with pellets of cotton-wool. Some recommend the removal, with the help of a mouthglass and a few excavators, of the soft dentine, an operation which may be safely undertaken by the practitioner himself. After the anodyne has been applied, the cavity may be packed with wool partially moistened with mastic, care being taken not to press too firmly in the direction of the nerve.

One of the following applications may be used :—

℞ Acid. Carbol. (sat. sol.) Chlor. Hydrat. (sat. sol.)		Tinct. Camph. Co. Ol. Menth.	āā ℥j ℥ss
℞ Liq. Opii Sed. Ol. Caryophyll.	āā ℥ij	Camphor.	℥iss

Irritation in the stomach and intestines may occasionally induce headache,

but headaches brought about by gastro-intestinal disturbance are generally due to secondary implication of the blood, and therefore come under Class 3.

The same is true of headaches associated with disturbance in the reproductive system. It is probably only exceptionally that such headaches are reflexly induced. Those associated with menstrual irregularities are certainly of hæmic origin.

3. **Headaches due to Morbid States of the Blood.**—These are, of all causes, much the most common ; indeed, functional headache seldom, if ever, occurs when the blood is healthy. Therefore, in such headaches always suspect the blood, even though marked peripheral irritation be present; and if it be unhealthy, seek to make it healthy and to raise the patient's health to the highest possible level. Measures to this end are eminently rational, in that they strike at the root of the evil ; anodynes, though they may alleviate for the time, do but mask the trouble.

Among the blood conditions productive of headache are the following :—

Plethora, such as one meets in the overfed, and in stout amenorrhæic women at the climacteric. This condition should be treated by limiting the diet, by giving mercurials and salines, and in severe cases by bleeding

High Arterial Pressure, whether of the renal variety or not. In these cases the heightened pressure indicates some fault in metabolism causing toxæmia, and this it should be our business to correct. Otherwise the treatment is the same as for plethora.

Anæmia, in any of its many forms. Headache thus resulting is apt to be neuralgic.

Indigestion Toxæmia (by which I mean blood-poisoning from defective digestion in stomach, bowel, or liver), including as it does the toxæmia of gout, " biliousness," and constipation, is the most common of all causes of headache. Obscure forms of intestinal and hepatic indigestion are especially apt to cause it, and it is probable that megrim, and the headaches associated with menstrual disturbances, arise in this way.

The importance of paying attention to the digestive system, in all sufferers from headache, cannot indeed be exaggerated. Their diet must be regulated with great care. Some patients require feeding up ; others, especially those past middle life, may need to have their diet restricted. For most, the golden rule should be to eat simple food in moderate quantity, and to chew it well especially the vegetable portion of it.

In some headaches, more especially megrim and its allies, benefit may be obtained by diminishing the quantity of animal food. A mere curtailment in the amount of butcher's meat may suffice ; or it may be necessary to forbid it altogether ; or, again, to prohibit bird, or even fish, limiting the diet to vegetable food, dairy produce, and eggs. It is a fact, however, that these headaches can also be benefited, and even cured, by an entirely opposite plan of treatment, i.e., by curtailing, or actually withholding, carbonaceous foods, as in the Salisbury treatment. Dr. Francis Hare claims to have obtained better results in megrim and the paroxysmal neuroses generally by treatment on these lines than on the opposite plan. We must not, therefore, bind ourselves to any one system of diet in the treatment of headache, but consider each case on its own merits, and if we find that one plan does not answer, try another, our object being to secure normal digestion in stomach, bowel, and liver. If we succeed in this, it probably matters little what kind of food we give; for with normal digestion, the blood poured by the hepatic veins into the systemic stream will be healthy, uncontaminated by the products of defective digestion, and thus adapted to normal nutrition.

It should be noted that headaches which have resisted every other form of

treatment can often be cured by change of air and scene; and it is probable that in such cases the good is effected essentially through the digestive system; digestion is improved, and this leads to a better quality of blood and to improved nutrition generally. One may see a nervous, jaded, headachy woman, whom in her own home no kind of treatment benefits, return after a few weeks' congenial holiday, full of joy of life and without ache or pain of any kind.

The Toxæmia of Fever.—Febrile headache is apt to be accompanied by painful throbbing. Cold applications to the head relieve the pain.

Uræmia.—Frequent headache in the occipital region is one of the classical signs of this condition. It may occur some time—in the case of granular kidney many years—before the onset of the acute stage. Headache which appears for the first time, or gets worse, after middle life, should always arouse suspicion of granular kidney.

Alcohol, Tobacco, and Drug Toxæmia.—The headache which follows upon a drunken debauch is well known. It is hardly necessary to observe that immature wines and spirits are much more likely to cause headache than the more mature varieties, nor to dwell upon the idiosyncrasies which are met with in respect of special alcoholic drinks—how some cannot drink even a moderate quantity of good champagne without suffering from headache the next day, while others can tolerate champagne and not burgundy, and so forth. In general, it may be said that those prone to headache are best without any alcohol whatever. Though smoking cannot be said to be a frequent cause of headache, it is a possible one.

In reference to drug headaches, it is important to remember that drugs, like iron and quinine, which have been wont to cause headache, can often be tolerated if they are given in small doses at first, and then cautiously increased. Nor must it be forgotten that imagination may play a considerable part in the production of these headaches, and when this appears to be likely it is well to keep the patient in the dark as to the drugs he is taking.

A few causes of headache not falling under any of the above headings still remain for consideration.

Mental Causes.—Intellectual effort may be a cause, as in the case of Newton, who is said always to have suffered pain in the head when he worked at the theory of lunar irregularities. This is, however, a much less frequent cause than emotional disturbance. School headaches result rather from eyestrain and from the emotional excitement attendant upon over-pressure, than from actual intellectual effort. Violent emotions, such as anger, may set up headache, and worry and suspense are yet more productive of it. Sufferers from headache should, as far as possible, live a serene and unemotional life.

Exertion.—Muscular exertion, especially if violent, or if pushed to the point of fatigue, or if necessitating stooping, as in gardening, may start a headache. Exercise within proper limits, however, may ward it off.

Atmospheric Conditions. — Excessive heat and cold, and low barometric pressure, may all induce headache. Indeed, persons liable to headache are very susceptible to these and the other subtle influences which go to make up climate: thus, a person may be a martyr to headache in one place and entirely free from it in another, a fact to be borne in mind in recommending change of climate. As a rule, moderately bracing climates are the best, and inland resorts better than seaside.

Hot, stuffy rooms are highly provocative of headache. Those prone to this affection stand in pressing need of fresh air by day and by night.

Topical Treatment.—*Cold*, applied to the head by means of damp cloths or the ice-bag, is useful in headaches attended by throbbing, such as may occur in fever and megrim. In the latter affection it often happens that the head is

flushed and throbbing while the rest of the body is unpleasantly cold. In these cases, steps should be taken to make the body and extremities warm, e.g., by warm wraps, and putting the feet in hot mustard and water, or even by immersing the entire body in a hot bath, while cold is applied to the head.

When there is difficulty, as during delirium or sleep, in keeping the ice-bag constantly applied to the head, the patient may use as a pillow an india-rubber bottle or water-cushion, filled with crushed ice and covered with the sheet.

In other cases, the opposite plan of applying great *Heat* to the head is beneficial, e.g., by means of a calico sand-bag heated to 120° F. and applied for half-an-hour three or four times a day. Good may also be got from the application of heat or cold to the neck.

The *Seton* is useful in obstinate forms of chronic headache, especially megrim. A portion of skin at the back of the neck is transfixed with a scalpel, and a probe passed through the wound; the knife having been withdrawn, a piece of ordinary household tape, about nine inches in length, is tied to the probe and pulled through the wound, and the ends are then loosely tied together. The patient is instructed to move the tape from side to side every day. The seton should be worn for three months at least, and if the pain recurs, a second, or even a third should be applied.

Blistering may be of service, but it is apt to leave an unsightly scar. Croton-oil liniment, if well rubbed in, is equally efficacious, producing a copious crop of pustules which leave no scar.

Dry Cupping is sometimes helpful. Half a dozen cups should be applied just below the clavicles and between the scapulæ, and smaller ones in the region of the ears, a procedure which may be repeated frequently.

Anodyne Applications.—Among these the following may be employed:—(1) Liniment. opii; (2) Liniment. belladon.; (3) A drachm each of chloral, camphor, and chloroform, with half a drachm of morphia, to be brushed in for its anæsthetic effect; (4) Twenty drops each of oil of cloves and oil of cinnamon, with one drachm of menthol and an ounce of alcohol; (5) One ounce of tinct. belladon. and ten drops each of tinct. aconit. and tinct. chloroform.; (6) One part each of chloral and menthol, two parts of cocoanut butter and four parts of spermaceti; (7) Half a grain of croton oil, with two ounces of petroleum ointment.

Electricity, either in the form of faradism, galvanism, the high-frequency current, or franklinism, may be useful. In employing galvanism, the negative pole should be placed on the nape of the neck and the positive moved slowly over the forehead, with an occasional reversal of the current; if faradism is used, the current should be mild, and applied to the temples or the cervical sympathetic, or recourse may be had to the wire brush.

Bleeding is indicated in the headache associated with plethora and high arterial tension, above all in that of acute uræmia. Its beneficial influence on headache is well shown in the case of spontaneous hæmorrhages, e.g., from the nose, rectum, or uterus.

Firm Pressure to the head, such as is afforded by a closely fitting capeline bandage, often relieves headache, especially when it is attended by fits of throbbing and when the patient is liable to fits of throbbing.

Compression of the Temporal Arteries is sometimes of service. For this purpose we may employ a semicircular band of steel, provided at each end with a movable pad, so that the pressure need not always be applied to exactly the same spot.

Trephining, as already stated, may be called for in organic headache.

Drug Treatment.—Of the various anodyne drugs employed in the treatment of headache, the best are antipyrine, phenacetin, antifebrine, phenalgin, aspirin,

citrate of caffeine, and opium; but it should ever be remembered that such drugs do little more than relieve the pain for the time being, leaving the root of the evil untouched.

In syphilitic headache, iodide of potassium should, as before observed, be given in heroic doses, e.g., 1 dr. three or four times a day, either alone or combined with small doses of mercury.

In violent neuralgic headache, we may prescribe ½-dr. doses of ammonium chloride, combined with 7½ drops tinct. gelsemii and a drachm of syrup. aurantii, the mixture to be repeated every hour till three doses have been taken. Croton chloral hydrate, in 5-gr. doses, is also useful in neuralgic headache and in the headache of anæmic girls. It readily dissolves in glycerin, or it may be suspended in mistura amygdalæ with a drachm of syrup.

The inhalation of 10–20 drops of chloroform, either from the hand or a piece of lint in a wineglass, may be of service, as may also the simple and saline ethers, e.g., ½–1½ dr. of the simple or compound spirits of ether, or the same quantity of spirit. ether. nitrosi. Oxygen inhalations are often of great service.

Nitrite of amyl and nitroglycerin may be tried when the arterial blood-pressure is unduly high. The latter drug, given for weeks together, is said to be useful in averting the attacks of megrim, for which also guarana is sometimes helpful. One to two drachms of the powder may be given in hot water sweetened with sugar, or the fluid extract may be prescribed in drachm doses. Turpentine, in 10–20-drop doses, sometimes does good; it should be mixed with mucilage, and flavoured with oil of cinnamon, in 1-dr. doses.

Quinine, in 10-gr. doses, is indicated in malarial headache, or in any severe headache coming on at the same time every day or night; it should be given just before the expected attack.

In some of the slighter forms of headache, acid mixtures are useful, e.g., 10 drops of dilute nitrohydrochloric acid, 10 drops tincture of nux vomica, ½ dr. each of tinct. gent. co. and syrup. aurantii, made up to an ounce of water. (See also MIGRAINE.) *Harry Campbell.*

HEAD-NODDING.—(See NYSTAGMUS.)

HEART, DILATATION OF.—(See MYOCARDIAL FAILURE and SCHOTT-NAUHEIM TREATMENT.)

HEART, FATTY.—(See MYOCARDIAL FAILURE).

HEART, IRREGULARITY OF.—Arhythmia is produced by many causes. Some of these are obvious: such as weakness of the heart muscle, and definite structural alterations in it leading to dilatation; heart strain, induced by over-exertion, physical or mental; high blood-pressure, producing cardiac stress, in all of which the myocardium is directly affected; toxic causes, resulting from such chemical agents as alcohol, tea, coffee, and tobacco, from such microbic agencies as are found in influenza and diphtheria, or such metabolic poisons as are produced in the system in gout, are all fertile sources of arhythmia; lastly, reflex influences arising from disturbances in other viscera, e.g., gastric or intestinal dilatation, renal mobility, vesical calculus, and analogous conditions, often bring about attacks of arhythmia.

TREATMENT.—One great point is, as far as possible, to reassure the patient; and, in truth, the gravity of cardiac irregularity is usually overestimated. It is often an inherent condition pursuing the patient throughout most of his life, and producing no serious effect beyond discomfort. When there is no evidence of serious structural alteration, the influence of confident assurance is of much value. The principles of general treatment are to give definite instructions

for regularity of life in every way. Abundance of rest, with sufficient muscular exercise to stimulate metabolism, and mental exertion to prevent the patient dwelling on the symptoms of the condition ; the use of baths and friction to encourage the action of the skin ; the avoidance of any alimentary irregularities and of every kind of excitement ; the use of dry meals, with sufficient fluid at times which will not interfere with the digestive processes, as given at the end of this article—the importance of such regulations cannot be overestimated. In every case respiratory exercises are of use, and the simple forms of movement described later are of far greater utility than the resistance exercises practised at Nauheim. When matters are more serious, a complete rest cure may be necessary, accompanied by general massage, employed twice a day, and especially by vibratory massage of the chest. Such measures may be followed by the use of effervescing baths of oxygen or of carbonic acid ; these baths may be obtained at many watering-places in this country, as well as on the Continent, and in America, or they may be administered in the patient's house by the methods of Weiss and Sandow.* Galvanism, employed with the one rheophore applied at the back of the neck and the other over the præcordia, is sometimes very useful. The high-frequency current is, as a rule, disappointing in its effects in the treatment of arhythmia.

Medicinal treatment must of necessity be based upon the factors at work in each case. It need hardly be said that if any definite cause can be discovered, it must, if possible, be removed.

The drugs useful in those cases in which the irregularity is the result of structural change must be those of heart failure. For slight degrees, the use of formic acid is indicated, as in the following :—

℞ Sol. Acid. Formic. (25%) ℥vj | Aq. ad ℥iij
Syr. Prun. Virginian. ℥j |

One teaspoonful in a sherryglassful of water three or four times a day after meals.

Strophanthus with nux vomica may also be of great use, e.g. :—

℞ Tinct. Stroph. (B.P. 1885) ℥ij | Tinct. Cinchon. ad ℥iij
Tinct. Nucis Vom. ℥iv |

A teaspoonful in a claretglassful of water three times a day with meals.

When the heart is so affected as to produce hyperæmia and enlargement of the liver, the excellent formula known as Guy's pill is the best means of treatment :—

℞ Pil. Hydrarg. | Pulv. Scillæ
Pulv. Digit. | Ext. Hyoscyam. āā gr. j

Ft. pil. Mitte tales xij. One three times a day.

If œdema should threaten, the salts of potassium, with digitalis, will act well, as in :—

℞ Potass. Citrat. ℥iv | Inf. Digit. ad ℥vj

A tablespoonful in a sherryglassful of water three times a day, half an hour before meals.

In such cases, saline aperients every morning, especially after the manner of Hay, may be given, and further steps, as detailed in the article on valvular diseases (*vide infra*), will often be required.

* The chemical substances employed in the oxygen baths may be obtained from Knoll, St. Mary-at-Hill, London, E.C. Sandow's powders and tablets are supplied by Buchner, 149, Houndsditch, London, E.C. Both are accompanied by full directions.

When high arterial pressure is present, the nitrites must be employed. The following will be found very useful :—

℞ Sol. Nitroglyc. (1%) ℥xxiv | Aq. Lauroceras. ad ℥iij

A teaspoonful in water three times a day after meals.

If the high pressure be associated with distinct cardiac weakness, the nitroglycerin should be combined with strophanthus or digitalis.

In the case of toxic influences, endeavours must be made to eliminate them from the system, and as regards chemical substances like alcohol and tobacco, the patient must be prevented from further use of the poison. In cases of this kind, due to poisons entering from without, strychnine is the most valuable drug we possess ; one of the combinations in which it may be administered is :—

℞ Liq. Strych. Hydrochlor. ℥j | Tinct. Cardamom. Co. ℥vj
Acid. Hydrobrom. dil. ℥iv | Inf. Gent. Co. ad ℥vj

A tablespoonful in water three times a day a few minutes before meals.

For gouty patients, in addition to dietetic regulations, an occasional dose of blue pill or calomel, followed by a saline aperient, should be employed. For such people, as a general rule, colchicum given with alkalies acts like a charm. These may be exhibited as follows :—

℞ Lith. Citrat. ℥j | Inf. Calumb. ad ℥vj
Vin. Colch. ℥iij |

A tablespoonful in a claretglassful of water a quarter of an hour before meals, three times a day.

This has often to be increased ; but, on the other hand, certain persons cannot tolerate colchicum, and for them piperazine, lysidin, or uricedin may be tried.

When anæmia is present, it must be removed by ferruginous remedies along with mild aperients.

In all instances of reflex disturbance, the cause must be ascertained, and removed when possible. For gastric or intestinal catarrh and distension, the methods of treatment laid down in the articles on these affections should be followed. Movable kidney will require the support of a suitable bandage or truss by day, while the lower end of the bed should be raised ; a fattening diet must be arranged. If such measures fail, surgical intervention ought to be invoked. Other causes of reflex disturbance, which need not be further detailed, will call for their own special management. Finally, in a large proportion of cases of arhythmia, the treatment is materially aided by the administration of a dose of ammonium bromide, trional, or veronal, at bedtime.

The following tables of diet and of exercises will be found useful :—

Dietary Table.

In early morning.—A tumblerful of hot water.

Breakfast.—Well-toasted stale bread without butter ; grilled white fish, chop, steak, chicken, game, or ham ; one small cup of tea or coffee.

About noon.—A tumblerful of hot water.

*Luncheon.**—Any kind of grilled meat, fowl, or game ; a slice of toast ; a claretglassful of water.

About 4 o'clock.—A large cup of weak tea, with dry toast.

*Dinner.**—Grilled or boiled white fish ; grilled or roasted meat, fowl, or game ; dry toast ; a claretglassful of water.

Late at night.—A large cup of hot water.

* In many cases it is well to reverse luncheon and dinner, so as to have the principal meal in the middle of the day.

MOVEMENTS ADAPTED TO STRENGTHEN THE HEART.

The following simple movements constitute the first and best for the purpose :—

1. Standing at "attention," with the hands on the hips, rise slowly on the toes while inspiring slowly and deeply, then slowly sink upon the heels again with slow expiration.

2. Standing at "attention," with the hands on the hips, slowly move the head back as far as possible with deep inspiration, and afterwards bring it gradually to the former position, breathing out with slow expiration.

3. Standing at "attention," with the hands on the hips, rise slowly on the toes with slow inspiration, bend the knees and slowly sink nearly to a squatting posture while slowly expiring ; rise again to the upright position on the toes with another deep inspiration, and then slowly sink to the heels with slow expiration.

4. Standing at "attention," with the arms hanging down, raise the arms slowly, along with deep inspiration, until they are at right angles to the body, then let them slowly fall to the former position with deep expiration.

5. As in the last exercise, but the arms are to be raised high above the head during deep inspiration, and then allowed slowly to fall with deep expiration.

6. Standing with the feet 18 ins. apart, and the hands on the hips, rotate the body slowly round in a circle, bending it to the right, then forwards, then to the left, then backwards, and lastly to the original position, all the time keeping the muscles of the calves and thighs rigid. This is to be repeated in the reverse order alternately.

See also SCHOTT-NAUHEIM TREATMENT. *G. A. Gibson.*

HEART, VALVULAR DISEASES OF.

Chronic Valvular Lesions.—In order to treat cases of chronic valvular disease rationally and to the best advantage, it is essential to try to determine in each individual case : (*a*) The exact nature and cause of the valvular defect ; (*b*) Whether the lesion be stationary or progressive ; (*c*) The exact character and degree of the disturbance, if any, in the circulation, both arterial and venous, which the valvular defect is producing ; (*d*) The condition of the secondary changes in the tissues and organs throughout the body which have resulted from the valvular lesion ; (*e*) The condition of the heart muscle and the capabilities of compensation ; and (*f*) The presence or absence of complications and associated lesions.

It is unnecessary to say that chronic valvular lesions may be due to a variety of causes, that in regard to severity different cases present great variations, and that the same form of valvular lesion and the same degree of valvular defect may, in different individuals, and indeed in the same individual at different times and under different circumstances, produce very different effects upon the circulation—very different symptoms and secondary results. In some cases of mitral regurgitation, for example, the valvular lesion is due to organic changes in the valve segments and chordæ tendineæ ; in others, to weakness, impaired nutrition, or degenerative changes in the cardiac muscle ("muscular incompetence") ; in others, to obstruction in front (disease at the aortic orifice, constriction in the minute arteries, cirrhosis of the kidney, etc.) ; and, in many cases, to a combination of these conditions. In some of these cases, the lesion is permanent and incurable, in others temporary and curable ; in some, the conditions for compensation are satisfactory, in others the reverse. The most superficial consideration shows that the therapeutic measures which are to be recommended in one case may be inadvisable in another.

The effect of all chronic valvular lesions, whether obstructive or regurgitant, is to impede the normal flow of the circulation. The object of treatment is to remove the cause and to cure the disease, or if, owing to the presence of incurable organic changes in the valvular apparatus or in the heart muscle, that is impossible, to aid nature to produce and maintain the compensatory changes required to restore the balance of the circulation, to store up a reserve of (cardiac) energy which may be called upon when required to meet future emergencies, and to protect the patient from all conditions which are likely to throw a strain on the damaged heart or to aggravate or re-excite the lesion.

Compensation is chiefly effected by the development of hypertrophic changes in the cardiac muscle, and it cannot be too strongly insisted upon that the success of our therapeutic measures, in cases of chronic valvular disease, chiefly depends, firstly, upon the condition of the heart muscle, and, secondly, upon whether the conditions for the maintenance of the nutrition of the heart muscle are favourable or not. In this connection the whole of the factors included under what is termed the " personal equation " have to be taken into account, more especially the condition of the blood, blood-vessels, kidneys, digestive and nervous systems, the age, vitality, and mental temperament of the patient, his occupation, financial position, ability and willingness to carry out the treatment which is recommended, etc.

Experience shows that, for the purposes of treatment, cases of chronic valvular disease may be divided into two great groups :—

1. Cases in which the lesion is so slight that it produces no practical disturbance of the circulation (no symptoms), and cases in which the lesion is more severe but in which it is well compensated.

2. Cases in which the compensation has broken down either temporarily or permanently.

This division is of the greatest practical importance, and is not always recognized by the practitioner. Some men when they hear a cardiac murmur immediately prescribe digitalis or strophanthus as a matter of routine. This is a grave error, and should be studiously avoided. It is essential to remember that in the slighter forms of valvular defect, and even in more serious lesions so long as the compensation is well maintained, the heart muscle does not require to be helped by cardiac tonics and stimulants. It is equal to its duties ; under such circumstances digitalis and strophanthus are unnecessary and likely to do harm rather than good.

In cases of this kind (slight valvular lesions unattended with symptoms, and more severe lesions which are well compensated), the great objects of treatment are :—

1. *To prevent Cardiac Strain, and to avoid everything which is likely to Embarrass the Damaged Heart or to Aggravate the Lesion.*—It is important to remember that cardiac strain may be due either to external causes, such as muscular over-exertion, or to internal causes, such as high blood-pressure, the result of gout, kidney disease, etc.

One of the chief difficulties we have in treating cases of cardiac disease is that, in the labouring classes, the patients are often unable to avoid muscular strain, and that, in the upper classes, patients are often unable or unwilling to avoid dietetic and other conditions which produce gout and high blood-pressure.

2. *To keep the Heart Muscle in the highest possible state of Health and Efficiency.*—In trying to carry out this indication, it is important to attend to the condition of the digestive and excretory organs, and carefully and judiciously to regulate the daily life of the patient as regards diet, exercise, sleep, clothing, alcohol, tobacco, tea, etc.

During this, the first stage of the disease, drugs (except perhaps the occasional administration of such remedies as arsenic, strychnine*, and, if the patient is anæmic, iron) are usually not required. Of course if temporary breakdowns in

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* *Prescription for Arsenic and Strychnine in combination.*—(It must be particularly noted that if arsenic and strychnine are prescribed in the same mixture, the solution must be *acid*, otherwise the strychnine is precipitated, and a poisonous dose is apt to be concentrated at the bottom of the bottle) :—

℞ Liq. Arsen. Hydrochlor. ℥j | Acid. Hydrochlor. dil. ℥ij
Liq. Strych. ℥ij | Liq. Peptici (Benger's) ad ℥iv

M. Sig. A teaspoonful in water three times daily.

the compensation occur, the administration of cardiac tonics (digitalis, strophanthus, etc.) is indicated.

Exercise.—It is not always easy to lay down hard and fixed rules as to the amount and kind of exercise which patients suffering from chronic valvular lesions should be allowed to take; but, generally speaking, one may say that out-door exercise, *so long as it does not produce shortness of breath, præcordial distress, palpitation, or over-fatigue,* is eminently beneficial. Walking is for most patients the best form of exercise; walking on the flat is usually better than hill-climbing, but in some cases a carefully regulated plan of hill-climbing, since it necessitates a greater amount of muscular effort and a more rapid flow of blood through the muscles of the body, is beneficial. All violent efforts, such as running to catch trains, lifting heavy weights, riding a bicycle up hill, against a wind, too far or too fast, etc., and prolonged muscular work which throws an increased strain on the damaged heart, must of course be avoided.

Diet—The diet must be carefully attended to. The food should be nutritious and easily assimilated; patients should be cautioned against over-distending the stomach; the amount of fluid which the patient drinks should in many cases be restricted; a dry diet is often best; articles of food which (for the particular patient) are indigestible should be rigidly prohibited, and anything which produces flatulent distension should be avoided. If flatulent dyspepsia is present, appropriate remedies for its relief (such as alkalies before, and carminatives after, meals) should be prescribed.

If the patient has been accustomed to use alcohol, a strictly moderate quantity of it may be allowed. A moderate amount of tobacco may also be allowed, but over-smoking, especially over-smoking strong tobacco, should be strictly prohibited. Tea and coffee, too, must not be taken in excess. The patient should be warned against over-indulgence in sexual intercourse.

ALKALINE MIXTURE FOR CASES OF DYSPEPSIA.

℞ Potass. Bicarb.		Sp. Ammon. Arom.	℥iv
Sod. Bicarb.	āā ℥iij	Tinct. Rhœi	℥ij
		Inf. Calumbæ	ad ℥vj

M. Sig.: A tablespoonful in water three times daily, a quarter of an hour before food.

NOTE.—In some cases I give a small dose of the tincture of nux vomica (3 drops) with each dose of the mixture.

ALKALINE CACHETS FOR CASES OF DYSPEPSIA.

℞ Potass. Bicarb.		Pulv. Rhœi	gr ij
Sod. Bicarb.	āā gr xv		

M. Fiat pulv. catchet; mitte tales xxxvi.

Sig.: One, three times daily, a quarter of an hour before food.

CARMINATIVE TABLOID FOR FLATULENCE.

Burroughs & Wellcome's soda-mint tabloid, which contains sodii bicarb. gr iv, ammon. carb. gr ½, ol. menth. pip. q.s., is an excellent carminative. Two, three, or more tabloids should be swallowed (not sucked) half an hour after food.

MENTHOL MIXTURE FOR FLATULENCE.

℞ Menthol.	gr iv	Sp. Ammon. Arom.	
		Sp. Chlorof.	āā ℥j

M. Sig: A teaspoonful in water when required.

NOTE.—The menthol is precipitated when the mixture is added to water, but in a very fine state of division.

It is of great importance to attend to the condition of the great depurative organs (the intestine, the liver, the kidneys, and the skin), for the defective

removal of waste products is apt to poison the blood, to interfere with the perfect nutrition of the organs and tissues, including the heart muscle, and to lead to high blood-pressure. Constipation and straining at stool are to be avoided; the patient should see that he has a sufficiently copious evacuation of the bowels every day. Cascara, aloin, tamar indien, or some other suitable laxative should, if necessary, be taken every night. In gouty cases, or where there is high blood-pressure, a watery purge may be given once or twice a week with advantage.

An abundance of sleep and a long rest in bed are in many cases eminently serviceable. Care should be taken that the bedroom is well ventilated and not too hot. A sufficiency of sleep is essential for the due nutrition of the nervous system, the healthy condition of which is one of the most important factors in maintaining the healthy functional activity and nutrition of the tissues and organs of the body, including the heart muscle.

Over-work, and particularly worry, should, if possible, be avoided; rest, recreation, frequent and long holidays are to be recommended; a continuous strain, whether of body or mind, is prejudicial. The subjects of chronic valvular disease should be told in a judicious and tactful way that their hearts are not sound (care being taken, of course, not to frighten them), that they must regulate their lives accordingly, and that they are not able to take liberties with themselves. In selecting a suitable occupation for a young person affected with a chronic valvular lesion, these facts must be kept in view.

All conditions likely to induce a fresh attack of endocarditis (such as acute rheumatism), or which throw a strain upon the damaged heart (such as acute bronchitis), must be carefully guarded against. The subjects of chronic valvular lesions should be well clothed and well housed; they should wear flannel next the skin. Intercurrent attacks of rheumatism, bronchitis, influenza, common cold, etc., however slight, should be very carefully treated.

Such are the general principles which should guide the practitioner in the treatment of the slighter forms of chronic valvular disease, and of the more severe forms during the period of satisfactory compensation. It is extraordinary how long some cases of this kind continue without the development of active symptoms, more especially in private practice.

The Treatment of Temporary Breakdowns of Compensation.—Temporary breakdowns of compensation, in which acute embarrassment and failure of the heart are the result of undue effort, excessive strain, or the development of some intercurrent complication, are of frequent occurrence during the course of chronic valvular lesions. In chronic mitral lesions, for example, an acute attack of bronchitis which throws an increased strain on the right heart, is frequently attended with the rapid development of serious symptoms (marked shortness of breath, cyanosis, œdema of the feet, etc.). Under such circumstances the bronchitis must, of course, be treated by appropriate remedies; but an all-important point is to aid the enfeebled right heart by the administration of cardiac tonics and stimulants. Digitalis is at this stage of the case an invaluable remedy. In some cases, in which the right heart is greatly engorged, the strain is best relieved by venesection. In many cases of chronic valvular disease in which acute pulmonary lesions with failure of the heart are developed, I have found great benefit from subcutaneous injections of strychnine (from 2 to 4 min. of the liquor every six or eight hours) and oxygen inhalations. It is unnecessary to say that, during temporary breakdowns of compensation, complete rest in the position which is most agreeable to the patient, and very careful feeding, are essential; purgatives, diuretics, antispasmodics, narcotics, and sedatives, may also be required, as in the more advanced stages of chronic valvular lesions. As soon as the compensation is again restored, the digitalis or strophanthus may be altogether discontinued, or given in much smaller doses, or alternated

with such remedies as arsenic, strychnine, and general tonics. After convalescence from such temporary breakdowns, a carefully regulated course of Nauheim treatment or of Oertel treatment is often beneficial.

The Treatment of Chronic Valvular Lesions after the Breakdown of Compensation.—In those cases of chronic valvular disease in which the lesion is actively progressive, or so severe that the compensation is unable to balance the lesion, a time ultimately, and often speedily, arrives when more active and energetic treatment is required. It is at this stage of the case that digitalis and strophanthus are especially valuable, in conjunction with other measures calculated to relieve the secondary results and complications, such as dropsy, and engorgement of the lungs, digestive organs, and kidneys, which are due to the failure and embarrassment of the circulation. Digitalis is useful in almost all cases and in all forms of chronic valvular disease, but especially in cases of mitral disease, with irregular and feeble pulse, dropsy, scanty, high-coloured, and often albuminous urine. In my experience, digitalis is more useful, and can be given in larger doses and continued for much longer periods of time, in mitral than in aortic regurgitation. When digitalis fails, or if it should for any reason be contra-indicated (in consequence, for example, of idiosyncrasy on the part of the patient, the development of vomiting, etc.), some other cardiac tonic, such as strophanthus, caffeine, strychnine, etc., must be employed. In many cases of chronic valvular disease there is no marked benefit until the full physiological effects—copious diuresis and slowing of the pulse—of the drug (digitalis) are produced. Several days may be required before these effects are produced. If small or moderate doses of digitalis (5 to 10 min.) do not relieve the symptoms and produce marked benefit, the dose should be increased, unless, of course, for any reason large doses of the remedy (such as 15, 20, or 30 min. of the tincture) seem to be contra-indicated. Over and over again I have seen the most striking benefit result from the administration of large doses of digitalis when small doses (5 min., three or four times daily) produced little or no benefit.

In the later stages of chronic valvular lesions (i.e., after the compensation has more or less permanently failed), rest is essential; the patient should be allowed to rest (lie or sit) in the position which is most agreeable to him. In cases of this kind the stomach and liver are often engorged, the digestive powers are much impaired, and the feeding of the patient is often a matter of difficulty. The diet should be of the lightest kind, and yet as nutritious as possible. Care must be taken to avoid over-distension of the stomach, and to prevent and allay flatulent distension. Dyspeptic symptoms must be carefully treated. In some cases of this kind, I have seen marked benefit from rectal feeding;* by means of rectal feeding, and giving nothing, not even water, by the mouth, the stomach is kept empty, and the flatulent distension, which is in many of these cases a most important cause of cardiac embarrassment, altogether avoided—over and over again I have seen the apex beat which was displaced far outwards to the left return to the normal, or almost to the normal, position, after a week or ten days of rectal feeding. As the result of rectal feeding the engorgement of the venous system is in some degree lessened, the cardiac strain is relieved, and the dilatation of the cardiac cavities becomes materially lessened. The altered position of the apex beat after a course of rectal feeding is partly, I think, due to collapse of the stomach (a mechanical result) and partly to contraction

* Nutrient Enemata.—The nutrient enema which I am in the habit of prescribing consists of two ounces of peptonized milk, half an ounce of raw beef juice or of Wyeth's meat extract, and a raw egg. If necessary, a little brandy may be added. If the rectum becomes irritable, as it often does after prolonged rectal feeding, and if the enemata are not retained, a small quantity of laudanum (10, 15, or 20 drops) may be added to every third or fourth enema. I usually prescribe one nutrient enema every eight hours; and, in some cases, also order a nutrient suppository every eight hours, so that the patient has a nutrient enema and suppository alternately every four hours.

of the heart itself (a most important vital result). The improvement in the general condition of the patient and in the relief of distressing cardiac symptoms which results from rectal feeding in cases of this kind is often most striking, and is in many cases the starting-point of long-continued, and in some cases of lasting, improvement. At this stage of the disease, dropsy and lung affections are often distressing complications, and require to be met by purgatives, diuretics, massage, and other appropriate therapeutic measures.

In those cases of chronic valvular disease—and they are chiefly cases of mitral regurgitation—in which a fatty condition of the cardiac muscle, the result of anæmia, is present, iron (in the chlorotic type) and arsenic (in the pernicious type of anæmia) are by far the most important remedies. In cases of this kind, digitalis and strophanthus are usually, I think, useless, and often harmful.

In those cases in which there is reason to suppose that the valvular lesion is complicated or associated with fatty infiltration and a dilated, flabby heart, careful regulation of the diet and bowels, plenty of fresh air and carefully regulated exercise, together with arsenic and strychnine, are the remedies which I chiefly employ. In cases of this kind, the Nauheim and Oertel plans of treatment are often beneficial. It is, however, always advisable to proceed cautiously and tentatively, and to watch the effect of the exercise and remedies employed; for it is often difficult or impossible to exclude organic conditions of a more serious kind, such as grave myocardial degeneration due to disease of the coronary arteries. When there is advanced organic disease, and particularly when marked degeneration of the cardiac muscle is present, the Nauheim and Oertel plans of treatment require, if employed at all, to be conducted with great care and caution.

In cases of chronic valvular disease associated with high blood-pressure and tightly constricted vessels, the essential objects of treatment are to relieve the cardiac strain, to reduce the blood-pressure, and to tone up the enfeebled heart. The diet must be carefully regulated, the amount of fluid which the patient drinks restricted, and the blood-pressure reduced by saline purgatives and nitroglycerin. In cases of this kind I usually prescribe strophanthus in preference to digitalis. Iodide of potassium is also, I think, a valuable remedy in these cases. If the patient is gouty, salicylate of sodium, bicarbonate of potash, piperazine, and a course of treatment at Carlsbad are often useful.

In those cases in which there is reason to believe that the valvular lesion is associated with chronic myocarditis and fibroid degeneration, arsenic, strychnine, digitalis, and, in some cases, iodide of potassium, are, in my experience, the most useful drugs.

In those cases in which angina-like pain is associated with a chronic valvular lesion, the appropriate treatment for angina pectoris must be employed. In dealing with these cases it is of importance to draw a distinction between those in which the blood-pressure is high and those in which it is low. In the former, nitrite of amyl, nitro-glycerin, erythrol tetranitrate, and nitrite of sodium; and in the latter, diffusible stimulants and subcutaneous injections of morphia, are, in my experience, the best remedies.

The Treatment of Symptoms and Secondary Results.—In the later stages of chronic valvular lesions, the treatment has largely to be directed to the secondary derangements and complications in the lungs, stomach, liver, intestinal tract, kidneys, brain, subcutaneous tissues, and internal cavities. Many of the most important of these derangements and complications, such as dropsy and dyspepsia, are the result of chronic venous engorgement and impaired cardiac power. In dealing with dropsy in the subcutaneous tissues and internal cavities, and other symptoms of this kind, cardiac tonics—more especially digitalis, which, I need not say, is, in such cases the best diuretic which

we possess—careful regulation of the diet, restriction of the amount of fluid which the patient drinks, watery purges, diuretics, massage, and, in some cases, the mechanical removal of dropsical fluids, are the most important means of treatment.

Hæmoptysis occurring during the earlier stages of mitral stenosis, i.e., when the lesion is satisfactorily compensated, is beneficial rather than the reverse, and does not require any active treatment. Hæmoptysis occurring in the later stages of chronic valvular lesions, the result of pulmonary apoplexy, dilatation and failure of the right heart, is of serious significance, and calls for the active administration of digitalis or other cardiac tonic.

Hemiplegia and other conditions which result from embolic infarction occurring in the course of mitral stenosis and other forms of chronic valvular disease, and septic endocarditis, which is especially apt to occur in cases in which the valvular apparatus of the heart is affected with chronic disease, have to be treated in accordance with the principles laid down in other parts of this work.

I conclude this article by briefly summarizing my experience as to the value of some of the different measures and remedies employed in the treatment of chronic valvular lesions.

Rest.—In cases of chronic valvular disease with failing or ruptured compensation, rest (more or less complete in accordance with the special peculiarities of different cases) is, in my opinion, the most important means of treatment which we possess.

Exercise.—This is a very valuable means of treatment in many cases, more particularly during the first stage of valvular lesions, in those cases in which the myocardium is fairly healthy, in which the valvular lesion is associated with neurotic disturbance, in which the heart muscle is flabby or debilitated as the result of some temporary cause, such as an attack of influenza. In many cases of aortic and mitral disease, in the less severe forms of senile heart, and in the slighter forms of myocardial degeneration, judiciously regulated walking exercise is invaluable, so long as the compensation is well maintained.

By muscular exercise we are enabled to promote the condition of the general health and of the cardiac health, to hasten the circulation through the peripheral organs and through the heart itself, to prevent stasis and engorgement with all their disastrous results. So long as exercise does not produce marked shortness of breath, over-fatigue, or other untoward symptoms, it should, I think, not only be permitted but encouraged.

Oertel's Plan of Treatment and *the Nauheim Method of Treatment* (exercise against resistance and aerated brine baths).—These are, I think, chiefly valuable in the same class of cases (valvular disease in which the cardiac muscle is reasonably sound). In advanced stages of valvular disease, and in cases in which the valvular lesion is associated with marked atheroma, grave degeneration of the cardiac muscle, aneurysms of the aorta, and angina pectoris, these methods of treatment are often harmful. (See also SCHOTT-NAUHEIM TREATMENT.)

In the Oertel and Nauheim methods of treatment, careful regulation of the diet and the amount of fluid which the patient is allowed to drink is an important factor in the treatment.

Mental Therapeutics.—I attach the greatest importance to sustaining the mental tone of the patient and encouraging him to hope that the treatment will be attended with success. A favourable opinion confidently expressed has often a most beneficial effect, more particularly in those cases in which the valvular lesion is well compensated, associated with a nervous and irritable condition of the heart, or in which the patient is of an anxious, nervous temperament.

Iron.—This is an invaluable remedy in those cases in which the valvular lesion is associated with, or due to, deficiency of hæmoglobin (the chlorotic type

of anæmia); the preparation of iron which I like best in cases of this kind is the Blaud-pill capsule made by Robertson & Co. (one, two, or three Number 3 capsules, three times daily).

Arsenic.—This is a valuable cardiac tonic in many cases of valvular disease, more especially during the first stage, in cases in which a temporary breakdown of compensation has been recovered from under the administration of more powerful cardiac tonics, and in many cases in which there is angina pain, and fatty or fibroid degeneration. Speaking generally, I find arsenic is more useful in aortic than in mitral cases. (In anæmic cases of the pernicious anæmia type, I usually give Fowler's solution in gradually increasing doses—beginning with 2 drops well diluted, three times daily after meals—until the maximum dose which the patient can take without discomfort is reached.)

Strychnine.—This I consider is one of the most useful remedies which we possess, both for the purpose of producing a sustained tonic effect and for more active stimulation. I find it very valuable in many cases of valvular disease before there has been a decided breakdown of compensation; in these cases I often give it in combination with arsenic. Strychnine is also most useful during temporary breakdowns of compensation, especially when there are bronchial or other pulmonary complications; in cases of this kind I rely chiefly on subcutaneous injections of strychnine, inhalations of oxygen, and digitalis or strophanthus.

Digitalis.—It is unnecessary to say that this is by far the most valuable cardiac tonic we possess, both for the purpose of producing immediate and lasting effects—tiding the patient over acute complications, and permanently sustaining the cardiac power and preventing further breakdowns of compensation. I agree with those who think that digitalis is more useful in mitral than in aortic cases; it is especially valuable in cases of mitral regurgitation with dropsy, quick, irregular, or intermittent pulse, scanty, high-coloured urine loaded with urates, etc. Digitalis should be given more cautiously, and for shorter periods of time, in cases of aortic regurgitation; in cases of this kind it cannot be expected to produce, and as a matter of fact does not produce, such satisfactory results as in cases of mitral regurgitation. When mitral regurgitation is super-added to aortic disease, digitalis is often most useful. Digitalis should, I think, be cautiously given in cases in which there is reason to suppose that the cardiac muscle is markedly fatty; it is very useful in some cases in which there seems to be chronic myocarditis and fibroid degeneration. Where the pulse tension is high, I usually prescribe strophanthus in preference to digitalis. Under such circumstances, if digitalis is given, I usually combine it with iodide of potassium, salicylate of sodium, or some remedy—such as nitroglycerin or nitrite of sodium—which reduces blood-pressure.

I usually give digitalis in the form of tincture (5 to 30 min.) or infusion ($\frac{1}{2}$ oz. to 1 oz.); the powder given in the form of pill ($\frac{1}{2}$ to 2 gr.) is also an excellent preparation; in some cases, Nativelle's granules (1, 2, or 3 in the twenty-four hours) are undoubtedly most valuable, more especially in cases in which it is necessary to produce the full effect of the remedy with rapidity, and in some cases in which the liquid preparations of digitalis produce vomiting and gastro-intestinal derangement.

Strophanthus.—I usually prescribe strophanthus (5 to 20 min. of the tincture) in preference to digitalis in those cases of chronic valvular disease in which the blood-pressure is increased, in cases in which one wishes to produce a rapid effect, and in which digitalis, owing, perhaps, to some idiosyncrasy of the patient, disagrees.

Caffeine.—This is a valuable cardiac tonic, and should be tried when digitalis and strophanthus fail (dose, 3 to 10 gr. of the citrate, three times daily).

Alcoholic, Ammoniacal, and Ethereal Stimulants are of great use for the purpose of relieving urgent symptoms and warding off asystole. In those cases in which there is vomiting, brandy and champagne are, I think, the most useful forms. Of recent years I have prescribed alcohol much less freely than I formerly did.

Oxygen Inhalations.—Inhalations of oxygen are of great value in some cases of chronic valvular disease in which respiratory difficulties are prominent, especially where there is bronchitis, pneumonia, or pulmonary apoplexy.

Iodide of Potassium (5 to 20 gr., three times daily).—This is a very valuable remedy in some cases of aortic disease, in valvular lesions associated with angina pectoris, gouty conditions, and, above all, in cases in which there is reason to suspect that the valvular lesion or the arterial disease which is associated with it is the result of syphilis.

Salicylate of Sodium (5 to 20 gr., three times daily).—This is a remedy which I often prescribe in valvular lesions associated with gouty and rheumatic symptoms.

Nitroglycerin (1 to 3 drops of a 1 per cent solution), *Nitrite of Amyl* (3 to 5 drops by inhalation, repeated if necessary), *Erythrol Tetranitrate* ($\frac{1}{2}$ to 1 gr.), and *Nitrite of Sodium* ($\frac{1}{2}$ to 3 gr.).—These remedies are very valuable in cases in which valvular lesions are associated with high blood-pressure or angina pectoris.

Menthol.—This remedy is very useful in many cases in which flatulent distension of the stomach occurs in the course of valvular lesions. I usually give $\frac{1}{8}$ gr. or $\frac{1}{4}$ gr. of solid menthol dissolved in $\frac{1}{2}$ dr. of spirits of ammonia and $\frac{1}{2}$ dr. of spirits of chloroform for a dose.

Rectal Feeding.—In several cases of advanced valvular disease with ruptured compensation, and in some cases of dilated heart apparently due to chronic degeneration of the cardiac muscle, I have seen marked benefit result from rectal feeding. The contraction of the stomach and the disappearance of the flatulent distension seemed to be the chief factors in the production of this improvement.

Purgatives—especially mercurials and salines—are, it is needless to say, most useful in many valvular lesions, especially in mitral cases attended with dropsy, and in cases in which the right side of the heart is over-distended and the tissues engorged and water-logged.

Diuretics.—In many cases in which the urine is scanty, more especially in mitral regurgitation with dropsy, and in the advanced stages of ruptured compensation with dropsy, whatever the nature of the valvular lesion, diuretics are of great value: digitalis, strophanthus, caffeine, diuretin (10 to 40 gr.), a combination of digitalis, squill, and mercury, the salts of potash (bitartrate, acetate, citrate, 20 to 30 gr.) and the nitrites (such as nitrite of sodium $\frac{1}{2}$ to 3 gr.) are some of the most useful drugs.

The Mechanical Removal of Dropsical Effusions.—In the advanced stages of many cases of valvular disease, the removal of dropsical fluid from the internal cavities, especially from the pleura and peritoneum, is sometimes attended with marked benefit. I never puncture the dropsical legs or scrotum, either by simple puncture or by means of Southey's tubes, until other measures have been fully tried and have failed to give relief.

Massage.—When subcutaneous dropsy is present this is often a useful means of treatment; it aids the venous and lymphatic return, and quickens the circulation in the muscular and peripheral tissues of the body. It is also of great use in many cases of valvular disease, unattended with dropsy, in which, owing either to the nature of the lesion, the presence of shortness of breath, or other symptoms, ordinary muscular exercise is contra-indicated.

Venesection.—This is undoubtedly valuable in some cases in which the right

heart is greatly over-distended and engorged, and is particularly useful, I think, when the engorgement depends upon temporary lung complications, superadded to mitral disease.

Dry Cupping.—This is useful in some cases for the relief of congestion of the lungs and other pulmonary and kidney complications.

Sedatives and Soporifics.—The soporifics which I chiefly use are trional (10 to 30 gr.), chloralamid (10 to 30 gr.), paraldehyde (1 to 4 dr.), and morphia ($\frac{1}{8}$ to $\frac{1}{2}$ gr.); sulphonal (10 to 30 gr.) is, in my experience, less certain in its action than chloralamid; I seldom give chloral hydrate in grave cardiac cases on account of the marked depression which it is sometimes apt to produce. Paraldehyde is often very useful, especially, I think, in cases associated with bronchitis or other pulmonary complications, and in which morphia is contra-indicated. After the breakdown in compensation and in the distressing restlessness, dyspnœa, and orthopnœa of advanced valvular lesions, small and frequently repeated doses of opium ($\frac{1}{2}$ to 1 gr.) or morphia ($\frac{1}{8}$ to $\frac{1}{2}$ gr.) are invaluable. The presence of albumin in the urine and of kidney disease is not, in my experience, a contra-indication, though in such conditions morphia and opium must, of course, be employed with caution. Morphia should not be given when there is œdema of the lungs or much bronchial secretion. (See also MYOCARDIAL FAILURE and SCHOTT-NAUHEIM TREATMENT.)

Byrom Bramwell.

HEAT APOPLEXY.—(See SUNSTROKE.)

HEMIPLEGIA.—In this article, the condition will be dealt with rather than its causes. Reference will be made almost entirely to cases of ordinary hemiplegia dependent upon a vascular lesion which has damaged some portion of the motor tract, from the cortex to the base of the brain, and remarks as to treatment will not apply to hemiplegia due to neoplasm, meningitis, or abscess. In the latter cases, treatment can only aim at removal of the cause, though, if this can be accomplished successfully, the question of treating paralysis resulting from the original lesion may still arise.

In all cases it will be assumed that we are dealing with hemiplegia due to post-vascular lesions, hæmorrhagic, embolic, or thrombotic, and that the cause of these conditions, such as arteritis, specific or otherwise, valvular heart-disease, nephritis, anæmia, and other diseases of the blood, receive attention. The gravity of any of these conditions may render treatment of resultant hemiplegia quite a secondary consideration, for any active treatment of hemiplegia in a subject with one foot in the grave would only accelerate his downward progress.

By ordinary hemiplegia is meant paralysis of the lower half of the face and tongue, and of the limbs of the corresponding side. The trunk muscles are also involved on the same side, though to a lesser extent than the affected limbs.

The lesion may be of the cortex, the subcortical region, the internal capsule or the neighbouring ganglia, corpus striatum, and optic thalamus, in the crus cerebri, or the pons and medulla.

As regards the localization of the lesion in different cases, only rarely can the whole motor cortex be simultaneously and suddenly affected so as to produce hemiplegia. Complete hemiplegia may, however, arise from gradual extension of the lesion from area to area. Such cases are usually accompanied by loss of tactile sensation and of the muscular sense; rarely, the sense of temperature and pain is affected. If the lesion be irritative to the cortex cerebri, convulsions may occur. Treatment of hemiplegia itself, arising from progressive softening of the motor cortex, is unlikely to be of service.

Hemiplegia from blockage of the middle cerebral artery usually affects the arm more than the leg, the upper part of the Rolandic area being supplied by the anterior cerebral artery. If blockage be complete, the prospects of recovery of the arm are unfavourable. Collateral circulation may, however, sometimes be established, when smaller branches are blocked, and not the main vessel.

A Subcortical Lesion, in order to produce hemiplegia, must again be so wide that the

general effects upon the brain will probably render treatment useless, unless the radiating fibres are involved near their conjugation, before entering the internal capsule.

The posterior part of the *internal capsule* is the commonest site of a vascular lesion causing hemiplegia. The part usually affected is the "knee," or that supplied by the lenticulo-striate and optic arteries. In its anterior two-thirds, it contains from before backwards, fibres from the cortical centres governing the tongue, mouth, upper limb (shoulder preceding thumb) trunk, and lower limb (hip preceding toes). Theoretically, a lesion might be so minute in this situation as to cause monoplegia of the cortical type, but practically, the fibres are so closely packed together that even a small focus will involve the greater part of them.

The posterior third of the lenticulo-optic, or hinder segment of the internal capsule, is known as the "sensory crossway." When this is involved, in addition to hemiplegia affecting the leg more than the arm, there will be hemianæsthesia, tactile and general, with loss of muscular sense, of hearing, taste, and smell, and homonymous hemianopsy.

The involvement of this area, together with the motor part of the internal capsule, necessarily renders treatment of little avail. Probably the cases most favourable to recovery are those in which hæmorrhage occurs in the neighbourhood of, and external to, the internal capsule, and not in the capsule itself, for the fibres of the motor tract may then only suffer from pressure and displacement, and not from actual destruction.

Lesions of the Corpora Striata and Optic Thalami do not produce hemiplegia unless the internal capsule is also damaged. No special symptoms attend disease of the corpora striata, except, perhaps, disturbance of temperature, and sometimes vasomotor paralysis, in addition to hemiplegia from affection of the internal capsule. Lesions of the optic thalamus are apt to involve the sensory portion of the internal capsule, and to produce paralysis of the mimetic movements of the face, and post-hemiplegic choreic disorders.

Crossed or Alternate Paralysis consists in hemiplegia on one side, and paralysis of one or more cranial nerves on the other.

A lesion of the crus causes paralysis of the third nerve on the side of the lesion, and of the limbs on the opposite side of the body. The characteristic signs of a lesion of the pons are paralysis of some of the cranial nerves—especially the fifth, sixth, and seventh—on the side of the lesion, and of the limbs on the other. When the lesion is below the middle of the pons, the paralysis of the seventh nerve involves the whole of the face, and not merely the lower half. In any case of pontine lesion, treatment of the resulting hemiplegia is useless. The same may be said of hemiplegia of bulbar origin.

Finally, it is only necessary to mention, that right-sided hemiplegia is usually associated with aphasia of varying kinds and degrees, which may render treatment difficult or unsatisfactory.

A right-sided hemiplegia does not show less tendency to recover than a left, but in cases of other than motor aphasia, recovery may be impeded because the patient may not understand what is said to him, and, therefore, it may be difficult to gain his co-operation in treatment.

Treatment of hemiplegia itself is unavailing, or unsatisfactory :—

1. When it is due to neoplasms or abscess.
2. In elderly broken-down subjects of advanced Bright's disease, wide-spread atheroma, diabetes, severe valvular heart-disease.
3. In cases of progressive cortical softening, with mental changes.
4. In cases of long-standing hemiplegia, in which there is evidence of complete degeneration of a considerable portion of the motor tract.

TREATMENT.—Many patients are not treated at all. Doubtless they receive plenty of iodide of potassium, strychnine, and other drugs ; but so far as their paralysis is concerned, they are too often left to themselves. The blame for this rests partly on the public. Paralysis, to the public, means incurability ; a rooted conviction prevails that a person who has had one stroke of paralysis is bound to have another, and yet a third, which will be infallibly fatal. Medical attendance is therefore discouraged as useless, and the medical attendant soon receives a more or less polite intimation that his visits need not be continued, and that he will be "sent for if wanted"—that is to say, for incidental ailments, or should the patient have another stroke, and appear at death's door. Neglect of hemiplegic patients may also be attributed to the pessimistic teaching that those who get well do so without treatment, and those who do not get well derive no benefit from treatment. Neither statement is strictly true. Mild cases may never recover unless treated ; and severe cases, unless treated, may go from bad to worse. It must be freely admitted that, unfortunately, little or nothing can be done for a patient when the greater part of one of his motor tracts has been

totally destroyed; yet the existence of such destruction should not be too readily assumed. Its presence may be simulated by a purely functional inability to make use of the powers which have been actually restored. Many a patient who is admitted to hospital complaining that his arm and leg have been absolutely useless for months, discovers, when the fact is pointed out to him, that the limbs are not so powerless as they seemed, and from this time makes, daily, fresh discoveries which cheer him.

In a severe case of hemiplegia of from six to twelve months' duration or longer, the patient's arm and leg may be quite useless and immobile. He is unable to stand or walk. His joints are fixed, and any attempt to move them causes extreme pain; his shoulder is usually adducted to his side, his elbow and wrist are flexed, his forearm is pronated and held across his chest, and his fingers and thumb are doubled into the palm of his hand. His hip and knee may also be flexed, though more commonly extended, his thigh adducted, his knee and foot inverted, and his heel drawn up. The muscles are all wasted, and some are shortened and contracted, thus causing the characteristic pose of the limbs which cannot be overcome, and the tendon reflexes are exaggerated. There may be œdema, lividity, pain, tenderness, and hyperæsthesia of the limbs.

This is the extreme and incurable state of helplessness at which the sufferer from hemiplegia may arrive. The immobility of the limbs is due (1) To articular adhesions; (2) To motor paralysis leading to muscular atrophy; and (3) To spasticity or spasmodic contraction of certain muscles, leading to permanent shortening of those most affected. These conditions in an advanced stage are incurable; but I submit that systematic and intelligent treatment from the first would lessen the number of incurable patients, and would alleviate the lot of those not cured.

Besides these far advanced and perhaps irremediable cases, we meet with others in which disablement is only partial. In the majority it is the arm which remains helpless. Sometimes it is in the condition already described, sometimes —long after a stroke has occurred—the limb remains powerless, wasted, and flaccid, though spasticity is absent. These are frequently most amenable to treatment, and to them further allusion will be made.

It is important to grasp the fact that the great majority of cases of hemiplegia tend towards, at all events, partial recovery. Yet such recovery is rarely spontaneous in lethargic, despondent, and timid subjects. These must be taught to realize the power which they have regained but do not use.

Functional or Hysterical Paralysis supervening on genuine Hemiplegia.—Sometimes, long after structural damage causing organic hemiplegia has been repaired, one limb, usually the arm, remains absolutely powerless. It dangles loosely at the patient's side, and when he wishes to alter its position, he will pick it up with his sound hand and throw it carelessly on his knee, or on the table, as desired. The limb may be slightly wasted, cold, and all forms of sensation may be blunted. The tendon jerks are active. Rigidity is entirely absent, but on manipulating the limb, and performing rough unexpected passive movements, the muscles will be felt to contract slightly in resistance, then becoming flaccid again as before. There may or may not be restriction of fields of vision and other hysterical stigmata in such cases, but the condition described is suggestive of the functional nature of the paralysis, and is usually promptly cured by a few applications of the electrical wire brush.

More frequently such cases enlarge the roll of miracles performed at the shrines of saints and quacks. It should be remembered that functional disablement may outlast organic lesions.

EXPERIMENTAL EVIDENCE OF THE EFFICACY OF TREATMENT OF HEMIPLEGIA IN ANIMALS.

The physiological interest of an experiment in animals sometimes overshadows its practical value from the clinician's point of view. For this reason it may not be out of place to refer to the well-known observations of Prof. C. S. Sherrington, on the results of treatment of monkeys after paresis of limbs has been induced by destruction of the motor cortex. He has stated that in monkeys, the effects of total or very large ablations of the Rolandic area are as follows: "The limbs become permanently flexed at elbow or knee, the shoulder and hip being adducted, the ankle flexed. This phenomenon usually begins about a month after healing of the wound. Its onset is hastened by want of exercise by the paretic limb. If the animal be encouraged to use it freely, and in roomy surroundings, or if passive gymnastics are practised, this form of contracture may be indefinitely postponed, and in early stages arrested. The fibres of the affected muscles degenerate after a time; the degeneration affects the stretched extensors more than the contracted flexors; the atrophy is the result of the inactivity" (*Clifford Allbutt's Syst. of Med.*, vol. vi., p. 517).

This interesting observation, that in the monkey post-hemiplegic rigidity and atrophy may be indefinitely postponed, or even arrested, in early stages, by passive and active exercises, encourages the employment of similar methods in the case of human beings. This illustration might be used as the text of the remarks which follow.

THE METHODS OF TREATMENT at our disposal are:—

(1) *Passive Movements;* (2) *Mechano-therapeutics;* (3) *Massage and Electricity;* (4) *Re-education of Movements* by passive and active exercises, combined with encouragement and suggestion.

It will be convenient to consider these modes of treatment in connection with the conditions which they are designed to remedy.

Spasticity or Rigidity.—Hemiplegic rigidity is described as "initial," "early," and "late," or "structural."

Initial Rigidity occurs at the onset of the lesion, and usually lasts but a few hours.

Early or Secondary Rigidity comes on after the lapse of a few days, weeks, or even months. It varies in degree, being often less marked, or even absent, after rest. It is increased on voluntary use of the limbs on the unaffected side. It may disappear when the patient yawns.

Late or Structural Rigidity is the ultimate result of prolonged early rigidity. It consists in permanent shortening of certain muscles, and is practically incurable. Hence it is of the greatest importance to endeavour to prevent its occurrence.

The Causation of Rigidity is still obscure. Both initial and early rigidity have been ascribed to direct irritation of the descending motor tract by the lesion. The more generally accepted theory is that it is due to unantagonized cerebellar influence, as suggested by Hughlings Jackson. This is supported by the fact that when descending sclerosis of the motor tract has taken place, the tendon jerks are exaggerated, showing that the normal inhibitory control of the cerebral cortex is annulled.

The muscles chiefly and usually affected are, the adductors of the shoulder, the flexors of the elbow, the pronators of the forearm, the flexors of the fingers and thumb, and the adductors and opponens muscles of the thumb. In the lower extremity, the adductors (rarely the flexors) of the hip, the hamstrings, the plantar flexors and invertors of the foot are specially involved. Spasmodic rigidity of these muscles causes the characteristic flexion, with adduction and inward rotation of the affected limbs, in hemiplegia.

Flexional Attitude.—The explanation usually given of the characteristic pose of the limbs is that the stronger muscles overcome their weaker opponents, but this is not quite satisfactory.

Horsley and Lowenthal have shown that, in an animal rendered de-cerebrate by severance of the crura cerebri, stimulation of the cerebellum causes contraction of the biceps and active relaxation of the triceps (*Mott. Arch. of Neurology*, vol. ii., p. 316).

It seems, therefore, that the most probable explanation of the flexional attitude in hemiplegic rigidity is, that cerebellar influence is chiefly over the muscles which undergo contraction, whilst cerebral influence over the opponents of these muscles is cut off by the lesion. Whatever may be the explanation, the facts afford a guide to treatment. The sooner early rigidity appears, the less favourable is the prognosis, and vice versa. As a rule, if rigidity, after three months from the onset, is absent, whilst the limb remains flaccid, yet powerless, the disability is probably largely functional, though to this there are exceptions.

1. **Passive Movements.**—*Articular adhesions* frequently cause limitation of movements. They may occur in the elbow, the wrist, the hip, the knee, and the ankle, but are most common and are formed earliest in the

shoulder, rendering movements of the joint painful, if not impossible. A limb which might have recovered is often useless owing to their presence. Some regard adhesions as trophic, others as rheumatic, in origin. In advanced cases, changes indistinguishable from those of rheumatoid arthritis may be induced, especially in patients who already have signs of that disease. The nerves in the neighbourhood of the joints may be involved, and give rise to the painful symptoms of peripheral neuritis. Whatever be their cause, in many cases adhesions are preventible. Unfortunately, it happens too often that in early days of hemiplegia a dread is entertained lest any disturbance of the patient should cause further hæmorrhage or other mischief in the brain. So he is left to cuddle and caress his paralysed arm to his heart's content. He usually hugs it to his side, and flexes his elbow and forearm across his chest in the very position it is desirable to avoid. This fear of moving the limbs is quite unfounded. Gentle passive movements of each joint should be practised many times a day from the very first ; for adhesions begin to form very early in the first week or two, during which it is advisable to confine the patient to bed. When formed, they are difficult to disperse, hence the importance of preventing their occurrence, or dealing with them early. Neglected adhesions soon become permanent. Arthritic adhesions are, however, often absent, and fixation of joints is solely due to muscular contraction.

Treatment of Early Rigidity.—The early treatment of this condition is as important as is that for the prevention of articular adhesions. Almost from the first the limbs tend to assume the attitude which may afterwards become permanent. Therefore, even whilst the patient is confined to bed, all faulty positions and any tendency to adopt a particular position should be corrected. Adduction of the shoulder may be prevented by placing a sandbag in the axilla. The elbow should be kept extended rather than flexed ; the tendency to flexion is easily overcome in early stages. Advantage may be taken of the curious consolation which the patient derives from playing with his paralysed arm, by instructing him to alter its position himself from time to time with his sound hand. Faulty positions of the lower extremity should be similarly treated. The limb should be rotated outwards and abducted, and the foot dorsiflexed and everted, in order to obviate the tendency to assume opposite positions. Spasm of the hip flexors is rare, but when it occurs it may be counteracted by placing a pillow beneath the buttocks. Contraction of the hamstrings should be treated by raising the heel. Sandbags may be used to ensure favourable position of the limbs. When the patient leaves his bed, similar precautions should be taken against malposition. He should never be allowed to carry his arm in a sling, but should keep it dependent as far as possible, only flexing it from time to time should œdema appear. He should not be allowed to sit with his knees and toes turned in, but should be told to correct these positions himself. The first principles of treatment, therefore, aim at prevention of fixation of joints and faulty positions of limbs.

Muscular Atrophy usually occurs sooner or later in hemiplegic limbs, and is always more marked in the upper than in the lower extremity. (In cases of post-hemiplegic violent athetoid movements, however, the muscles may become even larger and more powerful than those on the unaffected side.)

It is said that muscular wasting does not occur until late, or structural contracture appears ; but although certainly most marked in the latter condition, it may be present in earlier stages.

Muscular wasting in *early* hemiplegia is most commonly associated with coldness or lividity of the limb, and with some diminution of electrical reactions. Rigidity is usually less apparent, and the tendon reflexes are less active than in cases where muscular nutrition remains unimpaired. These conditions suggest implication of the anterior cornual cells. Yet these are not directly affected by a cerebral lesion, except in so far that cerebral impulses are cut off from them. This may indeed, according to Charcot,

produce degenerative changes in the anterior cornual cells, but most probably, muscular atrophy, and other symptoms pointing to implication of the cornual cells, are due to disuse of the limbs. For it must be remembered that, not only muscular, but nervous tissues suffer from disuse.

Mott* and others have shown that the neurons are dependent on stimuli from the periphery for their function and nutrition, such stimuli being derived from normal movements and alterations in tension of the skin, muscles, tendons, and ligaments. The lower motor neurons may suffer, their functional vitality may be lowered, owing to absence of normal peripheral stimuli. Hence, if normal stimuli be prevented by disuse of the limbs, artificial stimuli must take their place. Passive movements, massage, and electricity are such artificial stimuli. By them we may hope to preserve the nutrition of muscles and neurons alike. If we can do so, it is obvious that the patient will be better able than otherwise to make use of the gradual return of power expected in most cases of hemiplegia.

Passive movements may aid as stimuli to the lower motor neurons, as well as in the prevention of articular adhesions.

Some corroboration of the view that functional affection of the lower motor neurons may retard recovery in hemiplegia, is afforded by the fact that electrical treatment is always most useful in cases of diminished electrical excitability.

Another cause of hemiplegic muscular atrophy is neuritis, usually due to inflammatory changes in and about the joints, especially the shoulder joint, causing adhesion and exudation in which the nerves are involved. Such conditions are often extremely painful. The skin may become glossy and exquisitively tender in places, the electrical responses may be lowered, or show reaction of degeneration.

Treatment in advanced stages of these serious complications of hemiplegia can only be palliative. The pain may be relieved to some extent by painting the limb with equal parts of camphor and chloral hydrate, or glycerin and belladonna. Sometimes mild galvanism is of service.

Hysterical paralysis, as previously mentioned, should be borne in mind when wasting and powerlessness coincide with flaccidity, long after rigidity might have been expected. In such cases, electrical excitability is usually lowered, sensation is blunted, whilst the tendon reflexes are increased.

2. **Mechanotherapeutics.**—When early rigidity is marked and progressive, the constant tendency to flexion of the elbow, with pronation of forearm and flexion of wrist, should be treated by applying a back splint to the limb, care being taken to avoid undue pressure.

Flexion of the fingers and thumb only may be combated by placing india-rubber balls, graduated in size, in the palm of the hand. When raising the heel and buttocks fails to remedy flexion of the hip and knee, an extension apparatus should be applied, whilst sand-bags are used in order to counteract rotation inwards of the limb, and a "Scarpa's" shoe to obviate plantar flexion of the foot. Such apparatus should only be used so long as the patient is confined to bed. As soon as he is able to get up, the appliances should only be worn at night, and by day passive movements should take their place. When possible these should be carried out by the patient himself.

An excellent exercise for a patient with a paralyzed and stiffening arm is to interlace the fingers with those of his other hand, and then, helping the paralyzed by the sound limb, to imitate the movement of rowing with both. Thus the contracted fingers are expanded, the wrist and triceps extended, and the biceps relaxed, in one procedure.

3. **Massage and Electricity.**—Massage arrests atrophy, promotes muscular growth, prevents œdema, improves the circulation of blood and lymph, renders the joints supple, and probably has a direct action on nerves and nerve centres; but massage, unless employed with gentleness and intelligence, does more harm than good. It is useless to leave a masseur who has learnt the mysteries of *effleurage*, *pétrissage*, *tapotement*, *and hachage* in six easy lessons, to work his will

* "Croonian Lectures on Degeneration of the Neuron." *Lancet*, June 23 (p. 1779), 30 (p. 1849), July 7 (p. 1), and 14 (p. 80), 1900.

on the patient. The crude methods of the ordinary shampooer are not applicable to the sufferer from hemiplegia.

Having secured the services of a competent masseur, we have yet to teach him what to do. It has already been mentioned that spasticity tends to affect certain muscles more than others, and that those most affected may become permanently contracted. Contracting or contracted muscles should never be forcibly stretched, but coaxed to relax by gentle steady traction and stroking (effleurage). Rough kneading (pétrissage) and thumping (hachage), stimulate muscles to further contraction, and therefore should not be applied to those which are already in hypertonic condition. On the other hand, the more vigorous methods of massage are useful in improving the tone of individual uncontracted muscles, and thus enabling them to counteract their contracting opponents. Effleurage, or stroking, promotes general circulation in the limbs. A combination of centripetal and centrifugal massage is perhaps most efficacious.

Electricity, whether faradic or galvanic, is a useful adjunct to massage, but cannot take its place. If faradism and galvanism have been discredited in the treatment of hemiplegia, I believe it is because so-called "medical electricians" are sometimes over-anxious to give the patient his money's worth. The currents which they employ are often far too strong, their negative electrodes are too small, and they alarm and hurt the patient by sudden makes and breaks. Any current which causes pain or produces powerful muscular contraction, is too strong, and may do harm.

In old-standing cases, with advanced structural contraction of muscles, electricity is practically useless. Neither faradism nor galvanism should be used until five or six weeks have elapsed since the onset of cerebral hæmorrhage; for the patient is usually in a weak, agitated, and emotional condition during this period, and any sudden pain or shock may determine a fresh attack.

In early rigidity, mild faradism to the extensors and other muscles which show no signs of contraction, is, I believe, of service in promoting their strength and nutrition. But any current strong enough to make them contract forcibly may produce a similar effect on their opponents, which is undesirable: the current should, therefore, only be sufficient to excite slight muscular reaction.

Galvanism may perhaps allay spasm of muscles, and, theoretically, should be applied (the anode mobile) to contracting muscles only. Weak currents only of 1–5 m.a. are admissible; sudden makes and breaks should be avoided; the currents should be turned on and off gradually, and electrodes should be large, especially the stabile one. No *séance* should exceed ten minutes, once daily, at first, the period and frequency being cautiously increased. The utility of galvanism is, however, problematical; central galvanism of the cerebral nerve centres, with a view to "re-charging the cells with activity," is of therapeutic value only in proportion to the patient's credulity. If the patient professes himself the better for it, he probably feels so, although the improvement may not be apparent to the outside world.

4. **Re-education of Movements and Therapeutical Suggestion.**—So far we have considered the physical causes which impede recovery, and the methods of attempting to avert adhesions, late rigidity, and muscular atrophy. It must be admitted that in severe cases treatment at best is only palliative. Complete recovery cannot be expected when a large part of the cerebral motor tract is absolutely destroyed. Yet we can never tell the amount of destruction which has occurred until time has elapsed. The symptoms of an organic lesion are always widely in excess of its extent, so the prospects may not be so hopeless as they appear; even in the worst cases, a certain amount of improvement may be expected, and its degree will depend on the extent of the damage. We can

usually estimate this in a few months' time by the amount of spasticity and atrophy which prevails. Generally speaking, the less the spasticity and wasting, the better the prognosis. Motor paralysis is of less grave significance than spasticity.

Occasionally one meets with cases in which, although adhesions, spasticity, and atrophy are slight, or even absent, no improvement is manifested. After many months, or even years, the patient remains as helpless as at first. The reason may be that the patient is unaware that any restoration has taken place. He does not try to use the powers which he has unconsciously regained. He is too depressed and disheartened, too apathetic and resigned to his misfortune, or too timid, to attempt to help himself. Apart from such mental conditions, which of course need appropriate treatment, he seems literally to have forgotten how to execute voluntary movements. In re-educating him we are helped by knowledge of the natural order in which recovery occurs. Thus, the leg usually recovers before the arm, the hip and knee before the ankle, the shoulder before the elbow, the elbow before the wrist, whilst the extensors of the fingers, and especially the abductors and extensors of the thumb, are the last to be restored. The rule is that the parts whose movements are most specialized and least associated with movements of the opposite limb are the last to regain power. This knowledge is most valuable, for if we can foretell to the patient that power will return in due order in each limb or joint, and he finds the prophecy true in one instance, he will gain confidence in its truth as regards the rest, and will persevere in his attempts to anticipate progress. He is less apt to mourn over his useless fingers if able to rejoice over a serviceable leg. Therefore we endeavour to fix his attention on the parts which should be recovering rather on those which are still obviously paralytic. He has to be content to sit up before he can stand, to stand before he can walk, and to move his shoulder before his elbow, his wrist, and his digits ; but he will often be unable to regain any of those powers unless literally taught to do so. The method of teaching is to foresee the dawning approach of power and to elicit it by means of passive movements. It is useless merely to tell such a patient to elevate his arm at the shoulder. He will only sigh, " I cannot " ; but tell him to do so, and at the same time do it for him, and he will gradually learn to raise it himself. At each attempt the operator does less and the patient does more ; so the essence of re-education is in the use of passive and active movements combined.

This principle may be applied in the re-education and amplification of all movements. For instance, a patient has learned to walk, but complains that " one foot is always walking into the other and tripping him up." On examination we find that he always sits with his knees and toes turned in. He is unaware of the necessity for practising abduction, rotation outwards, and eversion of the limb, and he is quite unable to execute these movements until taught by passively working the thigh and the foot, and encouraging him to make voluntary efforts to do so, at the same time. Similarly, although he knows how greatly foot-drop interferes with his walking, he will not try to dorsiflex his foot unless persuaded. He must be taught to make the effort whilst sitting, helping himself meanwhile by pulling on a strap attached to the fore part of his foot. Or, again, he has never learned to use his hip flexors. He circumducts his leg, or drags it behind him, and has difficulty in getting upstairs. We may teach him to flex his hip on the same principles. When some power has been regained, it may be improved by making him stand, holding the back of a chair, and then directing him to place his affected foot on the rungs, from the lowest upwards. Kouindjy uses miniature staircases for this purpose.

Disordered Association.—The normal *alternate* association of leg movements in walking is often impaired and perverted after hemiplegia. The patient

may appear to try to move both legs forward at once. Directly he advances the sound limb the affected one becomes rigid, and is dragged painfully behind. To lessen the difficulty he should be taught to advance the unsound leg before the sound, bringing the latter up to the level of the former after each step. He needs to be lightly supported on the paralyzed side by an attendant, otherwise he will not rest on the affected leg for fear of falling. It is desirable to prevent a fall, of course, but the support which is given should be moral rather than physical. For this reason, the help of an attendant is preferable to that of a stick or crutch. The patient, if able to use either implement, is apt to make it a substitute for his weakened leg instead of an adjuvant.

Ataxy.—Want of precision in movements often follows recovery of both limbs. Exercises on the Frenkel system for the treatment of locomotor ataxy are useful in such cases. Games such as draughts, halma, or solitaire may be recommended, or targets may be constructed on which the patients practise, touching the bull's-eye and various circles with the forefinger, or the " Digitorium " or dumb piano may be used. Practice on a typewriting machine has the advantage of being useful as well as remedial. For ataxy of the lower extremity, Frenkel's various apparatus may be used whilst the patient is lying in bed. He should also stand, supported by the back of a chair, and then, resting on his sound leg, place the foot of his weak one into wooden curtain rings or chalk marks placed in various positions on the floor, touching each in turn as directed.

Summary.

1. Neglect and want of treatment aggravate severe, and retard the recovery of mild, cases.
2. The evils to be foreseen and guarded against are articular adhesions, late rigidity, and muscular atrophy.
3. Articular adhesions should be prevented by passive movements of each joint from the very first.
4. Faulty positions of the limbs should be constantly corrected, or they will become chronic.
5. Contraction of muscles should be treated by endeavours to improve the nutrition of their uncontracted opponents.
6. Massage, passive movements, and to a less extent, electricity, should be used with this object. These agents not only counteract muscular atrophy from disuse, but probably take the place of normal stimuli and invigorate the neurons.
7. The recovery of mild cases may be often hastened by re-education of movements. Want of re-education frequently prevents recovery.
8. Re-education consists in a combination of passive and active exercises.
9. Movements should be first encouraged in those parts which naturally tend to recover first.
10. Inco-ordination, and general weakness of limbs which have yet regained power of movement, should be treated by exercises and mechanical therapeutics.
11. It is important to find out what the patient can do, and to make him do it.

In conclusion, this article deals with the treatment of hemiplegia as a condition, without reference to its cause, for whether the cause be hæmorrhage or occlusion of cerebral vessels by embolism or thrombosis is immaterial ; the principles of treatment will be the same, and need not interfere with other measures taken for the relief of the disease which gave rise to the hemiplegia. (See also Aphasia ; Apoplexy ; Electrotherapeutics ; Palsies, Cerebral, of Childhood ; Paralysis.)

Leonard G. Guthrie.

HEPATIC ABSCESS.—If the presence of a hepatic abscess be suspected, the liver must be explored with an aspirator needle, for the earlier the abscess is drained the better are the prospects of recovery. A full-sized aspirator needle should be used, for the pus may not pass through the smaller needles.

When localizing signs are present over any particular area of the liver, puncture should be performed at this spot; otherwise the needle should be inserted through the 8th or 9th intercostal space in the mid-axillary line, and passed towards the upper and posterior part of the liver. If this should fail to find pus, Sir Patrick Manson recommends that at least five other punctures should be made before the attempt to discover pus is abandoned.

Operation.—The abscess may be reached either through the abdomen or through the chest wall; most abscesses are situated in the upper and posterior part of the liver, and for these the thoracic operation is preferable.

In the abdominal operation the incision is made through the outer part of the right rectus muscle; the peritoneal cavity is carefully packed off with gauze, unless already shut off with adhesions. The greater part of the pus is removed with the aspirator, the abscess cavity is then opened with a fine scalpel and the finger, and a large tube is inserted. The cavity should not be scraped or irrigated.

In the thoracic operation, a portion of the 9th, 10th, or 11th rib is resected in the scapular line; if the pleural cavity is opened, the upper portion should be closed off with a continuous suture or gauze packing; fibres of the diaphragm are then divided, and the abscess dealt with as in the abdominal operation.

T. Crisp English.

HEPATITIS.—In simple hepatitis, rest, and absolute avoidance of alcoholic stimulants and of highly spiced food, are most essential. Diet should be restricted to milk and farinaceous food. Free purgation by calomel, followed by saline aperients, will as a rule, rapidly reduce the severity of the symptoms.

After such an attack, the diet must be carefully regulated for months, alcohol avoided altogether, and any tendency to constipation corrected by the use of natural waters. Exercise in moderation is to be recommended.

The local application of iodine and biniodide of mercury may be used if any tenderness or enlargement of the liver be present. The abdomen must be protected from chill, particularly when the patient is in bed. *C. W. Daniels.*

HERNIA.

Non-operative Treatment.—This only applies to cases of reducible hernia, operation being generally indicated in cases of strangulated or incarcerated hernia. Treatment consists in preventing the hernia from coming down by means of a properly fitting truss. It is essential that the truss should retain the hernia at all times and under all conditions, since if it comes down behind the truss the patient is in more danger of strangulation than if none is worn. The patient should have three trusses. One will be for use during the day-time and one at night; the latter can have a lighter spring, or may be of the type known as the Moc-main lever truss, as there is not the same tendency for the hernia to come down at night. He should also have a third appliance, made of rubber or celluloid, for use in the bath, during which there is a special tendency for the hernia to come down. To prevent the truss becoming soiled, a removable linen cover should be made for it; some patients prefer to wear the truss over a thin vest. It is always advisable to wear the truss day and night. A great deal of the success or otherwise of a truss depends upon its fitting properly, and the doctor ordering it should satisfy himself on this point. If after the truss has been worn for a few days it still

causes discomfort or pain, this is generally due to a fault in the fitting or too strong a spring, and it should be altered accordingly.

Chances of Cure by Truss Treatment.—Though it cannot be said that a cure of the hernia never results from wearing a truss, this is so seldom the case that it is not worth considering, and if the patient decides to wear one he must be prepared to do so for the rest of his life. In infants and children a cure of the hernia more often results from truss treatment; but it is most uncertain, and only too often the hernia recurs when the child reaches adult life and the parts are subjected to greater strains.

Indications for Operation. — The advisability of operation in any individual case of hernia must depend very greatly upon circumstances: such as age, occupation, place, residence, and the like. In the vast majority of cases, unless there is some definite contra-indication, operation is by far the best method of treatment. Operation is indicated: (1) In all cases in young adults; (2) When a truss fails to keep up the hernia; (3) In patients whose occupation renders a truss unsuitable; (4) In cases of irreducible omental hernia; (5) In femoral hernia when operation is possible; (6) In patients who travel much or are going to reside in out-of-the-way places; (7) In patients desiring to enter the public services; (8) In children.

Contra-indications.—The operation is contra-indicated in the case of patients over sixty, except under special circumstances, and in stout persons with irreducible herniæ.

Hernia in Infants.—Operation is not advisable in infants under six months of age unless the hernia is causing symptoms and a truss will not keep it up. In children over six months operation is the best treatment, though if the child is breast-fed it is advisable to wait till it has been weaned. A wool truss, if properly applied, is generally sufficient to keep up the hernia in infants; but should it not do so, a pneumatic rubber truss should be used. The operative treatment of hernia in young children is more successful than in adults, as practically all that is necessary is the removal of the sac; the muscles grow together and soon close the ring. The operation is almost free from risk, and a permanent cure of the condition results with a minimum of scar. On the other hand, truss treatment is very tedious, and more often than not fails to cure the hernia; while even should it do so, there is considerable probability of its recurring when the child reaches adult life, and the operation will then be necessary, perhaps when the time for it can ill be spared. To effect a cure in a hernia in a child by means of a truss, it is absolutely necessary that the hernia should never at any time be permitted to come down, and the truss should be worn constantly for two years at least.

Strangulated Hernia.—Prompt treatment is here indicated if the patient's life is to be saved. Gentle taxis after the patient has sat in a hot bath may be tried, but if it fails, immediate operation is the proper treatment. Repeated and forcible attempts to reduce the hernia by taxis are not advisable, as considerable damage to the bowel not infrequently results. It is better to use taxis, except of the gentlest description, only in those cases where for some reason operation is impossible. When taxis is to be employed, the patient should be placed on his back with the buttocks well raised and the legs drawn up so as to relax the parts as much as possible. The tumour should be gently compressed by squeezing it with the whole hand to drive out the contents, and if this is successful the hernia should last of all be pressed upwards towards the internal ring.

Operation for Strangulated Hernia.—The skin having been thoroughly cleaned, an incision is made over the swelling and the sac exposed. The sac itself must then be opened carefully to avoid injury to the contained bowel;

this opening is generally followed by the escape of a little blood-stained fluid. The sac being opened, it is next necessary to examine the site of strangulation and to relieve the constriction. A flat hernia director is passed up through the neck of the sac (this is often facilitated by drawing the bowel gently downwards); a hernia knife is then passed along the groove in the director, and the neck of the sac nicked (in the case of an inguinal hernia the nick should be made upwards. When the strangulating neck has been sufficiently cut, the bowel should be drawn out and inspected. If its vitality is not seriously impaired, it should be carefully returned into the abdominal cavity. The wound can then be sewn up. When there is serious doubt as to the vitality of the bowel, the best procedure in most cases will be to stitch the damaged loop of bowel to the skin so as to form a colotomy; or to excise the damaged portion and tie a Paul's tube into each end. A few days later, when the patient has recovered from his obstructive symptoms, and proper preparations can be made, anastomosis of the bowel ends can be performed. The reader is, however, referred to a surgical textbook for the description of these procedures.

The chief difficulties in the operation for strangulated hernia are the recognition of the sac and finding adhesions between the sac and the bowel. The sac can generally be detected by the fact that there is fluid underneath it and between it and the bowel. In the case of adhesions it is best to expose the whole sac, when it will generally be found that there is some portion which is not adherent. Great care must be taken in separating the adhesions, or the bowel may be torn.

Strangulation of a hernia rarely occurs in children, and reduction is usually easy. The child should be placed in bed with the buttocks raised well above the shoulders on several pillows, or the child should be slung by the legs so that the weight of the intestines tends to pull the hernia out of the sac. If in about an hour the hernia has not gone back, or will not go back with gentle manipulation, an anæsthetic should be administered and gentle taxis tried. That failing, operation should be proceeded with at once.

Radical Cure of Inguinal Hernia.—An incision is made over the neck of the sac, the external oblique muscle is divided, and the sac having been exposed up to its neck, is opened: it is now separated and ligatured as high up as possible, and the part below the ligature is cut off. The gap in the muscles is then closed by buried sutures. The exact procedure differs according to the method adopted. The important points are to secure a good hold for the deep sutures, and to obliterate the sac as completely as possible.

In infants it is most important to obliterate the sac. Unless the ring is large it is seldom necessary to close it by sutures, as after the sac has been removed the muscles soon grow together and close the weak spot in the abdominal wall.

The results of the radical cure of hernia are very satisfactory, and in most cases the patient has no further trouble. Recurrence of the hernia is not common, and in children is very rare indeed. In elderly people the operation is generally done because a truss will not keep up the hernia, and in such patients it is often necessary to wear a truss after the operation, though one with a lighter spring can generally be substituted for that previously worn.

Umbilical Hernia.—This occurs principally in two classes of patients: children, and elderly women who have borne children. It is very common in children, and generally curable without operation. All that is necessary is to keep the hernia from coming down until the ring has had time to close together. In quite young children a piece of American strapping about two inches wide applied across the umbilicus sufficiently tightly to cause a crease and to prevent the hernia from protruding will quickly cure it. Another favourite

method is to sew a large flat cork into the child's binder so that it keeps back the hernia.

In the other type of case a cure cannot be secured apart from operation. A truss can be fitted, and may be quite satisfactory in keeping up the rupture, but in many cases, owing to the patient having a loose, pendulous abdominal wall, or the hernia being irreducible, it is very difficult, if not impossible, to treat the case properly by means of a truss. These patients are often not good subjects for operation, which, if the hernia is large and irreducible, is often a most difficult and serious matter, so that much careful consideration is necessary before deciding on the flest method of treating a large umbilical hernia in an elderly woman.

Ventral Hernia differs in no important particulars from umbilical hernia except that it follows an operation scar in the abdominal wall. Operation to close the opening by stitching up the gap in the abdominal wall is the proper treatment, unless there is some contra-indication in the matter of age, etc. Some very successful results have followed the use of silver-wire filigree placed between the abdominal muscles in cases where the gap in the abdominal wall is large, and some most desperate cases of large ventral hernia have been successfully operated upon by this method.

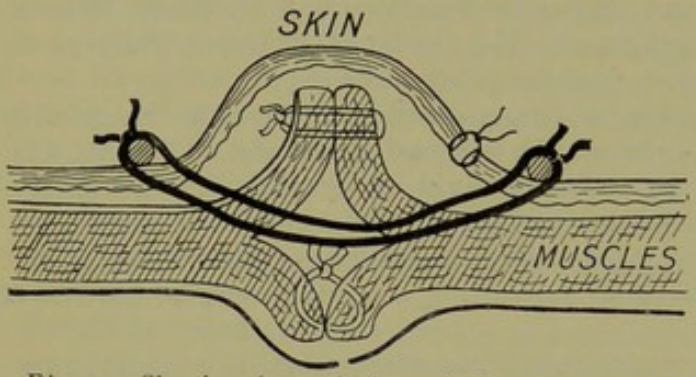

Fig. 17.—Showing the method of stitching up the gap in the abdominal wall in cases of Umbilical and Ventral Hernia. The muscles are split and stitched as shown, and a large mattress suture, tied over pieces of ebonite or rubber, is inserted to take tension off the deep sutures.

Femoral Hernia.—A properly fitted truss will in most cases keep up a femoral hernia satisfactorily. A good fit is essential, however, as owing to the movements of the thigh the pad of the truss is more liable to become displaced than is the case with an inguinal hernia. There are several operations for the radical cure of femoral hernia. Bassini's aims at closing the crural canal by stitches; other operators by suturing a flap of the pectineus muscle or some other structure into the crural canal.

J. P. Lockhart Mummery.

HERPES.

Herpes Zoster.—From the nature of the affection, it cannot be expected that any treatment will diminish the actual eruption. The pain by which this is often preceded is usually combated by the administration of morphine, antipyrine, etc. Spraying the painful spot with chloride of ethyl has been recently recommended.

When the eruption has commenced to appear, the parts should be protected from irritation in some way. Cotton-wool and a bandage may be applied: in the writer's opinion the best application is Unna's zinc gelatin, which seems to cut some of the lesions short in the papular stage.

If the vesicles become infected, and suppuration occurs, a weak antiseptic ointment (e.g., hydrarg. ammoniat. 5 gr., and vaselin 1 oz.) should be continuously applied. In most situations the sooner the vesicles dry up into scabs the better; but in supra-orbital herpes, a not uncommon variety of the disease, the formation of scabs tends to make the scars, which almost invariably develop in this situation, only still more evident. It is therefore advisable to keep the part soft with some simple antiseptic ointment, so as to encourage the granulations to reach the level of the surrounding skin.

The neuralgia which so often follows zoster, especially in elderly people, is often far more troublesome than the disease itself. For its relief, the number of remedies suggested is eloquent testimony to the difficulty of treatment. General tonics, especially arsenic, are usually of some benefit, and galvanism and high-frequency currents are sometimes followed by marked improvement, while a complete change is often the most efficacious remedy of all.

Herpes Genitalis is best treated by cleanliness, and the application of a simple dusting powder. It is liable to recur on very slight provocation, and the parts should therefore be protected from irritation of all kinds, particularly sexual. It may not be out of place to note how frequently herpes genitalis is followed by a true Hunterian sore, and the prognosis should always be guarded.

Herpes Labialis.—The cases which develop in connection with pneumonia and other acute conditions require no special treatment, and indeed, in any case not much beyond protection from injury is of any value; but in those constantly recurring eruptions to which, on any slight disturbance of health, many persons are unfortunately liable, something may be done to diminish the severity of the attack by bathing with very hot water when the familiar symptoms first appear. The same result is sometimes achieved by the application of collodion or nitrate of silver.

Norman Walker.

HICCOUGH.—In mild cases the spasm may be arrested by producing a forcible action of the diaphragm, e.g., by holding the breath for a minute, taking a long draught of water, etc. Warm applications to the region of the diaphragm are of service. An alkaline and carminative draught should be given, e.g., 1 dr. of aromatic spirits of ammonia in 2 oz. of peppermint water. If the spasm persists the following may be tried :—

(1) Nitroglycerin ($\frac{1}{100}$ gr. in tablet form) two or three times a day, or when recurrence threatens.

(2) Turpentine (1 dr. in mucilage).

(3) Bromides, valerianate of zinc, or chloroform in full doses.

(4) The hypodermic injection of morphia.

(5) In hysterical cases success has followed full ether narcosis ; the spasm not recurring after recovery of consciousness.

(6) Forcible traction on the tongue, maintained for one or two minutes at a time.

(7) The application of a blister on each side of the cervical spine over the roots of the third, fourth, and fifth nerves.

(8) Faradization of the epigastrium or of the phrenic nerves.

Robert Hutchison.

HIGH ARTERIAL TENSION.—(See ARTERIOSCLEROSIS.)

HORDEOLUM.—(See EYELIDS, DISEASES OF.)

HYDROCELE.

Acute Hydrocele occurs as a complication of acute inflammatory conditions of the testis or epididymis. The treatment of the hydrocele is a secondary consideration in these cases. If the sac becomes tensely distended with fluid and is the cause of pain, it may be tapped with trocar and cannula.

Chronic Hydrocele.—The following conditions are included under this name : Hydrocele complicating chronic diseases of the testicle or epididymis, chronic vaginal hydrocele, spermatocele, encysted hydrocele of the cord, congenital hydrocele, and infantile hydrocele.

1. *Chronic Hydrocele complicating Diseases of the Testicle or Epididymis* may rarely require treatment. The hydrocele should then be tapped with trocar and cannula. No injection of irritating fluids is permissible, nor should operative procedures be adopted apart from the treatment of the causative disease.

2. *Chronic Vaginal Hydrocele* is the common form of hydrocele that requires treatment. This may consist in (*a*) Tapping; (*b*) Tapping followed by injection; (*c*) Excision or other cutting operation.

(*a*). The simplest method is tapping by means of a trocar and cannula. The sac refills in from four to six months; rarely it fills rapidly and is tense in three weeks. The cannula should have a fine calibre: a large instrument causes unnecessary pain, and may give rise to bleeding. The following precautions should be taken before tapping a hydrocele. A hernia in close relation to the sac should be reduced, or at least its position clearly defined. The position of the testicle must be ascertained by shining a strong light through the hydrocele. The testicle normally lies behind the lower part of the hydrocele, and appears as a narrow crescentic opacity in its wall. The position of large scrotal veins should be noted. The skin of the scrotum must be washed with an antiseptic, and the trocar and cannula sterilized.

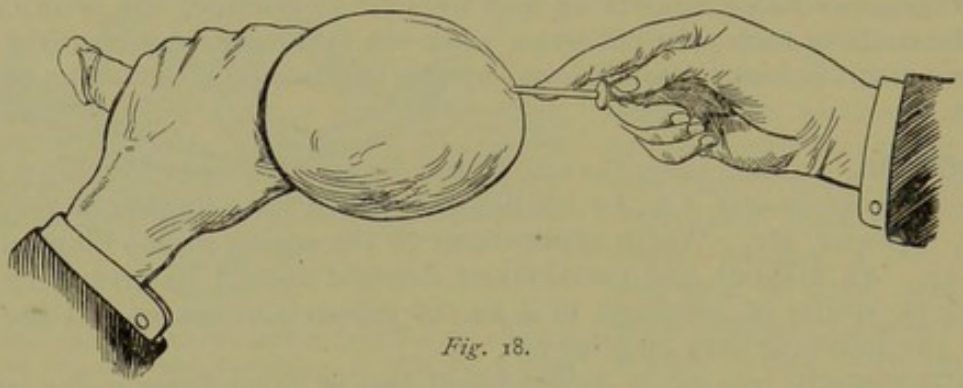

Fig. 18.

Method of Tapping.—The patient is recumbent, and the operator stands on his right side. The hydrocele is grasped with the left hand at its upper part, and pressure applied so that the whole cyst is projected downwards to the bottom of the scrotum, and the scrotal wall is stretched tensely over it. By this means the hydrocele is made very tense and the tension sustained, and the wall of the sac is kept in close contact with the stretched scrotal skin. This grasp is maintained from start to finish of the operation. The trocar and cannula is held in the right hand, with the forefinger acting as a guard an inch from the end (*Fig.* 18) to prevent it penetrating too deeply. The instrument is plunged through the wall of the scrotum and sac with a stabbing movement, at a point at the lower part of the anterior surface. This is near the normally-placed testicle, and here the last few drops of fluid will lie. After insertion, the cannula is pushed off the trocar with the forefinger of the right hand, and is pushed in up to its hilt, and held in with this finger during the whole operation (*Fig.* 19). When the last few drops of fluid are expressed the cannula is withdrawn, and the tiny

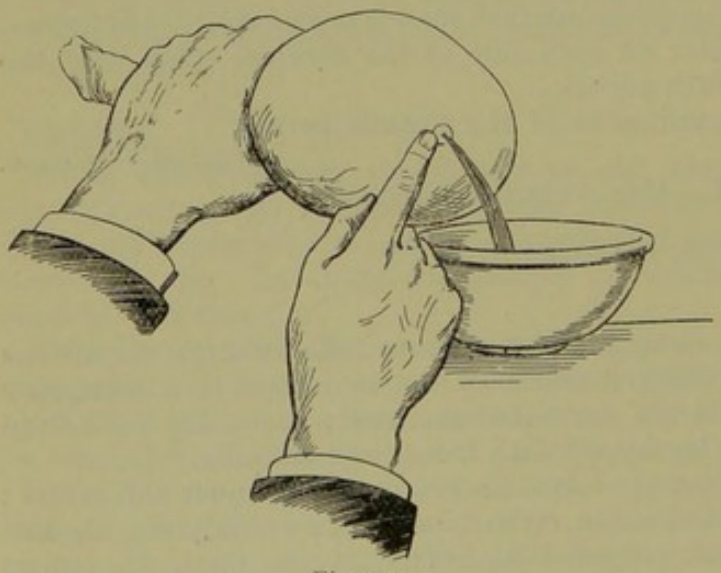

Fig. 19.

puncture washed with antiseptic lotion. No collodion or other dressing is required.

Accidents may occur during the tapping, and are due to neglect of these precautions. The cannula may slip out of the sac and lie between the skin and the hydrocele. This follows neglect to maintain sufficient tension with the left hand and to support the cannula with the right. The fluid escapes into the areolar tissue of the scrotum. If in quantity, it passes upwards, causing a tense acute œdema of the skin of the penis and mounting up over the abdominal wall. In old people this may lead to dangerous sloughing of the skin. Attempts to repuncture the sac are usually unavailing.

Hæmorrhage into the loose areolar tissue of the scrotum may follow the puncture of a scrotal vein. It is treated by application of an ice-bag and support to the scrotum. Hæmorrhage into the hydrocele sac is usually the result of puncture of the testicle. Similar treatment is adopted here. Later, if the effusion has been considerable, incision and turning out the tarry fluid and clot, followed by a radical cure of the hydrocele, is the best treatment.

Cases in which gangrene of the scrotum has followed the operation of tapping a hydrocele have been recorded. Lack of antiseptic precautions, and feeble circulation, probably accounted for these cases. A very few patients have been permanently cured by this operation; but it is a palliative measure, and no promise of cure by its employment can be given.

(*b*). The method of tapping and injection aims at a radical cure; but it is uncertain, and can only be recommended when for some reason a cutting operation is inadmissible. It is carried out as follows:—The needle of a large hypodermic syringe is plunged into the sac and left while the syringe is filled with the injection fluid. The hydrocele is now tapped with a trocar and cannula, and when it is quite empty and the cannula removed, the syringe is attached to its needle and the fluid injected. The needle is now withdrawn, and the fluid manipulated through the whole extent of the sac. The scrotum is surrounded with wool, and slung. The patient should remain in bed for one or two days. After injection the fluid rapidly reaccumulates by the pouring out of inflammatory effusion. This is reabsorbed in two or three weeks. If it remains longer the hydrocele may be tapped. Tincture of iodine (Edin. Phar.) has been used for the injection (2 dr.), but has been abandoned for carbolic acid on account of the pain it produces. Sixty minims of a 95 per cent mixture of carbolic crystals with glycerin is used. The carbolic acid numbs the sensation.

(*c*). A cutting operation, consisting of excision of the sac, or turning the sac inside out, or merely displacing the testicle into the areolar tissues of the scrotum, is the method by which a cure may be assured. The patient is confined to bed for a week.

3. *Spermatocele*, if large, may be treated by tapping and injection, or, better, by excision.

4. *Encysted Hydrocele* of the cord should be treated by excision.

5. *Congenital Hydrocele* occurs in infants. The funicular process remains patent, and the hydrocele thus communicates with the abdominal cavity.

If a hernia descends into the sac, a truss should be applied until the infant is old enough (about a year) for a radical operation. Sometimes the truss suffices to obliterate the communication. If the opening is very small, so that no hernia is present, the sac may be tapped, and a cure result.

6. *Infantile Hydrocele*.—The funicular process is closed at the abdominal end, but the rest of the tube remains patent and, together with the tunica vaginalis, forms a large hydrocele. This should be punctured in several places with a surgical needle, and, failing a cure by this means, should be tapped with a fine trocar and cannula.

J. W. Thomson Walker.

HYDROCEPHALUS.—Whether congenital or acquired, this is a condition for which treatment can do but little. Drugs are useless, and the various operations which have been tried have not resulted in any success. Lumbar puncture (q.v.) lowers intracranial tension for a time and effects a transient improvement, but the results are not permanent. Tapping through the anterior fontanelle is a perfectly safe procedure if carried out with antiseptic precautions and if care be taken to avoid the longitudinal sinus, and may be used instead of lumbar puncture. Only small quantities of fluid (half an ounce) should be removed at a time, and the head should be tightly bandaged afterwards until fresh symptoms of cerebral pressure render it again necessary.

Robert Hutchison.

HYDRONEPHROSIS—Is of varying degrees. It is due to blocking of the ureter, and the block may occur at any part. The two most common causes are calculi arrested in their descent from the kidney to the bladder, and kinking of the ureter in marked cases of movable kidney. It must not be forgotten, however, that the blocking may be produced by intravesical conditions. Thus the author has seen more than one case in which the drag of a large villous tumour, the pedicle of which sprang from a point in close proximity to the ureteric meatus, caused so much distortion of the orifice that an immense hydronephrosis resulted. In a somewhat similar way the extension of carcinoma of the bladder to the orifice of the ureter may cause so much occlusion that a hydronephrosis results.

Enlargement of the prostate and stricture of the urethra of long standing are frequently the causes of hydronephrosis, the backward pressure causing dilatation of the bladder, ureters, and pelvis of the kidney consecutively. (See PROSTATE, ENLARGEMENT OF.)

TREATMENT.—This consists in removing the cause.

In cases of movable kidney, the condition is usually intermittent, and is signalized by great lumbar pain on the affected side, together with a rapidly-forming swelling, which is very tender on palpation. Very frequently the kidney falls back into its right situation, and this is marked by a sudden considerable flow of urine into the bladder, with subsidence of the swelling and relief of the pain.

Frequently recurring attacks of this nature cause serious damage to the kidney, and must be prevented either by the application of a properly fitted belt or renal truss, or by fixation of the kidney by operation. Hydronephrosis due to stone in the ureter, abnormalities of the ureter, growths of the bladder and prostate, and stricture of the urethra, must be treated by the removal of these conditions. (See articles on affections of the Bladder, Ureters, and Kidneys.)

J. G. Pardoe.

HYDROTHORAX.—This name is given to the passive collection of serous fluid in the pleuræ, owing to cardiac failure, chronic renal disease, the pressure of tumours on veins and lymphatics within the thorax. If the primary cause be cardiac or renal, attempts may be made to lead to the absorption of the fluid by:—(1) Cardiac stimulants, (2) Purgatives, (3) Diuretics, and (4) Diaphoretics.

The value of the first of these methods is obvious, and in many cases, as the heart condition improves, the hyrdothorax disappears and the fluid is absorbed. The drugs available and their method of use are described under CONGESTION.

The use of purgatives, diuretics, and diaphoretics, to disperse a pleural effusion, is based on the clinical fact that it is not very uncommon, in the natural resolution of disease, for a hydrothorax to disappear simultaneously with the onset of diarrhœa, or profuse sweating, or the passage of a large quantity of urine. But it by no means follows that if we artificially induce these conditions we can bring about absorption of pleural fluid. It is well recognized now that

all three methods very often fail to produce the desired result, and only further exhaust the patient.

When hydrothorax is present on one or both sides, from cardiac or renal causes, the best course open to us is to aspirate, and draw the fluid off gently. This may be done with Southey's tube, the end of the india-rubber tubing being placed, before the trocar is thrust into the pleura, in a bowl of water; or with an ordinary aspirator syringe or bottle.

In all cases where the fluid is due to the pressure of an intrathoracic growth, aspiration is the only method available. It is well not to forget that, in cases of growth, sudden death frequently follows the withdrawal of fluid; this happens even though the fluid has been removed slowly and with great care. The relatives should be warned of this before the performance of the operation.

Gustave Schorstein.

HYOID CYSTS.—Dermoid cysts sometimes occur between the genio-hyo-glossi muscles, and when they have attained sufficient size bulge in the floor of the mouth, and between the chin and the hyoid bone. They are much more deeply placed than ranulæ, and the mucous membrane over them is of its normal colour.

They require removal, and this is best done through a vertical incision from the chin to the hyoid bone. The muscles are separated and the cyst enucleated by blunt dissection; if necessary the contents may be evacuated before the cyst wall is delivered.

These dermoids may also be removed through the mouth, but at the risk of leaving a cavity which may become septic. *Edmund W. Roughton*

HYPERIDROSIS.—General sweating is a part of some general disease. The term hyperidrosis may be taken to apply specially to cases of localized sweating, particularly those of the hands and feet. One recognizes certain constitutional conditions predisposing to this, and these should always be kept in mind, and treated if present. Thus anæmia is a very common predisposing cause in girls; alcoholism in men.

Drugs are not of much avail in directly stopping localized sweating, but a trial may be given to atropin, agaricin, and the like, while Crocker teaches that sulphur is often useful, large doses of the drug being administered. Locally, frequent washing with antiseptic and astringent lotions should be systematically carried out, and Condy's fluid is a favourite application; it is customary to advise the patient to change the socks daily, and dust with some absorbent powder. Such treatment may suffice in the mild cases, but in severe ones more active measures are required. Chromic acid is used in the French army, formalin in the Japanese, and the excessively heroic method of Neebe comes from Germany: this latter consists in the patient standing for a few seconds in crude nitric acid, only sufficiently deep to cover the soles of the feet. Such treatment is, in this country, reserved for a very small minority of the cases.

Norman Walker

HYPERPYREXIA, RHEUMATIC.—(See RHEUMATISM, ACUTE.)

HYPOPYON ULCER.—(See CORNEA, DISEASES OF.)

HYSTERIA.—This is one of the disorders of the nervous system in which no organic changes have as yet been determined to account for the symptoms. Nevertheless it is a definite disease, and if those affected by it are to be successfully treated, this truth must be recognized by all who are concerned in the management of the patient. To approach a case of hysteria in the belief that a condition akin to malingering is being dealt with, and to make it patent to the patient that this is the view taken, is to court failure. It is essential to successful treatment that such patients should be impressed with

the belief that their condition is recognized as due to disease, and is being treated as such, so that any show of ridicule, or other indication that they are regarded as imposters, must be studiously avoided.

It is often difficult to refrain from showing impatience, or giving some other indication which may be interpreted by the patient as meaning that she is regarded as responsible for her symptoms, and could prevent them if so inclined. Behaviour of the kind should be carefully avoided if it is hoped that treatment is to be successful.

One of the best established facts in regard to hysteria is, that the higher cerebral centres are in a very sensitive condition, and most receptive to external impressions, a fact that should be carefully borne in mind and utilized in the treatment of such patients, rather than that this state of things should be permitted to frustrate the attempts that are being made to effect a cure. The subjects of hysteria respond to suggestion in a remarkable manner; so that, judiciously employed, we have in it a means of treatment the value of which cannot be over-estimated.

That instability of the nervous system underlies the manifestations of the affection, is clearly established by all that is known with regard to the disease, and that this defect is in the main hereditary, is evidenced by the fact that hysteria, or allied neuroses, such as neurasthenia, mental disorders, and epilepsy, are usually to be traced in other members of the same family. This instability reveals itself by weakness of the higher centres which govern the will, but the mind is nevertheless quite clear, and the condition cannot be regarded as a from of insanity.

The emotional centres are usually in a highly sensitive condition, so that they react to stimuli that should be inadequate to disturb them, and the response may be out of all proportion to the amount of the stimulus. In addition to this, the response may be so distorted that the opposite of what should obtain is forthcoming, e.g., something that should induce tears evokes laughter, and vice versa. In the sensory sphere, the disordered state of the centres may give evidence of an over-sensitiveness, in which all sensory impressions are exaggerated in their effects, or the weakness of these centres may lead to a want of the power of perception of sensory stimuli, both in regard to common sensibility and the special senses. The same condition is evident in the motor sphere, where the instability of the neurons may be evidenced by an undue sensitiveness, which permits of spasms and convulsions, or a weakness which accounts for paralysis. It is, however, to disorder of the higher centres, which initiate or conduct the movements, that we must look for the explanation of the paralysis of hysteria, rather than to the lower centres more directly concerned in the liberation of energy, which results in the excitation of the muscles, which causes them to contract.

It is thus clear that in hysteria it is the mind that is to be treated, and that, although the affection is distinct from the various recognized forms of insanity, nevertheless it is a mental and not a physical disorder, and that, while due regard must be paid to the physical condition of such patients, notably as to their general state of nutrition, it is to the mind that treatment is to be chiefly directed if a cure is to be effected. This does not imply that the physical condition is to be neglected, for a healthy physical state is so far conducive to a cure, that without this it may be impossible to exercise a beneficial influence on the mind.

Although hereditary instability of the nervous system underlies the manifestations of hysteria, there are many other proximate causes which are directly responsible for evoking the manifestations of the disorder. A careful search must always be made for some such exciting causes, and measures calculated to correct them must form a part of the treatment.

Of the proximate causes, none is more common or effective than some form of mental emotion, and while a great shock, terror, sorrow, or anxiety may be responsible, the emotion may have been induced by an altogether inadequate cause, and nevertheless manifestations of the hysteria are forthcoming. The impressionability of such subjects makes them peculiarly liable to fall victims to imitation, so that there is a contagiousness about hysteria that has an important bearing on the prophylactic measures that are often needed if susceptible subjects are to be protected from this affection.

Although physical causes play a secondary rôle in the production of the malady, an impoverished state of general nutrition, anæmia, the debilitating effects of other disorders, and bad hygienic conditions of life, may be contributory factors, which enable other exciting causes to prove effective, or which themselves permit of the exhibition of the symptoms of hysteria in one predisposed. It is especially important to remember that grave organic disease of the nervous system may play this part, and that hysterical manifestations may co-exist with, and may even mask, the symptoms of the organic malady.

Peripheral irritation, notably from the female generative organs, has been regarded as a potent cause; but there seems little doubt that this influence has been over-estimated, and that, even when such disorders co-exist, the depressing mental effect engendered by the knowledge of their presence, is the more potent agent in the causation of any hysterical manifestations that may result.

Of toxic agents, alcohol and morphia, and drugs of a similar kind, appear to exert the most baneful influence.

Prophylactic measures directed towards preventing the development of hysteria in those predisposed, should include advice to neurotic mothers to avoid speaking of their symptoms in the presence of their children; not to show too much concern when there is anything wrong with the child, and especially to avoid making much of its every complaint, no matter how trivial. Removal of the patient from the home circle is a measure that may be required, not only for her own good, but to prevent other members of a susceptible family from falling victims by imitation.

Much good is also to be effected in prophylaxis by attention to the mental training, hygiene, and general nutrition of children in families in which hysteria and similar neuroses have claimed several members as victims. Wholesome food for mind and body, fresh air, and gymnastic exercises of various kinds, especially adapted to aid in the physical development of the child, are the measures to be chiefly recommended, while parents should be warned against the encouragement of precociousness and excitement in such children, and should be advised to guard them against undue mental and physical strain.

Cases of hysteria can rarely be treated with success in their own homes, so that the first thing to be secured is the removal of the patient to a good nursing home, or some other suitable place away from home influences, including that sympathy for which the hysteric craves, and which is meted out to her so lavishly by relatives and friends. Few things are worse for these patients than the gratification of this desire for sympathy, so that, without making the opposite mistake of ignoring their symptoms altogether, the less fuss that is made about them, and the more matter of fact the way in which their illness is treated, the better.

All who have to do with these cases must understand that they are dealing with a disease, and must make this clear to the patient. They must, however, be also careful to impress on the patient the fact that there is nothing wonderful in her malady, that many people are similarly affected, and above all things, that the condition is one from which they will make a complete recovery.

One of the most important elements, therefore, in the successful treatment

of hysteria is the selection of a competent nurse, who, without being harsh and unkind, knows how to exercise that firm control over the patient which leaves no doubt in the mind of either as to which of them is to be mistress of the situation. The patient should be left, as far as possible, in the sole charge of the nurse, and the less other people have to do with her the better. The best of nurses may, however, prove of little avail if she be not well supported by the medical man in charge, who must not only know how to deal with his patient, but—what is equally important—how to manage her relatives, so as to prevent them from interfering with the nurse, and undermining her influence with her patient. The medical man must accordingly be quite sure of his nurse, and be in a position to trust her implicitly, if he is to give her the unqualified support that she needs.

It is also essential that the medical man should gain the complete confidence of his patient, and should duly impress her with his thorough knowledge of her case, and with his conviction that, under the treatment he is adopting, a cure will be effected. If he succeeds in thus establishing his position, he can effect wonders by the judicious use of suggestion, combined with whatever form of treatment he has decided upon.

Of the various methods of treatment that are available, none is more suited to most cases of hysteria than the Weir-Mitchell treatment (see NEURASTHENIA). The main object of this treatment is, however, very different when employed in hysteria, for it is because it affords an admirable means of isolating the patient from the prejudicial influences of sympathetic relations and friends that it proves of such advantage in this affection. Moreover, the whole plan of treatment should be made as dull and monotonous as possible, with a view to making the patient tired of it, in the hope that this may be an incentive to her to try to get well, in order that she may be allowed to enjoy the pleasures of life again.

This being the case, the patient is not allowed to play games, read or look at picture papers, nor should the nurse be allowed to read to her. One by one these restrictions may be removed as rewards for any improvement in the symptoms ; but the slightest sign of relapse must be the indication for enforcing the restrictions again.

With the same object, it may be advisable to make the diet monotonous, to the extent of keeping the patient on milk alone for a time. Solid food is then added as a luxury, and the patient is told that it has become permissible because there is an improvement in the symptoms, but that it will not be continued if there is any relapse. Due regard, however, must be paid to the patient's nutrition and digestion, which must not be allowed to suffer by any modifications in diet that are suggested as likely to exercise a moral effect in the treatment.

During a course of Weir-Mitchell treatment, or independently of this, various other methods may be employed with advantage, which are directed either towards improving the general nutrition and tone of the patient, or with a view to influencing some local manifestation of the disease. Hydropathy is especially valuable, notably in the spasmodic disorders, when the cold bath or douche may arrest a hysterical fit, and the douche, systematically employed as a local measure, may help to bring about relaxation of a spasm. Apart from this, the general tonic effect of the cold bath does good, and the cold douche to the spine is especially to be recommended, not only on account of its tonic effect, but also because it has a good moral influence, in view of the fact that many of the patients do not delight in it. The cold spray and needle bath are also effective.

Electricity is especially useful in the management of hysterical conditions, whether they be spasmodic or paralytic. A strong faradic current, applied by means of the wire brush, may be as successful in arresting the hysterical fit,

owing to the pain which it engenders, as it is in bringing back movement in a part that is paralyzed. In making use of the electrical current to restore the power of movement, however, equally good results may commonly be obtained by applying a strong current by means of the ordinary pad electrode instead of the wire brush, when suggestion may also be made to play a part in the cure. The patient's attention should be directed to the fact that the electricity is making the muscles contract, and it should be impressed on her that this proves that the muscles are not dead, but are fully capable of doing their work if fresh life is put into them by means of the electricity. The movement of some part of the limb should then be evoked by the aid of the faradic current, and the patient should be induced to attempt to execute the same movement immediately afterwards. While she is attempting to perform the movement, a little moral persuasion should be employed by touching the limb with an electrode charged with a strong current. The part chosen for the application of this stimulus should be such that, in order to remove the limb from the unwelcome electrode, the patient must perform the movement which she has been previously unable to execute, and which she is being encouraged to attempt. By this means power may be rapidly or gradually restored to the paralyzed limbs.

Static electricity and high-frequency currents are also very useful. In both forms of treatment, the drawing of sparks from the body does much to impress upon the patient the value of the electricity with which she is so fully charged. The spasmodic disorders of hysteria are especially influenced by these methods of treatment. Electric baths also do good, but more from their general tonic effect than from any special local influence they exert on the disorder, whether it be spasmodic or paralytic. (See ELECTROTHERAPEUTICS.)

Massage, and Swedish and other forms of gymnastic exercises, are especially useful in the treatment of paralytic manifestations, quite apart from the place that massage occupies in the treatment of the malady as part of the Weir-Mitchell system.

The cautery, or a blister, may be employed locally with great advantage to the seat of pain or spasm, when either of these manifestations exists ; but in addition, counter-irritation in this way to the back or other regions may aid in the restoration of the power of movement to the affected parts.

Metallotherapy, by the aid of a large magnet, is also most useful, but owes its efficacy to the element of suggestion which it serves to convey rather than to any inherent virtue which the magnet imparts.

There is no measure in the treatment of hysteria for which so much can be claimed as suggestion. As has already been said, most of what is done with good result is tempered with a certain degree of suggestion ; but cures may be effected by these means alone, and, it may be, with marvellous rapidity. So easily are such individuals influenced by suggestion, that care is needed, when investigating a case, lest unguarded questions as to symptoms may induce phenomena which did not previously exist, and which have been unwittingly manufactured by the medical man in his zeal to discover whether this or that manifestation of the affection exists of which he may have read, or examples of which he may have seen. Suggestion, however, can effect much good, and does no harm when properly employed.

The same cannot, however, be said of hypnotism. This is a most potent agent in the treatment of the affection, but labours under the disadvantage that it may be responsible for increasing the mental instability, and even for producing more serious mental derangement. It seems scarcely necessary to add that, dangerous as is the use of hypnotic treatment in the case of any female, it becomes doubly so when the patient is the subject of hysteria, so that the medical man who decides on employing it should safeguard himself by having

at least one nurse in the room with the patient, when the treatment is being carried out.

As in cases of neurasthenia, the patient should be sent away with a nurse to some bracing place in the country or by the sea, after a course of Weir-Mitchell treatment in a nursing home. In addition to this, such treatment is an alternative plan of dealing with patients suffering from this affection when the family cannot afford the expense of treatment in a nursing home, or when the hysterical manifestations do not appear to be sufficiently pronounced to call for more rigorous treatment. Indeed, climatic treatment as a whole is beneficial for these patients, owing to the improvement which may follow in their general condition where this is below par.

Drugs play but a minor part in these conditions, but valerian is certainly of service in many cases, and the out-patient departments of hospitals could ill afford to dispense with this remedy. It is not merely the unpleasant nature of the drug that effects the good, for favourable results are obtained when it is given in the form of a pill; but the best results are certainly obtained when valerian is given in the liquid form, and there can be little doubt that its unpleasant qualities exercise a good moral effect in many cases. Asafœtida may be similarly employed with advantage in the treatment of hysteria, and both drugs do good, irrespective of the precise manifestations of the disease. Bromides may be employed with advantage when spasmodic disorders have to be dealt with, but they exercise little or no control over the hysterical fit, except when genuine epilepsy co-exists. It rarely happens that hypnotics are required in these patients, for, provided they be not told what they contain, cachets of sugar or some equally non-soporific substance will usually procure for them as excellent a night's rest as if the cachet contained one of the most active hypnotics. Similarly analgesics are rarely required to relieve hysterical pain, which may be favourably influenced by cachets which contain no active ingredient, or by suggestion, counter-irritation, or some other method of local treatment. Hypnotics and analgesics cannot be too carefully guarded against, as these patients very readily acquire the drug habit. Above all things, morphia must never be given, as it is pre-eminently the drug likely to prove most deleterious from this standpoint.

Tonics are commonly required, and iron is notably of advantage when the patient is anæmic. Aperients are habitually needed to counteract constipation; and in the forced feeding that forms part of the Weir-Mitchell system, medicines to aid the digestion may be called for. It is, however, a mistake to suppose that gastric symptoms of hysterical origin, such as pain and vomiting, can be influenced by drugs which have a direct action on the stomach, for the only good they can effect is through any influence of suggestion which they may impart. It is to the psychical condition that treatment must be directed, whether it be local or general, and whether a drug or some other measure of treatment is employed. Thus it is that valerian may effect what each gastric sedative in turn has failed to accomplish, in a case of obstinate hysterical vomiting, and that the cautery to the epigastrium may relieve a pain that has resisted every analgesic in the pharmacopœia that can be legitimately employed for its relief.

J. S. Risien Russell.

ICHTHYOSIS.—Although there are many grades of this disease, it is probable that they are all essentially of the same nature, though the severer the form the less amenable is it to treatment.

The principle of treatment is to supply to the skin that grease in which it is deficient, and this can be done, firstly, by doing everything possible to promote the patient's health and to encourage him to eat those things which tend to fat. Secondly, by a daily bath followed by the inunction of one or other kind

of grease; perhaps lanolin is best of all. Grease well applied from the outside, by lubricating the skin, diminishes the discomfort associated with its excessive dryness. Thirdly, the internal administration of thyroidin in carefully regulated doses, or small doses of nitroglycerin, is followed by increased suppleness in the cuticle. Although arsenic is not generally indicated in ichthyosis, there are cases where it seems to be more useful in fattening the patient than any other tonic. It is most important in the management of the case of ichthyosis to make it clear to the patient from the outset that it is only amelioration, comfort, and not *cure*, which you are able to promise him. *Norman Walker.*

IDIOCY.—(See MENTAL DEFICIENCY.)

IMBECILITY.—(See MENTAL DEFICIENCY.)

IMPETIGO CONTAGIOSA.—Few diseases are more amenable to suitable, or more rebellious to unsuitable, treatment than this very common disease. If the crusts are removed (either by starch poulticing or by oil soaks) and a weak antiseptic ointment (hydrarg. ammoniat. 5 gr., vaselin 1 oz.) constantly applied, even very extensive cases recover within a week or ten days. The secret of success is the thorough removal of the crusts, and the constant application of a *weak* antiseptic. *Norman Walker.*

INCONTINENCE OF URINE.—(See ENURESIS.)

INFANT FEEDING.—In ordinary cases the hand-feeding of infants is a matter of little difficulty if only certain plain rules are attended to. No doubt children are met with from time to time who have a constitutional inability to digest cow's milk; and to rear such children successfully may tax to the utmost the skill and resource of the physician. But except in cases such as these, care and common sense, together with observance of the ordinary principles of infant feeding, will enable us to bring our task to a successful issue.

Our first care must be to keep the digestive organs in a healthy state; for a food, however carefully chosen, and however well adapted it may be to the digestive activities of the child, ceases at once to agree when the stomach becomes upset. Now infants are keenly sensitive to changes of temperature, and if they are bathed at inordinate length, or needlessly exposed after leaving the water, or are allowed to lie with cold feet and legs, or are in any way exposed to chills, their digestive organs begin at once to suffer, and gastric or gastro-intestinal catarrh brings the work of the stomach, for the time, to a standstill. The first rule, then—one of paramount importance, and one which cannot be neglected without serious risk of disaster—is :—

1. *See that the infant is bathed as quickly as possible, and that his feet and legs are never allowed to get cold.*

In the next place we must remember that a hand-fed baby has to be reared upon a food which is not his natural food, but only something like it. His digestive powers, therefore, require all the help we can give them, and experience gained from our own bodies tells us that one of the greatest helps to easy digestion is variety in the diet. The sucking infant will take his mother's breast morning, noon, and night, and want no change. In the hand-fed infant, on the contrary, the stomach is often quick to resent monotony of diet; and to attempt, therefore, to bring up a child on one food, given continuously day and night, is wilfully to court the risk of failure. The second rule, then, is :—

2. *Take care that there is a sufficient variety of flavour in the various meals.*

In most cases it will be enough to order two differently flavoured meals to be given alternately in the daytime, and a third to be given in the night, but sometimes a still greater variety is required.

The next point regards the sanitary arrangements and cleanliness of the nursery. All feeding bottles, jugs, spoons, etc., used in the nursery must be kept scrupulously clean ; all foods supplied to the infant must be absolutely fresh and good ; soiled napkins and sheets must be taken away at once, and the living room must be well ventilated, so as to keep the air he breathes as pure as possible. The third rule, then, is :—

3. *See to the cleanliness of the feeding apparatus, the freshness of the food, and the healthiness of the sanitary arrangements generally.*

These three rules govern the whole practice of infant feeding, and a breach of them is almost certain to involve the practitioner in difficulty, if it do not lead to more serious consequences.

In our choice of foods we must be guided by the digestive energy shown by the infant, and by what we notice of his special peculiarities. A food which is well suited to one child does not necessarily agree with another, and therefore we must be prepared to change at once any food which is not found to be completely satisfactory ; for it is useless to force upon a child again and again a food which makes him sick or fills him with wind.

Most infants do well upon a mixture of cow's milk and barley-water. The milk should be sterilized to destroy morbific germs, and should be mixed at first with 2 parts of fresh barley-water. This combination, of which $\frac{1}{3}$ is milk, must be given from a feeding-bottle at a temperature of 95° F. A new-born baby will take about 1 oz. of this mixture at a meal, but this quantity will very soon have to be augmented as his stomach increases in size. It is safe to let the child suck until he is satisfied, for any excess of food is regurgitated without effort soon after the meal. The food can be sweetened with white sugar, and, if the milk is poor, fresh cream may be added in the proportion of 1 teaspoonful to the bottle of milk. The baby may be fed at first every two hours. For the sake of variety, every alternate meal should be flavoured with Mellin's food or a little extract of malt, added in just sufficient quantity to make a change of taste ; and in the night it is well to give one of the desiccated milk foods, such as Messrs. Allen & Hanbury's No. 1 food. This is only to be mixed with the water when the meal-time comes round ; indeed, no food should ever be kept standing ready mixed, but should be freshly prepared for each meal.

Instead of the above, milk and water may be given alkalinized with $\frac{1}{3}$ part of lime water, and many infants thrive upon this combination ; but in this case, too, some additional flavouring should be included in each alternate meal. If there is a tendency to flatulence or hiccough after the meal, 10, 20, or more drops of some aromatic water—according to the size of the meal—may be added to the feeding-bottle.

Infants vary greatly in their power of digesting cow's milk. An average new-born child will take without trouble $\frac{1}{3}$ part of milk as recommended above, but in exceptional cases we must give less, and in some babies the amount of milk allowed in the meal has to be changed frequently, according as the digestive capacity varies from day to day. It is in these cases that Dr. Poynton's plan of adding 1 gr. of citrate of soda to each oz. of the milk is so useful. As the child grows and gains strength, the quantity of milk in the meal must be increased ; but the change should be made cautiously, and we must be always prepared to reduce the quantity should the gastric abilities seem to be overtaxed.

Up to the age of six months farinaceous foods should be avoided or used only with great caution, for the secretions necessary for the digestion of starch are wanting in the new-born infant, and develop only slowly. But by the time the child is six months old the diastasic power of the saliva and pancreatic secretion has advanced sufficiently to allow of a proportion of starch being added to the diet without disadvantage. It is best to begin with one of the many foods

containing malt or other form of digestive. This must be prepared with milk and given at first once a day, but afterwards more frequently. Later on, the digestive may be omitted, and starch unguarded, such as Chapman's flour well baked, biscuit powder, rusk, etc., may be used. There is, of course, an infinite variety of infants' foods on the market, and any of these may be tried if a change in the diet seems desirable. At the same time it may be well to remind the reader that tinned foods and preserved or sterilized milks are not antiscorbutic, and can never be a satisfactory substitute for fresh cow's milk. The occurrence of tenderness in a hand-fed baby, or the appearance of blood in his urine, should suggest at once the administration of antiscorbutic remedies.

At ten months old the child may begin to take broth. This should be made of veal of the strength of ½ lb. of the meat to the full pint of broth. It should be thickened with barley and strained, and may be flavoured, if desired, with turnip or carrot. At fourteen months old the child may have sole or plaice boiled or pounded. Mutton and chicken had better be withheld until he is eighteen months old. At first they should be pounded and strained through a wire sieve, and served up hot with a little gravy. They may be mixed with well-boiled cauliflower or vegetable marrow, when in season, and bread crumb.

In the matter of puddings, our great care should be not to overload the child's stomach with starch. An infant, during the earlier months of life, as has been said, has not the secretions needed for the digestion of starch. Later, when these have been established, his power of dealing successfully with farinaceous matters is strictly limited, even when the digestion is in full working order. The slightest catarrh of the gastric mucous membrane materially reduces this faculty; therefore, starchy puddings, such as rice, sago, tapioca, etc., ought never to be allowed if the digestion is upset, and even in the healthiest subjects may usefully be varied with others made of flour, bread, or rusk. These are far more nourishing, as well as less likely to disagree.

Some children, as has been said, have a physical inability to digest cow's milk, but these are few in number. The large majority of infants in whom this disability seems to exist are those who, through prolonged bathing or careless exposure, have contracted a gastric catarrh a few hours or days after birth. These latter are met with only too often. In their case no time should be lost in treating the derangement. There will be vomiting or looseness of the bowels, or other sign indicating the nature of the disturbance, and the measures to be adopted are those described elsewhere. (See VOMITING and DIARRHŒA.)

In cases where the indigestion of cow's milk is a real disability and not a merely temporary incapacity, we can give help to the stomach by partially digesting the curd with Fairchild's zymine powders, and giving the milk largely diluted with barley-water. A grain of Finkler's papain added to the feeding bottle still further reduces the work of the digestive organs. If these means fail, it is best to put aside cow's milk for the time and fall back upon unsweetened condensed milk or a desiccated milk food, diluting them with fresh barley-water, and being careful to vary the flavour of successive meals—a precaution which, in cases such as these, is more than ever important. Sometimes, however, an infant can manage one meal in the twenty-four hours of the prepared cow's milk; sometimes he can digest easily $\frac{1}{10}$ part of milk, when double the quantity gripes him and fills him with wind. It is important to make every effort to enable the child to take the fresh milk, for the tinned substitutes are not a desirable food after the first few months have gone by. Sometimes the Clay Paget milk will suit an infant with whom other forms of milk have disagreed, but "humanized milk" I have rarely found satisfactory.

If, as sometimes happens, the tinned milks do not agree, but fill the child with wind and acid, they too must be dispensed with. Ass's milk is often well

borne in these cases; but as its nutritive value is small, it is well to add to each pint of the milk 1 oz. of fresh cream and an equal quantity of Lahmann's "vegetable milk," which suits some children well. As an alternative meal we may give fresh whey and barley-water in equal proportions, with a teaspoonful of cream in the bottle, and flavour the whole with half a teaspoonful of extract of malt; or instead of the malt we may give the whey and cream fortified by 10 or 15 drops of bovinine; or thin veal broth and barley-water with a teaspoonful of Mellin's food. It must be remembered, however, that in this, as in every case where a food disagrees and the infant's digestion is evidently upset, our first care should be to put a stop to the derangement of the stomach. The measures to be taken with this object are described elsewhere. (See VOMITING.) In every case our aim must be to get the child to digest a diet of cow's milk. Therefore, from time to time we should make a trial of a meal of the peptonized milk, freely diluted with absolutely fresh barley-water.

At first we must not be too exacting; often the amount of milk which can be borne has to be measured in the beginning by teaspoonfuls.

In conclusion, it is well to repeat that careful observance of the three simple rules for the successful rearing of infants by hand given in the earlier part of this sketch will go far to render the process an easy one. A healthy infant whose stomach is in a normal state is not difficult to feed. Any trouble which may arise comes generally from gastric catarrh. The practitioner should, therefore, keep a watchful eye upon the nursery arrangements, and as far as is possible see for himself that the directions which he has laid down are being strictly carried out.

Eustace Smith.

INFANTILE PARALYSIS.—(See POLIOMYELITIS.)

INFLUENZA.—It is most essential that the patient should be confined to his bed, or at least to his room, at the first symptom, however slight. The disease is most treacherous, and to neglect it is often disastrous. There is no specific for influenza, therefore symptoms must be treated as they arise. Much that is stated in the article, FEVERS, ACUTE INFECTIOUS, will be found to be applicable to this disease. In many instances, the attack begins suddenly, with pyrexia and various aches and pains. The ammoniated tincture of quinine in 1-dr. doses every four to six hours is an excellent remedy for these symptoms; or salicylate of soda or salicin in 10- to 20-gr. doses at the same intervals. When there is headache, antipyrin 10 gr., phenacetin 5–10 gr., or antifebrin 2–5 gr. may be given. Should these remedies fail to relieve pain, Dover's powder (up to 10 gr.) or some other form of opium should be tried. Heart-failure is common in some forms of influenza; hence it may be inadvisable to employ baths or wet-packs for pyrexia; sponging, however, is seldom unsafe. For acute failure of the heart, strychnine is the best remedy, combined with quinine if the temperature is much raised.

For weakness of the heart, more or less persistent, whether following an attack of syncope or of gradual onset, digitalis and caffeine are invaluable. Rest, and careful observation of the circulatory system, are also imperative, as in the case of diphtheria (see DIPHTHERIA). Bronchitis, and lobar and lobular pneumonia, are very common. The treatment appropriate to these conditions must be applied (see BRONCHITIS and PNEUMONIA). In lobular pneumonia, a mixture containing digitalis, chloride of ammonium, and nux vomica has in some cases proved very efficacious, as also has nitrite of sodium in 1- or 2-gr. doses. In the gastro-intestinal form, whey or peptonized milk should be given, in small quantities, frequently, and opium with some dilute mineral acid, e.g.:—

R	Tinct. Opii	℥v	Syr. Balsam. Tolut.	℥j
	Acid. Sulph. Aromat.	℥x	Aq.	ad ℥j

An attack of influenza is the cause of acute mental disturbance in some patients, who will, therefore, require careful watching during convalescence. Severe neuralgic pain, localized to a definite spot, is not uncommon after this disease. If the usual remedies for neuralgia fail, a blister over the seat of pain should be tried.

The patient may be allowed to go amongst other persons as soon as he is well.

Quarantine period, if enforced: a week. *E. W. Goodall.*

INSANITY.—(See MENTAL DISEASES.)

INSOMNIA.—Two distinct vital changes occur in sleep. These changes are associated, and are related to each other. One, as has been proved by experiment, is a diminished supply of blood to the brain, and especially to the blood-vessels of the cerebral cortex. The other change, the precise characters of which are as yet unknown, is some essential and intrinsic change in the brain—and probably also in the spinal cord and the ganglionic nervous system—of the nature of a functional depression of those parts, and especially of the cerebral cells, and arising from an accumulation in the affected organs of some of the products of normal tissue waste. It is very probable that for normal sleep an intrinsic change of this kind must gain the wide distribution here indicated, that this change is rhythmic in its occurrence, and is sustained by the physiological effects of some of the issuants of those muscular and nervous tissue changes which especially occur in the active, waking state of the body. The whole living body sleeps. The changes which the event of sleep declares, extend beyond mere interruption of consciousness; they extend to secretion, to the action of the heart and blood-vessels in the general circulation of the blood, to respiration, and to nerve reflexes, and extend to all the tissue modifications and to all the functional activities concerned therein.

In insomnia, sleep is absent or imperfect; there is inability to sleep at all, or long enough, or at a convenient time. Insomnia is a concomitant of some forms of unsoundness of mind.

Besides such mental sleeplessness, cases of insomnia, as met with in practice, divide themselves naturally into two groups, namely, (1) *Symptomatic insomnia*, and (2) *Intrinsic insomnia*.

1. **Symptomatic Insomnia** attends a vast variety of morbid states, and is secondary to them, or is part of them. Pain, if severe enough, and from whatever cause arising; pyrexial elevation of temperature; frequent coughing, such as often occurs in pulmonary consumption; dyspnœa, such, for instance, as results from obstructive dilatation of the cardiac cavities, and appears to require an extraordinary vigilance of the nervous centres for the maintenance of the vital processes of respiration and circulation—are clinical conditions of disease which may prevent, shorten, or break up sleep. Such conditions are frequently met with in medical practice, as single or conjoint causes of insomnia, in various combinations. In such and in similar instances the cause of the sleeplessness is obvious, and the consequential character of the insomnia—that is, its dependence upon a distinct and sufficient cause—is clear. For the therapeutic control of this kind of insomnia we may employ with success one of two curative methods, or we may employ a judicious combination of these methods, such combination being founded upon a skilled appreciation of the especial needs of each individual case. That is to say, we may control sleeplessness of the kind in question either by the exhibition of remedies which directly cause sleep—hypnotics or soporifics—or by the employment of measures which combat the cause of the insomnia, by removing pain, by reducing pyrexia, quelling cough, relieving cardiac disturbance and dyspnœal discomfort, and so on; or by using

in conjunction hypnotics and remedies, for the removal of the causes of the sleeplessness. In symptomatic insomnia, as in medical practice generally, it is best to regard the therapeutic indications of each case from the well-known standpoints, respectively, of the *indicatio causalis*, of the *indicatio morbi*, and of the *indicatio symptomatica*. The treatment of the sleeplessness of the secondary insomnia arising from pain, pyrexia, dyspnœa, and from other morbid conditions, is part of the treatment of a large number of diseases, and is given in other papers. If a hypnotic drug be needed in such a case, one of those described later may be selected. It must always be remembered that preparations of opium are contra-indicated, as a rule, in renal diseases and in bronchitis.

2. **Intrinsic Insomnia.**—These cases fall naturally, as to their causes, into three divisions, the *psychic*, the *toxic*, and the *senile*. In psychic insomnia, some severe mental shock or long-continued mental strain (such as financial worry or hard reading for an examination) has excited or kept up such relative cerebral hyperæmia that insomnia results. In toxic insomnia, some ingested agent, as in alcoholism, or in excessive smoking of tobacco or snuff-taking, or as in the drinking of strong tea or coffee near bedtime, or some autogenetic poisons such as arise in the gouty diathesis, in renal insufficiency, or in habitual constipation, keep up sufficient cerebral hyperæmia for the production of insomnia. In senile insomnia, the broken and short sleep is the result of senile degeneration of the smaller cerebral arteries. In such degeneration, those blood-vessels are less elastic and contractile than in health, and they may become dilated, so that the blood supply to the cerebral cortex is with difficulty reduced enough to permit of sleep.

Patients who are sleepless without physical discomfort, are usually those of nervous temperament, and their impressionability as to insomnia is determined by psychic or toxic causes, or by senile changes in the cerebral blood-supply, or by these conditions in various combinations.

Treatment.—As a rule, successful treatment follows the discovery of its cause. A hypnotic should only be prescribed in exceptional cases, and when its exhibition cannot be avoided. A removable cause of insomnia should never be allowed to continue. In the severer forms of psychic insomnia, the prompt use of a hypnotic will soon restore to the brain the power of sleeping, without further aid from drugs.

Potassium bromide is the best hypnotic in well-nourished patients and in the slighter cases generally. It produces nervous calm, is a direct brain sedative, and quite safe. It must be given in a full dose after getting into bed, 30–60 gr. dissolved in half a tumblerful of water.

Opium, or one of its hypnotic derivatives, may be given, especially when pain prevents sleep ; but is contra-indicated in children, in bronchitis, and in renal disease ; it is unsuitable for habitual cases, and its exhibition should not be long continued, or its dosage much increased. In severe psychic cases it may act well, thus prescribed :—

℞ Pil. Saponis Co. gr. iiss
Ft. pil. One or two to be taken at bedtime.

Chloral is the hypnotic most used, and it is certain in its action. Its disadvantages are, that sometimes it is a gastric irritant, it is a cardiac depressant, undesirable in heart-disease, or with a low blood-pressure, and the habit of taking chloral, which is a prevalent vice, may be induced. The officinal syrup of chloral hydrate is a good preparation. Each fluid drachm of the syrup contains 10 gr. of chloral hydrate. From ½–2 dr. of this syrup may be given at bedtime in a wineglassful of dill, peppermint, or other aromatic water, and repeated in a half dose in two or three hours, if necessary.

A combination of hypnotics is sometimes more successful than any of them singly; in such combination each acts better in a smaller dose than otherwise. Chloral and bromide of sodium or of potassium may be given together; or both may be combined with opium, thus :—

R	Tinct Opii	℥ v–x	Syr. Chloral.	℥ ss
	Potass. Brom.	gr. x–xx	Aq. Menth. Pip.	ad ℥ jss

M. Ft. haust. To be taken at bedtime.

Chloralamide is especially recommended in insomnia complicating disease of the heart. In such cases Dr. Hale White advises 25 gr. dissolved by stirring in 1 oz. of brandy, adding water to taste, taken about one hour before bedtime. On account of its disagreeable taste it is sometimes proposed that chloralamide should be administered in capsules; but if the drug be given as a powder, it may be very slow in its action, and cause a drowsy day after a sleepless night.

Sulphonal, and its chemical allies, *tetronal* and *trional*, are powerful hypnotics, which do not depress the heart nor irritate the stomach. None of them is safe if the kidneys be diseased, as each may cause hæmatoporphyrinuria. Each has the disadvantage of being comparatively insoluble in water, and their insolubility may retard their effect for some hours after they have been taken by the mouth. None of them should be administered for more than a few nights consecutively. While one of them is being taken, 20–30 gr. sodium bicarbonate should be given during the day, to prevent the urinary hyperacidity which these hypnotics cause by their action upon the blood. Each of these drugs is best given in a cachet, washed down with a little hot water, one hour before bedtime. The dose of sulphonal is 10–30 gr.; tetronal, 10–20 gr.; trional 15–30 gr.

Paraldehyde is a good hypnotic. It is a colourless liquid with ethereal odour and pungent taste, soluble 1–8½ of water. It is best given emulsified with yolk of egg. It acts quickly, and does not depress the heart. The dose is from ½–2 fl. dr. It has an unpleasant after-effect. For days after a single dose, a disagreeable smell is given to the patient's breath.

Veronal is a new and a good hypnotic. It is a white crystalline powder, comparatively insoluble in water (1–160). It is given in cachets and in pills, for which latter, syrup of glucose is a good excipient. The dose is 5–15 gr.

In many cases of chronic wakefulness from prolonged mental strain, the patient is anæmic. The insomnia cannot be cured unless the anæmia be cured. Hæmatinics are indicated, of which the best are iron or arsenic, singly or combined. The diet must be generous, containing plenty of fish, meat, and eggs.

The prescription of alcohol as a remedy in disease is often difficult and sometimes dangerous. To many people a "nightcap" of toddy is a superfluous, perhaps hurtful, luxury. It gives, however, perhaps better than anything else, rest and sleep to the worried brain of feeble persons whose blood is poor. Alcohol is the best hypnotic in many cases of chronic psychic insomnia, when the patient is worried and weakly, sorrowful and anæmic. When alcohol is prescribed in the form of any of the fluids which contain it, in the treatment of insomnia, the reasons for the employment of the remedy should be explained, and it should be discontinued when the conditions which called for its exhibition shall have disappeared.

In the toxic kinds of insomnia, if the cause be the consumption of tobacco, alcohol, tea, or coffee, such consumption must be stopped or lessened, as the case may be. In the toxic insomnia of gout, or of chronic kidney disease, with a pulse of high tension, the following combination is useful :—

R	Magnes. Sulphat.	℥ ss	Sod. Citrotart. Efferves.	℥ jss
	Sod. Potass. Tart.	℥ j		

M. Ft. pulv. One or two teaspoonfuls to be taken in half a tumblerful of water every morning, before breakfast.

In the toxic insomnia which sometimes accompanies habitual constipation and undue fæcal retention, and of which such fæcal retention may be the whole cause, the cure of the habitual constipation must be aimed at. If laxative drugs be necessary, the following modification of Marshall Hall's pill is useful :—

℞ Aloes Barb.
Theriacæ
Ext. Glycyrrhizæ
Ext. Taraxaci
Saponis Mollis, singulorum partes æquales

Solve in aqua, et calore lente inspisse ; deinde divide in pilulas, pondere 2½ gr. One or two pills to be taken at bedtime.

As a mild laxative, the following combination of remedies has proved excellent :

℞ Magnes. Pond.
Ol. Ricini āā ℥ss
Mellis Depurat. ℥j

M. Ft. conf. One teaspoonful to be taken at bedtime.

Senile insomnia is very obstinate. One of the hypnotics before mentioned may be given, with exceptional caution as to dosage. In many cases the bromides, with full doses of hop or of henbane, afford the most efficient and least harmful medicinal means of relief. (See also Bronchitis, Electrotherapeutics Gout, Heart, Etc.)

James Sawyer.

INTESTINAL INDIGESTION.—(See Colic, Enteritis, Flatulence.)

INTESTINAL OBSTRUCTION.—It is impossible to consider the treatment of the many causes producing intestinal obstruction under one heading. Although obstruction is present in all, and is the leading factor in producing death, other conditions may develop which may modify the treatment very materially. Again, some cases of intestinal obstruction have such special causes and symptoms that it is impossible to deal with them *en masse* with the others ; for instance, intussusception. This is considered separately (see Intussusception). There are certain cases of local and general inflammation of the abdominal viscera and peritoneum in which obstruction occurs, and may be the leading symptom ; for example, the distension of intestine that may occur in a case of general peritonitis.

If we could be sure that obstruction is the main feature of any case, the treatment would be of the simplest. Over and over again, however, mistakes are made both by the unskilled and the skilled ; from time to time cases occur in which the diagnosis of intestinal obstruction seems the only reasonable one, and yet they recover without surgical interference. It is this that makes the question of operative treatment so difficult. If no case in which the diagnosis of obstruction is made terminated favourably apart from operation, the question of treatment would be very simple—narrowing itself down definitely to operation. It is of course open to the surgeon to say that these were not primarily cases of intestinal obstruction ; but they have to be treated, and such an attitude does not help us out of the difficulty. What forms of obstruction would recover either spontaneously or without operative treatment ? It is quite possible that a band which has strangulated a coil of intestine may give way at any moment and relieve the obstruction ; again, a mechanical cause, such as a kink, may, as the result of peristaltic action, become undone with a similar result ; further, in the cases known as intussusception there is a well-recognized spontaneous cure, though the percentage of such cases has been undoubtedly exaggerated, especially in the acute forms. Even admitting that such cases exist, I am still of opinion that we cannot state that the patient has any definite chance of recovery from intestinal obstruction by natural means—the occasional exceptions only serve to emphasize the rule.

The next important question for discussion may be formulated thus : Why

is operation looked upon by so many practitioners as a desperate remedy—having so much risk in itself that great hesitation is displayed in resorting to it?

The two chief effects following operation are surgical shock and the harmful influence of the general anæsthetic. In cases of acute intestinal obstruction, shock, sometimes very profound, is always present, and therefore even a slight addition is to be avoided if possible. Unfortunately, the mere opening of the abdomen, and even the gentlest manipulation of the contents, cannot be carried out without producing some shock, and this may of necessity be much increased. We know how chloroform and ether may produce very serious results, and in certain cases the writer hopes that the introduction of local and lumbar anæsthesia will materially modify surgical shock. (See PERITONITIS, ACUTE GENERAL.)

Speaking broadly, cases of intestinal obstruction present themselves under three aspects :—

1. Cases in which the diagnosis is fairly straightforward, and in which the condition of the patient is satisfactory; in this group abdominal section, followed by any procedure necessary for the reduction of the obstruction, can be carried out with reasonable confidence of success.

2. Cases where the practitioner is called in so late that the patient's condition has progressed to a very serious stage, and which from the first present grave symptoms. In this group each case must be carefully considered, and if the patient's strength promises to withstand the operation, I feel that the surgeon's duty is to operate. I believe that local anæsthesia and lumbar anæsthesia, employed systematically, will enable us to save many such cases which hitherto have been lost.

3. There remains to be considered a third group, in which either the symptoms of obstruction are not very marked, or in which there may be sufficient grounds for concluding that the mechanical obstruction is not complete. In such cases the question of operation versus expectant treatment becomes a difficult one; at any moment the obstruction may become quite complete, or some serious complication such as perforation may occur, and then the operation carries with it a much greater risk. In this group, unless there is some special contra-indication, I am of opinion that operative treatment, carefully and judiciously carried out, would save a great proportion of the patients. It is true that in any given case the operation may have been the immediate cause of death. In all legislation we have to consider the good of the majority, and I am strongly of opinion that it is correct policy to regard this small percentage of deaths as a necessity; in any given case it is impossible to say whether, or how far, the operation contributed to the fatal result.

TREATMENT.—This may be considered under the following headings :—

1.—**Cases in which no Immediate Operation is to be performed.**—After a careful examination the practitioner has decided that immediate operation is not advisable, although the diagnosis is decidedly in favour of intestinal obstruction. The first symptom he is almost certain to have to deal with is pain. In acute abdominal diseases, especially peritonitis, opiates must be employed only with great caution. (See also PERITONITIS.) In acute intestinal obstruction pain is the first and dominant symptom; by giving $\frac{1}{4}$–$\frac{1}{3}$ gr. of morphia hypodermically relief is generally obtained at once. In a case of complete obstruction, especially when high up in the small gut, the relief may be scarcely noticeable, or it may be of very slight duration; in a case less serious the relief is very marked, and may last a considerable time. I am of opinion that this reaction to morphia is of considerable diagnostic importance; if there be a condition of marked abdominal pain—colic perhaps is the better term,—this dose of morphia often gives permanent relief; at any rate several hours' remission is often obtained, and if there be no definite obstruction present, the colic may not

return. For example, cases of lead colic or appendix trouble without definite inflammatory lesions, so-called appendicular colic, may recover after one dose. On the other hand, if the obstruction is complete, the relief is either absent or of but slight duration ; and therefore, if pain continues subsequent to the injection, or reappears after a short interval, operative treatment is, in my opinion, imperative. If the hypodermic injection has given obvious relief, lasting four hours or more, the practitioner is justified in relying upon non-operative treatment, so long as no unfavourable symptom other than pain arises.

The chief points in treatment are : (*a*) *Enemata* should be given to clear out the large bowel. I think it important that gravitation enemata should be given, the funnel being held at a height not exceeding two feet above the level of the body. (*b*) *Stomach lavage.* Some writers lay considerable stress on this ; if, however, the patient is bad enough to require any systematic treatment of this kind, it is almost certainly a case for operative treatment (q.v.). (*c*) *No more morphia* or allied drug should be given after the first injection, unless it is quite obvious that the patient's condition is really improving, and the recurrence of pain is sufficiently troublesome to warrant another injection. *If the patient's general condition does not improve, any further colic should not be treated by morphia unless operation is decided upon.* (*d*) *Feeding.* Within the first twenty-four hours nothing should be given by the stomach ; as a rule the patient does not require any nourishment. At the end of this time rectal enemata should be given, and suppositories of peptonized milk or meat with liquid enemata. (*e*) *Local treatment* may be useful. Hot applications to the abdomen in the form of poultices, or of spongio piline wrung out of hot water applied at frequent intervals, often gives considerable relief. Sometimes it is advisable to renew the poultice every half hour or so ; in my experience the patient is the best judge on this point. Sometimes he is relieved by gentle massage of the abdomen in the direction of the intestinal flow ; not only may the pain be thus lessened, but the general condition may improve—a method only possible when there is not much local tenderness.

Where vomiting is not marked, a little brandy and water given hot often relieves the patient considerably, both as regards pain and the sense of distension or abdominal discomfort ; in these cases one sees that excellent influence of alcohol so expressively termed anti-spasmodic.

2. **Cases in which Operation has been decided upon.**—Once the operation has been decided upon, the hypodermic injection of morphia may be repeated if the colic demands it ; at this stage we do not mind its harmful influence upon diagnosis—the surgeon, however, must remember that the condition of the patient may show a false standard of strength owing to the morphia injected, and he must bear this in mind in deciding upon the extent of the operation.

A full description of the operative procedures is out of place in this article, but the following points may be emphasized :—

(1) That the operation should be performed as quickly as possible after the decision has been arrived at.

(2) That every possible precaution should be taken to minimize shock, the patient being surrounded by warm bottles, and the foot of the bed raised if there is much collapse.

(3) Any elaborate preparation of the skin of the abdomen is likely to do more harm than good, both from the exposure of the patient and the amount of pain sometimes produced. In my opinion, sufficient cleanliness can be obtained when the patient is on the operating table.

(4) During the operation every precaution should be taken to maintain the patient's body temperature, and although the general condition seems satisfactory, the surgeon should always operate as rapidly as possible, bearing in

mind the fact that every minute's delay on the operating table means a chance of recovery lost. Apart from local and lumbar anæsthesia, chloroform is the best anæsthetic to use.

(5) The aim of the operation is twofold: first, to ascertain the nature and seat of the obstruction by a rapid and systematic examination carried out with as little damage to the viscera as possible; and next, to overcome the obstruction, a proceeding that often requires considerable judgment and experience. In bad cases, instead of carrying out some long procedure of excision of bowel, etc., it is better to open the gut above the seat of obstruction, and to get the patient back to bed as soon as possible.

The steps necessary to deal with the obstructed gut must be postponed until the patient's condition will allow; for example, supposing one finds a gangrenous coil at the seat of obstruction, it is wiser to bring this outside the abdomen, and to tie in a glass tube at the upper end of the coil, so that the contents of the distended gut may easily escape. If these principles of treatment were adopted systematically in all serious cases, I am sure the mortality would be much diminished.

(6) In some cases the seat of obstruction cannot be found without more or less evisceration of the abdomen; this is especially the case in obese patients with considerable intestinal distension. Evisceration always produces severe shock, and should never be resorted to unnecessarily. It is very easy to pull out coils of intestine from an overcrowded abdomen; it is sometimes almost impossible to return them, and at any rate, so much damage is done that the patient's fate is settled before he leaves the operating room.

The operative procedures connected with the various cases of intestinal obstruction are not within the scope of this article. It is obvious that the constricting bands must be ligatured and removed, twisted coils be untwisted, and internal herniæ relieved. If a foreign body, such as a gallstone, cannot be pushed on into the large intestine, the small gut must be incised at the spot where the stone is impacted. I do not advise any attempt to squeeze the stone into some less irritated part of the small gut; as a rule, further damage to the mucous membrane is thus produced, and if much damage has been done to the wall of the gut at the point obstructed, its exact condition is best seen when cut into; if its condition is serious enough to render recovery doubtful, a glass tube should be tied in by the usual means.

Finally, one may state that if the practitioner has no great experience in abdominal surgery, the less extensive the operative procedure the better for the patient in all cases; this restricts the operation to the opening of the distended coil, and to the tying-in of a suitable tube for intestinal drainage.

After-Treatment.—Every step must be taken to relieve shock; plenty of warm bottles in the bed, the foot of which is to be raised, an enema of hot strong coffee and brandy, and hypodermic injection of strychnine if the heart shows failure. If the shock by this time does not improve, intracellular injection of hot normal saline solution should be carried out in addition; this is best done in the region of Scarpa's triangle rather than in the flank, and for the first hour at least two pints should be injected, followed by a pint an hour for twenty-four hours, or more if necessary. If the patient complains of pain, or is unusually restless, a hypodermic injection of morphia should be given; but this should not be repeated, as it tends to maintain intestinal inactivity. At the first sign of abdominal distension the administration of small doses of magn. sulph. and sod. sulph. (1 dr. each) every two hours should be given, or small doses of calomel at similar intervals. Nothing should be given by the mouth except a little water for the first twenty-four hours. If by this time flatus is passed, or a spontaneous motion occurs, food by the mouth may be cautiously given.

H. P. Dean.

INTESTINAL PARASITES.

Ankylostoma.—In order to prevent this disease, care should be taken to exclude from mines persons already infected, and the latrines should be regularly disinfected with chloride of lime, or solution of common salt sprayed over the surface. The medicinal treatment is by giving a dose of castor oil, followed by 30 to 60 gr. of thymol, this to be followed by another dose of castor oil in the evening, the patient meanwhile to take no food. Another plan is to give four successive hourly doses of 30 gr. of thymol.

Tape Worm.—The treatment of this condition is often unsuccessful because it is not carried out with sufficient care. It is advisable to recommend the patient to stay in his bedroom while under treatment, and to begin the same evening by taking no food after mid-day, except milk and soda water, to be followed by a dose of an aperient, such as 10 gr. of scammony resin, at bedtime. In the morning he should take a drachm of the extract of filix mas, which may be given in milk or in capsules, each of which contains 15 min. During that day, no food should be taken but milk and soda water, and at night another dose of scammony resin. The stools should be passed into muslin, and carefully washed under a tap, so as to ascertain whether the head of the worm has come away; it may be lost in spite of care, but if after three months no more joints are seen, a cure may be certified. The important point in the treatment is that no food except milk should be taken for some hours before and after the administration of the dose, and in order that there may be no temptation, it is better that the patient should be confined to his room. The prophylaxis of tapeworms depends upon the careful inspection of the meat supply.

Round Worms are best treated by santonin, which should always be given combined with an aperient such as scammony. It may colour the urine yellow, but does not give rise to poisonous symptoms when combined as above directed with a purgative. Turpentine and castor oil, 2 dr. to ½ oz. of each, constitute an excellent vermifuge, but the dose is somewhat nauseous.

Thread Worms.—Treatment, to be successful, must be continued for some time; it is not sufficient to give an enema and clear out the rectum, when the parent worms probably lie higher up out of its reach. It is necessary, after clearing out the lower bowel, to give a copious irrigation of infusion of quassia, or salt solution, so as to flood the entire colon, and this should be repeated every day for a week or a fortnight. The itching may be relieved by the use of ointment of carbolic acid (B.P.) or mentholeate. As a rule, these worms are easily got rid of; but from time to time cases are met with where they have persisted for years, and, being acquired in childhood, have remained to trouble the patient long after adult life has been reached. In these cases, the persistent administration of the following mixture for many months is worth trying:—

℞	Ferri Sulph.	gr. ij	Ac. Sulph. dil.		℥iij
	Magnes. Sulph.	gr. xl	Aq. Menth. Pip. dest.		ad ℥j

Two tablespoonfuls three times a day.

Robert Saundby.

INTRACRANIAL HÆMORRHAGE.—(See HÆMORRHAGE, INTRACRANIAL.)

INTUSSUSCEPTION.—As a rule these cases run a very special course, and the great proportion occur in the early stages of life—it is essentially a child's disease. The chief difficulty in the treatment is due to the fact that reduction of the telescoping is often obtained by means short of abdominal section. One must also remember that spontaneous reduction of the strangulated region may take place. When brought face to face with a case of intussusception, the practitioner feels that every method of reduction should be tried before resorting to operative treatment. It is very satisfactory when these cases are reduced

by such simple means; at the same time this occasional success has reacted injuriously upon the problem as a whole. Frequently, considerable and unnecessary length of time has been wasted in the endeavour to obtain reduction by these methods, so that when failure occurs and an operation is necessary, the child's condition has suffered by the time lost and by the ineffectual measures employed. Further, very often the greater part of the intussusception is reduced, and the practitioner is unable to feel the small amount that is still telescoped: he hopes for the best, and waits a few hours to see what happens. In many cases the intussusception either recurs or has never been quite reduced, so that one can only regard these efforts as most harmful in progressively weakening the child's resisting power.

Non-operative Treatment.—This consists in: (1) *Manipulation of the lump.* The child is given an anæsthetic, and the sausage-shaped tumour is gently squeezed, the position of the child being changed from time to time. If this fails, one may resort to (2) *An injection of liquid or air per rectum:* from half a pint to a pint and a half of fluid is injected, care being taken not to exert too much pressure or any sudden pressure. Some use warm water only, or warm saline solution, others warm milk; personally I prefer the latter. Some authorities inject air as well; this is easily done when a Higginson's syringe is used. I have employed a mixture of the two with advantage.

In nearly all cases the major part of the lump disappears. It is generally quite easy to reduce the part of the gut most recently involved. It is very difficult, however, to make quite sure that complete reduction has taken place, and by no means easy to feel just that small amount of telescoping which often remains. On the other hand, in these cases the gut in the region of the cæcum is often œdematous and thickened, so that sometimes the mistake is made that reduction is incomplete, whereas in reality the telescoping has been entirely reduced. Sometimes after partial reduction the child improves for a time, so that a false sense of security obtains, and one feels bound to wait and see what happens. In the greater proportion of cases the symptoms continue, showing that the intussusception has not been reduced, or has readily formed again. As each hour passes the condition of the child becomes less and less satisfactory, so that when it is obvious that the intussusception remains, the time for a successful operation has gone by. In some cases the child's condition is obviously so satisfactory that an attempt to try and reduce it under anæsthesia is justifiable. If the result is apparently favourable, one can wait a few hours without much anxiety.

Generally, however, the child's condition is a serious one. In these cases I am not in favour of withholding the simple methods, but it is most important that the practitioner should have everything in readiness to proceed with an operation if the simpler methods fail. In this way no time is lost, undue shock is avoided, and the child escapes a second does of anæsthesia.

Operative Treatment.—In the large majority of cases, therefore, I would advise the following routine: The child having been anæsthetized with chloroform, the lump is gently manipulated and some part of it may become reduced; an enema of boiled milk at the body temperature is then given, and if the surgeon is positive that the intussusception has been completely reduced, he is justified in sending the patient back to bed. If, however, there is any doubt on this point, an incision should be made in the middle line of the abdomen and the intussusception examined. Reduction should be carried out by gently squeezing the tumour from below upwards, and *not* by trying to pull the intussusception from its sheath. The major part can be relieved easily as a rule, but at the spot where it commenced, usually at the ileo-cæcal valve, it may be most difficult to effect a complete reduction.

The great point is to exert gradual pressure from below upwards, and to maintain the pressure for some time if necessary. After a few minutes' continual pressure, the œdematous condition may become less, and one is rewarded by feeling the gut quietly slip out of its condition of strangulation. In some cases it is quite impossible to obtain complete reduction. The best plan then is to open the gut just above the obstruction, to tie in a glass tube, and to hope that the vitality of the patient will be maintained sufficiently to withstand the ordeal of the next few days; but very few cases indeed recover when this stage has been reached. Any radical means, such as resection of the ileo-cæcal region, etc., would most certainly kill the patient.

H. P. Dean.

IRITIS.—The iris and ciliary body together form the anterior part of the uveal tract. Anatomically they are continuous structures, and have a common blood supply; it is therefore not surprising that they are frequently involved in the same inflammatory processes, though not necessarily to an equal degree.

The chief dangers which may arise in iritis are twofold :—

1. *Posterior Synechiæ* (adhesion of the posterior surface of the iris to the anterior lens capsule). When these adhesions involve the whole circumference of the pupil (*total annular synechiæ*), the normal circulation of the ocular fluids is interfered with, and glaucoma results.

2. *Lymph in the Pupillary Area* obscuring vision (occlusion of pupil).

The ciliary body, on the other hand, is the main nutritive organ of the eye which supplies the aqueous and nourishes the lens and vitreous body. In cyclitis, therefore, the chief dangers with which we have to contend are :— (1) Opacities in the vitreous ; (2) Opacities in the lens (cataract) ; (3) Organization of the inflammatory products thrown out into the vitreous (cyclitic membrane), which may lead to : (4) Detachment of the retina, and later, (5) Disorganization and shrinking of the globe (phthisis bulbi).

The treatment of iritis and cyclitis have so much in common, that they will be discussed together and considered under the headings: (1) General, (2) Local.

General Treatment.—This consists in rest, dieting, purgation, and diaphoresis. In every case of acute iridocyclitis the patient must, for the first few days, be confined to the house or bed. The diet during the height of the attack should be restricted to milk and easily-digested foods, but as soon as the severity of the symptoms have passed off the patient may be allowed to resume his ordinary diet ; stimulants are, as a rule, best avoided. In every case the treatment should be commenced by free purgation, and care taken to procure a daily action of the bowels.

There can be little doubt that profuse diaphoresis is of great importance in the treatment of acute iridocyclitis, relieving pain, enhancing the action of mydriatics, and tending to cut short the attack. The best means of securing a free action of the skin is by means of the hot pack combined, if necessary, with the subcutaneous injection of pilocarpine nitrate, $\frac{1}{12}$ to $\frac{1}{8}$ gr. If there is much pain and sleeplessness, five grains of Dover's powder, repeated if necessary, will often give great relief, and at the same time encourage the skin action.

Many ophthalmic surgeons recommend mercurial inunction in every case of iridocyclitis, irrespective of causation ; but the administration of the drug should be chiefly limited to cases intimately associated with syphilis, and to cases of sympathetic ophthalmitis.

Various diatheses play so important a rôle in the etiology of iridocyclitis that it is necessary, in discussing the general treatment, to refer to them somewhat fully. No attempt, however, will be made to deal with the detailed treatment of these constitutional disorders ; but, in passing, brief mention will be made of the drugs which we have found most generally useful.

Syphilis is the causal factor in more than one half of all cases of iridocyclitis, either in the hereditary or the acquired forms of the disease.

Mercury is the remedy *par excellence*, and its physiological effect must be obtained as quickly as possible, inunction being a convenient form of administering the drug. In the later stages, and in the more chronic forms, potassium iodide is of the greatest value, and must be pushed to large doses (if necessary to 90 gr. per diem).

Gonorrhœa.—In this disease the eye affection generally shows itself in the gleety stage, and is often associated with joint affections. It is hardly necessary to point out that the urethra must receive careful attention; this, together with the administration of potassium iodide and quinine, combined with local treatment, will, as a rule, rapidly alleviate the symptoms. In the severer and more intractable forms of gonorrhœa, with marked constitutional symptoms, the injection of the gonococcal vaccine, controlled by the estimation of the opsonic index, may be found of great value.

Rheumatism, especially in the chronic articular, rarely the acute form, is undoubtedly a frequent predisposing factor in inflammation of the iris and ciliary body. Without attempting to discuss the general management of rheumatic affections, we may mention that aspirin is frequently of very great value in the more acute eye affections. In the more chronic forms potassium iodide is especially valuable.

Gout.—In rare instances the gouty diathesis is the exciting cause of the eye disease. In addition to local treatment, the diet must be regulated, stimulants given with caution, and a visit to a suitable spa is to be recommended.

Tubercle.—This form of iridocyclitis is most usually of the chronic type, and frequently, but by no means always, associated with nodules in the iris. The treatment must be directed to the improvement of the general health, and cod-liver oil should be given.

There is every reason to suppose that injections of tuberculin, controlled by the opsonic index, has a great future in such cases as these.

Diabetes Mellitus may be the direct cause of a chronic form of iridocyclitis; and it is important to test the urine in every case where there is any doubt as to the causation. With local and general treatment these cases do well.

Metastatic.—A purulent form of iridocyclitis is not infrequently met with associated with some specific disease, e.g., cerebrospinal meningitis; or with some septic focus in other parts of the body, e.g., discharge from the ear. As a rule, the case develops into a panophthalmitis, with loss of sight and shrinking of the globe. In addition to local treatment, the primary source of infection must be eradicated as far as possible. If the panophthalmitis is acute, and pain a marked feature, and if the patient's general condition is otherwise satisfactory, the eye should be removed. Usually, however, the disease runs a more chronic course, free from pain, in which case the eye should not be excised.

Malaria and Relapsing Fever.—Quinine and arsenic are especially useful.

Traumatic.—(See EYE, INJURIES OF.)

Sympathetic Ophthalmia.—(See OPHTHALMIA, SYMPATHETIC.)

Local Treatment.—This consists in protecting the eye from light, by means of a pad and bandage or dark glasses; the use of atropine, hot applications, leeching and blistering. Atropine is our sheet anchor in the local treatment of acute iridocyclitis, its action being threefold: (1) It dilates the pupil, thus preventing or breaking down posterior synechiæ; (2) It paralyzes the ciliary muscle, and places the eye at rest; (3) By contracting the vessels of the inflamed iris and ciliary body, it tends to relieve pain and reduce the inflammatory process. In a recent case of acute iritis it should be used in the form of ointment or drops, 4 gr. to the ounce, every two hours until the pupil

is fully dilated; but once that object is attained, every four hours is quite sufficient.

It is always well to combine hydrochlorate of cocaine with the atropine in the proportion of 3 to 1, as by so doing we induce a maximum dilatation of the pupil, and at the same time increase its analgesic effects. Should, however, the pupillary margin become firmly adherent to the lens capsule, and refuse to yield to the weaker solution, the strength of the atropine must be increased to 8 gr. to the ounce to endeavour to break down the adhesions; it is seldom wise to use a stronger solution than this, or alarming symptoms of atropine poisoning may arise, e.g., dryness of mouth and fauces, fever, rash, hallucinations, and delirium. Should these symptoms unhappily arise, they must be met at once by stopping the atropine, by the injection of morphia, and the administration of strong coffee.

The use of the strong (8-gr. sol.) atropine should not be continued for more than two or three days, and at the end of that time we must return to the weaker (4-gr. sol). If adhesions have not yielded to the energetic treatment, they must be left; but it should be remembered that many pupils, which have apparently resisted all treatment, may dilate in a week or longer under the influence of the fourfold battery of atropine, hot bathing, leeching, and purging.

Substitutes for Atropine.—The use of atropine may lead to a marked local irritation, such as eczema or erythematous swelling of the lids and even the whole side of the face, with chemosis of the conjunctiva. In such cases a substitute for the atropine must be used; hyoscine, 1 to 2 gr. to the ounce, is the best; but if this also gives rise to irritation, duboisine, 2 gr. to the ounce, may be tried. The application of ung. zinci oxidi or ung. calaminæ to the inflamed skin will be found especially valuable.

Hot applications, either in the *moist* or *dry* form, are of the first importance. If the former be preferred, frequent hot boracic bathings answer admirably. If the latter, covering the eye with a pad of absorbent wool, previously heated by contact with a can containing boiling water; or the use of the Japanese muff-warmer, with a pad of absorbent wool between it and the eye,—are both convenient and efficient forms for its application. Maddox's electric pad is a light and extremely ingenious invention, which also works well when obtainable.

If the pain is acute, two leeches applied to the temple, not nearer the eye than the margin of the orbit, will give the greatest relief and, moreover, assist the atropine in dilating the pupil. The leeching may be repeated at intervals if the pain is a marked feature and the general condition of the patient one in which local depletion is not contra-indicated. Should the natural leech be objected to, or unobtainable, a satisfactory depletion may be brought about by artificial means, e.g., Heurteloupe's leech.

In the more chronic cases, counter-irritation by blistering the temple is often extremely beneficial. Treatment must be continued until all signs of inflammation of the eye have ceased; and even after the eye is white the use of atropine must be kept up for at least a fortnight, otherwise recurrence is extremely probable.

Operative Treatment.—The most serious complication in iritis is the occurrence of glaucoma. If glaucoma supervenes with a deep anterior chamber, and without complete binding down of the pupil to the lens capsule, a paracentesis must be performed to relieve the increased tension; and this can be repeated every second or third day if necessary.

If glaucoma with *complete posterior synechiæ* occurs in the acute stage, atropine must still be pressed in order to break down the adhesions; but if this fails, we

must make some opening in the iris to restore the intra-ocular circulation. An iridectomy in the acute stage will probably become closed by lymph, and a less severe procedure is advisable, viz., Fuchs' quadruple puncture, which should be followed by iridectomy when the eye is quiet. After several attacks, when the pupil is nearly blocked, an iridectomy is indicated in the interval between the attacks, to prevent the occurence of a complete posterior synechia and secondary glaucoma.

Again, when the pupil has been occluded by lymph, an optical iridectomy may be indicated to improve vision. *Ilbert Hancock.*

ISCHIORECTAL ABSCESS.—(See ABSCESS.)

ITCH.—(See SCABIES.)

JAUNDICE, CATARRHAL.—(See BILE-DUCTS, CATARRH OF.)

JAW, ANKYLOSIS OF.—(See TEMPORO-MAXILLARY JOINT, FIXITY OF.)

JAW, FRACTURES OF.

1. **The Mandible.**—Fracture of the mandible is usually due to severe direct violence, such as a kick or fall on the chin ; but portions of alveolus may be split off in extracting teeth. It is important to remember that this fracture is always compound when any part of the jaw covered by muco-periosteum is involved, and that sepsis is very likely to occur.

The fracture is most commonly found in the neighbourhood of the mental foramen or the socket of the canine tooth ; but it may occur at the angle, the neck of the condyle, the coronoid process, or the symphysis.

The nature of the injury is easily recognized if the parts are carefully examined ; but it is quite easy through carelessness to overlook a fracture of the jaw. On drawing down the lower lip, the line of the teeth is seen to be irregular, and on grasping the two fragments, crepitus and preternatural mobility can be easily made out.

TREATMENT.—When the fracture is near the canine socket, and there are several firm teeth in each fragment, the case will be best treated by means of a Hammond's splint (*Fig.* 20) ; with this object the practitioner should obtain the help of a dentist who has had experience in this kind of work. A model of both jaws is taken, and the lower one sawn through at the line of fracture ; the pieces are then fixed together so that the upper and lower teeth articulate correctly. In this way is obtained a model of the same size and shape as the jaw before it was broken. To the model a frame of soft iron wire is accurately moulded, the ends being soldered together. The splint thus constructed is slipped over the patient's teeth and fixed in position by means of several pieces of binding wire, about five inches long, and pointed at the ends to facilitate their passage between the teeth. The first wire is passed over the outer bar of the splint, between the first and second molars of the left side, and below the inner bar ; it is then bent round, being made to return over the inner bar, between the first molar and second

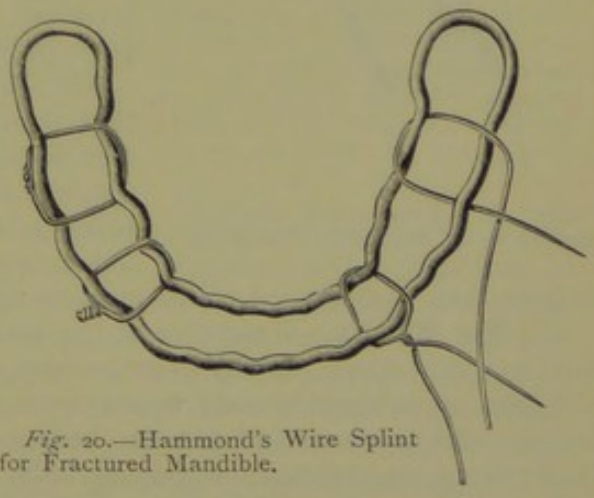

Fig. 20.—Hammond's Wire Splint for Fractured Mandible.

bicuspid, and under the outer limb; the two ends are then loosely twisted together. The same process is repeated on the right side of the mouth. The wiring is continued on alternate teeth, until the splint has a firm hold; it is not necessary to wire every tooth, and it is inadvisable to wire those in the immediate vicinity of the fracture. When all the wires have been passed, the ends are twisted up, cut short, and tucked away under the outer bar of the splint. After a few days they will probably require to be tightened up. The splint must be worn for a month, during which time the patient must keep his mouth clean by using a soft tooth-brush and an antiseptic mouth-wash. The parts must be inspected every few days, as a badly fitting Hammond's splint is worse than useless. The advantages of this method are that mastication and speech are but little interfered with, the "bite" is restored, the mouth can be kept clean, and the apparatus is out of sight. It can only be used when there are enough firm teeth in each fragment to enable the splint to obtain a good hold.

Instead of the wire splint to fit round the teeth, the dentist may prepare a metal cap to fit over them. This is fixed on with cement. The method is especially useful for children, or for older patients whose teeth are too close together for the convenient passage of binding wires.

In all other cases of fracture of the mandible, and when the services of a dentist cannot be obtained, the four-tailed bandage should be used (*Fig.* 21). A piece of bandage a yard long and four inches wide, with a hole two inches long in the middle of it, and with the ends split to within four inches of the hole, is applied so that the point of the chin is received into the hole. The hole should be about an inch nearer the upper than the lower edge of the bandage, so that the latter may lift the jaw rather than tend to drag it backwards. The two lower tails are tied over the top of the head, and the two upper ones behind the occiput, the two portions being subsequently knotted together to prevent slipping. If the upper tails are tied behind the nape of the neck (as usually recommended) they have a tendency to draw the anterior fragment backwards.

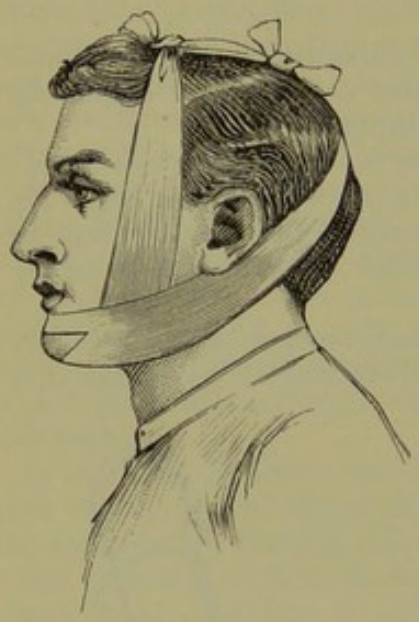

Fig. 21. — Four-tailed Bandage applied to a Fractured Mandible.

The objections to the four-tailed bandage are that mastication is interfered with, only liquid diet being possible, and that when there is much displacement, especially in oblique fractures, the bandage does not remedy it.

In cases of non-union or delayed union, a sequestrum or displaced tooth may be found between the fragments.

2. **The Maxilla.**—Fractures of the maxilla are usually due to a severe injury, such as a cart wheel passing over the face, or to a gunshot wound; fracture of the alveolus or tuberosity may result from dental extractions. The fracture may involve the antrum, and foreign bodies or displaced teeth may be lodged in that cavity, sometimes for long periods.

Fragments of bone or loose teeth should not be removed unless they are quite detached; the parts are so vascular that fragments which seem certain to necrose frequently unite perfectly. Should necrosis occur, it is easy to remove the sequestrum at a later period. Any displaced fragments should be pushed back into position, and if necessary fixed by means of the Hammond splint or denta plate. The mouth must be kept as clean as possible. *E. W. Roughton.*

JAW, NECROSIS OF.—Necrosis is more common in the mandible than in the maxilla ; this is due to the compact nature of the bone of the mandible and its comparatively poor blood supply ; it is also more exposed to injury.

In the maxilla very little repair occurs,—usually a gap remains when the sequestrum separates; but in the mandible the repair is remarkably complete ; practically the whole bone (excepting the alveolar processes) may be reproduced in cases of total necrosis. Necrosis of the jaws may result from injury, from dental disease, from the action of mercury or phosphorus, and may occur during convalescence from exanthemata (especially scarlet fever in children), and in the later stages of syphilis.

Traumatic necrosis often ensues upon a comminuted fracture, when a fragment has become separated from its vascular connections. Necrosis should be suspected when a fracture goes on suppurating and makes little or no attempt at union. Removal of the sequestrum will soon be followed by consolidation of the fracture.

Necrosis often results when an alveolar abscess strips up the periosteum instead of perforating it. In this way extensive necrosis may ensue, especially in deep-seated abscesses in the lower jaw. In the upper jaw extensive lifting of the mucoperiosteum of the hard palate may occur without producing necrosis, the bone being kept alive by the blood-supply derived from its nasal aspect.

Mercurial necrosis was a common affection in the days when syphilis was treated by excessive doses of mercury ; it is rare now, being only met with in patients peculiarly susceptible to the action of mercury or in those who have been dosing themselves unwisely. In cases of severe mercurial stomatitis the occurrence of necrosis may often be prevented by at once stopping the administration of the drug. The elimination of mercury from the system may be hastened by giving iodide of potassium.

Phosphorus necrosis occurs amongst those engaged in the manufacture of lucifer matches. The disease is caused by inhaling fumes consisting of phosphorous and phosphoric acids ; becoming dissolved in the saliva, these fumes reach the alveolar periosteum through carious teeth. The disease does not usually occur until the worker has been exposed to the fumes for a long time, probably never under a year, and it does not attack those who have sound teeth ; it is therefore very important that workers in match factories should have their teeth periodically inspected and promptly treated when found to be carious. Amorphous phosphorus is innocuous, and should always be used instead of the injurious yellow variety.

Exanthematous necrosis is most common after scarlet fever, and usually occurs in children about the age of five years. The necrosis does not commence until some weeks after the subsidence of the fever. The onset of the disease is very insidious : there are no active inflammatory symptoms, and pain is usually slight or absent ; fœtid breath is the first symptom to direct attention to the mouth. As a rule the necrosis is limited to the alveolus, and is often symmetrical.

Syphilitic necrosis is practically limited to the hard palate. It often causes perforation and impairment of speech ; but in some cases the necrosis is superficial, small fragments of bone come away, and the ulcer heals up completely. Before removing a large sequestrum from the palate, it is wise to inform the patient that the immediate effect will be to produce impairment of speech. Sometimes it is possible to remove the sequestrum through the nose, the mucoperiosteum of the palate remaining intact. As a rule a syphilitic perforation of the palate is best dealt with by a suitable obturator, care being taken to cover the opening and not to plug it. Plastic operations are generally inadvisable. Anti-syphilitic treatment must be conducted on the usual lines.

In all cases of necrosis of the jaws the following general indications for treatment must be borne in mind. The food must be adapted to the condition of the patient's mouth ; as mastication is in most cases impossible, the diet must be restricted to fluid or soft solids, such as milk, soups, eggs, mince, etc. Tonics such as quinine and iron are desirable, and the bowels must be regulated.

When possible the cause should be removed before the evil effect is produced. This is particularly the case with burrowing pus ; timely incisions must be made to prevent separation of periosteum, and free drainage must be secured. The mouth must be kept as clean as possible by the use of mouth-washes of Condy's fluid, boracic acid, sanitas, odol, listerine, etc. ; cavities in bone must be lightly packed with antiseptic ribbon gauze frequently changed.

Sequestra should not be removed until they are loose ; this can usually be determined by the sequestrum "rocking" when pressed with a probe. In cases of extensive necrosis of the lower jaw the sequestrum should not be removed

until the piece of new bone has attained sufficient strength to preserve the outline of the parts. Incisions for the removal of sequestra should be made inside the mouth if possible; when occasion necessitates their being made outside, they should be so planned as to leave as little deformity as possible. *E. W. Roughton.*

JAW, TUMOURS OF.—Tumours of the jaws are of many different kinds, owing to these bones (*a*) Bearing teeth; (*b*) Being largely covered by muco-periosteum; and (*c*) The upper jaw being hollowed out by a large cavity lined by mucous membrane.

It will be found convenient to arrange these tumours into. (1) Those connected with the teeth (odontomes); (2) Those arising from the gum and palate; (3) Those arising within the antrum; (4) Those growing from osseous tissue.

1. **Odontomes**—Are usually defined as tumours composed of dental tissues in varying proportions and different degrees of development, arising from tooth germs or from teeth still in the process of growth. Fully-formed teeth do not appear to produce tumours.

Odontomes are quite unintelligible without a brief reference to the method of development of normal teeth. Early in intra-uterine life the epithelium of the gum sends down a process into the subjacent tissue, extending along the whole length of the jaw (common enamel germ). From the deep aspect of the common enamel germ a number of flask-shaped epithelial bodies project (special enamel germs). Each is connected with the common enamel germ by a narrow band of epithelial cells (funicular bands). Each special enamel germ is met and indented by a differentiated portion of the subjacent connective tissue (dental papilla), the arrangement being comparable to a finger pressed into a flaccid indiarubber ball. The connective tissue around the papilla and enamel germ becomes fibrillated and forms a capsule (dental sac or follicle wall). The complete structure is called a dental follicle.

The following table shows at a glance the portion of the tooth and the kind of tumour attributable to each part of the embryonic structure.

Embryonic Structure.	Adult Structure.	Tumour.
Enamel organ	Enamel	Epithelial odontomes (multilocular cyst)
Papilla	Dentine and pulp	Dentomes
Follicle wall	Cementum	Cementomes
		Fibrous odontomes
		Follicular odontomes (dentigerous cyst)
Complete germ	Tooth	Composite odontomes

Epithelial Odontome.—This tumour originates in an overgrowth of portions of the enamel organ which do not get used up in the formation of enamel; these remain in the shape of epithelial cells (paradental epithelium), which may often be seen in sections of healthy gum. They grow in the shape of columns of epithelial cells, which undergo cystic degeneration, forming cavities in the bone containing mucoid fluid, often stained by admixture of blood pigment. These cysts distend the bone in an irregular manner, forming a more or less globular lobulated tumour.

The disease is very rare. It may occur at any age, but most commonly about the age of twenty. It grows very slowly; a tumour the size of an orange may have been growing for ten years. To the touch the bulk of the tumour is of bony hardness, but there are usually one or more spots where the growth can be indented with the finger owing to absorption of the bony covering. One or more of the cysts may burst into the mouth and discharge a dark brown fluid. Some of the teeth belonging to the affected portion of the jaw are very often missing, and those that are present are usually much disturbed in position. The adjacent glands are not enlarged, and the clinical course of the disease is essentially innocent.

The treatment consists in removing the whole of the diseased portion of the jaw; the operative procedure necessary to remove the growth must be determined in each case by its size and situation. If it be small and accessible from the mouth, it is better to operate from within, so as to avoid deformity from scarring.

An incision must be made through the mucous membrane of the mouth, and the growth completely gouged away, nothing remaining but a cavity with healthy bony walls. If the growth be too large to be dealt with from inside the mouth, it must be exposed through an incision on the face, so planned as to leave the smallest and least noticeable scar. The cavity in the bone is allowed to granulate up, so that the site of the tumour becomes filled up with fibrous tissue.

Dentomata are tumours composed of dentine attached to the root of a tooth.

Cementomata are bony masses formed by excessive ossification of the follicle wall.

Composite Odontomes are hard irregular masses composed of a disordered conglomeration of enamel, dentine, and cement. The growth of the various constituents of the tooth germ has apparently taken place without any co-ordinating supervision.

These three odontomes are exceedingly rare. Clinically they are either discovered accidentally on extraction of a tooth, or they present the characters of osteitis with necrosis of bone. If diagnosed they should be removed with as little damage as possible to surrounding parts.

The Fibrous Odontome consists of a greatly thickened follicle wall which has failed to ossify. It forms a mass of fibrous tissue enclosing a tooth, the roots of which are devoid of cement. These very rare tumours have been usually mistaken for fibrous or myeloid growths. The treatment is removal.

The Follicular Odontome or **Dentigerous Cyst** consists of a follicle wall distended with fluid and containing a tooth, the fangs of which are often imperfectly developed. These cysts occur most frequently in the lower jaws of children. Whilst they are still small and covered by a thick layer of bone they feel solid, and may be easily mistaken for solid tumours; sooner or later the bony wall becomes so thinned that it can be indented with the finger and the cystic nature thereby recognized; one of the permanent teeth is often found missing from the dental arch. When these cysts occur in the upper jaw they often project into the antrum, and may be indistinguishable from other cystic swellings in this situation until they have been opened.

TREATMENT.—The necessary incision can nearly always be made from inside the mouth, but in large or awkwardly placed cysts it may be necessary to make the incision outside. A portion of the bony wall must be excised with stout scissors or bone forceps, and the contained tooth and cyst wall removed. The expanded bone may then be squeezed in so as to diminish the size of the cavity; the latter must be packed with gauze, which should be removed daily, and the cavity syringed out until it has granulated up from the bottom.

2. **Tumours of the Gum and Palate.**—The word "epulis" is used to designate any tumour growing on the gum; it is well, therefore, always to prefix an adjective descriptive of the nature of the tumour.

The commonest growth is the *fibrous epulis*, which springs from the periosteum of the jaw and sometimes involves that part which lines the socket of a tooth (periodontal membrane). It is a slowly-growing swelling, of the same colour and consistence as the normal gum, somewhat pedunculated, and often found near a carious tooth or stump. It often separates two adjacent teeth. Many examples of this common epulis contain a few spindle-shaped and round cells as well as fully formed fibrous tissue; they are usually softer and grow rather quicker than the purely fibrous variety, and may recur after removal. The *myeloid epulis* is softer and darker in colour than the normal gum; it grows from the subjacent osseous tissue, and contains typical multinucleated giant cells; it occurs in young subjects, grows fairly quickly, and recurs unless freely removed. The *vascular epulis* consists of fibrous tissue, containing a large number of dilated thin-walled vessels. It is soft and compressible, of a bright red colour, and very prone to bleed when damaged by a tooth-brush or by hard pieces of food. It is quite innocent, and does not recur after removal.

There are one or two points worthy of attention in the treatment of the different kinds of epulis. The more the growth resembles the normal gum in colour and firmness, and the slower its rate of increase, the more limited may be its removal; thus the simple fibrous epulis may be scooped off with a sharp spoon; any carious tooth in the vicinity should be extracted. When a sound tooth is much displaced by a fibrous epulis, the tooth should be extracted and placed in sterilized water; the contents of the socket are then scraped out,

after which the tooth may be re-implanted. The softer and more rapidly growing tumours should be more freely removed, a thin layer of bone being included; this is especially important in the myeloid tumours. The vascular epulis may be cured by repeated applications of powdered tannin, or by the actual cautery. It is always well to examine an epulis microscopically after removal.

Papillomata are rather rare on the gum and hard palate, but are not very uncommon on the soft palate near the base of the uvula. These are innocent tumours, but when exposed to irritation in old subjects they may become epitheliomatous.

It is wise to remove them. As a rule they are pedunculated, and may be snipped off with scissors; removal may be attended with fairly profuse bleeding, requiring the actual cautery to arrest it.

Adenomata are the commonest tumours of the palate, being met with in children about the age of puberty and in older subjects between forty and fifty. In structure they are complex, closely resembling the common parotid tumour. They are commoner in the soft than in the hard palate; their growth is very slow, and they produce so few symptoms that they usually remain a long time before giving any trouble or even being noticed. They are rounded or oval, with their long diameters from before backwards; they are sometimes hard, but usually quite elastic; the mucous membrane covering them is as a rule healthy, freely movable, and unbroken.

These tumours can nearly always be enucleated; an incision is made through the mucous membrane, and the tumour shelled out with the finger or a blunt dissector.

Sarcomata of the palate are rarer than the adenomata; they are usually of the round-celled variety, and highly malignant; they occur in persons past middle life. Their rapid growth distinguishes them from the innocent adenoma.

A sarcoma limited to one side of the hard palate may be successfully dealt with by a partial excision of the jaw, the orbital plate being left undisturbed. Large tumours involving both jaws or extending backwards towards the tonsil or pharynx can rarely be operated on with reasonable hope of success.

Epithelioma usually begins as a small ragged ulcer close by a carious tooth which has been a long-continued source of irritation to the gum. After removal of the offending tooth the ulcer does not heal as it would were it of a simple nature, but tends to spread to the palate, cheek, or floor of the mouth. Induration of the base of the ulcer soon occurs, but owing to the natural hardness of the gum it cannot be appreciated until the ulcer has extended to the adjacent soft tissues. As the ulcer increases in size, its edges become ragged and everted, and its surface foul and sloughy. Before long the glands in the neck become enlarged, hard, and fixed.

Epithelioma of the palate sometimes occurs in the medullary form; it then forms a distinct tumour, which grows rapidly, and may attain considerable size before it ulcerates. This variety is extremely malignant.

Radical treatment of epithelioma of the gums or palate is available for early cases only. In advanced cases, when the disease has spread beyond the gums or palate to adjacent parts, or is attended with considerable glandular disease, operative treatment cannot be undertaken with much prospect of success. The paramount importance of early diagnosis is therefore obvious. No ulcer of these parts which refuses to yield quickly to simple remedies should be allowed to go on without a piece of its edge being removed for microscopic diagnosis. Whilst the disease is still limited in extent there is good hope of a very free removal resulting in a permanent cure. In the upper jaw it will usually be necessary to remove the whole bone, as epithelioma of the gum or palate is very apt to involve the antrum. In the lower jaw the alveolus must be freely removed; it is a great advantage to the patient, if it is possible, to save the lower border of the jaw; when this can be done the dentist can subsequently provide a very useful substitute for the lost parts. When the whole depth of the jaw has been removed this cannot be done, and the patient's condition is one of considerable discomfort. The cervical glands should be dealt with on the same lines as in epithelioma of the tongue (see TONGUE, CARCINOMA OF).

3. **Tumours of the Antrum.**—

Cysts are not uncommon in the antrum. They are usually attributed to distension of a mucous follicle. They produce no symptoms until they are large enough to distend the antrum. By causing absorption of the facial aspect of the superior maxilla a tumour slowly develops on the cheek ; cysts rarely or never bulge into the orbit, palate, or nasal cavity. On transillumination the affected side is more transparent than the other side, as the contents of the cavity are usually clear, and some of the opaque bone has been absorbed. These cysts contain a more or less clear viscid fluid, from which cholesterin crystals often deposit.

TREATMENT.—This consists in incising the most prominent part of the cyst from within the mouth ; the opening should be large enough to give free access to the cavity, so that the fibrous cyst wall may be completely detached and removed from the distended antrum. A large opening should then be made through the inner wall of the antrum, so that during the healing process there may be free drainage into the inferior meatus of the nose. The nose should be syringed out daily with a weak antiseptic lotion, and the incision in the mouth allowed to close up.

Solid Tumours of the antrum are nearly always malignant ; the records of surgery contain accounts of innocent tumours, such as fibromata, enchondromata, neuromata of the infra-orbital nerve, etc., distending the antrum, but these are so rare that they are of very little clinical importance.

Sarcomata are the commonest and most important tumours of the antrum ; they may start from the cancellous tissue of the bone and grow into the cavity of the antrum. Such tumours are either myeloid or round-celled in structure ; spindle or round-celled sarcomata may spring from the periosteum lining the antrum. However originating, these tumours soon fill the antrum, and then begin to invade neighbouring cavities by absorbing the nasal, orbital, or palatal aspects of the bone ; thus a tumour develops on the face, the nose becomes blocked or bleeds repeatedly, the eye becomes displaced and the arch of the palate depressed on the affected side ; teeth may become loose, and, after extraction, fungating granulations may protrude from the vacant socket.

Epithelioma of the antrum may be primary or secondary. The primary variety is rare ; it forms a very vascular tumour of a villous nature, which fills up the antrum and rapidly perforates its walls in all directions, causing at the same time a certain amount of distension of the cavity, but not nearly so much as the sarcomata. It may be composed of columnar cells like those covering the mucous membrane of the antrum, or of spheroidal cells like those lining the mucous glands. Secondary epithelioma is nearly always of the squamous variety. It is a very insidious disease ; no definite tumour is formed, and there is no distension of the antral cavity, but there is extensive and very rapid destruction of its bony walls. The disease is often first discovered on extracting a tooth with a piece of soft growth attached to its roots. The socket does not heal, but soon becomes filled with a fungating mass. It will then be found that the socket is in direct communication with the antrum, and that the latter is extensively diseased. To this disease the name "boring epithelioma" is often applied. In all cases of epithelioma of the jaws the disease is very rapid, and the lymphatic glands in the neck are early and extensively diseased, so much so that the patient is often led to seek advice on account of the glandular swelling, the primary growth being discovered only on careful examination of the mouth.

The diagnosis of tumours of the antrum is often difficult. The history of the case must be carefully considered and a thorough physical examination made, noting especially the condition of the cheek and the characters of any swelling there may be on the face or inside the mouth, and the condition of the hard and soft palate ; the nasal cavity must be examined with head mirror, speculum, and probe ; in doubtful cases the finger may be introduced into the nasopharynx to feel for any extension of growth in that direction. Sometimes the diagnosis may be cleared up by extracting a tooth or by making an exploratory incision in the canine fossa and removing a piece of growth for microscopic examination. The glands in the neck should always be palpated. Transillumination may give very useful information. Having made a complete examination, it is then necessary to consider (*a*) whether the swelling is solid or fluid, and (*b*) whether it is innocent or malignant.

(*a*). Cystic distension of the antrum nearly always forms a more or less uniform elastic swelling on the face, most prominent in the region of the canine fossa, and hardly ever encroaching upon the orbit, palate, or nose. Transillumination generally yields increased transparency, though sometimes cystic contents may be opaque enough to stop the light coming through. In case of doubt a fine trocar should always be introduced into the most prominent part of the swelling before proceeding to any major operation.

(*b*). So long as the tumour is confined within the antrum much difficulty will be experienced in determining whether it is innocent or malignant; but when a malignant tumour has passed beyond the cavity of the antrum, it grows with great rapidity, insinuates itself extensively amongst the bones of the face, creeps through the fissures and foramina, and encroaches on the orbital and nasal cavities. Obstruction to nasal respiration and repeated attacks of epistaxis are suggestive of malignancy. Early and extensive infiltration of the lymphatic glands point to epithelioma.

TREATMENT.—All antral tumours should be removed if it is surgically possible to do so. Slowly growing innocent tumours may, when small, be removed with as little sacrifice of sound tissue as possible. When growing from the surface they may be cut off, together with the piece of bone to which they are actually attached. Large innocent tumours require removal, together with the whole or a large portion of the maxilla.

Malignant antral tumours always necessitate complete extirpation of the maxilla, although sometimes the surgeon may be able to spare the malar bone or the orbital plate. Thorough and complete removal of the tumour is necessary, no partial or piecemeal operation being permissible.

Before attempting to remove the maxilla the surgeon should satisfy himself as to the accuracy of the diagnosis ; he must also determine whether the growth is one that can be removed with a reasonable prospect of success. No definite rules can be formulated, each case requiring separate consideration on its own merits. When the tumour is of many months' duration, hard, well-defined, limited to the maxilla, and the skin over it freely movable, it may be regarded as one favourable for removable. If on the other hand the growth of the tumour has been rapid, its consistency is soft and ill-defined, its vascularity great, the skin over it involved, the orbit, nose, nasopharynx, or temporal region invaded, the cervical glands enlarged, the patient old, weak, or emaciated, the case must be considered unsuited for operative interference.

The operation of excision of the upper jaw is much facilitated by performing a preliminary laryngotomy and plugging the lower pharynx with a sponge. The excision can then be carried out deliberately without fear of blood choking the patient, and with much greater certainty of completely extirpating the disease. In all cases of epithelioma the glands in the neck should be cleared out at a subsequent operation.

4. **Tumours arising in the Osseous Tissue.**—Sarcomata are the commonest tumours arising in the bony tissue. They may be myeloid, spindle-celled, or round-celled. In the upper jaw they are very prone to invade the antrum, and nothing need be added to what has already been written concerning sarcoma of that cavity.

In the lower jaw sarcomata may be central or peripheral. Central sarcomata may be of the usual myeloid or round-celled varieties so often met with in other bones ; they may also arise in connection with the follicles of developing teeth, especially the first molar. The myeloid tumours are malignant, but their malignancy is not great. They occur mostly in young subjects, grow rather slowly, and expand the bone evenly ; they can usually be successfully removed by a gouging operation without breaking the continuity of the jaw.

Round-celled sarcomata are much more malignant ; when growing inside the bone they cause rapid expansion and absorption of the plates of compact tissue, so that in a few weeks or months the tumour may fungate into the mouth or on the face. Early and free removal of the affected portion of bone, without any attempt to preserve the outline of the bone, is the only measure that offers any prospect of success. Recurrence is very common.

Periosteal sarcomata may be spindle-celled or round-celled. Spindle-celled sarcoma is one of the commonest tumours of the lower jaw. It begins as a small swelling on the gum ; as it grows the teeth become displaced and loosened from

their sockets, and the tumour assumes a lobulated outline, varying in colour from a light pink to a dark purple. If allowed to grow it may assume very formidable dimensions, forcing the mandible downwards and pushing the tongue backwards towards the pharynx, causing death by dyspnœa or starvation. The disease must be freely excised with a wide area of healthy bone at the earliest possible moment.

Osteomata of the jaws are not common. In the lower jaw they are usually met with in the form of ivory exostoses. They may be sawn off flush with the jaw with a fine saw.

In the upper jaw bony tumours are more frequently of the diffuse kind, sometimes called leontiasis ossea. The disease often involves all the facial bones on both sides, and is then not amenable to treatment. In some cases the disease is limited to one maxilla ; it may then be successfully removed by a more or less partial excision. *E. W. Roughton.*

JOINTS, TUBERCULOUS DISEASE OF THE.—It makes no difference what the joint is ; if it is the subject of tuberculous disease it must be kept at rest.

Plaster of Paris and other Splints.—Splints made of common house-flannel, hardened by plaster of Paris, are very useful in the treatment of tuberculous joints. The flannel having been duly cut into shapes and laid ready, an inch or so of water is poured into a basin and fresh plaster is shaken in until it forms a little island in the middle ; then it is quickly stirred in until a creamy mixture is made with which the flannel is to be soaked. It is well to have two pieces of shaped flannel on each side of the limb, one of which has a surface daubed with the cream on one side only, the dry side being placed next to the bare limb, and on the outside of this is laid the piece which is thoroughly soaked with the cream. A nurse, or other assistant, holds these two pieces close against one side of the limb, whilst the surgeon quickly fixes them in place by a few turns of a muslin roller. Without any loss of time the other side of the limb is similarly treated, only in this case the splints are put on outside the muslin bandage which held the other pieces in place. If the splints have been put on nicely, there will be a space running up the front of the limb between their borders, which is covered in simply by muslin, and then, or next day, the surgeon may run the scissors up this gap, take off the splints, trim their edges, and loosely re-apply them.

There is one great advantage with regard to these splints : they can be made at a moment's notice and of any length. It may happen that if they are being fitted on a tall man, or a very large limb, the first side will not be finished off before the plaster in the basin has become as hard as a rock, so that a second mixing will be needed. The plan of winding plaster-laden bandages round and round a limb, without any provision for their prompt removal in case of need, is unsatisfactory and obsolete.

But of all ways of fixing an inflamed joint, there is none so good as that of leather side-splints. These splints are made of undressed cow-hide, shaped to a paper pattern, and soaked in hot water and vinegar. Thus treated, the leather becomes as limp as wet brown paper, and after being bandaged on the limb in two side-pieces, it is left on for twelve or twenty hours to harden, and it may afterwards be lined with wash-leather, and fixed with straps and buckles.

Effect of Prolonged Rest upon an Inflamed Joint.—The question is likely to be asked of the practitioner whether there is not a risk of the joint being left permanently stiff if it is locked in a splint for month after month. The answer is that it is *inflammation* and not *rest* which leaves a joint stiff, and that the first thing necessary towards getting rid of the inflammation is to obtain perfect rest. That if a limb were, by mischance, kept at rest after the inflammation

had passed off, the worst that could happen would be the occurrence of some fibrous adhesions which could easily be got rid of. But that if the inflammation continued, a growth of granulation-tissue would destroy the softer part of the joint and the ends of the bones themselves, and that these granulations might grow into solid bone and weld the joint into a single mass.

Through the whole field of surgery runs the unvarying principle that the first thing necessary for an inflamed organ is to rest it. The inflamed breast is rested by the child being weaned; the inflamed eye is rested by the light being shut out by Nature or by Art; the inflamed larynx is rested by the call to silence; and for the inflamed joint, whether it is in a gouty great-toe, in a golfer's elbow, in a cricketer's knee, or a child's hip, *rest* is the one thing needful.

The question will probably be asked also if massage or electricity, or the two together, might not be of service to the wasting limb. But inasmuch as a limb cannot be subjected to massage unless it is taken out of a splint, handled, and moved about, massage must not be advised so long as a remnant of inflammation is left. Nature begins her treatment of a diseased joint by starving the muscles into a condition of feebleness and inactivity; a surgeon would be flying in her face, as it were, by having them roused and excited. But when the inflammation has passed away, the help of these useful measures may well be sought. And that will be the time also for alternate douchings with hot and with cold water, for gentle passive movements, and for the carrying out of well-considered exercises, either in or out of a gymnasium. But such treatment is too often resorted to before the proper time.

When may the Joint be set free?—After a joint has been for some time fixed in a splint, and cause for alarm has passed away, the question arises as to when the patient may have free use of the limb once more. If the surgeon was wise at the beginning of the treatment, he made no promise as to when the joint should be set free, and he is, therefore, less likely now to be hurried into doing something which he might afterwards regret. He takes off the splint and has a look at the joint, which, because of the wasting of the muscles, may now seem strangely large. Everything has been going on well: there is no spot where bulging has taken place—which might mean that the joint still held some "water," or, worse, that a cold (tuberculous) abscess was forming. If the joint is still inflamed, the skin over it is hotter than it should be; but the surgeon must remember that if a splint and bandage have only just been taken off, the skin is sure to be warmer; he gives it time to cool down, therefore, and afterwards satisfies himself that there is no unnatural warmth. Then he presses upon those parts of the joint which are nearest the surface, or gently squeezes them between his finger and thumb. As a rule the tender places are in the grooves between the two bones forming the joint. In the case of the *knee*, the tender spot is almost certainly over the internal semilunar cartilage, a spot which is found by gently bending the leg and feeling for the hollow beneath the front of the internal condyle. If there is no flinching when this part is pressed, it is unlikely that any inflammation remains. In the case of the *hip*, the surgeon makes gentle pressure upon the front of the capsule, which is in the crease of the groin behind the femoral artery. Tenderness in the *shoulder-joint* would be found by pressing around the globular head of the bone beneath the acromial process. In the *elbow* it would be best made out where the synovial membrane comes close up to the skin around the head and neck of the radius, just below the outer condyle of the humerus. *The wrist-joint* is examined by pressing with the finger and thumb sideways between the styloid processes of the radius and ulna and the first row of the carpal bones This is sure to find out any tenderness in the radio-carpal joint, and a gentle squeeze through the middle of the wrist reveals inflammation in the large synovial membrane of the carpus.

If the skin is not warmer than it should be, and there is no bulging about the joint, and if no tender spot is to be made out by pressure, the chances are that the trouble has passed off, and that movements may be restored to the joint. But this return to freedom and activity must be gradual. It would not do to say, "Now you are all right; throw away the splint and use the joint." At first the splint should be left off only at night, after the person is in bed, and it should be put on again before he gets up in the morning. Then, if all goes well, it may be taken off in the evening and not put on again till next day. Then it need be worn only when he is going out of doors, and so on, a little more freedom being allowed each week, and the surgeon keeping his eye on the joint the while. During this time, judicious massage will be helpful in bringing back tone and strength to the muscles of the limb. And, perhaps, day by day, a little movement may be given to the joint, so as to help on the return of activity and freedom; but this should be done with much care and gentleness. No risks must be run; far better is it that the limb be allowed to "shake itself loose," as Hugh Owen Thomas used to say.

General Treatment.—It may be said that cream, butter, bacon, and other fatty foods are all good for tuberculous patients; but there is probably nothing quite so valuable as cod-liver oil. And if a patient says that he cannot swallow or digest the oil, he may often be tricked into taking it by giving it with sardines. As soon as the sardine-box is opened, the preservative cotton-seed oil should be emptied away and the box filled with fresh cod-liver oil. For a tuberculous infant, systematic inunction with cod-liver oil, every evening after the warm bath, is useful. The smell is apt to be objected to, but when the child is found to be improving in weight and appearance this objection is disregarded. It need hardly be said that fresh air and sunshine are of prime value in the treatment of the tuberculous patient.

In those cases of tuberculous invasion which are hanging fire under the ordinary lines of treatment, it will be advisable to call in the help of the "bacterio-therapeutist," who, by investigating the power of resistance of the blood to the bacillary invasion, may by his methods so increase its strength as to enable the colourless corpuscles to carry on a completely successful attack against the bacilli; and should the case be one of those unhappy ones in which septic micro-organisms have found entrance to the joint and have joined hands with the bacilli of tuberculosis, he may give very material help by his vaccination or inoculations. At any rate, his help must not be ignored.

The Shoulder-joint.—The fore-arm and hand should be supported by a broad sling, and a poroplastic or leather splint should be moulded over the shoulder, reaching to the mammary and to the scapular regions, and extending half-way to the elbow. The arm and hand should be fixed to the chest by a binder and secured beneath all the clothes; it could not be brought through the sleeves without harmful disturbance. When the acute attack has passed off, the hand may perhaps be set free, but the elbow must still be fixed to the side. No oils or liniments applied to the skin are likely to be of any service, and the practitioner must be content to see the muscles of the shoulder-blade and arm steadily wasting without wishing to try the effect of massage or electricity.

If the joint-pains are very severe, menthol may be gently rubbed over the neighbouring skin, or a couple of leeches may be applied. If the disease quietly continues and the tuberculous granulation-tissue breaks down, a chronic "abscess" forms in the joint, and it will be likely to find its escape through the cuff of synovial membrane which passes out with the tendon of origin of the long head of the biceps, or it may point anywhere along the border of the deltoid or near the coracoid process. The collection must not be allowed to break through the skin lest septic germs should enter the joint, but it should be removed

by aspiration or by direct incision, as described under the heading HIP-JOINT (*vide infra*). In due course the cartilage disappears, and granulations, finding their way through the articular layer of bone, render the adjacent surfaces of scapula and humerus rarefied, as is shown by the Röntgen rays. But if the health remains good, and the arm is still kept at rest, the disease may completely clear up, the bones becoming solidly joined together as in the welding of a simple fracture. With this result the surgeon may well be content, for, as the scapula plays easily over the chest wall, the movements of the limb will not be very seriously hindered. But if the disease continues in spite, may be, of anti-bacterial vaccination, and if the skiagram shows steady advance of the process of disintegration, and the general health seems unable to cope with the persistent discharge, excision should be no longer delayed, and the cavity should be thoroughly scraped, flushed, and dried. This operation gives a freely movable and useful limb. I have never met with a case which called for amputation.

The Elbow.—The forearm must at once be bent to a right angle and the limb secured in a splint reaching three-quarters of the way up to the shoulder and almost down to the wrist; for a splint which occupies only about the middle third of the limb does not suffice to keep the joint absolutely quiet. Should the disease prove intractable, excision may be done. Excisions of the shoulder and the elbow give excellent results.

The Wrist-joint.—The hand and fingers should be fixed and worn in a sling. A wooden splint is not convenient, as it shifts its place, and the bandages get loose and dirty. Nor does plaster of Paris answer, as it is hard and uncomfortable, and is apt to become cracked and soiled. Nothing does so well as a moulded splint of undressed leather. It can be made to fit as close as a glove, and if it is covered with black kid it may be made to look smart. A splint for the wrist should be long enough to reach from half-up to the elbow down to the middle of the fingers, for if the fingers and thumb are left free the hand cannot get its full measure of rest, and unless this is secured the trouble may persist indefinitely.

Tuberculous disease of a **Finger-joint** is best treated by a leather splint, the hand being worn in a sling.

Hip-joint Disease.—The patient must at once be placed flat on his back and the limb be secured against movement. This may be done by a stirrup and weight; but if there is already persistent flexion, so that when the thigh is brought down flat upon the mattress the loins become arched, *the traction must be made in the line which the thigh takes when the loins are flat and the pelvis is squared.* Thus, if when the loins are flat the thigh is found flexed and adducted, the traction must be in an elevated direction and across the opposite limb, the thigh being supported on an inclined plane of firm pillows. But if a Thomas's splint of the correct size for the case is at hand, it should at once be adjusted and applied; this is far better than the stirrup, and I allude to the stirrup-treatment first only because it can be arranged at a moment's notice, and used whilst the Thomas's apparatus is being got ready. The stirrup and weight do not pull asunder the inflamed tissues of the joint—that is mechanically impossible—they merely fix the limb and protect it against muscular startings and accidental disturbances: Thomas's splint does exactly the same thing. The faulty position of the thigh is kept up by the effusion which has taken place in the capsule of the joint, and as it undergoes absorption so does the thigh come down. Gradually, therefore, under the influence of the stirrup and weight or of the iron splint, the surgeon is able to bring the limb down flat and straight.

If, as the result of acute effusion into the joint, the pains are unusually severe, they may be relieved by the introduction of a small cannula and trocar into the bulging capsule. In a more advanced stage acute pains are likely to be due to ulcerated surfaces of the bones being irritated by muscular contractions.

Possibly these may be lessened by fomentations or by the re-adjustment of the splint.

One great advantage of the treatment by a Thomas's splint is that as soon as the thigh has been brought down flat and the acute pains have passed off, the patient can be allowed out of bed, can be carried out of doors, and, due precautions being taken, can be permitted to walk on crutches—the foot of the sound side being raised by a four-inch patten or a thick-soled boot. It is highly important that the subject of tuberculous disease be out in the open-air, and with the use of a Thomas's splint this can generally be arranged.

Hip-joint "Abscess" is the result of the breaking down of tuberculous granulation-tissue with the addition of serous exudation. This is not an abscess in the usual sense of the word, in that it contains no pus : as a rule it forms quite quietly, and, tracking forward, is apt to point in front of the great trochanter. It may, however, bulge in the gluteal region, near Poupart's ligament, or at some distance down the thigh. The surgeon should constantly be on the look-out for such collections, and he must not allow them to break spontaneously, lest septic organisms should enter the joint and the patient should sink under the double infection. The abscess should be treated by aspiration, the puncture being made through healthy, unthinned tissues. The aspiration may have to be repeated several times, and the needle should be large enough to allow the easy passage of thickish material. Vaccination by sterile culture of the particular germs may be undertaken if suppuration has occurred.

If, notwithstanding the repetition of aspiration, fluid collects and the thinning skin threatens to give way, either a free incision should be made, the cavity being scraped out and flushed with iodine water and then tightly closed, or else the head of the femur should be excised and the joint and the abscess-cavity thoroughly scraped over, dried, and firmly closed by deep suturing.

Excision of the Head of the Femur for tuberculous disease would rarely be called for if the disease were diagnosed promptly and efficiently treated ; but unfortunately many of these cases are allowed to drift. Some surgeons advocate very early resort to excision in order that the tuberculous focus may be entirely removed. But experience has abundantly shown that if the limb is kept at rest and the general hygienic conditions are maintained, Nature may be trusted to effect a cure in her own quiet way. Probably those surgeons who have had most experience with Thomas's splints in hip-disease will be least inclined to endorse the treatment by early excision. Excision is fully justified, however, when long-continued discharge from sinuses suggests that extensive ulceration (and possibly necrosis) of the femur or of the acetabulum has occurred ; when the shortened and inverted condition of the limb, with other signs, shows that the head of the femur has been dislocated upon the dorsum ilii ; when digital examination by the rectum reveals the fact that perforation of the acetabulum has taken place and that an abscess is bulging towards the pelvis, or when, together with long-continued suppuration, the mutual contact of ulcerated surfaces of bone is wearing out the patient with distressing pain.

Resection of the Head of the Femur may be conveniently done through an incision over the anterior and outer part of the joint, and especially so if the operation is resorted to before septic sinuses have formed. The neck of the femur having been divided and the head of the bone brought out, the cavity should be scraped clean and dried, and the wound sewn up tight. But if staphylococci as well as bacilli are already infecting the joint-cavity, it is probable that the resection may be accomplished by enlarging one of the sinuses or by joining two of them so as to obtain more room. If the attack is made from behind, through the gluteus maximus, heed must be given that the great sciatic nerve is not injured. And if, as is probable, tuberculous softening has implicated also the

os innominatum, the affected surfaces must be thoroughly scraped over, and the sharp spoon must also be used for the removal of the granulation-tissue which lines the sinuses and fills the crevices about the bones. The area should then be dried with swabs of gauze, and finally washed over with a solution of chloride of zinc of about 10 gr. to the ounce. A large drainage tube should be left in for a few days, the hip being packed around by pads of absorbent wool firmly bandaged on.

If, after the operation, the local and general conditions improve only to a certain extent, it may be advisable to open up the wound and scrape the surfaces once more, draining again, or leaving the cavity open and packed with antiseptic gauze. But if there is no favourable response, if the suppuration persists, and the continual absorption of small doses of septic material renders the patient cachectic and anæmic, the liver, perhaps, becoming large and the urine albuminous, the question arises whether it may not be needful to remove the wasted, hopeless limb through what is left of the hip-joint. This is the only treatment for some of these old-standing cases: if one watches and waits too long, the child is at last carried away with what the old practitioners called colliquative suppuration and diarrhœa; whereas, after amputation, rapid and complete recovery may ensue, the albuminoid changes steadily clearing away.

Amputation at the Hip-joint is most conveniently performed (after a preliminary ligation of the common femoral vessels) by cutting straight across the thigh a little above the middle, and by enucleating the remaining part of the femur through an incision running down to the bone from the top of the great trochanter.

The Knee-joint, on account of its liability to sprains and direct hurts, is often the seat of tuberculous disease. Immediately that the knee is found hot, swollen, or tender, the patient should be placed in bed and a splint of house-flannel and gypsum should be applied, as described previously. As a rule, splints for an inflamed knee are not made long enough. A splint, for instance, which reaches a third of the way up the thigh and a third of the way down the leg does not absolutely prevent the knee from moving: it should go nearly up to the groin and almost down to the ankle. The complete rest thus obtained may promptly put an end to the disease; but if it does not, a Thomas's knee-splint should be ordered, so that, with a raised sole or patten beneath the other foot, the patient may be allowed to walk out. He certainly should not be kept in bed, or even in-doors. If, when the case first comes under treatment, the leg is more or less flexed upon the thigh, and possibly rotated outwards, no attempt should be made forcibly to straighten it under an anæsthetic. It must be fixed up in the faulty position, and as the inflammation quietly subsides and the intra-articular swelling diminishes, so will it become possible to get the limb straighter. Painting the skin of the knee with tincture of iodine has no material influence on the inflamed joint, nor has the application of camphorated mercurial ointment (Scott's dressing), though the even compression and rest which the latter method of treatment involves are always of great value. If the pains in the joint are very severe, the application of a few leeches, a small blister, or even of a hot iron may prove useful. If the disease continues and sero-synovial fluid collects in the joint, it may, if thought advisable, be removed by aspiration, but it generally becomes absorbed under the combined influence of compression and rest. If "tuberculous abscess" forms, it must be incised before the skin is reddened, and the joint having been washed out with weak iodine water, the wound should be closed by sutures. In those advanced cases in which septic micro-organisms have joined the bacilli of tuberculosis in their attack upon the joint, and in which, in spite of rest on a splint, the use of antiseptic lotions, and the adoption of every local and general measure which might prove helpful, the joint is steadily getting worse, some operative procedure may be necessary.

Probably the Röntgen rays have already shown advanced disorganization of the ends of the bones, with, perhaps, the existence of local necrotic areas. But even without these evidences it is obvious, from the failing condition of the child, the displacement of the head of the tibia, and the painful state of the articulation, that something active must be done: arthrectomy and excision may therefore be considered.

Arthrectomy (*Erasion*).—It may suffice that the joint be opened by a free semilunar incision, that the swollen pads and granulations of the synovial membrane be dissected out and scraped away, that the surfaces be washed over with a strong antiseptic solution, that the wounds be closed and the limb be readjusted on the splint. If an arthrectomy is being successfully undertaken without division of the crucial ligaments (in a comparatively early case, that is), it is quite likely that the free movements of the joint will be recovered; but it is impracticable to hope for movement in these advanced cases in which the crucial ligaments have been destroyed by disease or have been sacrificed in completing a thorough erasion.

Excision.—But if, as is likely the case, the destructive changes in the joint are found much further advanced than was suspected,—if, for instance, the crucial ligaments are soft and useless, or if ulceration of the cartilages has extended far backwards, or deeply into the tissue of the femur or tibia,—a complete excision will have to be undertaken, implying, of course, thorough erasion of all the affected tissue.

Amputation.—Lastly, there are certain intractable cases of tuberculous disease of the knee in which, either with or without the invasion of septic micro-organisms, the joint is so large, the limb so wasted, and the patient in such a miserable physical condition, that neither of the two operations just mentioned can be recommended, and to allow the patient to remain unrelieved is to court disaster. It may be, indeed, that there is already some tuberculous manifestation in the lung or skin, or in some other joint, or that the urine is albuminous, or that the patient is rapidly wasting. In these conditions amputation through the lower third of the thigh is likely to effect a change as instantaneous as it is happy.

The **Ankle-joint** may be the seat of primary tuberculosis, or the invasion may spread up into it from a synovial infection below or in front of the astragalus. The first thing to be done is to fix the foot at a right angle in some retentive apparatus, and if a Thomas's knee-splint is used with a patten the patient can be allowed to walk about. Rest, time, and patience work wonders in tuberculous disease of the ankle and tarsus, and there need be no haste to resort to incision or erasion. In certain intractable cases, however, a Syme's amputation is called for, which is far better in the circumstances than any partial amputation of the foot.

Sacro-iliac Disease is a very serious manifestation of tuberculosis; it does not allow of the patient being up and about during treatment, and there is nothing for it but to keep him continuously in the horizontal position. Tuberculin injection may be tried, and everything should be done in a general way to improve the health and vigour. Tuberculous "abscess" may be dealt with as mentioned in the paragraph upon hip-disease, and trephining and erasion of the joint may be called for. If, as is too likely to happen, the area becomes septic, anticoccic vaccination must be tried; but the outlook is very unhappy. *Edmund Owen.*

KIDNEY, MOVABLE.—The efficient treatment of movable kidney is intimately dependent upon the proper diagnosis. Four distinct classes of cases will be met with:—

1. Patients with a symptomless movable kidney.
2. Patients with movable kidneys where the other abdominal organs are also

loose, and where there are well-developed signs of neurasthenia, but no severe renal pain.

3. Patients with recurrent attacks of renal colic, with or without hæmaturia, which are obviously due to mobility of the kidney.

4. Patients with movable kidneys which are the seat of intermittent hydronephrosis, of stone, or of other disease.

In Class 1 no treatment is necessary; nor is it advisable to acquaint the patient of the undue mobility of the organ, if she is not already aware of the abnormality.

In Class 4 the treatment is operative, and the difficulty lies chiefly in the diagnosis.

In a clearly-defined example of Class 2 the treatment is non-operative, while in a pronounced case of Class 3 nephropexy is indicated.

The intermediate cases between the two latter classes give rise to difficulties in diagnosis, and account for many failures in treatment.

Non-operative treatment should be tried in all cases which come under Classes 2 and 3.

The treatment of neurasthenia should be carried out; the increase of the body fat should be encouraged by diet, cod-liver oil and milk in spare subjects, and an abdominal belt should be worn. The belt should support the abdominal wall, and press upwards and backwards. It may either be a separate structure, or a specially made attachment to a well-fitting corset. The latter is preferable when it can be carried out, for there is no need for the irksome perineal straps which are necessary to prevent the detached belt from working upwards. Kidney belts are made of many materials, and the details of their structure may be left to a good instrument maker, or a corset maker guided by the surgeon. They should have an insertion of strong elastic webbing at either side, and are better laced than buckled, since the latter method of union is more bulky. They should be stiffened by one or two vertical supports of whalebone.

Pads of various kinds have been used. No form of pad can press with sufficient force or precision to maintain the kidney in place without, at the same time, causing troublesome pressure upon the colon and other abdominal organs. A pad in some degree restrains the movement of the abdominal wall on the side of the movable kidney, and in this way gives a sense of comfort and support. The best form of pad is a flat indiarubber bag, which is distended with air or glycerin, and fits into a pocket in the proper position on the inside of the belt. The belt is worn over a well-fitting under-vest, and is discarded at night, but reapplied before rising from the recumbent posture.

The patient with a movable kidney should avoid sudden and violent movements. Horse and other vigorous exercise should be interdicted. The danger is, however, more frequently of the opposite nature, and these patients should not be allowed to indulge in a semi-invalid existence, spending their lives upon the couch or bed.

Operative treatment consists in nephropexy, and there are many varieties of the operation, dependent upon the individual taste or experience of the surgeon.

Operation is indicated in all cases where genuinely severe symptoms can be focussed on the movable kidney, where enteroptosis is not a marked feature of the case. It is likely to be followed by complete relief where definite crises of renal pain are present, when hæmaturia attends these attacks or follows exertion, and where signs of intermittent hydronephrosis, even of a slight degree, can be elicited.

Operation is imperative where hydronephrosis is marked, although intermittent, and where stone or other renal disease has been diagnosed. (See also NEURASTHENIA.)

J. W. Thomson Walker.

KNEE-JOINT, INTERNAL DERANGEMENT OF THE.—The semilunar fibro-cartilages are connected by their extremities with the head of the tibia, whilst their convex borders are feebly attached to the margins of the tuberosities by the coronary ligaments. The convex border of the internal cartilage is connected with the internal lateral ligament, but attachment of the outer disc to the external lateral ligament is prevented by the tendon of the popliteus, lubricated by the articular synovial membrane. Thus the internal fibro-cartilage is firmly fixed, whilst the other follows the movements of the tibia and femur. It is almost always the fixed or inner disc which causes the trouble; the outer one, being able to glide from pressure, escapes damage.

It does not follow that because a man has a loose semilunar cartilage his knee-joint must be opened. It should first be seen if the wearing of an apparatus may not render the knee comfortable and trustworthy. The illustration (*Fig.* 22) represents the sort of splint which may be tried. It is made by Montague, of New Bond Street, and it limits the movements of the joint to flexion and extension, entirely checking that rotatory inclination with which the slipping of the cartilage is usually associated. But if after fair trial it is found ineffectual, the advisability of resorting to an operation must be considered.

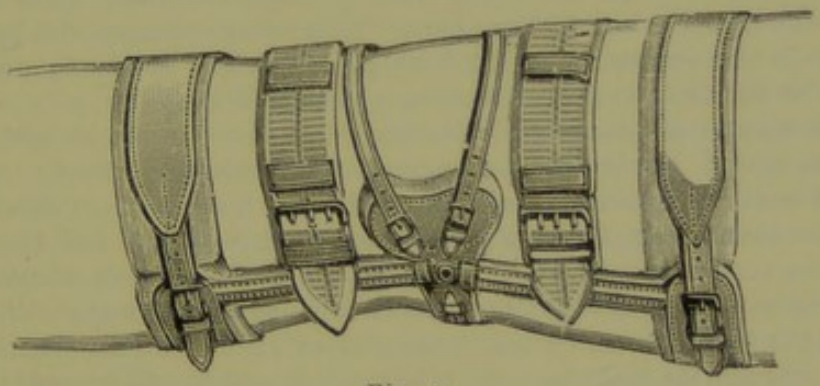

Fig. 22.

If the splint proves successful, it ought to be worn whenever the individual is likely to run the risk of imparting rotatory movements to the tibia, as these are the usual cause of the slipping of the fibro-cartilage. At first he should always wear the splint; but later, when he has learnt to keep a constant watch against irregular and harmful movements of the leg and foot, he need wear it only when about to take part in such exercises as golf, dancing, or riding on horseback. As to football, hockey, and cricket, they must be given up absolutely, as they are almost certain to involve a twist of the leg.

There is no game so likely to cause this derangement as football; at any rate, a large proportion of those persons who come to me for the treatment of it attributed the first lesion to a hurt at football. In one case a middle-aged man brought his knee into trouble by giving a loose kick at a ball with which his little boy was amusing himself upon the lawn. He struck the ball with the inner side of the toe of his boot whilst the leg was slightly flexed and everted—the very way to start the derangement or to invite its recurrence.

In the event of palliative treatment proving unsuccessful, the loose part of the cartilage had better be resected, or, at any rate, as much of the cartilage as is in front of the lateral ligament. The plan of suturing the cartilage to the head of the tibia is not to be recommended: it is not sufficiently thorough.

Preparation for Operation.—The patient should be lying up for at least three days before the operation. During this time his urine is examined, and laxatives are given. He is ordered a light diet, and is put into strict training for a fortnight's close confinement to bed. His limb is shaved and cleansed, and scrubbed

and cleansed again; and a leather splint is moulded on to the limb so as to be in readiness for application subsequently to the removal of the wooden splint on which the limb is placed after the operation. This leather splint is not absolutely necessary, but it is very convenient for application after the first dressing.

The preparation of the limb must be carried out with vigour and thoroughness, but with *discretion*. I have known acute dermatitis caused by a too energetic use of carbolic lotion and nail-brush.

The skin in the neighbourhood of the incision is to be rendered as free of likely sources of contamination as it is possible to make it; it is as impossible to render the skin "absolutely aseptic" as it is to obtain, theoretically, a perfect vacuum under the air-pump. It is advisable that sterile indiarubber gloves be used for this operation; there can be no doubt that the risk of infecting the joint is thereby lessened, for the surgeon cannot make his hands absolutely sterile.

The swabs and gauze—which no one touches but the surgeon and his assistant—are duly sterilized, as are also the instruments and the sutures.

Operation.—A three-inch vertical incision is made a little to the inner side of the patella, and, all bleeding having been arrested, the synovial membrane is opened, when, as likely as not, the fibro-cartilage is seen lying across the top of the internal tuberosity of the tibia, and perhaps detached to a considerable extent from the internal lateral ligament. This being the case, the knee is flexed, the cartilage is cut across as far back as possible, and the loose part removed. Sometimes the cartilage is found broken, twisted, or curled.

There is often a large amount of bleeding, and every vessel should be clamped before the synovial membrane is opened. Sometimes the torn or crumpled cartilage is found far behind its normal position; but whether this is so or not, it ought to be firmly gripped in a strong pair of clip-forceps and then cut across as far back as possible. If, after its removal, there is much bleeding into the joint, the cavity may be washed out with warm carbolized water, 1 in 80. Some surgeons would be content to use "normal saline" solution for this purpose, but I would advise the operator who is not too proud to call himself an *antiseptic* surgeon, as opposed to an *aseptic* one, to put his high principles on one side for this operation, and to hold on to the old, well-tried, and faithful antiseptic method of Lister.

Some surgeons write of removing the internal cartilage as if they took the entire crescent away. This, however, is not required, or, I think, quite practicable; it is the anterior part which gets caught between the bones and does the harm, and it is only this anterior part which need be resected. However, if the disc is actually detached from the internal lateral ligament, it may be pulled well forwards, and then be divided posterior to the ligament—as far back, indeed, as possible. It may be cut by a strong, narrow-bladed knife or by a pair of scissors.

The wound in the synovial membrane is closed by fine silk sutures, and the incision in the skin is stitched up with silk or silkworm gut. Catgut would answer well if only one could be *absolutely certain* of its being aseptic.

A drainage tube may be left in for twenty-four hours, its end being secured by a skin stitch. After the gauze dressing is applied, the limb is placed on a long back-splint with a foot-piece, and raised on a pillow. On the sixth day after the removal of the drain, and the seventh day after operation, the surface stitches are taken out, a collodion dressing is applied, and the limb is fixed up in the moulded leather splint which was prepared beforehand.

A few days later the patient is allowed to shift himself from the bed to the sofa, and in another week he is permitted to walk about the room, the limb being protected by the leather splint.

It sometimes happens after the operation that the joint becomes distended,

even when the tube is still in position, a collection of sero-synovial fluid taking place in the sub-crureal pouch of the synovial membrane. In these circumstances an incision should be made without delay through the quadriceps, in such a way that the distension may be thoroughly relieved, a drainage-tube being left in for a day or two. I have had several cases in which I have had to resort to this treatment. The tension being removed, the temperature comes down, and the patient is rendered comfortable and able to sleep. From the fluid which I thus removed in a rather anxious case of this sort, a culture of *Staphylococcus albus* was obtained; nevertheless, everything went quite well subsequently to the joint having been irrigated with a weak antiseptic lotion.

Should a joint become septic after the operation, with local redness and swelling, and should creamy, blood-stained fluid ooze from it, which the bacteriologist shows to be teeming with foul micrococci, a consultation should at once be held as to the course of action. Probably the best thing would be to give an anæsthetic and make free incisions in well-planned situations, and having washed out and dried the cavity, to paint every area over, first with pure carbolic acid, and afterwards with absolute alcohol, so as to limit the cauterizing effect of the acid. The cavity should then be stuffed with mercuric gauze, and the limb placed on a back-splint. Either with or without an examination of the patient's blood having been made, the increase of his resistance to the attack of the septic organisms in question should be sought by the injection into his tissues of a sterile culture of the particular organism indicated. If in these anxious and disquieting circumstances the treatment is prompt and thorough, there is hope for recovery of the patient with a good working joint. But one has heard whispers of cases in which synostosis has followed septic invasion of the joint, and of others in which the surgeon has been compelled to amputate through the thigh in order to save the patient's life.

There is this about the operation for the removal of the loose fibro-cartilage: it is completely successful. I have met with no cases in which the result has been mere *improvement*, or anything but an unqualified success. (I am not alluding here to the risks attending the operation, but am speaking only of the actual result of the removal of the loose body so far as the mechanics of the joint are concerned.)

It is fair, I think, to compare the large serous lining of the knee-joint with that of the abdomen. It is at once seen how feeble is the power of the former to protect itself. Sometimes, after removing a gangrenous appendix, we know that we have left the peritoneal surface infected with micro-organisms which we have been unable to remove. We have wiped the area with aseptic gauze—which may probably have had the effect of introducing some of the germs into the sub-endothelial layer; or an attempt may have been made to wash out the area by gentle irrigation—which may possibly have caused an infiltration of the germs into the crevices between neighbouring coils of intestine. At any rate, in whatever way the septic focus was dealt with, the surgeon knows that he has not removed *all* the germs; that a *complete* removal of them is absolutely impossible, and that he is unable to rob the remainder of their power for harm. But whilst applying the dressings to the operation-wound, he feels sure that he can trust the peritoneum to give a good account of those germs, for experience has shown him that it has a peculiar aptitude for overcoming such infection; that it has, in fact, a large "margin of error." One might have expected, *à priori*, that so large a synovial surface as that of the lining of the knee-joint would, in the normal state, have possessed a similar power in some considerable degree; but, as a matter of fact, in such circumstances it is absolutely helpless, and it therefore behoves the operator to take every possible precaution against infection.

I know nothing in the whole range of operative surgery which can cause a surgeon such distress as a knee-joint which is inflaming and becoming painful after an operation for internal derangement—an operation which is generally resorted to in the case of a strong, vigorous individual in the very prime of life—an operation, moreover, not of absolute necessity. The worst, as a rule, that could be said for the knee was that it was not "trustworthy": that it was apt to throw the individual down on the rink, in the field, the street, or the ball-room; that when an apparatus was worn the knee generally behaved fairly well, though even then a slipping or locking sometimes occurred; that the condition was perhaps nothing worse than "vexatious," or inconvenient, but that as the individual knew of exactly similar cases in which a perfect result had followed operation, he or she would like it done, and was prepared to take all risks in connection with it. But patients do not always know what risks they are running when they submit themselves to operations. I think I have said enough to make my warning clear that the opening of a healthy knee-joint is an operation that is not to be lightly undertaken; and I do not believe that any hospital surgeon who has had his fair share of these cases will think that I have made too much of it. With due care the cases may be expected to go right: they almost invariably do so; but I hold the opinion that no one ought to consider himself qualified to undertake this operation unless ample personal experience has proved to him that he may confidently trust himself and his methods. There is not an operation in the whole field of surgery which can be performed with "no risk," nor is any surgeon justified in saying or implying to the contrary—not even with the proper desire of inducing a patient to screw up his courage for an absolutely necessary treatment. And in the class of cases under consideration the surgeon must proceed with unusual care and circumspection.

Edmund Owen.

KNOCK-KNEE.—This is the name applied to a deformity where the tibia and fibula form an abnormal lateral angle with the femur, the apex being inwards.

There are two varieties: one is associated with general rickets, and the other, occurring from twelve to eighteen years, is static in origin. A flattened or everted foot generally co-exists. Knock-knee is often mechanically produced. If a plumb-line be dropped from the head of the femur it will drop outside the centre of the knee-joint. This is, of course, more marked in women than in men. The external condyle of the femur, therefore, and the external tibial facet transmit more weight than the inner side, because the centre of gravity is to the outer side of the joint. Tired folk from overstanding, instead of using their muscles to stand erect, substitute their ligaments. They do this by extending their knees and everting their feet. As a result the external condyle is atrophied. There are three chief deformities associated with knock-knee: (1) Obliquity of the line of articulation; (2) Difference in the condyles of femur and tibia; (3) Bending of the shafts above or below the joint.

In rickets the deformity is often associated with bowing or anterior curving of the tibia.

Treatment.—If knock-knee is associated in a very young child with active rachitic manifestations, it is best placed in a double Thomas's hip splint with head-piece attached, and two lateral bars to which the knees must be bandaged. The child must be carefully dieted and kept in the sun until the bones have hardened. He may then be massaged and exercised, and allowed to walk. It is most important not to allow these children to crawl or walk, and correction during recumbency effectually solves the problem of treatment. Cod-liver oil is almost a specific.

It has been observed that quite a large proportion of patients recover without treatment; but as it is impossible to foretell which cases will recover, it is wise

to treat every case. In very mild cases recumbency, massage, open air, and manipulation will suffice. With one hand the surgeon will press upon the lower part of the femur outwards, and with the other the lower end of the fibula inwards.

As walking with the feet turned out stretches the internal lateral ligament and increases the deformity, the child should be taught to walk with inturned or parallel feet. For the same reason the heels of the boots should be raised on the inner side. These simple procedures may suffice to check and correct a genu valgum.

Mechanical Treatment.—Knock-knee at any stage may be cured by proper splints, but such treatment in later adolescence is not justifiable, because of the time occupied and the weakening of ligamentous structures.

Many surgeons and all instrument-makers supply jointed splints for the correction of knock-knee. These are quite useless. To succeed, one must apply lateral pressure while the knee is fully extended. As soon as flexion begins, the corrective pressure-strain of the splint is relaxed and soon disappears. All knock-knee deformity disappears long before voluntary flexion reaches 90°; therefore, when any degree of corrective pressure is applied by splints having an antero-posterior joint at the knee, the patient flexes his legs slightly and all pressure is removed. The simplest splint for the treatment of knock-knee is a bar of iron running into the heel of the boot, placed to the outer side of the limb and reaching as high as the great trochanter. A posterior bar reaches well above and below the knee (*Fig.* 23). The knee is first bandaged to the posterior bar to keep it fully extended, and afterwards to the outer bar to correct the lateral deviation. During the night shorter splints should keep up the improved position; later, the day splints can be discarded and only the night splints used.

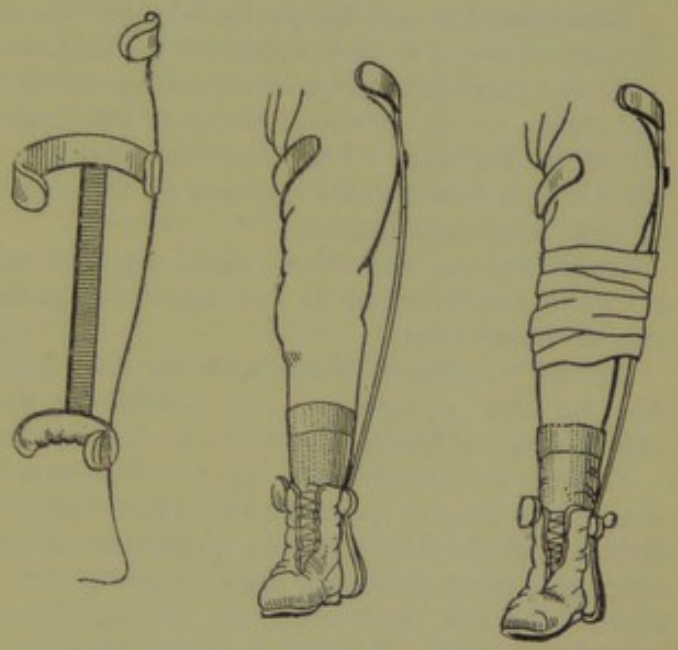

Fig. 23.—The Thomas Knock-knee Brace.

The test of recovery by which we know whether we may discard the splint is important, and is not referred to in books. When the straightened knee fails to yield laterally on manipulation, the child can be given liberty. Even then it is well to let him wear the altered boot and walk with parallel feet.

When knock-knee is complicated by bow legs, as is often the case in rickets, care must be taken not to correct the latter, or knock-knee would be increased.

Treatment by Manipulation.—Many surgeons advocate the manual rectification of knock-knee, and the procedure seems to be free from risk. Fracture sometimes occurs through the condyle, sometimes above, but very rarely are the ligaments torn. The knee is fully extended, and the lower end of the femur is grasped in one hand, while with the other the lower end of the tibia is forced inwards. The limb usually straightens following a greenstick fracture. It is necessary to keep the leg in splints for six weeks.

Treatment by Osteoclasis.—In cases which will not yield to the hand, a Thomas or a Grattan osteoclast may be applied. If the deformity is in the upper part

of the tibia, the fracture may be produced there. If in the femur, the ploughing blade of the osteoclast may be placed above the condyles.

The operative treatment will consist in an osteotomy of the femur or in the removal of a wedge from the tibia. The osteotomy may be done with a chisel from the outside (Macewen), or, as practised by the author, with a protected subcutaneous saw.

Robert Jones.

LACHRYMAL APPARATUS, DISEASES OF.

Acute Inflammation of the Lachrymal Gland (Dacryo-adenitis).—It has only recently become recognized that this disease is by no means uncommon. The symptoms are acute; great swelling of the lids and conjunctiva, tenderness, with brawny thickening over the lachrymal gland, enlargement of the pre-auricular gland, pain, and general febrile symptoms.

Hot fomentations, leeches to the temple, purgation, and antiphlogistic treatment will generally subdue the inflammation in a few days. Should, however, the gland suppurate, it may be necessary to divide the external canthus with a pair of scissors (canthotomy), and having everted the upper lid, incise the abscess. This, however, is seldom necessary, for the abscess almost invariably bursts into the conjunctival sac, when the symptoms are at once relieved. Rarely, the pus escapes into the orbital tissues, giving rise to an acute orbital cellulitis; or through the skin, when a troublesome fistula may result.

Lachrymation and Epiphora.—These terms, both used to imply an overflow of tears, have a widely different significance.

Lachrymation implies an excessive secretion of tears which flow over on to the cheek, owing to the inability of the normal excretory passages to cope with the increased flow. The treatment of this symptom is therefore described under the various injuries and diseases of the eye which cause a reflex hypersecretion of the lachrymal gland.

Epiphora, on the other hand, signifies an overflow of tears brought about by some imperfection in the excretory passages (puncta, canaliculi, lachrymal sac, or nasal duct).

In the treatment of epiphora we may first classify the conditions which give rise to this symptom. (1) *Stenosis or eversion of the punctum* (including ectropion). (2) *Obstruction of the canaliculus.* (3) *Obstruction of the nasal duct.*

1. *Stenosis or Eversion of the Punctum* (including Ectropion).—This most frequently results from chronic ciliary blepharitis. Should repeated dilatation with a Lang's dilator, with treatment of the diseased lids, fail to relieve the epiphora, the canaliculus must be slit up for its outer two-thirds. (For method of dilating the punctum, and slitting the canaliculus, see CHRONIC DACRYOCYSTITIS, *infra.*) Rarely we meet with cases of congenital occlusion of the punctum resulting from a membranous pellicle—it is only necessary in such cases to rupture the membrane with the dilator. Eversion of the lower punctum so frequently met with in old people, and resulting from loss of tone in the orbicularis muscle, is one of the commonest causes of epiphora, a very slight displacement being sufficient to give rise to this symptom in a distressing degree. For milder cases an astringent application, e.g., zinc sulphate drops, 1 gr. to the ounce, or painting the conjunctiva with 2 per cent silver nitrate solution twice a week, may be all that is necessary. Failing this, after the application of a few crystals of solid cocaine, an oval area, 4 mm. by 2 mm., of the conjunctiva immediately behind and below the punctum should be cauterized with the fine point of the actual cautery. By the contraction of the cicatrix thus formed, the everted punctum becomes restored to its normal position. In facial paralysis, eversion of the punctum from sagging of the lower lid, with distressing epiphora, is a prominent symptom. If the paralysis is permanent it becomes necessary to

slit up the lower canaliculus to make a gutter for the reception of the tears, and in some cases to shorten the lower lid by an appropriate operation.

2. *Obstruction of the Canaliculus.*—The lower canaliculus may become blocked by cicatricial contraction, or rarely by a foreign body, e.g., eye-lash or concretion.

In cicatricial contraction, if epiphora exists, the canaliculus must be divided by a Stilling's knife, which must be passed right on into the sac. A style is then inserted, and worn for several months. Foreign bodies must be removed, if possible through the dilated punctum, but failing this, by a small incision in the long axis of the canaliculus.

3. *Obstruction of the Nasal Duct* (see ACUTE AND CHRONIC DACRYOCYSTITIS, *infra*).

Acute Dacryocystitis.—Acute inflammation of the lachrymal sac (acute dacryocystitis) most commonly follows a chronic obstruction in the nasal duct, as shown by the frequent history of long-standing epiphora. Occasionally it may result from a syphilitic or tuberculous periostitis, very rarely from secondary infection from the conjunctival sac.

In the earliest stages, continuous hot fomentations, purgation, and antiphlogistic treatment, will sometimes cut short the attack. If, however, the symptoms do not subside in a few days, an anæsthetic (nitrous oxide or ethyl chloride) must be given, and an incision, one inch in length, made through the thickened tissues right down to the sac. The wound should then be packed with a narrow strip of gauze, and kept open until the discharge has ceased, the fomentation being re-applied and continued until all the swelling has subsided. Later, the case should be treated as in chronic lachrymal obstruction.

Chronic Dacryocystitis.—In this disease, which commonly results from a stricture of the nasal duct, the lachrymal sac becomes distended with muco-pus, forming a swelling immediately below the tendo oculi (mucocele). The disease is one of the most intractable with which we have to deal, and its successful treatment necessitates the exercise of great patience on the part of the sufferer and the surgeon. It may be laid down as a general rule in the treatment of this condition, that the simpler methods should be exhausted before we resort to cutting instruments or the passage of probes.

The different methods which we may find it necessary to adopt should be carried out in the following order: (1) Syringing; (2) Passage of probes; (3) Wearing a style; (4) Excision of the lachrymal sac.

We commence the treatment by ascertaining if the lachrymal passages are permeable to fluids, and to do this we must first dilate the lower punctum.

Method of Dilating the Lower Punctum.—With the patient seated in a chair, the lower lid is slightly everted and at the same time rendered tense by being gently drawn downwards and outwards.

A Lang's canaliculus dilator is then passed in a vertical direction until the point is well engaged in the lower punctum, when it is turned through a right angle and made to pass horizontally, until the opening is sufficiently enlarged. Having thus dilated the punctum, the nozzle of the lachrymal syringe filled with boracic lotion is inserted and passed along the canaliculus into the lachrymal sac. If, on gently emptying the syringe, the fluid does not regurgitate through the upper punctum, but passes freely into the patient's nose and throat, we may hope to cure such a case without either probing or slitting the canaliculus.

The sac should be freely syringed every second day with boracic lotion (10 gr. to the ounce), followed by astringent lotion, e.g., zinc sulphate, 2 gr. to the ounce, or protargol, 25 gr. to the ounce.* The patient should be directed

* After syringing with protargol it is always well to wash out the sac with boracic lotion before the patient is allowed to go.

to empty the sac frequently by pressure with the finger, and if there is any suspicion of rhinitis, a saline nasal douche should be used night and morning.

In the use of the lachrymal syringe, the greatest gentleness should be exercised, as too great force may lead to an extravasation of the septic fluids through the diseased wall of the sac, with disastrous results, e.g., orbital cellulitis and optic atrophy.

Should we find it impossible to syringe fluids into the nose, the same treatment should be persevered with for two or three weeks, in the hope that the inflammation may subside, and the normal channels again become patent; but if at the end of that time we are still unsuccessful, an attempt must be made to dilate the stricture by means of probes.

If the lid is sufficiently lax, a small probe may often be passed down the nasal duct without dividing the canaliculus; but if any difficulty is experienced, either from rigidity of the lid, or in finding the passage, the outer two-thirds of the lower canaliculus should be divided before attempting to dilate the stricture.

Slitting the Canaliculus.—A drop of 2 per cent cocaine is instilled into the conjunctival sac, and a few crystals of solid cocaine are placed along the line of the proposed incision. The surgeon stands behind the patient, who is seated in a chair with the head thrown well back and comfortably supported. Usually the lower canaliculus is the one selected, as being more convenient for subsequent probing or for wearing a style. The lower lid is everted and drawn downwards and outwards in order to make the parts tense. The punctum is now dilated, and a Tweedy's canaliculus knife, with the cutting edge directed upwards and backwards, is passed in the same way as the dilator (*vide supra*) along the canaliculus, until the point is distinctly felt to impinge against the lachrymal bone. The knife is now raised until the canaliculus is divided for the outer two-thirds of its extent. It is most important that the incision should lie on the conjunctival surface and not on the free border of the lid, which renders satisfactory drainage impossible. After the little operation is completed, the lips of the wound will speedily unite unless special care is taken to keep them apart for a few days by the passage of a small probe, or the same result may be obtained by snipping off the posterior lip of the incision.

Passing a Probe.—The position of the patient and surgeon are the same as for opening the canaliculus. The smaller sizes of Couper's bulbous pointed probes are the most generally useful, and to alleviate the pain and facilitate its passage, the probe end should be well coated with a 2 per cent cocaine ointment. With the probe held lightly between the finger and thumb, it is passed horizontally along the opened canaliculus and into the sac until it is *distinctly felt to strike the lachrymal bone*, and there is no dragging of the lid. It is most important that careful attention should be paid to this detail, otherwise a false passage will almost certainly result. Keeping the point of the probe pressed gently against the lachrymal bone, the hand is raised until the probe points downwards and slightly outwards and backwards. Gentle pressure is then exerted, when the probe will be felt to pass down the nasal duct. The amount of force to be used must depend to a great extent upon the experience of the surgeon, and it is only necessary to point out how extremely easy it is to make a false passage. Having passed a small probe (No. ½ or 1), we proceed at intervals of a few days to dilate the stricture, but it is seldom necessary to go higher than a No. 4. This probe should be passed once a week for some months, until regurgitation and epiphora have entirely ceased.

On no account should probing be immediately followed by syringing, or disastrous results may ensue, e.g., orbital cellulitis.

Continuous dilatation of the stricture by wearing a style, a form of treatment much in favour with some surgeons, should be preferred to probing under the

following conditions: (1) When probing is too painful; (2) When regular attendance is impossible; (3) When the stricture again contracts rapidly after dilating.

Unfortunately there are many cases of chronic dacryocystitis in which conservative treatment either fails or becomes impossible from the demands upon the patient's time. In such cases we must excise the lachrymal sac. This operation, which until recent years has been done but little in this country, gives the most admirable results and, contrary to what might be expected, the resulting epiphora is slight, and frequently only noticeable in a cold wind.

Excision of the Lachrymal Sac is indicated in the following conditions: (1) When the wall of the sac is distended; (2) When conservative treatment has failed; (3) When a spreading ulcer of the cornea associated with a mucocele progresses in spite of the ordinary treatment; (4) When an urgent intra-ocular operation is indicated, e.g., glaucoma. In the less urgent operations, e.g., cataract extraction, it is generally wise to previously excise the sac, though in some cases, after careful treatment of the sac for some days, the operation may be performed without great risk; (5) When the sac is tuberculous; (6) When there is necrosis of bone.

Congenital Lachrymal Obstruction.—Not infrequently we meet with cases of lachrymal obstruction associated with dacryocystitis (acute or chronic) in the newly-born, resulting from the nasal duct being blocked by epithelial débris. These cases, as a rule, can be cured by frequent syringing; but failing this, the passage of a No. $\frac{1}{2}$ Couper's probe through the dilated punctum seldom fails to bring about a complete cure.

Fistula of Lachrymal Sac.—This condition is a not infrequent sequela of acute dacryocystitis. The treatment consists in excising the fistulous tract and restoring the patency of the lachrymo-nasal passage. *Ilbert Hancock.*

LARYNGEAL OBSTRUCTION.—The causes of laryngeal obstruction from intrinsic changes in the larynx may be broadly classified into (1) Diphtheritic; (2) Non-diphtheritic affections. In the latter group are included acute simple laryngitis, syphilitic and tuberculous laryngitis, acute purulent perichondritis, œdema of the larynx, neoplasms of the larynx, and the impaction of foreign bodies.

1. **Diphtheritic Laryngitis.**—In its *primary* form this is an exceedingly rare disorder, and indeed the condition can only be absolutely identified by obtaining a culture of the Klebs-Lœffler bacillus from the interior of the larynx. *Secondary* diphtheritic laryngitis is easily identified by finding evidence of the primary infection in the pharynx or nose.

When the swelling in the larynx is so great as to seriously impede the entry and egress of air, the air passage must be kept patent by artificial means. (This is merely an adjunct to the routine treatment of DIPHTHERIA, which see.) The two means at our disposal are intubation and tracheotomy. When the child can be kept continuously under the immediate supervision of a medical man, the former method has many advantages over the latter. Intubation can be performed quite soon after the onset of obstructive dyspnœa, since the risk of injuring the larynx is exceedingly slight. No anæsthetic is required. The formation of an open wound in the neck, with the associated risk of infection, is entirely avoided. The inspired air is warmed and filtered by passing through the normal channels for respiration, which is not the case after the performance of tracheotomy. Lastly, experience has shown that in cases of diphtheritic laryngitis the mortality is less after intubation than after tracheotomy. The great disadvantage of this method is the need for the continual presence of a medical man, since the replacing of a tube that has

been coughed out cannot as a rule be performed by a nurse, and death may ensue from suffocation before help can be obtained. It is thus a mode of treatment that must be almost entirely limited to cases in a hospital. (For further details of the operation, see under DIPHTHERIA.)

If the dyspnœa is not relieved after intubation has been performed, then *tracheotomy* must be resorted to. The directions for performing this as a leisurely surgical operation are too well known to need repetition, and may be found in any text-book. The opportunities for performing it under such conditions are, however, far fewer than those for an emergency operation. Under such conditions, as a rule, it has to be performed with great rapidity in cases of extreme urgency, and the following method will be found to be a safe and reliable one.

A sharp scalpel and a pair of Spencer Wells' forceps are the instruments required. Place the child in the recumbent position, with a sand-bag under its shoulders, so that the head and neck fall backwards, with the skin more or less tightly stretched over the front of the neck. Identify the lower border of the cricoid cartilage by running the finger up the middle line of the neck. With the index finger and thumb of the left hand grasp the trachea firmly on either side immediately below this point, and do not release it until air is entering freely through an opening in its anterior wall. With the trachea thus fixed, cut boldly from above downwards in the centre of the space between the thumb and finger. The anterior surface of the trachea is thus rapidly exposed. Then grasp the blade of the scalpel near to the point and incise the trachea freely from below upwards. Insert the tip of the forceps into the opened trachea and separate the blades. By this means the opening is made to gape, and the trachea can be steadied in the wound. Not until this has been done should the hold on the trachea by the left hand be released. A piece of ordinary rubber drainage tube can be inserted as a temporary substitute for a proper tracheotomy tube. In making the incision in the soft parts of the neck with the trachea thus fixed there is no necessity—and frequently no time—to search for the interval between the infra-hyoid muscles, to identify the isthmus of the thyroid gland, or to avoid the distended veins which are described as a likely source of danger. Hæmorrhage, as a rule, is unfortunately only too scanty, since a free flow of blood would be a welcome relief to a badly distended right side of the heart. Moreover, the entry of blood into the trachea can be easily averted by pressing back the soft tissues on either side of the wound with the thumb and finger at the same time as the opening into the trachea is mopped by wool. The tube must be kept clean by spraying at short intervals with an alkaline lotion, and when necessary the inner tube must be removed for a more thorough cleansing. Feathers or other bodies must never be thrust down a tube to clean it. The outer silver tube should be changed at the end of twenty-four hours after operation, and a rubber tube may be substituted for a silver one within about three days.

2. **Non-diphtheritic Laryngitis.**—Either or both of the foregoing methods of treatment may be necessary in cases of *non-diphtheritic origin* after other measures have failed.

In *acute simple laryngitis* the bed must be drawn up alongside a window widely open at the bottom. The child must be covered by blankets, and the head and hands protected by a warm cap and gloves. Hot-water bottles must be kept in the bed. Glycerin of belladonna fomentations or ice bags should be applied to the front of the neck, and plenty of hot drinks administered. By these means the maximum amount of pure air is ensured to the child, and in many cases after a short time the patient falls into a quiet sleep. Preliminary measures of treatment have so frequently been directed towards keeping the

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child in a stuffy room, and thereby directly aggravating the symptoms caused by an imperfect supply of oxygen, that the adoption of the above methods often affords instantaneous and permanent relief. But when these measures fail after a short trial only, intubation must be performed. (See also CROUP.)

In *œdema of the glottis*. intubation is useless on account of the œdematous tissue which overlaps the opening of the tube and because of the extensive ulceration that the tube causes in these cases. Tracheotomy must be performed at once. New growths and foreign bodies must be removed by intralaryngeal operations. The detection of the latter may be aided by X rays. Laryngoscopic examination should be attempted in all cases, and under a general anæsthetic when necessary.

In frequently recurring attacks of laryngeal obstruction without any obvious cause, syphilis should be suspected and antisyphilitic remedies used. In advanced cases of tuberculosis with secondary involvement of the larynx, tracheotomy may have to be performed for the relief of obstruction. (See also LARYNGITIS.)

George E. Waugh.

LARYNGEAL STRIDOR (Congenital).—Although in most cases due to malformation of the epiglottis, which causes obstruction to respiration, this complaint may sometimes depend on want of co-ordination between the muscles which close the glottis and those which are otherwise concerned in respiration. Whether the defect is of the higher cortical centres, or of those in the bulb, is unknown. In many cases the affection subsides towards the end of the second year. It is, however, persistent in some, but these are usually the subjects of congenital spasticity or other forms of birth-palsy. Special treatment, unless nasal obstruction by adenoids or catarrh be present, is unnecessary.

Leonard G. Guthrie.

LARYNGISMUS IN CHILDHOOD is commonly associated with tetany, convulsions and rickets (*q.v.*). Intermittent spasm of the glottis (laryngismus) should be distinguished from congenital stridor, from the various forms of laryngitis, from dyspnœa due to laryngeal obstruction by a foreign body, and from dyspnœa dependent upon intrathoracic causes.

Laryngismus occurs under excitement, on suddenly waking, and on exposure to cold draughts. Hoarseness, continuous stridor, clanging cough, and pyrexia are absent in uncomplicated cases.

TREATMENT.—For the immediate relief of laryngismus, sponges wrung out of hot water should be applied to the front of the neck, and the chin should be drawn forwards. By the time a hot bath can be prepared, the spasm is usually over, or the infant is dead. But death from simple laryngismus is rare. When fatal, it is usually in association with enlargement of the thymus, and the so-called "status lymphaticus." Dangerous symptoms are sudden blanching, cessation of struggling and attempts to breathe, and wide dilatation of pupils. On their appearance, artificial respiration should be at once employed, and parents and nurses should be instructed in this method of restoration in all cases of laryngismus, in case necessity for its use should arise. Children in these dangerous conditions are too often hurried to the nearest chemist, doctor, or hospital, and are dead by the time they arrive. During artificial respiration, smelling salts may be held under the nostrils, but not whilst struggles for breath continue, for ammonia may increase spasm.

Very few cases of laryngismus resist treatment by suitable diet, and by castor oil suspended in mucilage, with rhubarb and bromide of potassium. Belladonna or chloral hydrate may be added, especially if convulsions have occurred.

Leonard G. Guthrie.

LARYNGITIS.—(See also CROUP, DIPHTHERIA, LARYNGEAL OBSTRUCTION, and MEASLES.)

1. **Acute Laryngitis.**—Primary acute laryngitis when it occurs in the adult is usually met with in males who have been indulging too freely in alcohol and tobacco, or over-using the voice. It also occurs in the course of the acute infectious diseases, but more frequently in influenza, when the patient has persisted in using his voice during the attack.

TREATMENT.—Without treatment the attack will generally pass off in a few days, and may leave no ill-effects behind, or it may become chronic. It is generally those who have to use the voice professionally who seek for advice, and often with the earnest request that they may be cured at once in order to fulfil an engagement. The risk of injuring the voice permanently in such cases is so great that it is best not to undertake them at all unless the patients will give up the engagement, for three or four days' complete rest of the voice is the essential element in treatment.

The patient should be put to bed, and given a mercurial purge. The windows should be kept open, and if the weather be cold, a fire lighted. If the patient complain of cold, a light Shetland shawl should be put over the head. Alcohol and tobacco should be strictly forbidden.

Internally, aspirin 10 gr. may be given thrice daily, especially if there be any fever, but if the temperature be very high, as occasionally happens in very nervous subjects, drop doses of tincture of aconite may be given every hour until it falls to 100°.

Liq. ammon. acetat. in ½-oz. doses combined with 10-min. doses of spiritus ætheris nitrosi may be given every two hours, followed by hot weak tea or large draughts of hot barley-water until perspiration occurs. Vapour in the form of 1 teaspoonful tinct. benzoin. co. to a pint of hot water should be inhaled at a temperature of 150–140° F. for 10 minutes three or four times a day. The following prescription the writer has found very efficacious :—

℞	Sod. Bicarb.		Acid. Carbol. pur.	gr. xv
	Sod. Benzoat.		Glycerin.	℥jss
	Sod. Biborat.	āā ℥ij	Aq. dest.	ad ℥viij

One part of this should be mixed with one of cold water, and put into the tumbler of a Siegle's steam spray. The spray must then be so arranged on a table or chest of drawers that the patient's mouth .is exactly opposite it, and on the same level. If necessary the patient can be put on a chair and raised with books or pillows.

The patient should then put a large bath-towel round his neck and shoulders, and, taking hold of his tongue with one corner of the towel, pull it well out whilst sitting so that the funnel of the spray is not more than two inches from his open mouth. He should then, while keeping the tongue well out, inhale the vapour deeply into his lungs for five or ten minutes at a time—including also the nose, when there is catarrh of that organ—and then get back to bed and roll his head up in the shawl. This can be repeated three times a day.

When there is much pain, a mustard leaf will be found very soothing. It should be applied as follows : Cut it in half lengthways, and apply one half to the larynx just below the chin, and the other half below that, so that it forms a long narrow strip down the front of the neck. The leaf should be allowed to remain on for twenty minutes by the clock. On removing it, a little vaselin should be rubbed over the reddened surface, and some cotton wool applied to it and kept on by a bandage.

A carbolic acid compress will also be found very soothing. A doubled piece of lint about three inches wide, and long enough to go half round the neck,

should be wetted with a solution of carbolic acid (1–60). This should be applied to the neck and covered with a piece of guttapercha tissue large enough to extend at least two inches beyond it on all sides. This should be kept on by applying cotton wool and a bandage.

Guttapercha tissue is preferable to jaconet or oil silk, as it clings to the skin better, and prevents the evaporation of the carbolic acid. This can be kept on for twelve hours and then renewed.

From the very beginning it is of the utmost help to have the neck properly massaged for twenty minutes night and morning, and the use of an electric vibrator, such as Barker's, will be found a great adjuvant to the treatment, and will greatly help to prevent the disease becoming chronic, i.e., if the voice has been rested during the attack.

It is best not to begin tonics until the acute symptoms have passed off, and then the following mixture may be given :—

℞	Ferri et Ammon. Cit.	ʒiij	Ext. Glycyrrh.	℥j
	Ammon. Chlorid.	ʒiv	Inf. Seneg.	ad ℥vj
	Liq. Strychnin.	ʒj		

One-twelfth part thrice daily after meals in a wineglassful of water.

When the patient is fit to go out, the hot inhalations should be stopped and the following spray be used four or five times a day :—

℞	Menthol	gr xij	Ol. Gaulth.	āā ♏ij
	Camphor.	gr vj	Ol. Cinnamom.	♏iv
	Ol. Eucalypt.		Ol. Adepsin	ad ℥j

To be sprayed into the nose and throat four or five times a day by means of a De Vilbiss spray.

2. **Acute Œdematous Laryngitis,** when it occurs primarily, may be set up by the sting of a wasp, the impaction of foreign bodies, or the drinking of corrosive or scalding fluids. Sometimes it occurs in patients of a well-marked rheumatic diathesis without any apparent exciting cause. It may also be secondary to septic inflammation of the pharynx from infection by some pyogenic organism.

TREATMENT must be based on the cause. In a great many cases the feeling of choking, even when there is not much œdema, frightens the patient so much that he will not allow any examination to be made. In that case large doses of bromide of potassium should be administered, and, if necessary, ¼ gr. of morphia should be injected, and the throat sprayed with a mixture of 20 per cent cocaine and 1–2000 adrenalin. A large dose of calomel should be given as soon as possible, and if there be any rheumatic history, salicylates in full doses.

Locally, the œdema must be reduced by scarifying the inflamed tissue by means of Mackenzie's laryngeal knife ; this, however, must not be done in a haphazard way, but by means of the laryngeal mirror. If the operator is not expert in its use, it would be advisable for him to perform tracheotomy or intubation. (See LARYNGEAL OBSTRUCTION and DIPHTHERIA.)

3. **Chronic Catarrhal Laryngitis.**—In most cases this is due to an acute attack which has not completely resolved, but it may result from an extension of disease downwards from the nose, or upwards from the trachea. In both cases there is constant cough from an endeavour to get rid of mucus. It also occurs very frequently in gouty, rheumatic, and dyspeptic subjects, and in those who suffer from liver complaints or uterine troubles. It is also a concomitant of syphilis, tuberculosis, lupus, and some cases of paralysis.

TREATMENT will depend to a great extent upon the cause, but in every case rest of the voice is essential to success. This is the great difficulty in curing professional voice-users, to whom such vocal rest is often impossible. The use of alcohol and tobacco should be forbidden. For those who can afford it—

especially if a gouty or rheumatic diathesis be present—it is best to begin treatment by a course at Aix-les-Bains, Mont Dore, Ems, or Salsomaggiore, where the local treatment is thoroughly carried out. In no English spa (that the writer knows of) is the local treatment so well done, however good the general management of the cases may be. At home, the treatment recommended under acute laryngitis must be persevered with, but in the writer's experience the greatest good is obtained from skilful massage of the neck and larynx combined with vibration. In most cases of professional voice-users, the voice has been badly produced from the beginning and is extremely "breathy": it is sometimes very difficult to get patients out of their old habits, which is so necessary in these cases before they can learn to produce their voice with a wide-open pharynx and, therefore, without "pinching" or "squeezing."

4. **Hypertrophic Laryngitis.**—This is only a more marked form of the condition just considered. Treatment is not satisfactory, but when the hypertrophy is situated in the interarytenoid space, it may sometimes be of advantage to pinch out a piece of the hypertrophied mucous membrane with forceps.

5. **Atropic Laryngitis** is generally associated with the same condition in the nose and nasopharynx, and should be treated on the same lines as these.

6. **Subglottic Laryngitis.**—Owing to the swelling taking place below the glottis, and therefore in a restricted space, this is a more dangerous form than any of the others previously mentioned. If the case is at all severe it should be kept under constant supervision, because at any time tracheotomy may be necessary.

7. **Chorditis Tuberosa.**—This is generally called "singer's nodules," but it more often occurs in teachers than in singers. It is in all cases due to a wrong method of voice-production, and it occurs more frequently in females than in males, because the former are more liable to anæmia, and because they have the smallest children to teach and have to speak in a higher pitch in the endeavour to make their voice heard over the din.

In all cases *absolute* rest of the voice must be secured, and if the nodule or nodules be not large this may be sufficient, combined with cold astringent sprays. But if the nodules be very large, the quickest way to get rid of them is by removal with forceps, which of course must be very cautiously done, especially in the case of a singer.

The "coup de glotte" has often been supposed to be a cause of the formation of these nodules, but that is only the case when the "coup de glotte" is improperly carried out, and when it is combined with abdominal or diaphragmatic breathing. *George C. Cathcart.*

LARYNGITIS, CATARRHAL.—(See CROUP.)

LENS, DISLOCATION OF.

(1). **Congenital.**—This condition is treated either with glasses, optical iridectomy, or needling, according to the degree of the dislocation.

(2) **Traumatic.**—(See EYE, INJURIES OF.) *W. Tindall Lister.*

LEPROSY.—This intractable disease sometimes results in spontaneous cure, and in all cases the progress is subject to great variations. Periods occur during which the disease advances, retrogresses, or remains apparently stationary.

Attention to cleanliness, good food, and bodily comfort, in many cases is associated with marked improvement, and in a cold bracing climate similar marked improvement is common and may be maintained for years.

Numerous drugs, local applications, sera, etc., have been advocated from time to time, but all, when fully tested, have proved unreliable. Some drugs, such as the iodides, are injurious. Of the others, sodium salicylate

appears to be of some value during the febrile attacks. Mercury has been advocated for long periods and in many forms, and occasionally appears to be of value, especially in cases and under circumstances where there is a tendency to improvement. Intramuscular injections have the most effect.

Chaulmugra oil, in gradually increasing doses, commencing with 3 min. three times a day in capsules, or gurjun oil, commencing with 10-min. doses, have many advocates. The same oils, diluted, are used as liniments.

X rays have given good effects on the local manifestations, but must be used with great care, as the leprotic tissues are of low vitality.

The special manifestations may require surgical treatment. Amongst the minor of these, the painful perforating ulcers are readily relieved by free incision, dividing both the base and sides of the ulcer and subjacent tissues.

C. W. Daniels.

LEUCORRHŒA, pure and simple, is generally the result of morbid conditions of the cervix, and not of the endometrium. The natural secretion of the cervix is a glairy mucus, and this may be present in excess. In many cases, especially in single women, this is the result of general ill-health, and not the cause of it, as is the popular idea. It is a pure hyper-secretion, not due to any definite local lesion.

In married or parous women morbid changes may be discovered in the cervix which account for the discharge. In addition to changes in the cervical mucosa, the cervix may be bilaterally torn and the lips everted. If the discharge under these circumstances is immoderate, antiseptic or astringent douches, together with general tonic treatment, may be employed. In more severe cases solid nitrate of silver or pure carbolic acid may be applied to the cervix two or three times at intervals of a few days. Frequent applications of strong caustics to the cervical canal are dangerous, and if they fail to effect an improvement after the third application should not be repeated; such applications should be reserved for severe and long-standing cases. Trachelorrhaphy, or even the removal of the lips of the vaginal portion of the cervix, if much hypertrophied and everted, may be required in very chronic cases of leucorrhœa which have not been benefited by the treatment above described. *W. J. Gow.*

LEUKÆMIA.—In regard to treatment, it must be remembered that there are three main varieties of the disease: acute lymphatic leukæmia, chronic lymphatic leukæmia, and chronic myeloid leukæmia, which is often called spleno-medullary. The first of these runs a course of from a few days to a few weeks, and is invariably fatal. Very rarely, cases which commence acutely become less acute and pass into the chronic form. No treatment, beyond the symptomatic, is of any avail. The symptom which is apt to be most troublesome is hæmorrhage from some of the mucous surfaces. This is often the cause of death. The use of the X rays in this form has seemed rather to hasten the process than to retard it, apparently by a toxic action. Chronic lymphatic leukæmia, as regards its symptoms and physical signs, is not distinguishable from the myeloid form, except by examination of the blood. The only other distinction between the two is that in the lymphatic form the lymph glands are more apt to be enlarged, and at an earlier period of the disease. These cases are very rare, and the treatment does not differ from that of the next form. Before the application of the X rays to the treatment of myelæmia, the remedy most used was arsenic, and very good results were sometimes obtained from its employment. What was aimed at was the diminution of the leucocytes in the circulating blood, and the diminution in the size of the spleen; and these ends were very often attained, especially in cases which had not lasted too long. The drug had often to be given in full doses, very much in the same way as is

the rule in pernicious anæmia. It must not be forgotten in connection with any form of treatment in this disease that some cases show well-marked remissions, and the leucocytes may fall to normal without any treatment whatever. The condition is so insidious in its onset that cases probably rarely come under observation until the disease is well established.

Of late years a large number of cases have been treated with X rays, which have usually been applied over the spleen, and sometimes, in addition, over the long bones. The results have been very surprising. The spleen has diminished in size, sometimes falling back almost to normal, in a comparatively short time and with only a few exposures, and *pari passu* with that, the circulating leucocytes have greatly diminished in number and the general condition of the patient has improved. The earlier the case, the more certain is this result, and the more rapidly can it be brought about. Very old-standing cases, which have become anæmic and are in poor health, either do not respond so well or take a longer time to do so. There is no doubt whatever that this is a more certain method of producing a remission than by arsenic, but it ought to be clearly understood that it is not capable of curing the disease. Cases which were supposed to be cured in the early days of the treatment are now reported as having died, and it has been found that second courses of X rays are not so uniformly successful as the first; still, there is little doubt that the duration of cases has been prolonged. It has not been clearly ascertained how the rays act. It is evident, however, that the leucocytes in the body are broken up, as there is a large initial increase in the amount of uric acid in the urine. This increase soon ceases, though the diminution of leucocytes goes on, and it seems probable, therefore, that the rays act by preventing the formation of leucocytes as well as by breaking them down. Some observers consider that this breaking down is due to the production in the blood of a substance toxic to leucocytes; others regard it as directly due to the action of the rays. The point has not yet been settled. Experiments in animals show that the treatment can be carried too far, and that it must be carefully controlled by blood examinations, for by prolonged action the power of the marrow to produce leucocytes can be completely abrogated. The cells which are mainly destroyed are those of the granular series. The basophils and eosinophils of polymorphonuclear type are the first to disappear; then the myelocyte forms; then the polymorphs and myelocytes of the neutrophil series; while the lymphocytes are entirely unaffected by the rays. In cases where these cells are present in large numbers, this may produce a condition of blood like a lymphatic leukæmia. In other cases, apparently in the more advanced ones, the total number of cells may lessen, but the qualitative relations may not alter; that is to say, myelocytes are still present. The fact that the rays have no effect upon lymphocytes may explain their failure in cases of lymphatic leukæmia. Great care must be taken in the actual application. Burning of the skin, of course, must be avoided. The applications should not be too prolonged, nor follow one another too quickly, as rises of temperature and other phenomena evidencing a toxic action may follow.

The removal of the spleen has occasionally been attempted, but usually with fatal results. As the marrow is the primary seat of the disease, it is not to be expected that splenectomy would serve any useful purpose.

In cases where anæmia is prominent, iron or arsenic should be given, according as the colour index is low or high. *G. Lovell Gulland.*

LICHEN PLANUS.—The term lichen, as used by the older authors, was like charity, and covered a large number of sins of diagnosis. Nowadays, the term used by itself is understood to mean the disease named at the heading of this article. Lichen planus was described simultaneously by Erasmus Wilson and

Hebra, and is a comparatively common disease, although it probably impresses itself as such more upon the specialist than the general physician, since it is an obstinate condition, and is likely to drift his way.

Acute cases are very characteristic. The eruption may appear and develop rapidly; it itches violently, and the spots have typical characters and a typical distribution. Their outline is angular. Their colour is a peculiar livid lilac, and their surfaces, when looked at sideways, appear as if burnished. The eruption appears by choice upon the flexor aspect of the wrist, and the inner side of the thigh just above the knee. It is, however, not confined to these situations, but may extend all over the surface, and also, and this is most important, it appears on the mucous membrane of the mouth, where it reverses the colour relation, and appears as white patches against the red membrane.

The method of development, and the symptoms which often accompany the disease, suggest some general cause, and we find that it is most readily attacked by internal remedies. Of these, the first place may be given to mercury, which, in the majority of cases, acts with great rapidity in dispelling the eruption. The drug may be given in any convenient form, and the dose should be equivalent to $\frac{1}{12}$ gr. of the perchloride, thrice daily. If mercury should fail, recourse may be had to the older remedy arsenic, which is often satisfactory. If that in turn does not dispel the eruption, antimony may be tried.

In acute cases, local applications are chiefly useful in allaying the itching, which is very severe, and for this purpose lotions of tar or carbolic acid may be used. In the chronic patches, in which the disease often lingers on the limbs, local applications are of more value. Unna's ointment—hydrarg. perchlor. 2 grs., acidi carbolici 15 min., zinc ointment 1 oz.—may be tried; or salicylic ointment 5 per cent, or the tar ointment of the Pharmacopœia. In obstinate patches, the X rays may be resorted to with considerable confidence. (See also URTICARIA.)

Norman Walker.

LICHEN URTICATUS.—(See URTICARIA.)

LITTLE'S DISEASE.—(See PALSIES, CEREBRAL, OF CHILDHOOD.)

LIVER, CIRRHOSIS OF.—(See CIRRHOSIS OF LIVER.)

LIVER, HYDATID DISEASE OF.—This condition is to be treated in almost all cases by laparotomy; in a few cases it may be advisable to approach the disease through the thoracic wall. Aspiration and injection of the cysts should no longer be practised, for the method is rarely successful, and involves at least as much risk as the open operation.

The most satisfactory procedure is enucleation of the cyst and closure of the cavity in the liver without drainage; when this is not practicable, the cyst should be opened, its contents cleared out as far as possible, and free drainage established.

T. Crisp English.

LIVER, INJURIES OF.—In severe abdominal injuries the liver is more likely to be ruptured than any other viscus, and this accident is a particularly fatal one. In many cases the injuries are multiple and severe, and the patients die either at once or within a few hours. On the other hand, rupture of the liver may be caused by an apparently slight injury, and the serious nature of the case may easily be overlooked.

In all open wounds of the liver, immediate operation is necessary, for in these cases there is probably a large quantity of extravasated blood, foreign bodies may be present, other viscera are usually damaged, and the risks of septic infection are great. In cases of subcutaneous injury to the liver, the need for immediate operation depends entirely upon whether there is active or excessive hæmorrhage.

Recovery from the slighter degrees of contusion and rupture may undoubtedly occur under palliative treatment.

TREATMENT.—The removal of the patient from the scene of the injury must be carefully superintended; in fact, under certain circumstances it is best to postpone removing him until some improvement in his condition has occurred. He is then put to bed, and kept absolutely still in the horizontal position; regular observations are made of the pulse, respiration, and temperature. Warmth in the form of blankets and hot bottles is applied according to the degree of shock; if there are symptoms of hæmorrhage, an icebag or Leiter's tubes may be placed over the right hypochondrium.

If the shock be severe, it must be actively treated by the usual methods; if the shock is moderate, the patient may be allowed to recover from it without active assistance, for the measures which relieve shock also tend to restart or to increase the hæmorrhage. No fluid or food should be given by the mouth, but nutrient enemata should be ordered if the patient survives the first few hours. Pain should be treated by giving aspirin and phenacetin, 5 gr. of each, and repeating this every four hours if necessary. Repeated vomiting is usually an indication for operation; otherwise it may be controlled by 20-gr. doses of bismuth subnitrate; morphia and purgatives are to be avoided. As the shock passes off, a careful watch must be kept for symptoms of increasing hæmorrhage; as stated above, all measures which tend to increase the blood-pressure must be avoided.

Operative Treatment.—This is indicated in all cases of open injuries to the liver and in cases in which there are signs of severe or increasing hæmorrhage. If the initial shock be profound, operation must be delayed for two or three hours until the patient is in a condition to stand it. The abdomen is opened in the outer part of the right rectus muscle by a vertical incision; if more room is required, part of the rectus muscle is divided transversely. Bleeding vessels are ligatured, and the wound in the liver is closed if possible by deep broad mattress sutures of stout catgut or silk. If the wound is contused or irregular, so that suturing is impossible, firm packing with gauze must be adopted, but this is not as satisfactory as suture. The extravasated blood must be thoroughly mopped away, and it is usually advisable to flush the peritoneal cavity with saline solution. Drainage must be effected by the insertion of a tube and a gauze plug in the upper part of the wound. *T. Crisp English.*

LOCOMOTOR ATAXIA.—(See TABES DORSALIS.)

LUDWIG'S ANGINA.—(See ANGINA LUDOVICI.)

LUMBAGO.

General Treatment.—In a case of lumbago it is of paramount importance to ascertain, as exactly as possible, its true nature. *Gouty cases* form perhaps the largest proportion; they are usually males of middle age, and of the working classes. These demand the careful regulation of diet, etc., required by the uric acid diathesis (see GOUT); medicinally, a combination of colchicum and iodide of potassium sometimes acts like a charm.

℞	Potass. Iodid.	gr. v	Magnes. Sulph.	gr. xxx
	Sp. Ammon. Co.	♏xv	Aq. Menth. Pip	℥ss
	Vin. Colchic.	♏xx		

Thrice daily in half tumbler of water after meals.

In a smaller group, true rheumatism may be the cause; in these, salicylates combined with alkalies will bring about rapid improvement.

℞	Potass. Citrat.		Tinct. Aurant.	āā ♏xx
	Sod. Salicyl.	āā gr. xv	Aq. Chlorof.	ad ℥ss
	Sp. Ammon. Aromat.			

Every four hours.

Salicylates thus prescribed should be left off gradually, and a dose taken, say twice daily, for at least ten days after the pain has disappeared. In obstinate rheumatic cases, quinine, with small doses of opium, should be given a trial.

R	Quin. Sulph.	gr. v	Syr. Aurant.	℥j
	Ac. Hydrobrom. dil.	♏xv	Aq.	ad ℥ss
	Tinct. Opii	♏x		

Thrice daily.

Traumatism may be responsible for an attack of lumbago. Often, a sudden muscular effort is the exciting factor in a gouty or rheumatic patient, and as such demands no special treatment. Occasionally, a sprain or "rick" of the back is followed by persistent lumbar stiffness, which may be classed as chronic lumbago. In such cases it may even be necessary to resort to an anæsthetic and various surgical manipulations, to break down adhesions.

In perhaps the majority of cases no definite cause can be detected; there may or may not be a history of exposure to cold or wet; the patient is usually an adult who, except for this sudden excruciating pain, appears to be in excellent health. In these acute cases, complete rest in bed is imperative; a very hot bath and a powerful diaphoretic will sometimes give relief in a few hours; the following may be tried:—

R	Salicin.	gr. xx	Liq. Ammon. Acet.	℥ss
	Pulv. Ipecac. Co.	gr. xij	Aq. Camph.	ad ℥ij
	Sp. Ether. Nitr.	℥j		

Ft. haustus. At bedtime.

The patient must remain in bed for the next two days, and should continue a dose of 10 grs. of salicin, twice daily, during the next week.

In chronic cases internal medication is of less value than local treatment. Guaiacum is always worth a trial; it is conveniently given as the powdered resin, stirred up in a little milk or on a morsel of bread-and-butter.

R Pulv. Resin. Guaiac. gr. xv

Twice daily as directed.

Quinine, sulphur, and arsenic are all recommended.

In less severe cases, where the pain appears to be especially of the *neuralgic type*, various of the coal-tar derivatives are often helpful. Antipyrine, antifebrine, and phenacetin are of value, singly or in combination.

R	Phenacetin.	gr. v	Antipyrin.	gr. vj
	Acetanilid.	gr. ii		

In pulv. j. Thrice daily.

In *all cases* of lumbago especial attention must be given to securing a free action of all the excretory organs. A brisk purge should be given at the onset, and a daily evacuation of the bowels secured by a suitable aperient, if necessary. The patient should be encouraged to drink freely of water, or other bland fluids, to promote the action of skin and kidneys. Morphia is seldom or never necessary. After the attack is over, a consideration of preventive measures is necessary, and these suggest themselves: the wearing of a "cholera" belt seems, at times, to aid in preventing recurrence.

Local Treatment.—In every case some kind of local treatment is called for, and, as a rule, is of more value than internal medication. At the onset of an acute case, a well-made linseed and mustard poultice applied across the loins will often give unspeakable relief. In less severe cases, the application of dry heat in some such form as the Greville lamp, will sometimes cut short an attack. Counter-irritation remains our sheet-anchor, in one form or other. Brisk friction with turpentine liniment, followed by the application of a thick layer

of hot cotton-wool fixed with a flannel bandage, is an excellent remedy. A good liniment is as follows :—

℞ Lin. Terebinth. Acet. ℥ss | Lin. Camph. ad ℥ij
Ft. liniment. To be well rubbed in night and morning.

Blistering is worth a trial in more obstinate cases.

Acupuncture has sometimes succeeded when a lumbago proves more than usually intractable. Ordinary surgical needles may be used, thrust deeply into the lumbar muscles at the seat of pain, and withdrawn after five to ten minutes. Not infrequently a case may improve up to a certain point, and yet not entirely clear up ; in such, regular massage, Turkish baths, or a course of salt baths at Droitwich or Llandrindod, may be required to complete a cure. (See also RHEUMATISM, CHRONIC.) *Lewis Smith.*

LUMBAR PUNCTURE is admissible as a therapeutic measure in all cases in which there are signs of increased intracranial pressure, e.g., meningitis, cerebral tumour, fracture of the skull, uræmic coma, eclampsia, and in some cases of tinnitus and vertigo. Headache, vomiting, and coma may thus be relieved, and the danger of optic neuritis supervening may be warded off for a time at least. The procedure may be repeated when symptoms return. Lumbar puncture is carried out as follows : Draw a horizontal line across the back at the level of the highest points of the iliac crests. This line crosses the vertebral column at the level of the tip of the fourth lumbar spine, and the puncture should be made just below this spine in the fourth interlaminal space. Puncture may be made with a platinum-iridium needle fitted to an all-glass sterilizable syringe, or with an ordinary antitoxin needle, or a small trocar and cannula. The needle should be about three inches in length. The patient should be lying on the left side with the knees drawn well up and the trunk bent forwards, or he may sit on a low seat, stooping forwards with the hands on the ground. The skin should be sterilized and anæsthetized by means of an ethyl chloride spray. The index finger of the operator should be placed on the tip of the fourth lumbar spine, and the needle inserted half an inch below and to the right of that spot, the point being directed horizontally forwards and a little inwards, till the arachnoidal sac is reached. The syringe should then be detached and the fluid allowed to drop through the needle. Only a little fluid should be allowed to escape at a time : in most cases 5 cc. will be enough. *Robert Hutchison.*

LUNGS, ŒDEMA OF.—(See CONGESTION, PULMONARY.)

LUPUS ERYTHEMATOSUS.—This is one of the most troublesome of skin diseases to treat, as the multiplicity of the remedies suggested shows.

One can recognize two distinct varieties, which may be described as the sebaceous or scaly, and the erythematous. For the scaly form, provided it is not widespread, Hebra's treatment, which consists of the vigorous application of soap spirit on flannel, is often successful. For the erythematous form, dusting powders, and such applications as exercise a certain degree of pressure, e.g., collodion, are often valuable. It is of primary importance not to aggravate the disease, and it is a good plan to commence the treatment of almost any case with some soothing application such as boro-calamine lotion, on which many cases do surprisingly well.

℞ Ac. Boric. ℥j | Zinc Oxid. āā ℥iij
Calamin. | Aq. ad ℥iv

Ointments should, in the writer's opinion, always be avoided, as they tend to

irritate and spread the eruption. The following application will often be found useful :—

℞ Pyrogallol Oxidisat. 1 per cent in Acetone-collodion.

This was originally recommended by some German authority in 10 per cent strength, but that has not proved nearly so satisfactory as the weaker application. Quinine, strongly recommended by Payne and others, is occasionally useful in the erythematous type of case, but it more often fails than succeeds.

Like so many obstinate skin diseases, lupus erythematosus has run the gamut of all electric methods—Finsen, X-ray, and high frequency. The Finsen method is reported to have been successful in several cases ; the results of X rays have been successful in some, disastrous in others, and though the writer cannot speak of any marked benefit from general high-frequency applications, he can speak strongly in favour of sparking the lesions with a pointed electrode.

The curious relationship of this disease to chilblain seems to indicate the desirability of promoting a vigorous circulation, and keeping the patient well over par, though it must be admitted that the disease often enough attacks persons in apparently robust health. *Norman Walker.*

LUPUS VULGARIS.—It is necessary in the first instance to differentiate between cases as regards their variety and extent. The writer finds it convenient to describe the varieties as simple, catarrhal, fibroid, and warty or verrucose. The circumstances of the patient, and his general condition, are also of importance in deciding on the line of treatment to be followed. It is well to lay down, at the outset, the all-importance of early diagnosis, so that cases come under treatment at the early stage, and the more severe varieties of the disease do not develop. And it may further be laid down that, in spite of the great prominence given to the novelty, it is perfectly possible to treat a large number of cases of lupus without the aid of electricity, and indeed, in many cases, the older simple methods are to be preferred.

Since most cases, when they first come under observation, are catarrhal, this variety may first be dealt with. This catarrh is due to the complicating presence of cocci, and is not a necessary accompaniment of the disease. The complication may be dealt with in various ways. It may be greatly modified by the internal administration of thyroid, to the extent of 15 or 20 gr. a day. It may also be treated by the application of mild antiseptic ointments, such as ammoniate of mercury, 5 gr. to 1 oz. of vaselin, or it may be treated by thorough scraping under anæsthesia. It is at this stage, and for this purpose, that the sharp spoon is most usefully employed.

The fibroid form occurs most frequently on the limbs, and one may almost say of it that it has a natural tendency to recover. At all events, the prognosis is generally good. If the patch is very small it may be excised, care being taken that the incision goes both deep and wide of the disease. It may generally be treated with success by the application of some counter-irritant, such as blistering fluid or liq. antimon. chlor. Occurring as it does on the limbs, it readily lends itself to treatment by Bier's congestion method. But, as has already been said, the tendency is towards recovery, and it is not wise to generalize as to the value of any particular treatment of lupus from its effects in fibroid lupus on the limbs.

The warty form may be looked upon as a mixture of the two diseases, tuberculosis and verruca, and the complication may be got rid of, either by the spoon, knife, or the application of the X rays, which affect both conditions.

There remains for consideration the treatment of the simple variety of the disease, i.e., these cases where there is no apparent ulceration, but only the

presence, below the epidermis, of those brownish nodules which are characteristic of tubercle of the skin. If the patch is small and the position favourable, it may be excised. The line of incision must go well clear of the disease, in every direction, and if the situation is such as to incline the surgeon to conservatism regarding the amount to be removed, it returns in the scar, and the last state is worse than the first. The next method for consideration is the caustic one. Many caustics have a selective action, i.e., their effect is more vigorous and rapid on the feeble tuberculous tissue than on the healthy surroundings. Arsenious acid has long been a favoured remedy. Hebra's prescription was as follows :—

℞	Acid. Arsenios.	gr. x	Ung. Rosæ	℥ss
	Hydrarg. Sulph. Rubr.	℥ss		

This is applied to the part for at least forty-eight hours (being changed at intervals), and provided the patient can endure it, it should be continued for twenty-four hours more. The pain is, however, very severe, and none of the suggested analgesic additions have, in the writer's experience, proved of much value in ameliorating it; so that one has to fall back upon the internal administration of morphine. At the end of the period mentioned, the healthy surroundings are seen to be violently inflamed, and the diseased area is studded with a series of little black sloughs corresponding to the nodules. Under some application (and in the writer's opinion it is not desirable to aim at too rapid healing, and he therefore usually prefers the strong iodoform ointment), the part heals up, and if the application has been continued for a sufficiently long time, the disease may be permanently cured. The main objection to this method is that the resulting scars often tend to be unsightly. Its place has therefore been largely taken by salicylic acid, which is best applied in the form of Unna's salicylic creosote plasters. These are applied night and morning. At first there is no inconvenience, but as the salicylic acid penetrates, and bores out the elements of the nodules, a more or less constant boring pain is experienced. The pain interferes very much with the use of the method in children. In a few days, the little white sloughs which represent the nodules separate, and the part may then be healed by zinc ichthyol salve muslin or some other soothing ointment. As before indicated, the writer prefers rather to delay healing, and always endeavours to persuade patients to persevere with the use of the plaster until complete healing has taken place. If that is not possible, he rubs in dry iodoform, or uses a strong iodoform ointment. If the disease is extensive, this method may still be used, different parts being attacked in succession. But when a very large area is affected and electric methods are not available, probably the best application is that known as Brooke's ointment, of which the following is the formula :—

℞	Zinc. Oxid.		Acid. Salicyl.	gr. xx
	Pulv. Amyl.	āā ℥ij	Ichthyol.	♏ xx
	Vaselin. Alb.	℥ss	Ol. Lavand.	q.s.
	Hydrarg. Oleat. (5%)	℥j		

M. Ft. Ung.

The writer finds that Allan Jamieson's modification is much more easily remembered, and is equally efficacious :—

℞	Ung. Hydrarg. Oleat. (5 %)	℥j	Acid. Salicyl.	gr. xv
	Ichthyol.	♏xx		

To be rubbed in for half an hour every night, and twenty minutes every morning.

It is essential that the directions for prolonged rubbing-in be carried out; simple application is of comparatively little value. Under the

prolonged use of this method, the nodules are very much reduced in number, and may then be attacked by one of the methods already described. When the nodules are so far reduced as to be easily counted, probably the best, at any rate the simplest, method of treatment is their individual destruction. This may be brought about in various ways. The galvano-cautery is an excellent method. It permits of great accuracy of application, and it evokes a secondary reaction which is beneficial. The fine-pointed thermo-cautery is more generally available, and in skilled hands is probably almost as useful. The difficulty in its application is that it is not so easy to accurately pick out the nodules, since the cautery is hot, and the patient, at first at least, shirks the apparent ordeal by fire. Still more simple is the method recommended by Mr. Hutchinson, in which wooden matches are sharpened, and dipped in solution of the acid nitrate of mercury, and then bored into each individual nodule. In this connection a caution must be given. The liq. hydrarg. nitrat. is prepared with nitric acid, and a fresh preparation is very much more active than that which has stood on a consulting-room table for months, and sometimes far exceeds the desires of the surgeon in its effects. These may, if desired, be intensified by cutting off the piece of wool which has penetrated the nodule, and leaving it *in situ*. Unna has recommended "gooseberry prickles" in preference to matches, but in the writer's experience, they are inconvenient to handle, and no better than the match. Carbolic acid may be used instead of the nitrate of mercury, and other caustics may also be chosen. In the case of children, who cannot be expected to submit patiently to the drawn-out pain of these methods, probably the best application is carbolic acid, for, although the pain is severe for a moment, the anæsthetic effects soon develop, and the pain is forgotten.

The writer has already indicated his opinion of scraping, but there is no doubt that its temporary effects are good, and many patients have a preference for scraping, since it usually gives them a period of relief. But it must be recognized that it is hardly possible to *cure* a case of lupus by simple scraping. If one aims at a cure, it must be very vigorously done, and the resulting scars are almost as disfiguring as the lupus.

The cautery was, and still is with some, a popular method of treatment in extensive cases. Anæsthesia is, of course, required, and the instrument must be used freely, in order to destroy the tissues deep down. If only applied to the surface, it is simply a severe form of counter-irritation. Kaposi used a solid stick of silver nitrate, with which he ploughed furrows in all directions through the disease. This was followed by some improvement, as is indeed any method of counter-irritation, but the method is rarely employed now.

Before passing to the consideration of the electric methods, it may be well to refer to the fact that lupus of the skin is very generally associated with diseased oral or nasal mucous membrane, and it is often distressing to find cases long and carefully treated as to the skin, while the disease is allowed to go on unchecked in the mouth. In that situation we have in lactic acid a remedy of wonderful efficacy. Some authors prefer to dilute it, but the writer uses it in its full strength. The mucous membrane should be dried with cotton wool before the application, and the mouth washed out immediately afterwards. (See also NOSE, TUBERCULOSIS OF.)

Treatment by Electricity.—Of electric methods, the most generally useful is the X-ray, for the expense, both initial and working, of Finsen apparatus, places it beyond the reach of all but wealthy hospitals. One need only lay down here a few general principles, for those who intend to use it must go to fuller sources of information for their instruction. Here, too, the extent of the disease has to be carefully considered. If a patch is small it may be exposed—the surrounding parts being carefully protected by lead-foil—for a considerable period of time

(twenty minutes to one hour) to the X rays from a soft tube, with the deliberate intention of producing an X ray burn. This method is often very successful: the ulcer produced takes a long time to heal, but it requires only simple dressing, which can be done by the patient himself at home. The results are often very satisfactory. In widespread cases it is more customary to proceed by means of a series of exposures, using the rays from a tube which is moderately hard, and beginners, at least, should endeavour to keep under the line of reaction. There is, however, no doubt that a moderate reaction is beneficial, and as experience increases this may be aimed at, either by the use of longer exposures or of softer tubes. Since the edge is usually the part where the disease is most active, it is often a good plan to produce greater reaction there. As it is obviously difficult to do this by means of the rays, other methods are adopted in addition. The simplest of these is the plan of painting the edge with pure carbolic acid. Under the steady and prolonged—often very prolonged—use of the rays, the lupus steadily improves. The nodules diminish in number, the hyperæmia disappears, and in favourable cases the condition of the skin is restored to an appearance not very far from the normal. The two drawbacks to this method are, the occasional production of severe burns (although these are much rarer than they used to be) and the occasional production of cancer, which is, unfortunately, commoner. It is not possible to say definitely which cases are likely to develop this, a complication to which all cases of lupus are liable, but in the writer's experience it has developed mostly in what might be called the "florid" cases of the disease, those associated with a good deal of hyperæmia and catarrh. It seems likely that this unfortunate complication is not to be attributed directly to the rays, but to the fact of their beneficial action compressing the ordinary years' duration of a case into a few months. It is the old cases of lupus which develop cancer, and by hastening the progress one seems sometimes to increase this risk. Needless to say, when this complication develops it must be immediately treated by surgical means. It must be remembered that the X ray produces many other effects than those desired, and the parts which it is not intended to affect must be carefully protected by lead. The effect of the rays in bringing out the hair must be kept in mind, and if convenient the eyes should be protected. The writer, however, believes that the danger to these is exaggerated, and in the treatment of rodent ulcers, where it was not possible to protect the eye, he has not seen any ill-effects. Where, therefore, lupus affects the eyelids, the rays may nevertheless be applied. A further advantage which the rays possess is that their effects are not confined to the skin, but the mucous membranes in the neighbourhood are also affected.

Though not strictly within the scope of this article, the writer feels compelled to repeat his many warnings as to the effect of the rays on the operator. The sterility which has been proved to result in animals is a matter which must be considered where the administrator is exposed for hours to the effects of the rays. But undoubtedly the principal risk is the development upon the hands of warty growths which develop into epitheliomata. These are generally to be found on the hands of young enthusiasts, or those who were once young enthusiasts. It should be a fixed rule never to expose the hands to the rays, and the plan of testing a tube with the screen of the operator's hand is one which no sensible man should ever practise.

The Finsen method has been described so often and so fully that it is hardly necessary to say more than that it consists in focussing the light from a powerful arc lamp upon the area of skin to be treated. The part must be rendered anæmic by pressure of a crystal lens, and this is further used to cut off the heat by means of a stream of cold water which circulates through it. Each application must be of an hour's duration, and its efficacy depends entirely upon the skill

and care of the nurse who applies it. If she does not understand the principles, does not get the light properly directed, and does not keep up constant pressure, the results are nil.

If all has been properly performed, a blister is evident on the following day; this is let out and dressed with any simple dressing, and a fresh part is attacked. The treatment of an extensive case requires a very long time, and it is the writer's opinion that the Finsen method should be reserved for comparatively small patches, which can be gone over in a reasonably short time.

Allied to these methods, is the exposure to the rays of radium. Unfortunately the expense of this is so great, and the quantities procurable so small, that only limited patches can be treated. The effects are very similar to those of the X rays. It is possible to produce burns just as with these. In the writer's opinion, the greatest value of radium is in lupus of the palate, which is not easily got at by the rays, and is inaccessible to the Finsen method.

In uranium (another radio-active substance), which is easily procured, we have a means of treating lupus which may possibly come into more general use. The application may be continuous, and the beneficial effects are often striking. It is, of course, particularly useful to those living in the country, where electricity is not available. The writer uses it in the form of plaster, but the powder of the oxide may be applied in any convenient form.

In conclusion, it may be said that the greatest remedy of all in the treatment of lupus is *perseverance*. The disease must be relentlessly pursued until the last trace of it has disappeared, and if the writer has seemed in any way to depreciate the value of the Finsen method, he fully appreciates that it is to Finsen we owe the lesson of perseverance in the treatment of this formerly uninteresting disease.

Norman Walker.

LYMPHADENOMA. (See also TUBERCULOUS GLANDS.)—A large number of conditions are often confounded under this name, the principal being indolent tuberculous glands, lympho-sarcoma, pseudo-leukæmia, and the true lymphadenoma. It is often exceedingly difficult in life to distinguish between these, and it is no uncommon thing to find that a case which had been supposed to be lymphadenoma turns out to be either tuberculous or sarcomatous. The really important point in diagnosis is to exclude tubercle. This may be done with fair certainty by the consideration of personal and family history; by the examination of other organs and of the sputum for bacilli; by the diagnositc injection of old tuberculin, or, still better, by the estimation of the opsonic index in conjunction with the injection of tuberculin T.R., according to Stewart and Ritchie's method (*Edin. Med. Jour.*, May, 1907). I have found this latter method exceedingly useful and reliable. Should all these fail, it is usually justifiable to excise a gland and examine it microscopically.

If the glands are found to be tuberculous, the question of surgical interference must, of course, be considered. If, for any reason, this is inadvisable, good results can sometimes be obtained by arsenic and cod-liver oil given together, and by the judicious application of some ointment containing iodine. Iodine has sometimes been injected into the glands, and this is a well-recognized form of treatment in Italy, where it seems to have met with more success than in this country. Of course, the ordinary hygienic measures necessary for all cases of tuberculosis must be carried out in these cases, in addition. Very good results are sometimes obtained by the use of tuberculin T.R., either controlled by the opsonic index, or used in such doses and at such intervals as experience with that estimation has shown to be proper. It is not wise, for example, to use a greater initial dose than $\frac{1}{1000}$ mgram, and as a general rule, it is found that the positive phase, during which a second injection should be given, is at

its maximum about three weeks after the first dose. There are now, however, so many laboratories at which the index can be estimated, that it should be done whenever it is possible, as it adds greatly to the safety of the treatment. Care should be taken never to embark upon this course until pus, if present, has been removed, either by incision or aspiration.

Lymphosarcoma admits only of surgical treatment, and that, unless the disease begins in some accessible part of the body such as the tonsil or cervical glands, has little prospect of success. In cases where the condition commences in the mediastinal or abdominal glands, it is, of course, impossible to remove these, and where it commences in the glands about the pelvic brim, it is usually too far advanced before the patient seeks advice for anything to be done. Very much the same may indeed be said of true lymphadenoma. The only remedy which has much influence over it is arsenic, and the effect of that is, as a rule, only temporary. Excision should always be practised if the glands are accessible. In some cases of lymphadenoma, the patient is greatly distressed by evening rises of temperature, sometimes to a great height. I have known kryogenin of value in preventing this rise. It should be given in 5-gr. doses about an hour before the rise is anticipated, and if necessary, repeated later in the day. For the weakness and prostration which attend the condition, cardiac tonics such as strophanthus and digitalis, rest in bed, and careful feeding with whatever the weakened digestion will stand, are essential. Fortunately, the course of the disease is often prolonged, and remissions of symptoms not infrequently occur.

G. Lovell Gulland.

MALARIA.—Quinine is the only drug that can be said to be a certain cure, but the method of administering the dose, and the compound used, vary in individual cases.

It is of the utmost importance that the diagnosis should be clearly proved by blood examination, as it may be necessary at any time to push the doses beyond the ordinary limits, and only when such certainty is attained are extreme doses justifiable. In all cases, during the pyrexial periods, rest in bed is essential. The diet should be light, fluids (other than alcohol) administered abundantly, and the bowels freely opened. Changes of temperature, draughts, and chills must be carefully avoided.

Quinine is usually given as the hydrochloride, sulphate, or bisulphate. In some cases, where the taste is particularly objected to, the carbonate "euquinine," in equivalent doses, can be given. As this preparation is tasteless, it is particularly well suited for children.

Method of Administration.—Quinine can be given by the mouth or rectum, or by intramuscular or intravenous injection. If given by the mouth, the effects are most certain when the drug is in solution. Uncoated tabloids of the bisulphate are fairly reliable. Sugar-coated tabloids, pills, etc., are almost worthless, and may be passed per rectum unchanged.

Rectal administration is useful in severe cases where frequent large doses are required, or where vomiting is persistent and intramuscular injections are objected to. The quinine should be dissolved with tartaric acid. If hydrochloric acid be taken as the solvent, the solution must be well diluted and the minimum amount of acid used. In children, retention of the injection must be insured by pressing the buttocks against each other.

Superficial hypodermic injections cause much pain, and *intramuscular injections* should be substituted. Tetanus has resulted from such injections, and quinine appears to increase the probability of such an event if dirty needles be used. The careless preparation of the skin, instruments, and solutions, that are safe enough with morphia and other injections, are full of risk in the case of

quinine. The syringe and solution should therefore be boiled immediately before use, and the skin rendered as aseptic as possible.

With these precautions, there is no risk of tetanus or of abscess, although there may be some pain and induration for a few days. The injection should be made into a large muscular mass such as the gluteus maximus ; injection into the smaller muscles is more painful. A daily dose of 9 gr. of the bihydrochloride dissolved in 20 min. of water will suffice for most of the intractable cases, but if there is any immediate danger to life, more frequent doses are absolutely necessary.

Intravenous injection is occasionally required as a last resource. It is not, as a rule, more effective than intramuscular injection, and is more dangerous.

Dosage.—This must vary according to the severity of the case and in different attacks. Minute doses, even the small amount of quinine contained in half a drachm of Easton's syrup, may control or reduce the fever in some cases, whilst in others, 60 gr. a day have had little effect, even when given intramuscularly. It is on account of the variation in the dose required that it is so important, in any grave case, that the diagnosis should be certain, as heroic doses may be necessary in order to save life.

In an ordinary case of benign tertian or quartan malaria, 5 gr. three times a day is an ample dose ; smaller doses may be used, but with less certainty. In malignant malaria, similar doses may be successful, but the attendant must be prepared to increase them greatly if symptoms do not speedily subside, or if any grave signs supervene. A daily intramuscular injection of 9 gr. is sufficient in the great majority of cases.

If coma should supervene, there is little time to lose, and large and frequent doses should be given, e.g., 16 gr. or more intramuscularly, and hourly rectal injections of 10 gr. till the symptoms subside. Under the free and frequent administration of quinine, even these grave cases usually recover rapidly. The risk of quinine poisoning must be run, for if the disease be not controlled, death will occur in a few hours.

Malarial convulsions in infants and children up to about five years of age, belong to the same class of cases. Malaria in children shows comparatively few of the ordinary symptoms, and in the tropics its presence should be suspected in all cases of convulsions in children, particularly in those over six months old.

In such cases, rectal injections of quinine are of great value, and if ample doses are given, the convulsions speedily cease ; but the doses to be effective must be large. Children stand quinine well, and a rectal injection of 5 gr. in a child a year old, followed by 2½ gr. every hour till the convulsions cease, and then repeated at longer intervals, will, in the majority of cases, save the patient. With smaller doses there is a much greater mortality.

These doses are much above those authorized in the British Pharmacopœia, or approved by some authorities, but with small doses the condition of the patient is desperate, and even these heroic doses will occasionally be found to be insufficient. When the severe symptoms have passed, moderate doses will suffice to prevent recurrence, and these smaller doses may be continued, preferably in solution, by the mouth. Hot packs should be employed for adults and hot baths for children, and on any sign of cardiac failure, stimulants, preferably alcohol, should be freely administered.

Recurrences and relapses occur in the great majority of cases, and therefore, after convalescence from an attack of malaria, the administration of quinine should be continued for at least three months. It is well to reduce the frequency of administration of the drug gradually. For a full week after apparent convalescence, 5 gr. should be taken three times a day. For a further period

of two weeks, 5 gr. once daily. Subsequently, 10 gr. two or three times a week, further reduced to once a week, should be taken.

Intolerance of Quinine.—Mere intolerance in the sense of dislike of the taste can be overcome in many ways, and especially by the substitution of euquinine in equal doses. The ordinary physiological effects are reduced by the use of bromides, but when quinine is persisted in, the patient usually becomes less susceptible to these effects even when no bromides are given.

In some persons, after frequent attacks of malaria, quinine may cause hæmoglobinuria. Such cases are not common, but do occur, especially in persons who have suffered from fever in Africa. In such cases, quinine must be administered cautiously, beginning with small doses, slowly increased till sufficient to control the fever is reached.

Various substitutes for quinine have been advocated from time to time. Of these, methyl blue is the most effective. It can be given in doses of 5 gr. in cachet with good effect, but is on the whole less certain in its action than quinine.

Patients to whom this drug is given should be warned of the change that it will produce in the colour of urine and fæces. Arsenic, in many forms, has been advocated. It does not destroy the parasites, and therefore is useless in the acute stages. During the convalescence, it is of high value in the treatment of the anæmia often present.

Adjuvants.—Phenacetin, antipyrine, and other antipyretic drugs have been advocated. No reliance can be placed on these drugs as curative agents, but they relieve headache, promote diaphoresis, and render the patient more comfortable. In small doses, and in mild cases, their use is therefore occasionally permissible. There is no object in giving such drugs merely to reduce the temperature, and in no case are they a substitute for quinine.

Hot drinks, such as tea and various native decoctions (lemon grass tea, etc.), can be freely used to promote diaphoresis during the hot stage. *C. W. Daniels.*

MALTA FEVER.—Treatment here is essentially symptomatic. Quinine, salicylates, and antipyretics are often used, but have no action beyond temporary relief of the symptoms in some instances, and as the disease runs a most protracted course, the use of such drugs cannot be persisted in.

Diet must be light and nutritous; solid food often appears to cause or precipitate a relapse. Constipation has a similar effect.

The temperature is best reduced by local applications, sponging, etc., and if hyperpyrexia threatens, by the use of cold baths. The joint affections may be relieved by local applications. The occasional use of hypnotics may be necessary.

C. W. Daniels.

MAMMARY ABSCESS. — Mammary abscesses appear to afford some difficulty in treatment, judging by the many cases in which secondary operations are necessary.

As soon as suppuration is evident, operation should be performed; the skin should be very carefully cleansed with the most rigid antiseptic precautions, for it is important to avoid introducing any fresh organisms. A general anæsthetic should be given, either A.C.E. mixture or nitrous oxide gas, followed by ether; gas by itself is inadvisable, for it often results in a hurried and imperfect operation. Puncture of the abscess without an anæsthetic, a plan often adopted, almost invariably leads to failure.

The nature of the incision depends on the position and size of the abscess. The essential points are that the incision should be free, that it should be made as low in the breast as possible, and that it should avoid the main milk-ducts. In most cases the best incision is a large one in the lowest part of the breast; a free opening here gives efficient drainage in the most dependent part, will not

injure the main ducts, and will leave an inconspicuous scar. If the abscess is in the upper part of the breast, it should be opened from its lower and outer aspect. When there are multiple abscesses scattered through the breast, several incisions must be made, and be made freely, otherwise the whole breast may have to be sacrificed.

Mammary abscesses are often multilocular, and after incision it is essential to convert the loculi into one large cavity; this is done by inserting the finger and breaking down the intervening septa. A large drainage tube is then inserted, and it is well to secure this to the skin with a stitch; an antiseptic fomentation is applied, and the arm is placed in a sling. The cavity should never be scraped or irrigated. The fomentation should be changed about two hours after the operation, and then be repeated every four hours for the first two or three days; the tube should be gradually shortened, and then be replaced by a smaller one.

The patient should be kept to bed for a few days, but should be encouraged to sit up in bed as much as possible in order to facilitate drainage; the bowels should be kept well opened, and a liberal diet should be given; iron and quinine do much good in these cases.

Persistent Sinuses.—When a mammary abscess has burst spontaneously or has been inefficiently opened, multiple sinuses are apt to form and to persist. In fact, in many of these cases the breast is riddled with sinuses, and this continued suppuration seriously affects the patient's general health.

TREATMENT.—At the earliest opportunity the sinuses should be freely opened up, their walls scraped, and the cavities plugged with cyanide or iodoform gauze. Small pockets of pus must be thoroughly opened. The sinuses may be syringed with one of the following solutions: Merc. biniod. 1–1000; iodine 1 dr. to the pint; or hydrogen perox. The arm must be kept at rest with a sling.

The most effective treatment in these cases, when it can be practised, is vaccine inoculation. Observations must be taken as to the micro-organism present, and the patient's opsonic index in relation to that organism; the corresponding vaccine is then prepared, and its use will as a rule bring about a rapid cure.

The treatment of the general health is almost as important as the local measures. Sea air will usually cause rapid improvement, whilst iron, quinine, syrup. ferri phosh. co., and salines are valuable.

In obstinate and long-standing cases, *amputation* of the breast may be necessary, but should be avoided if possible. If this operation is performed, special precautions must be taken to avoid infection of the wound; the best method of rendering the opening of the sinuses aseptic is the use of thermo-cautery.

Sub-mammary Abscesses.—These abscesses may be acute or chronic; they show themselves by œdema at the base of the breast, and by forward projection of the breast which itself is not affected. The treatment consists in early and free incision at the lower and outer part of the breast, with free drainage. (See also ABSCESS.)

T. Crisp English.

MAMMARY NEURALGIA.—(See BREAST, NEURALGIA OF.)

MASTITIS.—This condition may be conveniently described under three divisions: (1) Acute; (2) Chronic lobular; (3) Chronic interstitial.

Acute Mastitis—Is usually associated with cracked nipples during lactation; it also occurs during pregnancy, shortly after birth and at puberty, and as the result of injuries and the specific fevers.

TREATMENT.—Prophylactic treatment has been referred to under BREAST; any cracks or fissures of the nipple must be attended to; suckling must of course be stopped, and the milk should be drawn off gently with a breast pump.

Hot fomentations are then applied with moderately firm pressure, and are repeated every three or four hours; the arm is placed in a sling. In order to diminish the secretion of milk, a light diet is given, with restriction of liquids, and the bowels are freely opened with saline purgatives. With this treatment most cases of acute mastitis will recover.

The difficult cases are those in which it is doubtful whether suppuration is occurring or not. The temperature is an unreliable sign, as simple mastitis may cause a considerable rise in nervous women. Suppuration may be suspected under the following conditions: (1) Failure of the swelling to subside under the treatment recommended above; (2) Any fixation of the skin over the indurated area; (3) Continued temperature; (4) Insomnia.

When in doubt an exploratory puncture may be made with a small scalpel or tenotome into the centre of the swelling, division of the main milk-ducts being avoided. An incision should not be made unless there is good reason to suspect pus, for if no pus is found the incision is very liable to suppurate, and a troublesome sinus may form. (See MAMMARY ABSCESS.)

Chronic Lobular Mastitis.—In this variety of chronic mastitis a portion of the breast only is affected, usually as the result of injury, or as a sequel of lactation; continued irritation, such as that of badly fitting corsets, is commonly a cause.

TREATMENT.—All forms of irritation should be removed. The arm should be put in a sling and a breast bandage firmly applied. The best local applications are the ointment or glycerin of belladonna. If the condition persist, the breast should be firmly strapped, or mercurial ointment be firmly applied on lint. Repeated blistering will often cause rapid resolution of the indurated area. Iron, arsenic, quinine, and sea air are valuable.

If there be any doubt about the condition, or if it persists or increases in spite of treatment, the troublesome area should be excised.

Chronic Interstitial Mastitis—May occur at any age, but is met with most commonly between the ages of thirty-five and fifty; there is usually no obvious cause for it; both breasts are generally affected, but one may suffer more severely than the other.

TREATMENT.—The treatment of this condition forms a very difficult problem; no hard and fast rules can be laid down; each case must be considered individually, treatment varying with the extent and distribution of the mastitis, and with the age and general condition of the patient. The following points may be emphasized:—

(1) In many cases, the condition is mild and non-progressive, and does not give the patient any serious trouble. She may come under observation, complaining of a swelling in the breast which she fears may be cancerous: reassurance, if it can be honestly given, is the main treatment required. Belladonna plaster or liniment may be applied.

(2) If the disease be more advanced, more active treatment is called for; and this applies especially to those cases in which the condition is distributed evenly in the two breasts, and in which pain is a prominent feature. The trouble can usually be cured or considerably improved by the following measures: The application of mercurial ointment on lint, a circular hole being cut for the protrusion of the nipple; over this a firm bandage is applied. A mixture containing sod. iod. 3 gr., potass. iod. 3 gr., and tinc. nucis vom. 5 min., is taken internally three times daily after food, half a glass of water being taken with each dose. Improvement as a rule shows itself in seven to fourteen days.

(3) The question of *operative treatment* has to be considered. In France and the United States it is customary to regard this condition as pre-cancerous, that is to say, as being liable to develop into cancer, and so operation is recommended

far more commonly than in this country. There is no doubt that cancer develops in a certain number of these cases, especially in patients over forty ; but there is equally no doubt that the liability to the development of cancer varies greatly in different types of chronic mastitis. Each individual case therefore must be judged on its merits, for in some the disease is comparatively harmless, in others a source of danger.

If the trouble be persistent in spite of treatment, and be the cause of pain and worry to the patient, excision of the breast should be advised. If there be hard, irregular induration in the upper and outer quadrant of the breast, with enlargement of glands, excision is advisable. If the patient is over thirty-five years of age, and the mastitis is definite and resists treatment, then excision should be recommended. Under these conditions the disease may be considered as clinically pre-cancerous, and as such should be thoroughly removed. Removal of the breast for non-malignant conditions is an easy and simple operation ; extensive incisions are not required, and the nipple may be spared if desired. (See also BREAST, TUMOURS OF.) *T. Crisp English.*

MASTOID.—(See EAR, AFFECTIONS OF.)

MEASLES.—In this disease the chief danger is from complications of the respiratory organs ; every endeavour, therefore, should be made to avert them. The air of the room should be kept fresh, and at the same time at a temperature of 60° to 65° F., and should be moistened by means of a bronchitis kettle, to the water in which some aromatic, such as eucalyptus, creosote, or compound tincture of benzoin, may be added with advantage. There is strong reason for believing that the pneumonia of measles is communicable from one case to another ; hence, when several cases are being treated in the same ward, any that show signs of pulmonary complication should be removed to another room.

The very irritating early laryngitis is usually relieved by concentrating medicated steam round the patient—by means of a tent if he is in a ward or a large apartment—and by applying frequently renewed hot fomentations over the larynx and trachea, care being taken not to blister the skin, in case tracheotomy should be needful. A mixture containing bicarbonate of soda, ipecacuanha wine, and compound tincture of camphor should also be given every four hours. Only in extreme cases of dyspnœa, however, should surgical interference be sought, for usually the laryngeal symptoms will subside as soon as the rash makes its appearance. But if the laryngeal obstruction requires surgical relief, intubation should be tried in the first place. Great care should be taken that the tube rests without pressure in the larynx, since in this form of laryngitis ulceration is easily caused. If the tube is constantly coughed out, tracheotomy should be performed, for in such cases persistence in intubation is almost certain to lead to ulceration.

The writer strongly recommends that in all cases of laryngitis in measles occurring in localities where diphtheria is at all prevalent, a subcutaneous injection of 4000 units of antitoxin be given. Laryngeal diphtheria, without any faucial affection, is a frequent complication of measles, and in most instances it is impossible to be sure, without waiting for two or three days, whether the laryngeal symptoms are due to diphtheria or not. Laryngeal symptoms arising after the appearance of the rash are especially likely to be due to diphtheria.

The photophobia consequent upon the conjunctival injection or inflammation necessitates that light should not be allowed to fall directly upon the patient's face. But the room should not be darkened except when the patient is asleep at night. In these cases the eyes should frequently be bathed with a saturated

solution of boracic acid, and occasionally with adrenalin chloride, 1–1000, and cocaine, 1–2 per cent solution. These remedies will usually prevent more serious complications.

A high temperature and delirium are best treated with cold sponging or cold-water packs. For robust children iced water may be used. If pneumonia be the cause of these symptoms, an ice poultice should be applied to the affected lung. At the same time 2 gr. sulphate of quinine should be given every four hours, with an alcoholic stimulant (brandy or champagne).

In other respects the lung complications should be treated on ordinary principles (see PNEUMONIA, BRONCHITIS, etc.). The most common is lobular pneumonia, and for this 3 or 4 min. of tincture of belladonna every four hours is very useful. Stomatitis is not infrequent. The mouth, therefore, must be frequently washed or swabbed out with the solutions mentioned in the article FEVERS, ACUTE INFECTIOUS.

Vomiting is best met by peptonizing the milk and giving a bismuth mixture.

The treatment of diarrhœa depends upon its cause. If it be due to undigested food, give less food for a time and peptonize it, or give whey; clear out the bowels with a dose of castor oil. If the diarrhœa still persists, prescribe some astringent, and if this fails to act, add small doses of compound tincture of camphor or laudanum. The writer has found the following mixture from the Guy's Hospital Pharmacopœia very useful:—

℞	Bismuth. Carb.	gr. ij	Muc. Acac.	℥xv
	Pulv. Cret. Aromat. c. Opii	gr. j	Aq	ad ℥j
	Glyc. Acid. Tannic.	℥v		

If there is colitis, the lower bowel should be washed out twice a day with warm water. In very intractable cases, raw beef-juice should be tried, instead of milk or other nourishment. If the motions are very offensive, some intestinal antiseptic is indicated, as recommended in the article on TYPHOID FEVER. Severe cases of diarrhœa will require some stimulant: brandy is the best.

Other complications do not call for any special notice.

There is often much wasting after an attack of measles, especially when there has been diarrhœa of any severity; so that during convalescence close attention must be paid to the child's diet. Cream, virol, cod-liver oil with iron, are often indicated in addition to the ordinary food.

Uncomplicated cases of measles may be allowed out of bed a week after the temperature has become normal, and out of doors in another week or two if the weather is fine. Such cases are free from infection at the end of three weeks from the appearance of the rash. Probably even complicated cases are free from infection at the end of four weeks. But it is advisable to keep pulmonary cases isolated till the lungs are clear.

Quarantine period: three weeks. *E. W. Goodall.*

MEDITERRANEAN FEVER.—(See MALTA FEVER.)

MEGRIM.—(See HEADACHE and MIGRAINE.)

MEMBRANA TYMPANI.—(See EAR, AFFECTIONS OF.)

MÉNIÈRE'S DISEASE.—(See EAR, AFFECTIONS OF.)

MENINGITIS.—For therapeutic purposes it is convenient to divide cases of meningitis into three main groups:—(1) *Acute Infective Meningitis*; (2) *Epidemic Cerebrospinal Meningitis and Posterior Basic Meningitis*; (3) *Syphilitic and Tuberculous Meningitis.*

1. **Acute Infective or Purulent Meningitis.**—Most of these cases are secondary to some septic process in the bones of the cranium, whence the organisms

penetrate the dura mater and spread through the pia arachnoid. The majority of cases, as a matter of fact, follow suppuration, acute or chronic, of the middle ear. The symptoms of meningitis are familiar and need not here be recapitulated. One point, however, is worthy of special mention, viz., that the cerebrospinal fluid obtained by lumbar puncture in these infective cases contains polymorphonuclear leucocytes in enormous numbers.

The treatment of meningitis secondary to gross suppurative conditions of the cranial bones must first of all be directed to the original source of infection, and is, therefore, primarily surgical. The diseased area of bone must be freely exposed, and any pus must have free exit.

In addition, we adopt certain general measures, applicable to all cases of meningitis. These comprise the following: The patient must be kept in bed, in a quiet, darkened room, his head shaved, and an ice-bag or a Leiter's coil of cold tubing applied to the scalp. In cases due to ear disease, leeches should be applied behind the affected ear. Meantime we administer a mercurial purge, such as calomel or blue pill, followed by a saline aperient, and the bowels thereafter must be kept regular. If the temperature becomes alarmingly high, we endeavour to reduce it by sponging the patient. Convulsions should be controlled by a mixture containing potassium bromide, 20 gr., chloral hydrate 10 gr., syrup aurantii ½ dr., and aqua chloroformi to 1 oz., repeated every four hours if necessary. Withdrawal of cerebrospinal fluid is of great value, not only for purposes of diagnosis, but as a therapeutic measure. It diminishes the excessive intracranial pressure, thereby tends to relieve the headache, and sometimes even restores a comatose patient for a time, at least, to consciousness. The amount of fluid to be withdrawn depends largely on the degree to which the intrathecal pressure is increased.

Normally, in health, the cerebrospinal fluid issues from the needle drop by drop; but in cases of meningitis we often observe quite a jet or fountain of fluid. We allow this to flow until the pressure is reduced to normal. Negative pressure, by suction with a syringe, should never be employed.

2. **Epidemic Cerebrospinal Meningitis and Posterior Basic Meningitis.**—In this disease, the measures already detailed for meningitis in general should be followed. In addition, we endeavour to apply remedies to attack the causal organism, the *Diplococcus intracellularis*. Inasmuch as the most important channel of infection in this epidemic variety is probably through the nasal passages, these latter should be carefully disinfected, and all nasal discharges collected and burnt, to minimize the spread of the disease to other patients. We may also introduce antiseptics into the cerebrospinal fluid through a lumbar-puncture needle. A 1 per cent solution of lysol is perhaps the most satisfactory for this purpose, about 10 cc. being injected at a time. The procedure may be repeated for several successive days. In any case, repeated withdrawals of cerebrospinal fluid are always of benefit, and I have seen severe cases recover after this alone, even without introduction of an antiseptic. Intravenous solutions of collargol are also of considerable value, ½ gr. being injected at a time, in a 2 per cent aqueous solution. (See FOLLOWING ARTICLE.)

3. **Tuberculous and Syphilitic Meningitis and Meningo-encephalitis.**—In these varieties of meningitis, the cerebrospinal fluid obtained by lumbar puncture contains a large excess of mononuclear lymphocytes. The treatment of the tuberculous variety offers but little prospect of success. We should, however, employ the general measures already described. And in addition, mercurial inunction of blue ointment to the abdomen, or administration of mercury by the mouth, is advisable. Repeated lumbar puncture relieves the intracranial pressure, if the communicating channels between the cranial and spinal ponds be not already closed by adhesive meningeal inflammation.

In syphilitic cases the prospect of recovery is much brighter. Here we administer both mercury and iodide of potassium, energetically. Iodide of potassium we give by the mouth in doses of from 10 to 20 gr., three times a day. Mercury may be given by the mouth in full doses, say 1 dr. of the liquor hydrargyri perchloridi three times a day, or by inunction of a drachm of blue ointment daily, or by intramuscular injection of a soluble mercurial salt. For this purpose it is convenient to give 1 cc. of a 1 per cent aqueous solution of benzoate of mercury, twice or three times a day, according to the severity of the case.

Purves Stewart.

MENINGITIS, EPIDEMIC CEREBROSPINAL.—The patient should be kept quiet in a darkened room. Great care must be exercised in order to avoid bedsores, which are particularly prone to form rapidly. A certain amount of restraint is necessary in delirious cases. It should be applied by methods recommended in the article FEVERS, ACUTE INFECTIOUS. The joints should be wrapped in cotton-wool lightly bandaged on. In most cases nerve-sedatives are called for, and of these the most efficacious are morphia and opium. Large doses of these drugs can be tolerated in this disease; 40 min. of laudanum every hour; or 7½ gr. of opium at the beginning, and 1 gr. every half hour; or morphia hypodermically in doses of ¼ to ⅓ gr. at intervals of a few hours. Opium or morphia appear to be most beneficial when administered very early in the illness. As the patient becomes drowsy, the dose must be diminished, or the administration stopped. In cases where there may be any objection to opium, potassium bromide or chloral hydrate may be used. The following mixture will be found useful:—

℞ Potass. Brom. Chloral. Hydrat. Cannab. Indic.	āā gr. cxx	Hyoscyamin. Elix. Simplic.	āā gr. j q.s. ad ℥j

Of this mixture, a child of three is given 10–15 min. every twenty minutes until profoundly under its influence, and the dose must be repeated as soon as there is either moaning or restless movement of the limbs. The dose for an adult is half a teaspoonful, administered in the same manner.

Most authorities agree that counter-irritation to the spine and back of the head is a valuable measure; so that blistering, or rubbing the spine with stimulating liniments, such as camphor liniment, or mustard poultices, may be employed. It is not desirable to blister deeply; frequent flying blisters are preferable. Cold should be applied to the head, either by means of crushed ice in a cotton or flannel cap made in two layers, or by iced water running through an aluminium coil. In severe cases hot packs or baths (water at 104° F.) for fifteen or twenty minutes, two or three times a day, are recommended by some observers. The bowels should be kept freely open by castor oil or calomel. Stimulants are to be employed when the state of the heart requires them. In severe and prolonged convulsions chloroform should be given. The diet is that of the febrile condition: small quantities of easily digested nourishment given frequently.

A method of treatment employed in nearly all the cases in the Lisbon epidemic was tapping the spinal canal. In severe cases this was done daily during the first ten days; in milder cases one or two tappings were sufficient. "The patient was placed in a sitting posture, and with due antiseptic precautions the puncture was made with a needle 5 cm. in length and ¼ mm. in diameter. Though any part of the lumbar region may be chosen, the fourth interlaminar space is preferred, the guide being given by the line joining the postero-inferior iliac spines, which crosses at the level of the fifth lumbar vertebra. The needle is inserted 1 cm. outside the spinous process and slightly below, and directed

inwards and slightly upwards, and the puncture is so rapid that local anæsthesia is unnecessary" (Carlos Franca). When the fluid drawn out is thickly purulent, it must be withdrawn by an aspirator, and a solution of lysol (1–100) injected into the spinal canal.

The place of lumbar puncture in the treatment of this disease is not yet established; but there is evidence to show that even if it does not bring about a cure, it yet affords relief. Laminectomy, with irrigation of the spinal canal with normal salt solution, first performed by Cushing, is still on its trial.

The patient may be allowed out as soon as he is well enough.

Quarantine period: one week. *E. W. Goodall.*

MENORRHAGIA and METRORRHAGIA.—These may be considered together for the purpose of this article. It must be remembered that menorrhagia and metrorrhagia are symptoms and not diseases, and that a diagnosis of the cause of the bleeding must be made before any rational treatment can be adopted. One should never treat unusual bleeding without an examination, except in young unmarried girls in whom the history precludes the possibility of pregnancy. In menorrhagia or metrorrhagia occurring in older women, whether married or single, it is impossible to over-emphasize the importance of making a vaginal examination, and, if necessary, a bimanual examination. Carcinoma of the cervix or of the body of the uterus may be present without causing any symptom besides bleeding—there may be complete absence of pain, wasting, or any foul-smelling discharge—and neglect to make a local examination may deprive the patient of her only chance of cure.

In young girls at or soon after the time of puberty the commonest cause of an increased amount of bleeding is anæmia. Improvement of the general health by the administration of iron and removal of the causes of the anæmia, e.g., long hours of employment indoors, constipation, and dyspepsia, usually brings about a cure. In some cases rest in bed is necessary, and exceptionally it may be necessary to curette the uterus. The most useful drug, after iron, is cannabis indica, which may be given in doses of ¼ gr. of the extract three times a day. Ergot is generally of little use in such cases.

In older girls a frequent cause of menorrhagia is found in mental strain, worry, assumption of responsibility for the first time, etc., and in occupations involving long hours of standing, with no abnormal physical signs. In these cases, rest, ergot, and iron are to be advised.

In cases where early pregnancy is diagnosed or suspected, the possibility that extra-uterine pregnancy is the cause of the bleeding must never be forgotten.

After miscarriage or labour, if the uterus, though enlarged, does not seem to contain any retained portion of the ovum, ergot, rest, and hot douches will be sufficient treatment. If, on the other hand, the uterus is not only bulky but seems likely to contain some portion of the ovum, the cervix should be dilated and the uterine cavity explored with the finger. If no definite piece of placenta can be found, the endometrium should be curetted.

Increased frequency of the monthly periods does not necessarily call for treatment. If the flow, though occurring more frequently than normally, is not too free and has no deleterious effect on the general health, no special treatment is required.

"Erosions" of the cervix may cause a blood-stained discharge. After making certain that the "erosion" is not an early carcinoma, by testing its friability, etc., the treatment will consist in rubbing it with silver-nitrate stick, or swabbing it with pure carbolic acid or iodized phenol. If the erosion bleeds readily, bimanual examination may reveal the fact that the patient is pregnant.

Mucous polypi should be twisted off with a pair of blunt forceps, such as ovum

forceps. An anæsthetic is not necessary except in the case of a very nervous patient. When a middle-aged or elderly woman who complains of unusual bleeding is found to have a mucous polypus, the attendant should not be content with removing this, but should keep her under observation, and, if the bleeding persists or recurs, should dilate the cervix and explore the interior of the uterus. Mucous polypi of the cervix are not uncommonly found in cases where there is carcinoma of the body of the uterus.

The fact that a patient with uterine fibroids has arrived nearly at the time when the menopause may be expected does not necessarily contra-indicate an operation. Atrophy of large fibroids after the menopause is rare, and degeneration is common. Unusual bleeding at the time of the menopause must never be diagnosed as being due to the menopause until every other possible cause has been excluded. Carcinoma of the uterus is particularly common at this time of life. Recurrence of bleeding after a more or less prolonged period of amenorrhœa in a patient who is known to have uterine fibroids should always arouse the suspicion that there may be malignant disease of the endometrium. Any irregularity, ulceration, or new growth of the cervix, must be investigated by the aid of sight and touch, assisted, if necessary, by microscopical examination. If there is any suspicion that there may be malignant disease of the body of the uterus, the condition of the endometrium must be investigated, after dilatation of the cervix. The treatment of carcinoma of the uterus, involving major operations, is outside the scope of this book.

It is well to remember that a hydatidiform mole may occur at about the time when the menopause is expected, and that the history in such cases is often misleading, so that pregnancy may not be suspected until an examination is made.

One need not be afraid to employ iron during the occurrence of unusual bleeding from the uterus. It is often the most useful drug that can be given. (*Vide* also articles on HÆMORRHAGE, UTERINE, and FIBROIDS OF UTERUS.)

H. Russell Andrews.

MENSES RETENTION OF.—(See AMENORRHŒA.)

MENTAL DEFICIENCY IN CHILDREN.—With regard to the treatment of these cases two general statements may be made :—

1. In the vast majority the condition is, strictly speaking, incurable, in the sense that children who are mentally weak to begin with will remain so to the end, whatever is done.

2. There are few mentally deficient children, however, who are not capable of great improvement under suitable treatment.

These two statements are equally true, but the latter is much the more important as a basis of action.

It is a great mistake to suppose that the imbecile, because he cannot be cured, "tuto, cito, et jucunde," is therefore outside the sphere of the medical practitioner. Indeed, he is one of the very few members of the community who should rank as a patient from his birth to his death. If his mother gets no help in her management of him from her medical man, she is not likely to get it from anyone else. It is obviously the doctor's duty to lessen as much as he can the suffering caused by the presence of an imbecile in a family. With this end in view, he has to treat both the child who is causing the suffering, and the parents who are feeling it.

When a baby is mentally defective and his parents do not know it, the first question that arises is : Are we to tell them ? If they ask plainly, they must, of course, be told the truth. If, however, as often happens, they ask no direct questions (either from ignorance or because they are afraid of the answer), it is

usually far better to tell them nothing. There are two reasons for this: (1) A very large proportion of imbecile babies die early. When this happens, it is clearly well for all concerned when the child's defect has remained a secret known only to the doctor. (2) The parents often know nothing about the subject of mental defect. When this is so, a sudden intimation that it is present in their child, if made before their own observation has prepared them to receive it, is apt to produce unsatisfactory results. They either refuse to accept it, or, if they do, it causes such discouragement as to paralyze their efforts for his improvement.

Whether the parents realize the significance of their child's backwardness or not, the main thing is that they should turn their attention actively to what can be done to improve him. It is by trying to make him do things better, that they will come to see the true state of the case. They should, however, be told plainly that the expectation of sudden unworked-for recovery at seven, or fourteen, or any other age, is an utter delusion.

The extent to which mentally defective children benefit from treatment, and the best treatment to employ, vary, of course, greatly, according to the degree of the defect and the nature of the case. In many forms of the condition the improvement under bodily and mental culture is remarkable. In the lowest type of idiocy no treatment, beyond general mothering, may be possible. And there are cases, e.g., of epileptic and syphilitic dementia, in which any attempt to train the mind will only aggravate the child's condition.

The object of our treatment, so far as the child is concerned, is to make him as happy and as good as possible. As his happiness will largely depend on how many things he can and does do and notice, and on how he commends himself to others by his behaviour, our chief aim must be to make him more capable and likeable. We must also try to give him some sense of duty, proportionate to his intellect, and to show him that his duty lies in doing things that he is quite able to do.

What follows refers chiefly to young children (under five or six years). It is mainly at first that the mothers require assistance; and the treatment cannot be begun too early.

The main indications for treatment may be stated as follows:—

1. *Attend to the General Health.*—This includes the giving of good plain food suited to the child's powers of mastication, attention to the bowels, much open-air exercise, frequent baths, and especially warm clothing, for the child will always be duller if he is feeling cold.

If epilepsy or cretinism be present, its treatment is, of course, to be seen to. It is also important to treat such conditions as rickets, anæmia, tubercle, and dyspepsia, which may greatly interfere with the child's mental, as well as with his bodily, vigour. Local defects, such as refractive errors, adenoids, and contracted tendons, are often well worth attending to in these children; and massage and electricity are sometimes useful. Craniectomy has proved of no value, and whether surgical operations for chronic hydrocephalus are ever of benefit to the intellect is questionable.

2. *Awaken the Child's Faculties, (a) Bodily, and (b) Mental.*

(a). He must be encouraged in the *voluntary use of all his muscles* regularly and carefully. Such exercises are not only good for improving his strength and co-ordination, but are also helpful in stopping the purposeless automatic movements which so many of these children have. Musical drill, dumb-bells, ball games, bean-bags, walking between the steps of a ladder, nail-boards, beads and all sorts of kindergarten occupations, are useful for the older and more intelligent of the children, as well as singing and reciting. For young children and those who are less capable, various very simple actions, such as clapping

hands, or playing with a rattle, may to some extent answer the same purpose. It is important to teach the child chewing if possible ; and if he dribbles, his lips may be strengthened by exercises, such as holding things between them, and blowing whistles, trumpets, etc.

(b). Teach him *to notice things* and to compare their characters—roughness and smoothness ; hardness and softness ; heaviness and lightness ; heat and cold ; colours ; shapes (circles, squares, triangles, spheres, cubes, cylinders, etc.) ; distances ; sounds (musical and other) ; tastes and smells. Take him out or to the window and let him see the people, horses, dogs, cars, etc. If objects do not attract him, perhaps bright light and colours will. Find out what arouses his attention, and let him have it. Encourage him to look at, listen to, and handle anything that he is taken up with. Any sort of interest will help to brighten him.

3. *Encourage him to use his Awakened Faculties in giving himself Pleasure.*—Remember that he needs to be taught to do many things which normal children do of their own accord without teaching. Incite him to try to do things ; and, at first, plan easy successes for him. If he deliberately wants a thing, tries to get it, and succeeds, this is a most valuable and a very pleasant lesson for him. In the case of a baby, if he likes a noise, give him a key and a pot-lid and let him make it for himself. Never let the mother or nurse go on doing for the child anything that he can be made to do for himself For most mentally defective children, mere memory knowledge is of little use, but the more things they can do the better for them.

4. *Promote Self-control*—This is of immense importance and very difficult. It includes a number of things. There is, firstly, keeping himself clean and letting his mother know when he requires to be attended to. Some mentally defective children cannot be taught cleanly habits at all. A great many, however, who seem to have complete incontinence in early childhood, may, with persevering training, become quite normal in this respect in time. General personal cleanliness and tidiness in person and dress are also to be constantly insisted on. Another point of great importance is that bad habits of all kinds, to which these children are particularly prone, must be watched for and checked at their earliest beginning. This applies not only to such things as masturbation, thumb-sucking, and dirt-eating, but equally to little tricks of manner and expression (grimacing, unrestrained gestures, making unpleasant noises), which do the children much harm by drawing attention to their defect, and making them objectionable to others. The acquisition of good manners, including good temper, is of far more consequence to the child in most cases than that of reading or writing, and the ability to speak nicely and to use a knife and fork like other people is for him an invaluable accomplishment.

Thoroughness in everything, so far as it is practicable, is of inestimable importance. The mother must never acquiesce in the child's doing less than his best because he is weakly.

5. *Cultivate the Moral Character.*—Prompt obedience is as all-important in the education of character in mentally defective, as it is in ordinary children. Ideas of justice, honesty, truthfulness, affection, unselfishness, and gentleness to younger children and to animals can and should be inculcated. If we exclude the so-called " moral imbeciles," we may say that there are few mentally defective children who have not some sense of right and wrong to develop.

Institution Treatment.—If the home is comfortable and well-conducted, it is generally far the best place for the mentally defective child, during the first five or six years of life at least. After that, if he is educable, there are usually great advantages in sending him to an institution. If he is being well brought up, he will, indeed, in most cases, do no harm whatever to his normal brothers

and sisters. It is, however, very discouraging for him, as he grows older, to be associated in his work and play with normal children. Not only are they apt to tease him, but the fact that they always do everything so much better than he does, is very demoralizing. If, again, he is kept apart from other children, he loses the immense advantage and pleasure of society and healthy rivalry. These he will have among children about his own level. Certainly for most of these children, institution treatment is much happier as well as more instructive, because more stimulating, than treatment at home. *John Thomson.*

MENTAL DISEASES.—General Considerations.—Any medical man may be called on at any time to treat a case of mental disease without a specialist's assistance, and without the aid of a mental hospital. What is here to be said on the subject will refer to home treatment and management rather than to the more organized treatment which is possible in a mental hospital. This task is often one of great difficulty and responsibility. There are considerations in carrying it out which do not occur in the treatment of any other disease. From the purely medical point of view mental disease may rightly be called brain disease; but inasmuch as the mental faculties, power of regulating self-action, and personal liberty, are specially involved, questions other than medical necessarily arise in most cases. The right treatment of mental disease can seldom be restricted to the giving of medicines. The patient's life has to be regulated, his whole environment provided for, and frequently his liberty restricted. There are often questions of extreme urgency which have to be faced. Is the patient's life in danger through his own actions? Are the lives and safety of those about him in any danger? Is his business or reputation or his social position at stake? Is his brain forming a pathological habit which may become pe manent, and issue in mental death? The symptoms of his disease may largely consist in changed ideas, perverted affections, lessened will-power, immorality, or crime. Still, the doctor must never forget that at the back of all those mental, moral, and legal disturbances there is disease of the brain cortex as their real cause. He must ever keep in mind that the brain cortex is so related to every function and organ of the body that bodily symptoms in abundance will usually be found if they are looked for, as an essential part of every case of mental disease. Examination of the body and its functions, therefore, before treatment is decided on, must be as thorough, and commonly far wider in scope, than is required for most cases of bodily disease.

PREMONITORY AND EARLY SYMPTOMS, AND THEIR TREATMENT.

Some cases arise suddenly and with few premonitory symptoms, but the majority have such prodromata, which it is of the first importance for the family practitioner to recognize and treat. It is here that the general practitioner's knowledge and skill come in rather than those of the specialist, who is commonly not called till the disease has established itself. Those premonitory symptoms are often bodily rather than mental in character. It is certain that if the right treatment be adopted in this early stage, many cases need not become technically "insane" at all. The nervous exhaustions, explosions, and toxæmia on which mental disease is so often founded would, in such cases, be put right, and the disease go no further. The brain has a solidarity of action whereby a disturbance in one area tends to spread into others if not checked at its source. Those early symptoms and prodromata of mental disease consist in different cases of the following symptoms.:

Sensory symptoms, such as headaches and all kinds of perverted sensations in head and body, sleeplessness, loss of flesh, digestive troubles, constipation, altered secretions, dry skin, circulatory disturbances, blood changes, neurasthenia, hysterical

attacks, changes of facial expression, twitchings and muscular restlessness, and many other such bodily disturbances. All such changes may mean either that the brain is becoming deranged and causing such disorders, or that the disorders have arisen elsewhere than in the brain and are causing auto-intoxication, reflex irritability, or nerve-cell starvation. The more usual of the early and prodromal mental symptoms are loss of energy and power of doing work, irritability, hyperæsthetic or anæsthetic emotional states, morbid anxieties, accentuation of natural temperament, undue "nervousness," inability to fix the attention, morbid antipathies and suspiciousness, mental automatism, and mental actions independent of the patient's volition. The mental attack is not a simple and localized phenomenon in most cases. The sensory motor and nutritional functions often break down before the mental apparatus is reached.

The treatment of such preliminary and early symptoms of mental disease is necessarily different in different cases, but it mostly comes under the following headings :—

1. Remove the cause as far as possible.

2. Restore the functions of any bodily organ that may be disturbed in its normal working.

3. Try and change the patient's environment for the time being, so as to give him the stimuli or sedatives of different air, new surroundings, change of food, a change of occupation and of social life.

4. Try and effect a better general nourishment of the body, this usually implying specially digestive and tempting foods, aids to digestion and alimentation, bitter tonics, sometimes dietetic alcoholic stimulants, hydrotherapeutics, and life as much as possible in the open air. Food medicines, such as cod-liver oil, extract of malt, and plasmon, are often most useful. Such patients should be regularly weighed, and every pound of body weight gained will often be found to be the further removal of the patient from the threatened mental attack.

5. The use of direct and stimulating nerve tonics and blood-forming medicines, such as strychnine, the mineral acids, and iron.

6. The judicious use of hypnotics and nerve sedatives, where insomnia and muscular instability exist. Paraldehyde in small doses given experimentally, hot water at bed-time, warm baths, hot applications to abdomen at bed-time, hot whisky-and-water or London porter, trional, sulphonal, veronal, and the bromides, all in small experimental doses, not continued too long, may be indicated as suitable in different cases.

7. The removal of all possible sources of mental worry and anxiety is clearly indicated. As a rule it is worry, not work, that causes a mental attack.

8. Rest in bed, either alone or combined with massage, is in many such cases an effectual therapeutic measure ; but my experience is, that in cases with mental symptoms, the effects of early bed treatment, with the isolation that is usually prescribed along with it, is a measure not unattended with danger. I have seen scores of melancholics become daily worse, and the mental malady aggravated, by this means. The patient had no distractions from his own morbid fancies.

9. There are other cases where life in the open air, vigorous exercise, out-door games, fishing, golf, tennis, etc., will suit the patient best. It is often well to try rest first, and if it fails, to try exercise. Many cases will do well with rest for a week or a fortnight, and then exercise following on it.

Risks and Warnings.—Quick and exciting travel is nearly always to be avoided, as being both exhausting and irritating. Sea voyages, long or short, are always attended with danger of easy suicide, are indeed often suggestive of such a catastrophe. Many are the persons whom I have seen sent to sea and who never returned. Such a sea trip is too often a recommendation of despair. It should never be undertaken without the most careful consideration of the risks involved. In giving sedatives, hypnotics, and alcohol in any form,

remember that in some constitutions a drug habit is very easily set up. Watch, therefore, whether the patient is beginning to like his drug too well. Some cases can be, and are, over-fed through the zeal of the doctor and the anxiety for speedy cure by anxious relatives. I often used to fall into this error. Watch the tongue, the liver, and the bowels, as well as the kidneys, if over-feeding is carried out. Some tonics are undoubtedly stimulating, and should, therefore, not be pushed. Strychnine is the chief of these. Remember that in many cases change of employment is the best rest. Use recreations with circumspection. In certain cases, if they do not cheer, they bore and irritate. Always consider the reactive capacity and peculiarities of the brain you are treating. You often get the exact contrary reaction to the one you are aiming at, when the brain is in an abnormal or exhausted condition. It is well to assume in many cases that human brain constitutions are various, that mental working is infinitely subtle, and that our knowledge is limited: therefore our treatment is, more or less, of an experiment which may turn out to be wrong in any case. Do not, therefore, hesitate to alter it if your plan is not working well; but naturally a wise man does not accentuate this view to the patient or his relations. Dogmatism always comes in well in medical treatment, but never more so than when the mind is affected and has to be cured.

Established Mental Disease and its Treatment.

If the preventive treatment of early symptoms has failed, and mental disturbance of a more decided kind has shown itself, then the medical man is at once faced by many responsible questions. One of the first of these is the following:—

Is the Treatment to be conducted at Home, in Rooms, or in a Mental Hospital? The patient's relations, he himself if sufficiently sensible, and the family doctor, all naturally desire home treatment if this is possible. As a matter of fact, it has been the experience of all who have had most to do with mental cases, that home is on the whole the worst place for treatment, but there are *exceptions*. A man's, and especially a woman's, home, is so naturally the place for the treatment and care of sickness and weakness, that it must not be left without sufficient reasons. Some persons, too, are such home-birds, that being turned out of it is an especial hardship and irritation. In all I am about to say I assume that the home is good, and that there are means to provide good nursing and all other requirements. There are many cases of short toxic delirium, of mania transitoria, of epileptic excitement, of puerperal insanity, of very slight melancholia, and, above all, of insanity of the aged, where home treatment can be effectually carried out if good nursing, companionship, and attendance can be secured. Especially is this the case if the home happens to be in the country or in the open suburbs of a city.

If it is decided that home is not the best place for care and cure, then, if the patient has sufficient means, or if he has kind relatives in the country who want to do him a service, a suburban house, or rooms in such a house, or a country residence, form the next alternative in certain cases. The private house of a doctor, a clergyman, or any other person of intelligence, is often a suitable temporary hospital in a mental case. In Scotland we have the enormous advantage of being able legally to treat an early case of mental disease away from his home, "for profit" or without profit, for six months. Though the profession in England strongly desires such a measure for that country, the Lord Chancellor and the Attorney-General have three times failed to get it passed by Parliament. The house we are to use should, if possible, have an enclosed garden. Rooms on the ground floor should nearly always be selected for use if the case is an acute or suicidal one. All door-keys should be taken away and kept by the nurse. Inside bolts to the w.c.'s and bathrooms should be

taken off. The windows should be temporarily stopped so that the lower sash cannot be raised more than five inches. A sunny and cheerful outlook is a distinct adjunct to treatment. The medical visits should be frequent and thorough. They make the patient feel he is under treatment and not merely in isolation. Every precaution against suicide and accident should be carefully taken and stringently enforced. In many cases the day should be systematically divided up as a therapeutic measure. Though the nearest relative is legally responsible, yet the doctor and nurse must be invested with plenary powers. I have superintended the treatment of almost every kind of mental disease, from acute mania down to the mildest melancholia, in such circumstances, with reasonable success in many cases. It is largely a question of the doctor, the house, and the nurse. The expense is necessarily great, and risks cannot be entirely eliminated. The forms of insanity that are on the whole most suitable to treat in this way are melancholia, where the suicidal impulse is not very intense, adolescent insanity of the milder types, recent puerperal insanity, hysterical insanity, mental disease associated with neurasthenia, mild and fairly manageable cases of mania, lactational insanity, that of pregnancy, senile insanity, and some cases of alcoholism. Poverty or limited means seldom admit of home or private treatment, but it is surprising how often it is possible to get even poor people with mild mental symptoms sent off for a change to some country relation with admirable curative effects.

If the case is unsuitable and the means inadequate, or if treatment at home or in rooms has failed, then comes the question of a good mental hospital. The chief considerations which determine such a decision are a continuation of acute symptoms, a marked aggravation of the disease, intense persistence in, and subtly schemed, suicidal attempts, great violence, homicidal impulses, very dirty habits, much noise, offensiveness to decency, quarrelling with a succession of nurses, and manifest failure of other methods of treatment. These undoubtedly point to institution treatment, where there is abundant nursing, a medical régime of orderly living, discipline, suitable rooms, and instant medical attendance. Many patients will obey the rules of an institution quietly who will not submit to personal orders. Good institutions, too, have suitable occupations, amusements and means of passing the time which cannot be got in private treatment. They have villas, means of classification, hospital wards, and seaside houses. I am of opinion that scarcely any case that seems curable should ever be allowed to drift into incurability without such a hospital being tried. The mental and therapeutic effect of a hospital is sometimes immediate and indubitable.

Speaking of hospital treatment, I am strongly of opinion that in all our large general hospitals there should now be instituted wards suitably administered and specially adapted for the treatment of our poor suffering from early and transient mental symptoms. Especially since the treatment of so many recent cases of insanity by rest in bed, plus medical treatment, has been found so efficient, the provision of such wards in our general hospitals is called for.

If a hospital is decided on, certain legal forms and medical certificates are required, but the particulars of these, and the forms themselves, can always be got from the physician in charge of the institution. A very difficult question often occurs after everything has been arranged. How is the patient to be got to hospital? My advice is, leave that to the physician or take his advice. Avoid deceiving the patient. Say he is going to be under a doctor's care. The principle holds good, that a man whose mind is affected has a moral right to truthful statements. But I admit there are many exceptions to this axiom where truth may clearly aggravate symptoms of the patient's disease. Then it comes to be a medical question whether euphemisms and a certain modification

of brutal candour may not be reckoned among the medicines the patient has to swallow for his good.

Nursing.—The securing of a good and experienced nurse, male or female, is one of the most important early considerations. Nowadays experienced and certificated nurses of both sexes trained under the Medico-Psychological Association rules can be got from most nursing homes. A "mental nurse" has many advantages over one with no such special experience. The orders to the nurse must be specific, and in detail. She should keep a regular record of the food taken, the exercise, and the patient's condition and symptoms, mental and bodily. Provision must be made also for her going off duty, as no kind of nursing is more exhausting than the nursing of a bad mental case. If means allow, the nursing strength ought to be over what would be necessary in a case of ordinary bodily disease.

Feeding.—The next thing that has to be provided for is the feeding of the patient. A good cook is often of as much importance as a good doctor. Food should always be tempting, nourishing, well-cooked, and well served. For most acute cases some of the food at least should be fluid or nearly so. Nothing is so good, so handy, or so easily got as milk or liquid custard, made of a pint of milk just under the boiling point, into which one or two eggs, after being beaten, are stirred, with sugar. Such a custard is dietetically a meal. Several such custards a day constitute a nutritive diet that is easily digested. The doctor should always be provided, in case it is required, with a long rubber tube, No. 12 or 14 catheter size, with a funnel attached, which can be passed through one nostril, and in this way the patient may be fed if food is entirely refused; this can now be got from all surgical instrument makers. If the feeding has to be long continued, the custards can be supplemented by strong soups, mutton ground in a mortar, vegetable juices, jellies, fruit juices, wines, and sugar in solution. The condition of the stomach and of the digestion must, of course, be the test of how much food is to be given. In my judgment, under-feeding is more risky to recovery than over-feeding, in most acute cases. Nourish your patient well and make him gain in weight, is a rule to which there are few exceptions in mental medicine. Frequent feeding and night feeding are often required. To many cases a tumbler of hot milk at bedtime, with sometimes 1 or 2 oz. of whisky added, will be found to be the best soporific the patient can have.

Bed Treatment versus Exercise in the Fresh Air.—Of late years, in this and all other countries, many early and acute mental cases are being treated in bed, for the first few weeks at least, and often for longer periods. The theory of this mode of treatment is that most such cases are either the result of bodily weakness or exhaustion, or tend towards those conditions. It is to conserve the strength of the patient that this is recommended. Undoubtedly, when patients die in the acute stages of mental disease, the brain cells often show marked signs of having undergone the process of chromatolysis, which indicates that the katabolic process, that of using up material, is in excess of the anabolic process, or building up material, in the substance of the cells. Rest treatment in bed for mental cases was the natural outcome of the success of the Weir-Mitchell treatment in neurasthenia. It is most applicable to very acute and exhausting cases, to those who are thin and ill-nourished, to those who are easily excited by outside impressions, to puerperal cases, to many toxic cases, to cases where the temperature is high, and to those with concurrent bodily disease. It should never be forgotten, however, that moderate and suitable exercise or sitting in the fresh air is one of the sheet anchors of the treatment at some period of nearly every mental case, and during its whole course in many such patients. It must not be pushed

to excess. It must be prescribed and watched as a powerful medicine is watched. It can soothe and stimulate, can cure insomnia, can help digestion, can stimulate appetite, can promote the action of the excretory organs and of the bowels, and can stimulate normal metabolism in every tissue and organ. If there is muscular restlessness or nervous "fidgetiness," it affords the best outlet for such superfluous energizing. Massage is a substitute for it in some cases, but an uncommonly poor substitute. The fact is, rest and exercise should not be looked on as antagonistic systems, but complementary to each other, each being the right thing at different stages of the same case or in different cases. There is no doubt, however, that the bed treatment in many cases solves certain difficulties of the treatment at home and in rooms, and is a great boon, therefore, to the doctor as well as to the patient.

Occupations and Amusements.—In most cases of mental disease, provision must be made for the patient's mind being withdrawn from his own morbid ideas and feelings. He must be taken out of his morbid self. Selfishness and self-centredness are the characteristics of most forms of insanity; therefore we must try to get the patient to do simple kinds of work, such as gardening, knitting, or sewing. We must also amuse him by suitable games, such as golf or fishing, or anything else that he takes an interest in. The social instincts are often morbidly lessened, and we must try and provide suitable company and pleasant social intercourse. In fact, for the treatment and cure of this disease the patient's whole life must be conditioned. This is almost never a simple matter, and implies constant thought on the part of the doctor and the nurse. New problems and new conditions are apt to arise every week, and must be met. Mental disease is as various as the human countenance. The human brain is not a simple mechanism; human nature is complex; and mental disease is a disorder of both in their highest functions and deepest recesses.

The Use of Tonics and Nerve Stimulants.—There are very few cases for which tonics of some sort are not beneficial at some stage. I unhesitatingly put quinine and nitrohydrochloric acid as amongst the most generally useful and applicable to most cases. There are some cases where the temperature is high, such as acute puerperal mania, where I am in the habit of giving 10-gr. doses of quinine, three times a day, with markedly good effect, but in most instances 1 gr. or 5 gr. three times a day, combined with 3 min. of dilute nitrohydrochloric acid, will be found sufficient. Strychnine is only applicable in the early stages in simple melancholia, and in the later stages of all insanities when the acute and excited symptoms have passed away. Iron is applicable where anæmic conditions exist. I often use a pill composed as follows:—

℞	Pil. Aloes et Ferri	gr. iij	Ext. Nucis Vom.	gr. ¼
	Quininæ	gr j		

This is, of course, laxative as well as tonic. The compound syrups, such as Easton's, Fellowes', etc., should not be given indiscriminately. They often cause excitement and frequently aggravate insomnia. They are not suitable in most acute cases, nor in excitable melancholia, nor in super-sensitive neurasthenic cases, nor in hysterical patients, nor where convulsive symptoms exist.

Laxatives, Hepatic Stimulants, and Intestinal Disinfectants.—The most ancient treatment of insanity we know was the Hippocratic practice of using a strong purgative in the shape of hellebore. It is certain such a practice has remarkably good and curative effects in many cases. Few things are more evident in most acute cases and many chronic forms of mental disease than derangements of digestion, of the action of the bowels, and of the hepatic functions. The tongue

will constantly be found coated and furred. It tends frequently to be dry, this morbid condition being shared by the mucous membrane of the mouth and throat. It will be found that in most cases of melancholia the bowels are inactive and are often obstinately constipated. Frequently the stools are devoid of bile, while the colour of the skin and of the conjunctivæ is muddy and yellowish. Of late years the opinion has become strong and widespread that the contents of the bowels may become very septic, and that catarrhal conditions of the stomach and bowels frequently result from this cause. Dr. Ford Robertson, of the Scottish Asylums Pathological Laboratory, has lately astonished those of us who have seen most symptoms and treatment of insanity, by drawing attention to the enormous multiplication of bacilli over the surface of the mucous membrane of the stomach, duodenum, and small intestine, in general paralysis. As the result of those clinical and pathological facts, it may be said that purgatives have lately "come in again." Calomel, so long disused in psychiatric practice, has come into use in a marked degree, either in alterative and disinfectant doses of $\frac{1}{8}$ gr. to 1 gr. twice a day, or in larger purgative doses of from 1 to 5 gr. at night. Its good effect in some cases cannot be questioned. Castor oil, cascara, aloes, podophyllin, euonymin, iridin, and most of the common laxatives are largely used according to the fancy of the doctor or the constitution of the patient. Saline laxatives, including the ordinary mineral waters of the Continent, are used as early morning draughts with excellent effect. A melancholic or a maniacal patient with a foul tongue, bad breath, and constipated bowels, is in nine cases out of ten in a better state mentally after the bowels have been well moved. Purgative treatment must, however, not be pushed to an extreme, for it may weaken still further the patient, who cannot afford to lose any of his strength. There are a few cases, especially in epileptics, where croton oil will work wonders in quieting acute maniacal frenzy or in preventing the occurrence of this condition when those early symptoms begin to appear. A foul tongue and the use of purgatives need not, and should not, prevent feeding in large quantities in certain weakened or acutely excited patients. The old "rhubarb pill" is often an admirable tonic-laxative. The three intestinal disinfectants that are used most and seem to be most effectual are salol, in doses up to 10 gr., β-naphthol, 2 to 8 gr., and calomel in small doses. They should be mostly combined with laxatives. We have all been disappointed in their general usefulness, but in individual cases good results have been remarked by most practitioners who have used them. Some physicians begin treatment by washing out the stomach.

General and Cardiac Stimulants, Tonics, and Depressants.—The heart's action is often weakened in cases of mental disease, especially in patients suffering from excited melancholia, acute mania of long duration, and in the toxic and infective forms of mental disease. There is often a seeming contradiction in the condition of the cardiac action and of the vascular pressure. We may have a very weakly-acting heart along with high vascular tension; very frequently indeed in the graver forms of melancholia, and in some cases of mania, the pulse rate is high, up to 100 and even 150. This tends to continue during the whole of the acute period. I believe it indicates two morbid conditions: first, a toxic condition affecting the cardiac centres; second, a state of irritation in the brain cortex which acts secondarily on those centres. Alcoholic stimulants in the shape of wines, malt liquors, and spirits are often indicated in mental disease to combat weak cardiac action, impaired digestion, and collapse of the higher cortical centres. In acute puerperal mania, undoubtedly a toxic condition, I constantly give 3 and 4 glasses of whisky spread over the twenty-four hours, always, of course, along with some nourishment. I have even given far larger quantities than this, with the very best effect. Prolonged sleep often results from the

use of alcohol in this way. Where the pulse is weak I use digitalis, strophanthus, and strychnine, along with tonics. In those quick-pulsed cases to which I have referred, iodide of potassium in 5-gr. doses is often very useful. I am in the habit of using the iodide for a time in nearly all the cases of alcoholic insanity. Thyroid extract, used in small doses of 5 gr. a day as an alterative, or in larger doses of 40 or 60 gr. a day, given for a week, as recommended by Dr. Lewis Bruce, is a most valuable remedy in certain cases. It affects the circulation, the general metabolism, and the nervous action, in a marked degree. When a case of mania has passed the acute stage, and there is threatened a condition of lethargy and the fear of dementia, to put such a patient to bed for three weeks, to give the thyroid extract for a week, beginning with 40 gr. for the first three days and 50 or 60 gr. for the following four, the pulse being watched, the temperature taken, the diet regulated, and the patient carefully nourished on light, digestible diet, may be, I believe, the means of preventing such a patient sinking into incurable dementia. There is a loss of from five to twenty pounds in weight during the continuance of this "thyroid course," but after the medicine is stopped, the appetite, the digestion, and the assimilation of food become much stimulated, so that the patient will put on from 1 to 2 stones in weight within two months of the drug being discontinued. The patient should always be kept in bed for at least a week after the medicine is stopped. Thyroid extract is, beyond doubt, a strong cortical stimulant. There are certain cases where, as pointed out by Dr. Lewis Bruce, the leucocytes are low in number. A hypodermic injection of 15 min. of turpentine in the flank is recommended by him to produce hyperleucocytosis, and so keep up the fight against injurious bacteria or toxins.

Baths and Hydrotherapeutics.—For a long time the ordinary hot bath has been used as a sedative for maniacal excitement, and as a hypnotic. There can be no doubt whatever of its powerful effect in certain cases, but unfortunately its use is attended with risk of cardiac failure and death. I have had this happen on two occasions, which naturally makes one very careful in the use of this powerful remedy. On the other hand, I have had cases where the sedative effect on an attack of mania was immediate and permanent. Considerable differences of opinion exist as to what the temperature of the water should be. In some of the German psychiatric cliniques, patients are kept in water at a temperature of about 97° for whole days and even for weeks, it is said. The results are reported to be good; but this plan requires special arrangements, and is scarcely in use in this country. But to put a patient in a bath for half an hour in a temperature of 99°, with cold applications to the head, I have seen produce effects which were most striking. If this is followed by 10 gr. of sulphonal or 50 gr. of bromide of potassium, given in a tumbler of hot milk, the patient will sometimes have a prolonged and most restorative sleep. This plan is always worth a trial in the early stages of excitement coming on quickly.

Many cases of melancholia of the milder sort derive enormous and permanent benefit from a course of mineral waters with baths, at Harrogate, Bath, Buxton, Strathpeffer, at Schwalbach, Carlsbad, and the other German watering-places. Naturally the kind of water used, whether sulphur, iron, or saline, must be according to individual requirements. Gout, rheumatism, anæmia, and the effects of over-feeding with too little exercise, are frequently enough accompaniments and causes of mental attacks. In such cases those morbid conditions are naturally treated by the physician in the early and milder stages of the mental attack. Mild shower baths and spray baths are generally good stimulants in certain melancholic cases, and towards the end of acute attacks when lethargy and stupidity are threatened.

On the Use of Hypnotics, Sedatives, and Motor Depressants.

Four cases out of five of recent mental disease have either sleeplessness, active brain excitement, or undue muscular activity as part of their symptoms. Such symptoms are so urgent that they seem to the patient's relations, to the nurse, and even to the doctor, to be the disease, and the only disease he suffers from, and direct treatment, therefore, of them seems the most urgent of all the duties of the doctor in the case. To treat them thus directly means, in most cases, the use of hypnotic sedatives and most motor-depressant drugs. The immediate effects seem so directly counteractive of the worst symptoms that it is not surprising they get more credit than they really deserve. Their use is sometimes undoubtedly curative: it is more frequently merely palliative, and in many cases it is really harmful at the time, and afterwards, in spite of the apparent benefit it produces. Their use and selection, therefore, I consider a matter for the utmost care in each case. Their effects should be carefully watched, and in nine cases out of ten, treatment of the case, through them, should be looked on as only a part, and often a small part, of the real treatment of the case. We should always ask and observe whether those drugs are disordering other functions while mitigating the wakefulness and restlessness; whether the natural tendency to recover in any case is interfered with by them? Is the patient gaining or losing weight during their use? Is the hypnotic tending to restore the natural sleep habit? Is a bad brain habit being formed? Is the patient's inhibitory power—the highest mental function that he possesses—being increased or lessened?

The effects aimed at through the use of those drugs are (1) To cut short the disease in acute cases; (2) To re-establish the sleep habit of the brain; (3) To tide over short attacks; (4) To give needed sleep and rest to relatives and nurses; (5) To combat temporarily dangerous symptoms; (6) To take the edge off bad symptoms, so far as to let other measures have their effects, and to save the exhaustion of insomnia and motor excitement; (7) To quiet screaming and noise; (8) To give home or villa treatment a chance before a mental hospital is resorted to.

We must never forget, in the use of all hypnotic and sedative medicines whatsoever, that they are brain poisoners and arresters of function, when given in large doses. Through experiment we have found out the doses that diminish the cerebral functions. By the use of such small doses we diminish the morbid action that is going on in the brain cells, whose nutrition and katabolism we thus modify. I would lay it down as a principle that very few cases of mental disease should be treated by hypnotics and sedatives alone. To do so would imply a narrow view of the functions of the brain and their relation to the whole body. A physician's broad view of every case must be taken, not a mere specialist's brain view. To feed the patient, to restore the nervous and nutritive energy, to rest the brain, to restore to normal action every function that is abnormal, to exercise the muscles, to improve the controlling power, to restore the emotional faculties by providing natural pleasures, to remove attention from morbid to healthy objects, to make the environments healthy and healing—these must be the prime objects of treatment. We must always ask ourselves, when giving sedatives and hypnotics, whether any function is disordered thereby, whether the sleep and quiet produced is in some degree a natural or merely a drug sleep? As to sleep, our main object must be to restore this periodic brain habit. We must ask whether the patient is really refreshed in the morning? Is he really better in regard to his disease? Is he nearer recovery?

It is well, before we make up our minds which drug to use, to ask whether a pure hypnotic is needed, a general sedative and lessener of reflex irritability,

a motor depressant, or a combination of these. Many cases need different drugs with different effects, at different phases of the malady. I would put paraldehyde, chloral, trional, and veronal, as types of pure hypnotics; sulphonal and opium as hypnotic-sedatives; the bromides and their combination with cannabis indica and hyoscyamus as types of the diminishers of reflex irritability, mental, cerebral, and spinal, with some sedative effects; and hyoscine as the type of motor-depressants.

Paraldehyde.—This drug I have used very extensively for many years. It is unquestionably the quickest and the best hypnotic we yet know. It is safe, acts very quickly, the sleep it produces is more apt, I believe, than that of any other drug, to pass gradually into normal sleep—"tired Nature's sweet restorer." No doubt, in a few cases, it causes headache and disagreeable feelings. I have even seen, though very rarely, diarrhœa and sickness produced by it. It is of no use, and should not be given, as a sedative during the day. It seems to act on the very highest cortical cells and not on the motor areas. In mild cases of melancholia and mania, drachm doses will be sufficient. Mixed with tincture of orange and slightly sweetened, its disagreeable taste may be somewhat modified. It may be given by the mouth, as an enema, or in capsules. If drachm doses are found insufficient, the quantity may be gradually increased to 4 dr. I have even given 6 dr. I have known 1½ oz. given by mistake, with the result that the patient had a twelve-hours' stertorous sleep, with no bad after-effects. It should be given after the patient is undressed, with the room darkened, and the head should be laid on the pillow the moment it is taken. It never depresses the heart's action, but, on the contrary, stimulates it. Its use may be continued in some cases for long periods without any bad effects. No doubt some patients acquire something of a paraldehyde craving, so that its use should always be periodically intermitted. In some cases I add ½ dr. of bromide of potassium to the dose of this medicine to prolong the effect. I have seen many cases where insomnia has been completely overcome by it, with a speedy restoration to soundness of mental function.

Chloral.—Chloral was our great stand-by as a hypnotic thirty years ago, and many persons still believe in it as strongly as ever. If a hypnotic is only needed for a few nights, chloral is admirable in 15- to 30-gr. doses; but unquestionably its prolonged use poisons and weakens the heart's action, and is not safe. I now attribute two sudden deaths after chloral in cases of mania in my early practice to its depressing cardiac action. It may be combined with the bromides with good effect.

Trional.—This is an admirable hypnotic in doses of from 10 to 20 gr. It should be given after the patient has gone to bed, and its effect is increased by a tumbler of hot milk. Its effects do not usually last into the next day. It seldom has unpleasant after-effects.

Veronal.—Veronal is our latest chemical hypnotic. It produces, given in 5- to 15-gr. doses, a sound, and in many cases almost natural, sleep, with few after-effects. It is safe and pleasant, but in most cases there is some confusion felt by the patient next day. I have seen a disagreeable skin eruption after its use. It is usually of little service in very acute cases.

Sulphonal still has an enormous run as a hypnotic, with subsequent sedative effects, often lasting for twenty-four, and even forty-eight, hours. It takes from one to two hours to act after the dose is given. The sleep produced by it is in most cases refreshing, but it often leaves giddiness and unpleasant sensations in the morning. Not being soluble to any extent, it is best given in doses of from 10 to 40 gr. stirred into hot milk. In Germany, the combination of sulphonal and trional is highly praised. The cases in which sulphonal acts best are those of sleeplessness combined with restlessness, noisy excitement,

and general troublesomeness to manage. In early cases I have over and over again seen it produce calm and comfort and an apparent arrestment of the attack. It is often combined with the bromides. My favourite prescription for the restless, irritable, excited, and troublesome senile cases is a mixture of 10 gr. sulphonal with 30 gr. bromide, given at night, or, if necessary, twice in the twenty-four hours. I am quite sure that by this means I have been able to keep many such cases at home, soothing gently their downward path, and rendering them manageable and a source of comfort to their relations. In melancholia, sulphonal often aggravates the depression. It seems to stupefy and bewilder such cases too much. I consider it certain that by its use I have been able to arrest the excited attacks in the periodic insanities, by giving it in the very early stages. In general paralysis, in the early stages with acute symptoms, I have seen it produce calm and manageableness, though I am bound to say that in such cases the patient seems to be pushed on too rapidly into the second stage of the disease. In some cases it aggravates the motor incoordination in this disease very markedly.

There is a danger in the use of suphonal which must be kept in mind: its continued use may cause the condition of hæmatoporphyrinuria. This is a very serious and indeed dangerous condition. The urine becomes bright red, the patient becomes excited, partially paralyzed, often vomits, the blood corpuscles are found to be disintegrated, and the patient's life is sometimes lost and is always in danger. Sulphonal should always be intermitted for a day or two once a week. The urine should be daily inspected while it is being used. A dose one night will often give two nights' sleep. It seldom excites any craving for its continuance.

Opium.—There is a greater diversity of opinion in regard to the good or bad effects of opium than in regard to any other such drug. In Germany, and largely in America, the majority of cases of melancholia are treated by opium in doses of 1 gr. twice a day. Kraft-Ebing says that opium is one of the most important of the sedative remedies. He, and the German school generally, contend that it diminishes mental hyperæsthesia, improves the appetite, stimulates the vaso-motor nerves, and has a good trophic effect on the central nervous system, so that its nutrition is improved. Its advocates maintain that in many cases its use is specific as a remedy in early melancholia. I used it largely and experimentally at one time, but it seems to me that its effects are by no means those believed in by the German school. I performed a series of experiments with it on many melancholics and maniacal patients, the result of which was that I almost entirely lost my faith in opium as a remedy in mental disease. Almost all my patients lost weight during its use, the secretions were often dried and the bowels constipated; while of all agents, next perhaps to cocaine, it was apt to set up a craving in the sensible melancholics for continued use and larger doses. Still, I admit that there are individual cases where opium does good and should be used. (See also ELECTROTHERAPEUTICS.)

T. S. Clouston

MERALGIA PARÆSTHETICA (Bernhardt's Disease).—(See NERVES, PERIPHERAL.)

METEORISM.—(See FLATULENCE.)

METRORRHAGIA. (See MENORRHAGIA.)

MIGRAINE.—A term often applied to any severe attack of headache occurring periodically. In its more limited use, however, it is applied to a group of symptoms characterized by headache, which may be general or local, peculiar visual phenomena, generally with the loss of central vision and scintillations round the

periphery, and vomiting. Vomiting may relieve the headache, but the patient often remains in a prostrate condition for several hours. The visual phenomena may be present without other symptoms. The symptoms occur usually in persons of a nervous temperament, whose occupation is sedentary and requires concentrated visual and other attention. It is not infrequently hereditary.

TREATMENT.—This may be dealt with under two heads: (1) *The Acute Attack;* (2) *Between the Attacks.*

1. **Treatment of the Acute Attack.**—The patient will often awake in the morning knowing that he is about to have an attack of migraine; under such circumstances, a brisk effervescing saline purgative will sometimes inhibit it.

During the attack the patient should be kept in bed in a slightly darkened room, 1 or 2 grains of calomel, or blue pill, should be administered, and the patient given hot water to drink. For the relief of headache, local remedies may be tried by the application of heat or cold to the head, a mustard plaster, or leeches. The feet should be kept warm by hot-water bottles. As a rule, habitual sufferers prefer to be left in absolute quiet and not to be disturbed by any local application.

A large number of drugs are accredited with specific powers in giving relief; among the most important are phenacetin, phenazone, acetanilide, caffeine, bromides, and these in various combinations are often used with success, both during and before an attack.

2. **Treatment between the Attacks.**—The occurrence of an attack depends so much on general health, that attention to this, to any anæmia, constipation, or gouty condition, is of the first importance.

The eyes, too, should be carefully examined, and errors of refraction attended to, not only the more marked errors, but even the slighter degrees of hypometropia and astigmatism.

The teeth, nose, ears, all require careful inspection, and attention should any abnormality be found. Disorders of the digestive and urino-genital systems must be borne in mind. But even when all these possible factors have been eliminated, there yet remain a certain number of cases in which the migraine returns periodically without any very definite cause.

Diet.—Regulation of diet is of the first importance. The patient should be instructed to have meals regularly, long intervals between food should be avoided, and a short rest be insisted on before the meal is begun. Many patients are benefited by being placed on a diet in which animal food is eliminated or greatly diminished. In some cases, however, this form of diet is not only not beneficial, but the frequency of the attack is actually increased. In such cases a simple meat diet may be advised. Patients are, as a rule, better without alcohol in any form, but claret and whisky may be allowed when it seems to improve the general condition.

Mode of Life.—The patient should be instructed to avoid as far as possible all mental and ocular fatigue, should lead a quiet, regular life with moderate outdoor exercise, and should avoid hot and crowded rooms.

Drugs.—The remedy, which, when taken during the interval, tends more than any other to delay the return of the attack, is nitroglycerin. This may be given in ½- to 1-min. doses of the liquor trinitrini, twice a day, the dose being gradually diminished to the smallest amount that suffices to ward off the attacks or to diminish their severity or frequency. The drug may be given in the following mixture:—

℞	Liq. Trinit.	℥vj	Acid. Phosp. dil.	ʒiij
	Tinct. Nucis Vom.	ʒj	Aq. Chlorof.	ʒvj

Ft. mist. One tablespoonful to be taken at 9 a.m. and 9 p.m.

or nitroglycerin can be conveniently administered in tabloid form, one tabloid containing $\frac{1}{200}$ to $\frac{1}{100}$ gr., being taken twice a day.

At the same time it is well to recommend the patient to take half a pint of hot or cold water every morning immediately after rising. This form of treatment is simple; it can be carried out without inconvenience over long periods, and has in my experience been attended by very good results. In other cases, such drugs as the bromides, gelsemium, cannabis indica, arsenic and strychnine do good.

Counter-Irritation.—Blisters or other forms of counter-irritation may be used, and the insertion of a "seton" has been advocated in intractable cases, and is said to have prevented the attacks so long as the seton was in position. (See also HEADACHE.) *F. E. Batten.*

MITRAL DISEASE.—(See HEART.)

MOLLUSCUM CONTAGIOSUM.—Treatment of this condition depends on the number and size of the lesions. If they are of some size and still moderate in number, they are best removed by the flat curved scissors. If they are very tiny, they may be squeezed out and a drop of pure carbolic acid applied to their cavities. If the lesions are very numerous and of considerable size, the writer can testify to the benefit following exposure to X rays, under which crops of 60 or more will disappear without leaving any traces of their presence and without any inconvenience, in two or three weeks. *Norman Walker.*

MORPHIA HABIT.—(See DRUG HABIT.)

MUMPS.—The painful swelling of the parotid glands will be relieved by the application of hot fomentations with a few drops of laudanum sprinkled upon them, or of glycerin and belladonna.

Pain may also be allayed and sleep afforded by Dover's powder or laudanum, the dose being according to age. When there is orchitis, the testis must be supported and hot fomentations applied. In severe cases, the application of ice will answer better.

Hydrotherapy will be found useful in those not common cases where the temperature is high and symptoms of excitation of the nerve centres are present; with it may be combined a sedative mixture (see FEVERS, ACUTE INFECTIOUS).

The patient should be kept in bed at least eight days, even in the mildest cases; in severe cases, longer. He may be considered free from infection three weeks from the onset of the parotitis.

Quarantine period: twenty-five days. *E. W. Goodall.*

MUSCULAR RHEUMATISM.—(See RHEUMATISM, CHRONIC.)

MYALGIA.—(See RHEUMATISM, CHRONIC.)

MYASTHENIA GRAVIS.—This rare disease is characterized by muscular weakness, and by the facility and rapidity with which the muscles become exhausted as the result both of voluntary effort and faradic stimulation. Our knowledge as to its etiology and pathology is at present uncertain, and no treatment is known which will arrest or cure it; a good deal, however, can be done by palliative measures.

All unnecessary muscular effort should be prohibited, and especially is this the case as regards the muscles chiefly affected. If the symptoms are severe the patient must be confined to bed. Mental excitement of every kind is to be avoided. The patient should be warmly clad, as cold undoubtedly tends to aggravate the symptoms.

The feeding in these cases requires careful attention. When there is weakness of the muscles of mastication and deglutition, the larger portion of the food should be taken early in the day, for the weakness becomes more pronounced towards evening. The food should be of high nutritive value and be taken slowly. Solid food should be minced in order to spare the muscles of mastication. It is possible that the lives of some fatal cases might have been saved had this precaution been attended to, for asphyxia consequent upon the impaction of an unchewed bolus in the throat has in several cases caused death. Where dysphagia is pronounced, rectal feeding is preferable to the stomach tube, the passage of which is apt to produce great exhaustion.

Faradism is on no account to be used, since it increases the "myasthenic state." Very weak galvanic currents applied to the affected muscles have been said to do good in some cases, and may be employed. Massage appears to be of no service.

Drug treatment is unsatisfactory. There is no agreement as to the beneficial effects of any one remedy. Various drugs, among which potassium iodide, hypodermic injections of strychnine, and thyroid extract may be mentioned, have, it is affirmed, done good in individual instances; but the relapses and intermissions which are so common, in the absence of any detectable exciting cause, render therapeutic deductions difficult. The writer has seen a large number of drugs employed, but has not been able to convince himself in any case that improvement was the direct consequence of the "remedy." Arsenic and strychnine may be given as a general tonic.

Strümpell points out that the attacks of dyspnœa, which, when they occur, are of such serious prognostic significance, may sometimes be relieved by pulling forward the tongue. In a severe attack in which there is great weakness of the respiratory muscles, artificial respiration may have to be resorted to.

Edwin Bramwell.

MYCOSIS FUNGOIDES.—Arsenic was formerly the only treatment which had any influence, and that only a retarding one, on the fell progress of this disease.

Since, however, in 1902 Allan Jamieson first demonstrated the wonderful effects of X rays, that treatment has practically taken the place of all others. Under suitable exposures the ulcerated surfaces heal up and tumours melt away as if by magic. Every fresh outbreak must be treated, and these are frequent; but watchfulness and steady perseverance in the occasional use of the rays are successful in restoring to, and keeping the victim in, a state of comparative health and capacity.

Norman Walker.

MYOCARDIAL FAILURE.

Rest.—In the great majority of cases of cardiac muscle failure, bodily rest is an essential part of the treatment, and *alone* its influence, by no means very rarely, determines a profuse diuresis. The diminution of work on the part of the heart implied by such rest is sufficient to enable the organ to recover its vigour and again to perform its functions efficiently, so that venous stasis ceases. Of late years much has been heard of the treatment of heart disease by means of baths and graduated exercises. It is in certain cases of slight cardiac muscle failure that this treatment is most likely to prove useful—in cases of a heart muscle that has become "flabby" and lost its tone. In many such cases, no doubt, the disturbance of the circulation is not all central, i.e. cardiac, in origin, and blood conditions, probably in the direction of plethora, may play a part. As far as the "exercise" part of the treatment is concerned, it is worth noting that the treatment is not recent, and so long ago as 1854 Dr. Stokes, in his book, "The Diseases of the Heart and of the Aorta," refers to a patient whom he advised "to

pursue a system of graduated muscular exercises," and remarks that, "the symptoms of debility of the heart are often removable by a regulated course of gymnastics, or by pedestrian exercise, even in mountainous countries;" but Dr. Stokes' use of the expression, "debility of the heart," clearly designates the type of case that was in his mind's eye. By sedentary occupation, and abstinence in the matter of exercise, combined with a vigorous digestion and good appetite, it is easy for certain individuals to pass into a condition that may be regarded as the most remote from the desirable one, which is known as "fitness" or "training" among the athletic. No one expects "good wind" in a stout person, and his "bad wind" is to be attributed largely to the condition of his heart, which, however, cannot be regarded as "diseased," but only as temporarily "debilitated." Moreover, there are factors other than cardiac that have to be reckoned with in the circulation; for instance, the quantity and quality of the blood, and the state of the tissues of the body, including the capillary walls. Upon these, graduated exercise, diet, and general regimen may be expected to exert special influence.

When, however, the heart-muscle is failing intrinsically, it is surely irrational to impose upon it a heavier burden. If a patient has severe dyspnœa on exertion, and, still more, if he has dropsy and a congested liver, there can be no question as to the absolute necessity of rest. But he may have neglected early warnings and struggled on till his dyspnœa has become *orthopnœa*, and he is no longer able to lie down. In a hospital ward, into which heart cases of this kind are quite commonly admitted, it is a very rare thing to find a patient really unable to remain in bed with his shoulders well raised and supported on a "bed rest" or pile of pillows. In the paroxysm of dyspnœa that occurs in certain cases of Cheyne-Stokes respiration, the patient will sometimes spring out of bed as the dyspnœal period reaches its maximum. Under the circumstances, the hypodermic injection of morphine and atropine will usually be effectual in allaying the distressing condition, and enabling the patient to remain in bed When a patient is incapable of passing the night otherwise than sitting on a chair, leaning forwards, supported on the back of another chair, his greatly œdematous legs swelling till the tense skin cracks and exudes serum, the plight of the patient is very terrible, and treatment very difficult. Care must be taken that he does not bury his face in a pillow or in his sleeve while his neck is sharply bent, and so become asphyxiated. The presence of much secretion in the bronchial tubes renders morphine dangerous; moreover, there will usually be serous effusions that directly or indirectly interfere with the action of the heart and lungs. Such effusions may be mechanically removed, while the presence of secretion in the bronchi need not absolutely forbid the use of morphine, though it necessitates an infinitesimal dose being given, and that well guarded by atropine or strychnine as a respiratory stimulant. Moreover, dry cupping over the lungs is often useful under the circumstances. By these means it may be possible to get the patient once more to remain in bed. But in truth, the condition described may often be anticipated by treatment, and its full development is most often seen in patients who have struggled on without, or in spite of, medical advice. Digitalis, strophanthus, and allied drugs are much more likely to bring about a diuresis when the patient is recumbent, at any rate in bed, with his shoulders raised.

In the promotion of rest it is often useful to have two small beds, which can be brought up side by side, the patient being changed from one to the other, night and morning. Although the changing entails movement, and even slight exertion, it may be that, on the part of the patient, such movement and exertion are no greater than are implied in the ordinary "making of the bed," while to neglect this last, is often to produce "soreness" of compressed parts, and ultimately bed-sores.

Hospital patients appreciate the use of a crossbar, suspended by a rope from the roof or bracket on the wall, by which, especially in the case of heavy patients, movements of the body are greatly facilitated. No doubt the exertion entailed by the use of the crossbar is injurious, but compromise has to be made, and such exertion is to be weighed against the manœuvres requisite in lifting a heavy patient about, even when several attendants are available, which is seldom the case in a private house. In the latter, the writer has occasionally had constructed by a joiner an apparatus resting on the floor, affording the patient the advantage of the hospital suspended crossbar. Though it may seem paradoxical to say so, the contrivance really tends to the promotion of *rest*. When in a ward, some of the beds have the crossbars referred to and others are without it. Patients with grave heart disease, and nurses alike, prefer the beds so provided. Another mechanical aid to the cardiac sufferer is supplied by affording him a resisting object against which he may press his feet, and so raise himself up in the bed, or at least prevent himself slipping down.

DIET.—In the treatment of cases of cardiac muscle failure, there is perhaps no part more important than the diet of the patient; and yet how often is this neglected, while, as the saying is, "no stone is left unturned" in the matter of drugs. Yet the common experience of humanity—and especially of athletic humanity—teaches that the influence of diet on the heart muscle is immense. In two ways it shows itself: on appropriate diet the sound individual gains in "wind," and he gains, too, in power of endurance. There is, the writer believes, a third gain, which hardly concerns the present subject, namely, in resistance to injury. As immediate "fuel" for physical exercise, the value of sugar as an easily burnt-up carbohydrate is admitted, but in the case of the bed-ridden cardiac sufferer this consideration does not apply. In Dr. Pavy's "Treatise on Food and Dietetics," there is related the interesting experience of a traveller in South America, Sir Francis Head, who, we are told, got tired at first, when crossing the pampas, with constant galloping, and was forced to ride in a carriage after five or six hours on horseback, "but who, after he had been riding for three or four months and had lived on beef and water, found himself in a condition which he could only describe by saying that he felt no exertion could kill him. Although he constantly arrived so completely exhausted that he could not speak, yet a few hours' sleep upon his saddle on the ground always so completely restored him that for a week he could daily be upon his horse before sunrise, could ride till two or three hours after sunset, and have really tired ten or twelve horses a day." "This will explain," he remarks, "the immense distances which people in South America are said to ride, and which I am confident could only be done on beef and water." No doubt Sir Francis Head could have burnt up much sugar or other carbohydrate, which the cardiac patient cannot be expected to do. Such an experience as that related cannot be gainsaid by the present-day theorist. Moreover, it is confirmed by what we know of the pugilists of the middle of last century and earlier, who were dieted on the "beef and water" system.

That the heart is chiefly influenced in the process of training is rendered almost certain by the extraordinary improvement in "wind" that is brought about. First in occurrence and first in importance throughout, in cardiac disease, is the symptom of *failure of "wind."* While the heart-muscle, which we know to possess many special and remarkable attributes of its own, is chiefly influenced by the process of training, of which dietetics form so important a part, muscles of the ordinary voluntary type no doubt share in the influence exerted, and especially, it is allowable to believe, so do the *respiratory* muscles. In one respect the old system of training may be open to criticism, in that the drinking of water

was discouraged. The writer would mention in defence two considerations: that large draughts of water *with meals* are probably injurious, and that, as a matter of actual experience, a largely nitrogenous diet is *not conducive to thirst*—rather, he thinks, the opposite, *salt* meats of course being excluded

One of the three cardinal symptoms of cardiac disease is engorgement of the liver—"venous stasis"—revealed by its swelling and tenderness. This condition of the liver no doubt interferes with the functions of its cells. These functions concern both carbohydrate and albuminous feeding; but it may be presumed, perhaps, that they concern the former rather more than the latter; at all events it will give relief in any case to have one set of functions reduced to a minimum, while the other set is raised. If the writer be wrong in attributing the major influence of the liver to be upon the carbohydrate constituents of the food, the reduction of these constituents will in any case leave the liver cells more energy to bring to bear upon the albuminous constituents.

In heart cases, again, as regards the digestion of the two great classes of food referred to, a strong argument in favour of a chiefly albuminous diet is the much greater tendency of the carbohydrate elements of food to produce flatulence, and every clinician knows the amount of distress occasioned to cardiac sufferers by flatulence. For this distressing condition, the writer knows no treatment so effectual as the withdrawal of carbohydrates from the dietary.

It must not be supposed that a diet of "beef and water" is advocated. Two considerations must be allowed predominance: one concerns metabolism chiefly, and has been already discussed, the other concerns primary digestion. Is the "mixed meal" of modern life not based upon the fact that the average healthy individual has an excess of digestive power? Surely it will give relief to weakened digestive organs (and who can doubt that these are weakened in heart disease?) if, instead of the "mixed meal," the albuminous and carbohydrate constituents of the food are given as far as is possible separately? The fatty constituents of the food will be considered later. If a beef-steak and a rice pudding are taken together, will not the latter interfere with the digestion of the former in the stomach, where the latter undergoes no essential change? No doubt in disease the digestion of albuminous food is often accomplished essentially in the intestine, and in an alkaline medium, as for instance in severe fevers; but in heart disease it is a common marvel how long gastric digestive power is retained.

Only *simplification* in the feeding of the cardiac patient is pleaded for as regards primary digestion: that he should avoid the "mixed meal" of modern life. In primitive savage life, in all probability, man would eat his flesh food and his vegetable food separately, as he obtained them at different times and under different circumstances.

To carry out the principles referred to, the writer has for a good many years advocated for cardiac patients, who are still able to take ordinary meals (and with temporary exceptions this state may continue almost to the end of the case), the following dietary:—

Breakfast: Chinese tea, or weak coffee and cream; toast—the bread cut in thin slices and toasted slowly—buttered cold. Fruit: bananas, etc.

Mid-day meal: any kind of flesh food, plainly cooked, with green vegetables (preferably passed through a sieve after thorough cooking and pounding); custard pudding or junket with cream, or cheese fondue, if a second course is required.

At 4 or 5 o'clock p.m. a cup of Chinese tea and cream. Nothing to be eaten. No sugar to be taken; if sweetening be required, saxin may be employed for the purpose.

Evening meal: similar to mid-day meal, the articles being changed.

No bread, no potato, and no farinaceous pudding on any account to be taken with the mid-day and evening meals.

Fruit, natural or cooked, without the addition of sugar, may be allowed after the mid-day and evening meals, as well as after breakfast. The writer believes that, whatever be the explanation, the carbohydrates of fruit are much less injurious than those of bread, potato, and farinaceous pudding.

There are certain circumstances that interfere with the adoption of such a dietary as has been outlined. Some individuals are intolerant of most fats, and on the other hand have great facility in the digestion of carbohydrates. Others, again, have an inveterate dislike to much flesh food, and two daily flesh meals are abhorrent to them. Compromise can generally be made without departing from the principles of the dietary laid down. The cardiac sufferer may do well on a carefully regulated dietary comprehending a minimum of flesh food only, such articles as custard, junket, and fondues of cheese largely replacing it.

There is a numerous class of patients whose habitual tendency is to take too large a quantity of both albuminous and carbohydrate food, and in addition to take too much fluid with meals. Usually the albuminous diet detailed suits them, but if they insist on " mixed meals," these must be spare, and each should be finished short of the feeling of satiety. Another great class is composed of patients in whom cardiac muscle-failure is associated with (one may say in most cases is secondary to) kidney disease. Although in chronic Bright's disease albuminous food is much better borne than theoretical considerations would lead one to anticipate, it seems hardly wise to throw an excessive burden on the function of damaged organs. *Small* " mixed meals " are usually best under the circumstances, and it is possible that casein and even egg albumen are less injurious than flesh, though the belief that white flesh is less injurious than red, to patients with Bright's disease, has been too commonly and too rigidly held.

The good effects of an exclusive milk-diet in the cardiac muscle-failure of Bright's disease are generally admitted, but few patients will tolerate it for a lengthened period. The writer adds fruit to an otherwise exclusively milk diet, and finds that it renders the diet very much more agreeable, and it serves to keep the bowels free—at least to obviate constipation—while the salts contained in the fruit may be supposed to act beneficially.

In simple cases of cardiac muscle-failure, attacks of gastric catarrh are common, as in cardiac cases generally, and for them " koumis " or fermented milk, is often useful, but the patient must not have any other kind of food at the time. Some patients dislike the taste of koumis, and will not take it. For them, peptonized milk may be used to the exclusion of all other food. If koumis and peptonized milk alike are vomited, the best plan is to let the patient fast for six, to eight, or even twelve hours, at the end of which time the sickness has usually ceased, though feeding must be gradually resumed. Counter-irritation —as by a mustard and linseed poultice over the epigastrium—is often helpful, or seemingly so. The gastric catarrh of heart disease is, no doubt, often set up in the first instance by some indigestible article of food irritating the venously congested mucous membrane.

Unsatisfactory as is feeding by the rectum, it may be used when it seems necessary to give the stomach absolute rest for a time. Even the throwing into the bowel of warmed water renders a period of abstinence from food and drink more endurable. An acetone odour from the breath in gastric catarrh is probably associated with the starvation occasioned by the frequent vomiting.

Drug Treatment.—Among the drugs useful in the treatment of cardiac muscle-failure, digitalis is pre-eminent. Although in many ways our knowledge of its action is imperfect, notwithstanding the large experience of its clinical use that has accumulated, and the numerous experimental studies of its physiological

effects that have been made in laboratories, there is no other drug that for usefulness can bear comparison with it. The official preparations are all open to the objection that the crude drug from which they are made is more or less liable to vary in precise chemical constitution, according to the soil in which the plant is grown, and many other pharmaceutical particulars. On the other hand, all are more or less and similarly active. To attain, as far as possible, to precision in the administration of the drug, the writer for many years has used chiefly the granules of "crystallized digitaline," made by M. Nativelle, of Paris. The active principle they contain is unquestionably present in precise dose ($\frac{1}{240}$ gr. in each granule), but its action, of course, does not represent that of all the active principles contained in the crude drug, and it has one property—a so-called cumulative effect—that is both useful and, in a measure, objectionable: useful, inasmuch as it is easy by the use of the drug to bring the heart under its physiological effects; and objectionable, because the prolonged administration of even small doses is apt to eventuate in a toxic effect upon the heart and also on the alimentary canal. Thus, slowness and irregularity of the pulse may result, and be combined with abdominal pain and vomiting. The most desired effect of the drug in all its forms is an increased flow of urine—diuresis. But this may fail to appear before the manifestations of the objectionable effects referred to, and yet when, owing to the latter, the administration has been stopped for a day or more, profuse diuresis may set in and continue for a considerable time. The most likely explanation of this occurrence is, that the drug has acted too energetically upon the arterioles in the first instance, so that in the kidney the requisite conditions for diuresis fail, and occur only later, when the effects of the drug have to some extent passed off. Whether this explanation be correct or otherwise, it accords well with the clinical facts. Another, fortunately rare, clinical observation with regard to the effects of digitalis is, the abrupt supervention of a very profuse diuresis, which, however, is not maintained and cannot be re-established. In exceptionally severe and urgent cases, the writer prefers a freshly-made infusion of the crude drug, a tablespoonful of which he is careful to have given every eight hours: that is, three times in the day of twenty-four hours. On the other hand, he seldom gives more than two of Nativelle's granules in the twenty-four hours, one night and morning being usually the dose. Should he wish, however, to give a larger amount, he is careful to divide three granules equally over twenty-four hours, i.e., to give one granule every eight hours. In exceptional cases it may be desirable to "push" the action of the drug, and to give four doses in the twenty-four hours: a granule or half-an-ounce of infusion every six hours. It seldom happens that as much can be taken for any length of time without indication that the dose must be diminished, and during the administration very careful observation of the patient, who must be in bed, is necessary.

In certain cases in which there is indication of too great contraction of the arterioles and the retention of a pulse of some considerable tension, it is often desirable to give, during the administration of the digitalis, a vasodilator—say a tabloid of erythroltetranitrate ($\frac{1}{4}$, $\frac{1}{2}$, or 1 gr.) sufficiently often to keep up the physiological effect of the drug, and thus, as it were, to negative or diminish the influence of the digitalis upon the arterioles. While the administration of full doses of digitalis, under observation for a short period, is usually quite safe, the prolonged administration of even small doses leads to toxic symptoms. Fortunately, abdominal pain, sickness, and vomiting are apt to supervene and put a stop to the further absorption of the drug, even if continued; but in certain cases in which quite small doses have been given for a long time, the patient being allowed to go about meanwhile, there is grave reason to believe that the drug has contributed, at least occasionally, to a sudden death, if it has not indeed

been the essential cause of it. Much has been written about the use of the drug in aortic incompetence ; the writer has no fear of giving it in cases of this lesion, and has obtained excellent results from it. Mitral stenosis is also a lesion in which the usefulness of digitalis has been in question, and perhaps with greater reason, inasmuch as the muscle of the heart immediately concerned is that of the thin-walled left auricle, while the lungs must suffer congestion before the musculature of the right ventricle can be brought into play.

With regard to aortic incompetence the fear has been that, the diastole being prolonged, there would be more time afforded for the distension of the left ventricle by the regurgitated current of blood. But slowing of the pulse is by no means often observed in cases of aortic incompetence under action of the drug, while it occurs occasionally independently of digitalis. In a case of the latter kind, the writer was alarmed by the slowness of the pulse, no digitalis having been given, and the patient died suddenly shortly after. Had digitalis been given, it would have been impossible to eliminate the effects of the drug from the result.

The next drug to be considered in point of usefulness is undoubtedly strophanthus, the physiological action of which was long ago carefully worked out by Sir Thomas R. Fraser. If the action of strophanthus be exerted upon the heart essentially, and the musculature of the arterioles to a large extent escapes, the drug should have a great field of usefulness in clinical practice, inasmuch as cases of heart failure in the presence of arterial tension and peripheral resistance, abound. It can hardly be said, however, that the indication has proved of practical value. For instance, some of the best results the writer ever obtained from strophanthus were in a case of rheumatic disease of the heart in a young subject, without mitral stenosis and aortic valve disease, and with very low pulse-tension. There could be no question of *post hoc* rather than *propter hoc* in this case, inasmuch as the same result was *repeatedly* obtained.

On the other hand, strophanthus has often failed in cases in which arteriole contraction seemed to play a predominant part. Moreover, the introduction into our therapeutic armamentarium of vasodilators would seem still further to enhance the usefulness of digitalis and diminish the application of strophanthus. Admitting all this, and that the indications for the use of the drug are still to a large extent empirical, the right of strophanthus to the second place in treatment may be cordially admitted.

It seems to be practically impossible to give any drug, with justice, the third place. The writer admits, however, that he at least has hardly given drugs such as convallaria majalis and apocynum cannabinum a fair trial, inasmuch as he has reserved their use for the worst cases of heart disease, which have resisted both digitalis and strophanthus. Still more is this the case as regards erythrophlæum, which would seem, however, to be worse than digitalis as regards its action on the arterioles. Citrate of caffeine, and still oftener diuretin (theobrominum natrio-salicylicum) and theocine he has frequently found useful in setting up a diuresis under apparently most unfavourable circumstances. He has generally regarded evidence of sound kidneys as an indication for the employment of the latter drugs, believing that their action was essentially exerted upon these organs. In at least one case of the heart-failure of chronic Bright's disease, however, a profuse diuresis has resulted from its use. Whether the effect was dependent on the action of the drug upon the kidney or upon the heart, remained doubtful.

Of the treatment of the complications of cardiac muscle-failure this is hardly the place to speak : they are the complications for the most part of the venous stasis of heart disease in general. Purgation should be reserved for cases in which arterial tension is preserved and is indeed over high. It should not be

repeated too frequently, but should be thoroughly effective when employed. More or less constant purgation entails exertions on the part of the patient that must be harmful in the end, while means of lowering arterial tension without exertion are nowadays available (vasodilators). For pulmonary œdema, dry cupping is often of use; the cups should be large and effectively applied. A few leeches may be employed over a congested liver that is causing more than usual distress. Exceptionally phlebotomy may ward off the threatening danger of an over-distended paretic right auricle. Tapping may be required when hydrothorax or ascites are manifestly interfering with respiration and cardiac action, and dropsical legs may require the application of Southey's trochars or acupuncture, which should be made with great antiseptic precautions. With regard to the use of the trochars, the writer has been much struck by the difference as regards the flow of serum in individual cases apparently alike.

Insomnia may threaten the patient's life, and prove most difficult of treatment; resort to morphine and atropine hypodermically will often be the best course to adopt, and generally so whenever an element of dyspnœa enters into the insomnia or is associated therewith.

Paroxysmal Dyspnœa. — The treatment of chronic dyspnœa resolves itself into the treatment of the heart, and aims at the restoration of its vigour, as far as that is possible, with the removal of subsidiary conditions interfering with the play of the lungs, such as hydrothorax and ascites. The dyspnœa, which comes on in paroxysms, and is probably associated with a general tightening up of the arterioles, requires special reference. It is usually relieved, in greater or less degree, by vasodilator medication, such as the inhalation of amyl nitrite, or the internal administration of erythroltetranitrate, nitroglycerin, nitrite of sodium, etc. Alcohol, no doubt, acts largely like a nitrite, dilating the arterioles and so relieving the heart. When such remedies fail to relieve paroxysmal dyspnœa, with its violent "struggles for breath," the subcutaneous injection of morphine and atropine is the only reliable mode of treatment; but the dose should always be very small at first, and then slowly increased in subsequent attacks, until relief is obtained. Much blocking of the bronchi with secretion, and Bright's disease, are contra-indications as regards the use of morphine, especially the former: in both cases, if the treatment be employed, the first dose must be infinitesimally small, and subsequent doses must be increased with the greatest caution.

Strychnine is a drug that has come greatly into fashion in the treatment of heart disease. Its action is probably an indirect one as far as the heart is concerned. Its essential action is that of a respiratory stimulant. The best results are obtained from its subcutaneous injection, but naturally such mode of administration is usually reserved for cases that have reached a critical stage.

Iodide of potassium is often recommended in those forms of heart disease that are associated with arterial disease. Whether or not the drug exerts a beneficial influence on the latter process in its earlier stages is doubtful, but in the later stages no evidence of improvement is usually forthcoming after its administration. It tends to lower arterial tension, however, and in this way its use may be to some extent beneficial. In a case of muscle-failure of the heart in a syphilized subject, the cause of which is not obvious, it would be prudent to at least employ the drug, with or without mercury, for a time, in view of the presence of a gumma of the myocardium. The removal of neoplasm is all that can be expected; the restoration of tissues that have been destroyed must not be looked for.

It is impossible to regard cardiac muscle-failure as a definite clinical entity: its causes are too numerous and different, while it is they that determine the line of treatment. The chlorotic girl, and the middle-aged man with gout and

granular kidneys, may equally be the subjects of cardiac muscle-failure—the one curable, the other not, though susceptible to judicious therapeutics. In like fashion, the young rheumatic subject of myocarditis, and the old man whose progressive cardiac failure is wrought by his arteries alike increasing the burden of the heart and crippling its nutritive supply, furnish a striking contrast, though both are well-nigh equally hopeless. Between such extremes there are a vast number of cases of cardiac muscle-failure that offer a fruitful field for therapeutic effort. Their treatment, however, must not be limited to drugs, but must include diet, rest, the regulation of exercise, and the freeing of the mind from worry as far as in us lies.

In chlorosis, rest in bed, iron, and a plentiful supply of red meat, usually speedily cure, without recourse to digitalis, strophanthus, or like drugs. (See also SCHOTT-NAUHEIM TREATMENT.) *Graham Steell.*

MYOCLONUS (in Childhood)—(Paramyoclonus Multiplex.—Myokymia).—This condition may be met in children upwards of five years of age. It consists in simple, sudden spasms of individual muscles—not groups of muscles—and usually affects the same muscles on the two sides of the body. The movements resemble those produced by faradic stimulation of the nerves supplying the affected muscles. They do not occur rhythmically, and do not resemble any volitional movements. The face is rarely affected. Thus they may be distinguished from the exaggerated normal movements of muscle groups in Sydenham's chorea, and from the fantastic parody of normal movements which obtains in co-ordinated tic (habit spasm) and other functional derangements. The absence of sensory stigmata distinguishes myoclonus from hysteria.

The etiology of myoclonus is unknown. Probably it is due to congenital functional abnormality of the motor cortex and of the motor cells of the spinal cord. In many cases it is a familial affection. The prognosis is unfavourable as to cessation of the movements, though the disease is not as a rule dangerous to life. Spontaneous recovery may take place, but the complaint is wont to recur. Treatment is probably useless, though hydrotherapy, electricity, and arsenic have been credited with good results. *Leonard G. Guthrie.*

MYXŒDEMA.—In carrying out the treatment of a case of myxœdema, we have to make good the loss of function of the thyroid gland by supplying the secretion from another source. This can be readily obtained from the thyroid gland of an animal, such as the sheep. Normally, the secretion is continually being carried into the blood-stream. We cannot exactly imitate this, but it is found in practice, that if the supply is given in a single daily dose, the results are quite satisfactory. The thyroid secretion may be administered by the mouth in several different forms. The actual gland itself may be given, and though, as a rule, this is not so convenient as one of the preparations of the gland, it may be useful when the patient lives in some remote place. The fresh gland can be readily obtained wherever sheep, oxen, or pigs are killed. If the raw gland is used, from $\frac{1}{8}$ to $\frac{1}{4}$ of the lobe of a sheep's gland is an average daily dose for an adult, half of one lobe being equivalent to about 10 min. of liquor thyroidei. The raw gland may be lightly fried on the outside, or it may be minced and taken in some sweet vehicle, such as a syrup, to make it palatable. As a rule, it will be found more convenient to employ one of the two official preparations, liquor thyroidei and thyroideum siccum. The former is simply the original thyroid extract, which I first introduced more than fifteen years ago, and the latter is a powder obtained by drying the minced glands at 90°–100° F. One grain of the powder is equivalent to about 6 min. of the liquor. Of the two preparations, the best results are obtained in

the treatment of myxœdema by the use of the liquid extract, though the dry powder is more convenient, as it can be readily made up into compressed tablets.

In dealing with an advanced case of myxœdema, which is now rarely seen, the patient should be confined to bed during the first part of the treatment, so as to avoid any over-exertion. This is important, as these patients are apt to have some fatty or fibrous degeneration of the myocardium, and any increased exertion may induce an attack of syncope, which has proved fatal in several cases. Only small doses of thyroid should be given at first, 2–3 min. of the liquor or ½ gr. of the dry thyroid, at bedtime. This dose may be gradually increased up to 5, 7, and finally 10 min. during the course of two or three weeks, when the patient may be allowed to get up again. Exercise must be strictly regulated, and only increased by degrees, according to the condition of the pulse. Any increase of the pulse-rate beyond 80 or 90, when the patient is at rest, is an indication that the dose should be reduced.

In early cases in which no cardiovascular changes can be detected, this period of rest is not necessary, though patients should be warned against undertaking any unusual exertion during the first stage of the treatment. In these cases 5 min. of thyroid extract may be given each night, and the dose gradually increased up to 7, 10, or 15 min. according to the progress made. As soon as the first stage of the treatment is completed, that is to say, as soon as the symptoms of the disease have disappeared, a somewhat smaller quantity will probably suffice for the permanent dose. It is most important to make patients clearly understand the nature of the treatment, and the necessity for its steady continuance during the rest of life, in order to avoid a return of the symptoms of myxœdema. This is easily done in the case of educated people, who can readily understand the *rationale* of the treatment and the necessity for taking the thyroid extract regularly, as part of a daily diet. Some hospital out-patients, on the other hand, are inclined to neglect the treatment as soon as the symptoms have disappeared, and of course they sooner or later return as before. As a rule, 10 min. of the extract each day is quite sufficient. Thus the first case of myxœdema in which I began the treatment in 1901 still takes regularly 10 min. each week-night, that is, 1 dr. of thyroid extract each week. She remains well, and free from any symptoms of the malady. In some cases a daily dose of 5 or 6 min. is sufficient; in a few, 15 or even 20 min. a day may be required. The liquid extract should be obtained fresh each fortnight, though as a rule it will keep quite well for a month.

During the first stage of the treatment, the solid œdema steadily diminishes, the skin gradually becomes less dry, and perspiration returns. The temperature rises to the normal level, so that the patient no longer complains of feeling cold. The normal mental and bodily activity is gradually regained, and the speech becomes natural. At a later stage, the hair grows again, in fact, the patient recovers, and remains free from the symptoms of the disease as long as a sufficient daily dose of the thyroid extract is regularly taken. *George R. Murray*

NÆVUS.—(See ANGEIOMATA.)

NASAL CATARRH.—(See RHINITIS.)

NAUHEIM TREATMENT.—(See SCHOTT-NAUHEIM.)

NEPHRITIS.—The treatment of renal disease must be based on the considerations of the functions of the kidney, and especially on the nature and degree of the impairment of these functions produced in disease.

The normal kidney has the following functions: (1) It serves as a channel for the elimination of approximately half the total quantity of fluid ingested within the twenty-four hours; (2) It is the main channel for the elimination of salts and nitrogenous

extractives, in part derived more or less directly from the food, and in part products of the activities of the metabolic processes; (3) Certain substances are synthesized in the kidney prior to their excretion, such as hippuric acid; (4) Lastly, it is probable that the cell activities of the kidney have some indirect effect on nutrition, the exact mechanism of which is still obscure.

In addition to these functions, the kidney is an extremely vascular organ: alterations in the diameter of the renal blood-vessels play a part in many vasomotor mechanisms, and changes in the calibre of the renal vessels produce marked effects on the general blood-pressure.

The functions of the kidney are affected to very different degrees, and in a different manner, in the various forms of renal disease. Speaking broadly, its efficiency as an excretory organ tends to be impaired, and it would seem that in many diseases very marked changes in nutrition are produced as a sequel of the disturbance of what may be called its metabolic activity. Further, in many diseases marked vascular changes, affecting the circulation generally, occur as a result of progressive renal disease.

In addition to these three sets of effects, two other groups of phenomena are also seen as a result of disease. Dropsy is of frequent occurrence as an accompaniment of renal disease, and has certain peculiar characteristics, both as regards the distribution and the composition of the dropsical fluid. Secondly, a number of symptoms dependent on the presence of toxic material in the blood, and collectively known as uræmic, are liable to occur.

Renal disease not only tends to produce all the above disturbances of function, but, in addition, the resistance of the tissues of patients suffering from these maladies is lowered, and hence they are liable not only to be affected, but also frequently to succumb to a number of secondary infections of an inflammatory character.

One of the most important questions materially influencing the principles of treatment, is the relationship between impairment of the excretory activity of the kidney and the development of such effects as dropsy and uræmia. This question is of peculiar importance in the case of renal dropsy, the occurrence of which is invariably accompanied by a diminution in the excretion of urinary water; but the exact relation between these two phenomena is by no means certain. Some have thought that the diminution in the excretion of urinary water was the actual cause of the dropsy, owing to the production of a condition of hydræmic plethora. Others have looked on the scanty urinary flow as a result of the dropsy. According to the latter interpretation, the transudation of fluid from the blood-vessels is dependent on some other cause disturbing the normal transudation of lymph, and the flow of urine is necessarily diminished in consequence. The nature of the treatment of renal dropsy must be very different, according as to which of these views is the correct one.

A somewhat similar question presents itself in the case of uræmia, since, although all are agreed that uræmia is essentially of toxic origin, there is much difference of opinion with regard to whether the toxic agent is merely a normal constituent of the urine, retained as a result of insufficient elimination, or an abnormal constituent formed by the tissues in consequence of defective metabolism.

It is difficult to look upon renal dropsy as entirely dependent on impairment in the excretion of urinary water, since dropsy is not an invariable accompaniment of all the renal diseases, whether the flow of urinary water is diminished or even suppressed. In many forms of nephritis, even including those of a very severe type, there may be a great diminution in, or suppression of, the urinary flow, without the occurrence of any dropsy. Further, in some diseases of the kidney, complete suppression, lasting a week or more, may occur without a trace of dropsy. On the other hand, some affections of the kidney are ushered in with the occurrence of generalized dropsy; in fact, it is not uncommon for this to be the first sign to draw attention to the existence of renal disease. For these reasons it is at any rate probable, that renal dropsy is not dependent merely on the incapacity of the diseased kidneys to excrete water.

The retention of salts, particularly chloride of sodium, in the blood-stream, in consequence of deficient elimination by the kidney, has recently been supposed to be an important factor in the production of dropsy. This again, is a conception which, if correct, must materially influence the treatment of the disease. According to this view, the sodium chloride taken in the food is not freely excreted, but accumulates to some extent in the blood-stream, and so causes a disturbance of the normal osmotic relationships existing between the blood and the lymph bathing the tissues, with the result that a large quantity of fluid passes out from the blood-vessels into the lymph spaces, thus causing dropsy. The elimination of chlorides in the urine would seem to be specially diminished in the so-called parenchymatous forms of nephritis, whereas in interstitial nephritis, where dropsy is not a leading clinical sign, the elimination of chlorides is not diminished.

Suppression of the urinary excretion may also take place without necessarily producing acute uræmia, even when the suppression lasts for as long as a week. Thus, it would seem that the mere retention in the blood of the normal constituents of the urine, is not

capable of producing ordinary acute uræmia. Further, in many cases of the most severe forms of uræmia occurring in chronic renal disease, quite considerable quantities of urine are excreted, although it is no doubt true that the onset of uræmia is generally accompanied by a diminution in the amount of urine excreted.

Although the occurrence of uræmia cannot be correlated directly with the mere retention in the system of normal urinary ingredients, it is quite probable that this toxic state may be due to the abnormal formation by the tissues, and the subsequent retention, of some toxic substance.

The leading principles in the treatment of renal disease may be summarized as follows: (1) To diminish the work of the kidney as much as possible, and this includes not only diminishing the excretion of nitrogenous extractives, but also the other excretory activities of the organ, e.g., salts and water; (2) To promote, as far as may be, excretion by other channels; (3) The treatment of such associated conditions as dropsy and uræmia; (4) To check, so far as possible, the disordered metabolism.

Acute Nephritis (Acute Bright's Disease).

The necessity for restricting, as far as possible, the excretory activity of the kidney, is greater in acute than in most cases of chronic renal disease, since the activity of the organ is usually more impaired in acute than in chronic affections. There are exceptions to this, namely, where an acute exacerbation or complication occurs, superadded to a chronic lesion, and in the terminal stages of fatal chronic cases.

In acute renal disease it is possible to restrict the output of nitrogenous extractives, salts and water, etc., to a greater degree than in chronic cases, owing to the transitory character of the affection. In chronic diseases, undue restriction of the ingesta may produce injurious effects by lowering the general health, and it may not be advantageous to attempt to produce an improvement in the urinary excretion at the cost of still further impairment of the general nutrition. In acute renal disease the indications are clear, to restrict as far as possible the work the kidneys have to perform.

Food.—The food given in acute renal affections must not only be small in amount, but also of the simplest character, and readily digestible, owing to the frequent occurrence of gastric disturbance, and the accompanying nausea and vomiting.

All food rich in nitrogenous extractives is obviously contra-indicated, such as soups, broths, meat essences, as such articles of diet not only increase the work of the kidney, owing to their richness in nitrogenous extractives and saline ingredients, but because of their small nutritive value. Solid food is also inadmissible, owing to the gastric disturbance. Thus the diet is practically limited, if food be given at all, to milk. Three pints of milk per diem are usually looked upon as the minimum quantity necessary to maintain the nutrition of the body in an approximately normal condition, as this quantity will supply 60 to 70 grams of proteid, usually regarded as the minimum necessary. In acute renal diseases lasting but a short time, probably no harm will result from diminishing the input to a still greater extent, and a pint to a pint and a half per diem is probably sufficient, at any rate for some days.

In cases where the acute nephritis is of a very severe type, leading, it may be, to practical suppression of urine, it is advisable to cut off all food, and simply to allow the patient to sip water. A few days' starvation will not produce any disastrous effects on the body generally, and it may turn the scale in favour of the patient, by still further diminishing the work of the kidney. Even in starvation, considerable quantities of nitrogen in the form of urea, etc., are excreted in the urine, especially during the first few days, so that even by starvation it is impossible to afford the kidney complete rest; but there is much

to be said in favour of only allowing water in moderate quantities for two or three days in the treatment of severe cases of acute nephritis. In the majority of cases, however, the type of the disease is not so severe, and milk as mentioned above, in quantities of from one to one and a half pints per diem, may be allowed. The amount of proteid that is available for nutrition in this quantity of milk is diminished in acute nephritis owing to the albuminuria, and hence such a diet cannot be maintained for any great length of time. After the lapse of a few days, the condition of the urine will probably improve, the amount of blood diminishing and the quantity of urine increasing, and further quantities of milk may be given, and some carbohydrate in the form of bread, arrowroot, etc., may be added. Great care, however, should be taken not to increase the diet too rapidly, and to be guided mainly by the condition of the urine, trusting to make good the patient's condition subsequently, when the acute renal lesion has subsided.

Where the kidney lesion is less severe and gastric symptoms are not marked, there is no objection to increasing the food by the addition of more carbohydrates, and fats in the form of cream ; but the quantity of proteid food should be restricted as much as possible, and care taken not to give fluids in large amount. Where gastric symptoms are marked, it is advisable to pancreatize or artificially digest the milk, and usually a mixture of equal parts of gruel and milk make a more suitable food for artificial digestion than milk only. Such a mixture is much more palatable, and its nutritive value is greater, than if the same quantity of milk be simply diluted.

There is considerable difference of opinion with reference to the quantity of fluid that should be allowed to patients suffering from acute renal affections. Some writers advocate the free administration of water, with the idea of its elimination by the kidney leading to the washing out of the débris in the form of shed epithelium that is choking the renal tubules. Others consider that the administration of large quantities of water in acute nephritis is liable to be followed by the production of hydræmic plethora, owing to the diminished and imperfect elimination of water by the kidneys, and they regard this plethora, if not as the actual cause, at any rate as a powerful predisposing cause, in the production of dropsy. It is probable that an indication as to the free use of water may be afforded by the state of the patient. If the acute renal affection is one where only urinary changes are present and dropsy is absent, water as a diuretic is probably useful. On the other hand, in the acute lesions, where dropsy is a marked sign, fluids should certainly not be given freely, although it must be remembered that it is impossible to treat dropsy by the mere restriction of the input of water : such restriction only leads to great distress, and produces no beneficial results. No good results can follow the administration of large quantities of water in such patients, with the idea of flushing out the kidneys. The indiscriminate giving of fluids in large quantity may not only perhaps aid the development of dropsy, but the hydræmic plethora is also liable to be accompanied by cardiac dilatation, which is one of the most serious complications of acute renal disease.

Thirst should be treated, not so much by the giving of water, as by measures directed to promote the flow of saliva. Lemonade, and fruit juice of various kinds are advisable for this purpose.

Measures directed to promote the excretion of fluids and salts by other channels than the kidney are of the utmost importance in the treatment of acute renal disease, and such excretion must take place by means either of the bowels or of the skin. Treatment of this kind is not only necessary for the relief of dropsy, and of uræmic symptoms when these are well marked, but it is also advisable in all instances where the excretory activity of the kidney is diminished, even if marked uræmic symptoms are absent.

Under normal circumstances the activity of the skin is correlated with that of the kidney, at any rate in so far as concerns the excretion of water; but in renal disease, both acute and chronic, but especially the latter, it is often difficult to promote the secretion of sweat, the skin being unnaturally dry.

The intestinal mucous membrane may not only serve as the channel for the elimination of large quantities of fluid, but in conditions where the activity of the kidney is impaired, the fluid secreted by the bowel contains appreciable quantities of urea and other nitrogenous extractives, and quite considerable amounts of urea may even be excreted from the stomach in renal diseases. Measures directed to increase the loss of fluid by the bowel will therefore also remove from the blood considerable quantities of the normal constituents of the urine. Purgation is also useful, as it necessarily procures immediate relief of the hydræmic plethora so often present. The only contra-indication to free purgation in renal disease, is the fact that enteritis may occur as a complication; and in some instances, but especially in chronic renal affections, this enteritis may be of an ulcerative type, and affect the lower bowel. The purgatives selected should be those tending to produce copious watery motions without causing much griping, and saline purges are especially useful for this purpose. They should be given in a concentrated form, as it is desirable to produce a hydragogue effect. Sulphate of magnesia, sulphate of soda, phosphate of soda, acid tartrate of potash, are all useful. Sulphate of magnesia and sulphate of soda have the advantage of being more soluble than the others, and consequently it is easier to give them in a concentrated form, and thus a greater hydragogue effect is produced than with the use of phosphate of soda or acid tartrate of potash. Sulphate of magnesia has one drawback, that it has a considerable depressant action on the heart, far greater than that produced by any other saline cathartic. This objection is perhaps more of theoretical than of practical importance, the amount of sulphate of magnesia absorbed being probably very small. The saline purges should be administered in small doses at frequent intervals, rather than in large doses at longer intervals, and very good results are seen by giving the drug in a drachm dose every hour, or every two hours, until the desired effect has been produced. Although saline cathartics are especially indicated in the treatment of renal disease, other purgatives having a hydragogue action are also useful, jalap being especially recommended for this class of case. Elaterium is occasionally used, but its action is liable to be unpleasantly violent at times, and its use is really more or less restricted to cases where marked uræmic symptoms are present, and where it is essential to produce a prompt evacuation of the bowels.

In some cases, purgatives are required to produce simply a free evacuation of the bowels rather than a marked hydragogue effect, and in such instances the traditional mercurial purge, either in the form of blue pill or a small dose of calomel followed by a saline draught, is the most efficacious. Some writers have objected to the use of mercury as a purge in almost all forms of renal disease, owing to the fact that in large doses it produces necrosis of the renal epithelium. Even if this objection were a valid argument against the use of mercury in routine fashion in cases of renal disease, it can scarcely be urged against the occasional use of the drug as a purgative. Although in large doses it does produce a coagulative necrosis of the renal epithelium, yet in small doses it is a very useful stimulant diuretic.

Sweating may be brought about, either by the use of drugs or by hot baths. The promotion of sweating by the application of heat in moderation, cannot but be beneficial, and for this purpose the hot pack may be used with advantage. Hot-air baths may also be useful, provided they are not employed at such a temperature as to cause syncope, or tendency to syncope, since many patients

are very intolerant of the more extreme temperatures often employed in hot-air baths. Such a bath at a moderate temperature, 120°–140°, can do nothing but good if it causes sweating, but, as already mentioned, the skin in renal disease is often unnaturally dry and harsh, and sweating cannot be produced, even by the application of much higher temperatures. Great care should always be taken that the first hot-air baths given are at a comparatively low temperature, and the temperature should be gradually raised, and the patient should be watched all the time, to see if any feeling of faintness or acute discomfort is produced. Sweating may often be promoted by the giving of hot drinks during the bath, or by the administration of small doses of drugs : acetate of ammonia, nitrous ether, or even pilocarpine. The use of hot-air baths at high temperatures, above 170°, is not altogether free from risk. Many instances of sudden death in the bath, in patients suffering from renal disease, might be quoted. It is true most of these occur where the hot-air baths are used for the treatment of uræmia in chronic renal disease, but cardiac dilatation is not very uncommon, accompanied with much circulatory weakness, in acute renal disease. It is doubtful whether much good is to be derived from persisting in hot-air baths, in cases where the skin does not readily respond to such treatment.

Sweating can also be brought about by medicinal agents, but it is difficult to cause profuse sweating by this means without the occurrence of other, more or less undesirable, effects. Thus pilocarpine in full doses will produce very free sweating, but at the same time it may cause a considerable degree of bronchorrhœa, and so lead to marked respiratory embarrassment. Further, pilocarpine in full doses has a very marked action on the heart, and the profuse salivation and lachrymation, although not serious, are often very distressing. The bronchorrhœa is especially serious in waterlogged patients, and pilocarpine should be given in small doses in association with hot-air baths. There is no objection to the promotion of sweating by the administration of acetate of ammonia and nitrous ether, and hot drinks.

In acute renal disease of a severe type, where the urinary functions are not only seriously hampered but may be suppressed, great benefit may be obtained from venesection. The circulation generally and in the kidney, may be relieved by this means, and the amount of toxic material in the blood diminished. The blood is usually drawn from a superficial vein of the arm or neck, but according to some, it is desirable to bleed from the dorsal vein of the foot, with the idea that the circulation through the kidney is more directly relieved by such a procedure, and bleeding from the dorsal vein of the foot has been specially recommended in cases of acute hæmorrhagic nephritis, with more or less suppression of urine. In some instances of extreme congestion of the kidney, incision of the renal capsule itself has been recommended and carried out, with the idea of relieving the extreme congestion that is sometimes present, and very beneficial results have been claimed in such cases from this procedure.

Transfusion of saline solution is also useful in association with venesection, and is more especially indicated in cases where uræmic symptoms are marked ; but transfusion, or even the subcutaneous injection, of salt solution is of material service where complete or partial suppression of urine without uræmia is present. In many cases where complete suppression occurs, either in acute nephritis or in other forms of renal disease, such as calculous obstruction and occlusion of the renal arteries, uræmic symptoms are frequently in complete abeyance for many days, and it is not uncommon for death to occur in such cases without the development of ordinary uræmia. Transfusion is peculiarly useful in such cases, and by its aid life may not only be prolonged, but may also be saved in some conditions, e.g., calculous anuria, thanks to the patient being tided over a critical period. The transfusion would seem to dilute the blood, and thus

prevent the development of serious toxic symptoms, and elimination may be promoted through the bowels, and the acute congestion, or other renal lesion causing the symptoms, may subside. In calculous anuria this method of treatment may enable the patient to tide over the time necessary for successful surgical interference.

In the convalescence from acute nephritis, the treatment must be directed with the aim of preventing, so far as is possible, any recurrence of the renal lesion. With this object, all possible exposure to damp and cold should be avoided, and it is in this class of case that residence in an equable climate during the winter is especially desirable. The South of England (e.g., Cornwall), Aix-les-Bains, Madeira, Canaries, Egypt, are especially suitable for such patients. Their diet should be an ordinary plain, unstimulating one; but there is no necessity to avoid meat completely, and there would not seem to be any real advantage in recommending white meat, as is so frequently done. Such patients are commonly anæmic, and their general nutrition and power of resistance to disease have often been considerably affected by the acute malady; thus, they require plenty of good plain food in order to regain health. Although a moderate diet is necessary with such patients, alcohol is probably inadvisable. Careful attention should be paid to the bowels, and a course of saline purges is frequently beneficial. Tonics, in the form of iron and arsenic, are useful, and the iron should be administered freely, but in a form that does not lead to gastric disturbance; for this reason the perchloride, although a powerful tonic, is very often unsuitable, and better results are obtained with the sulphate of iron, given as a pill. Some of the milder preparations, such as the citrate and tartrate, may also be employed, especially in the case of children, and some authorities think that the administration of small doses of iodide of potassium with the tartrate of iron is more beneficial than giving the iron by itself. Arsenic in small doses is also extremely useful in the treatment of the anæmia and debility following acute nephritis. No preparation of arsenic, however, should be administered for prolonged periods, as even small doses not infrequently cause toxic effects; it is advisable to order the drug for periods of ten days or a fortnight to be followed by an intermission of a week. Renal extracts, prepared in a variety of ways, have been recommended by some writers in the treatment of acute renal disease; these extracts are usually prepared from the kidney of the pig, and have been administered in the form either of glycerin extracts, or as broths or infusions of the macerated fresh kidney. There is a general consensus of opinion that the broths are useless, and that no results of any value are obtained from organs that have been heated or cooked. There is much difference of opinion, both from the experimental and from the clinical side, with regard to the efficacy of the fresh extracts; the watery extract prepared from the macerated fresh kidneys has been stated to be of value, both in the treatment of acute and chronic renal disease, especially where uræmic symptoms are present. The fresh infusion is extremely nauseous, and very repugnant to the patient, both in appearance and taste, and not uncommonly leads to gastric disturbance and to cutaneous eruptions. Notwithstanding these obvious drawbacks, such extracts, given by the mouth, have been stated to produce beneficial results in cases where the secretion of urine was very scanty and the uræmic phenomena marked. The subcutaneous injection of such extracts into animals produces very marked toxic effects, and later experiments would seem to have led to different results to those obtained at first. Brown-Séquard and others stated, that the use of such extracts led to the prolongation of life in animals after double nephrectomy, but more recent results would seem to show that this is not so, and that the use of such extracts after experimental double nephrectomy in animals, really tends to shorten rather than to prolong

life, and that the supposed benefits at one time obtained were simply due to the fluid of the injection, inasmuch as better results follow the use of copious saline injections than the use of renal extracts. In the present state of knowledge it cannot be said that there is any clear and definite evidence in favour of the use of renal extracts in the treatment of renal disease, and the same remark applies to the use of blood-serum derived from the renal vein, which at one time was thought to possess marked beneficial properties.

Chronic Parenchymatous Nephritis.

The general principles of treatment of chronic renal disease are essentially similar to those guiding that of the acute form, with certain modifications mainly dependent on the more serious disturbance of nutrition, and the greater involvement of the circulatory system, seen in the chronic forms. In all forms of chronic nephritis, whether of the so-called parenchymatous or of the interstitial variety, the metabolic processes of the body have been profoundly affected, as is shown by the emaciation usually present. This wasting reaches its highest degree of development in the contracted white kidney, especially in that form seen in young adults; but it is also very marked in ordinary chronic Bright's disease, or chronic parenchymatous nephritis, where, however, it may be masked by the dropsy present. In cases of the true granular kidney, great individual variations are seen; sometimes such patients present an appearance of apparent health, with no marked wasting and no anæmia; high tension, and the cardiovascular degenerative changes may be the only marked effects produced by the renal disease. In other cases, where the renal lesion is possibly more advanced, wasting quite comparable to that seen in the other forms of chronic Bright's disease is present. The degree of impairment of the general health, as measured by the emaciation, the anæmia, and the general cachectic appearance, is the most important indication to guide the treatment, and attention should not be directed solely to the state of the urine. There is a great tendency for the treatment, and especially the dietetic treatment, to be determined very largely, if not entirely, on considerations derived from the state of the urine, and especially from the degree of albuminuria present. Treatment is often directed solely with the object of diminishing the albuminuria. In some forms of chronic renal disease the daily loss of albumin is very considerable, and is a serious drain on the patient, but even in such cases, a low diet, ordered with the view of diminishing the albuminuria, may lead to further impairment of the general health. A more liberal diet, although somewhat increasing the albuminuria, may be productive of general beneficial results.

There are many other factors that ought to be taken into consideration besides the mere amount of albumin present. One of the most important is the efficiency of the kidney as a filter, in other words its permeability; this varies much in different renal affections, and may be notably diminished in diseases where only a trace of albumin is present, e.g., the granular kidney. The presence of serious diminution in the efficiency of the renal filter is often a more important indication for a low diet than the mere amount of albumin. The permeability of the kidney may be gauged by the rapidity with which such drugs as iodide of potassium and methylene blue are excreted.

Some authorities lay great stress on the efficiency with which chlorides are excreted in chronic renal disease. Speaking broadly, the excretion of chlorides tends to be diminished in those forms of chronic renal disease of a parenchymatous nature associated with the presence of dropsy, and to be either unaffected or increased in those forms akin to the granular kidney, where renal dropsy is absent. It would seem that beneficial results are obtained by restricting the

input of salt in cases where this elimination is deficient. It is claimed that this is one of the most successful methods of treating renal dropsy. It is possible to diminish very largely the amount of salt taken in the food, by avoiding all use of it in cooking and as a condiment. Further, there would seem to be clear evidence that the free administration of salt, in patients suffering from tubal nephritis associated with dropsy, is followed by a considerable increase in the dropsy, which reveals itself by an increase in the body weight of the patient. Thus an increase in weight in a patient with chronic renal disease is not always to be regarded as a sign of improvement, at any rate if dropsy be present.

Diet.—In all cases of chronic renal disease associated with the presence of some complication, such as marked or increasing dropsy, or the presence of uræmia in any of its forms, the diet should be similar to that suitable for acute nephritis, since it is obvious that it is necessary to diminish the work of the kidney as much as possible ; but in such cases the quantity administered cannot be reduced to the same extent as in acute disease. The daily loss of albumin leads to the waste of a considerable amount of proteid, and thus, if the diet be restricted to milk, quantities considerably greater than those ordered in acute disease must be given. Three pints in the twenty-four hours is usually regarded as the minimum, and it is generally advisable to increase the nutriment by adding some carbohydrate material such as bread or arrowroot ; if the patient's digestion will tolerate it, moderate quantities of cream may also be given. The milk will often be required to be diluted with lime-water, barley-water, soda-water, or to be artificially digested, owing to the gastric intolerance frequently present. Such a diet should be persisted in so long as there is any evidence of the presence of marked uræmic symptoms, or any increase in dropsy, but should not be continued for long periods of time merely on account of the presence of marked albuminuria, or of a certain, more or less stationary, amount of dropsy. In this latter group of cases—which is after all the most common—if, after the lapse of a few weeks on such a diet, the improvement is not obvious and marked, the food should be increased, and especially in those cases where marked anæmia and cachexia are present. The increase should be of the same nature as that ordered in the convalescence from acute diseases, small quantities of fish and chicken being allowed, and if, as is often the case, the patient's general condition improve under the more liberal diet, there is no real objection to ordering meat in small quantities and in a readily digestible form. In fact, the diet should be selected rather from the point of view of its digestibility than from any theoretical considerations as to the vaunted superiority of white meat over red. Mutton is more digestible than beef, and therefore is more suitable for such patients.

The decision whether a case of chronic renal disease should be treated by a prolonged milk diet or not, should be determined rather by general considerations than by the mere amount, or even the continued presence of the same amount, of albumin in the urine. The presence of complications of any kind is an indication for the continuance of a milk diet ; but it is impossible to maintain the nutrition of an adult in a satisfactory condition on a milk diet if this is persisted in for long. The use of milk was advocated mainly on the grounds of its plain, unirritating quality, and also as it was reputed to lead to a diminution in the loss of albumin. Observations on the amount of albumin lost are usually simply determinations of the percentage amount present, and a milk diet undoubtedly frequently leads to a diminution in the percentage amount of albumin. This, however, is very frequently due to the diuretic action of the milk, owing to the contained lactose increasing the quantity of urine, and the total amount of albumin lost in the twenty-four hours is not materially affected. In other words, the improvement as gauged by the

albuminuria is often apparent rather than real, and a better gauge of the patient's condition is afforded by his general aspect, body weight, and general feelings of well-being or of illness.

The general plan of dietetic treatment in cases of chronic tubal or parenchymatous nephritis is to put the patient on a milk diet for a few weeks, and then, unless complications already alluded to exist, gradually to increase the diet, but always keeping the amount of proteid as low as possible. Fish is often recommended for these patients in lieu of ordinary meat ; but it must be remembered that fish is peculiarly rich in nitrogenous extractives, and, as already mentioned, the diet should be chosen rather from the point of view of its digestibility than for other reasons. Highly-flavoured, spiced, and smoked articles of diet should be forbidden. It is obvious that smoked meats must necessarily be very rich in proteids, owing to their concentration. Further, all so-called " high " food should be avoided, as the powers of elimination are often seriously compromised in chronic renal diseases, and very serious toxic results may follow the ingestion of decomposed food which, in a healthy person, might only cause an attack of gastro-enteritis. Twice-cooked food is inadvisable owing to its relative indigestibility.

The improvement in these patients is generally shown rather by their general condition, as measured by their strength, aspect, etc., than by any notable diminution of the amount of albumin, and patients with chronic parenchymatous nephritis may, with care, live for many years notwithstanding the albuminuria.

There are some renal diseases where intense albuminuria may be present, and yet where the amount of albumin should not be regarded as an indication for a low diet ; this is especially true of the amyloid kidney. This complication usually occurs in more or less debilitated patients, and they require a generous diet, which is often withheld under the mistaken idea that they are suffering from chronic Bright's disease. In syphilitic nephritis the albuminuria is also often very marked, the urine containing half or three-quarters, or becoming even solid on boiling. In such cases, the albuminuria often persists for many months, and although it may be advisable to treat these patients at the outset with a rigid milk diet, there is no necessity for this to be persisted in, and such cases often do better on a more liberal diet. The albuminuria may entirely clear up, even after the lapse of six or eight months.

In the granular kidney, the diet should also be plain, moderate in amount, but not restricted to milk unless complications of some kind are present. In these cases, a diet of an unstimulating character should be ordered, to prevent as far as possible, any increase of the blood-tension, which is already so high. Large meals, spices, etc., are peculiarly harmful.

In all forms of chronic renal disease, meat soups and meat extracts are not only of no value, but are directly harmful, on account of their richness in nitrogenous extractives and their tendency to produce diarrhœa. Vegetable soups, and especially those made with milk, are useful.

Stimulants are contra-indicated in chronic Bright's disease, and should only be used in quite exceptional circumstances, where circulatory weakness is present. Some forms of alcohol, as for example gin, have been recommended by some, owing to their diuretic action ; but where it is desired to produce this effect it is probably better to use simple diuretics.

Stimulants should also be avoided in the granular kidney, although it is often more difficult to effect this, as such patients often do not present any marked symptoms of illness for prolonged periods, and hence are frequently intolerant of the necessary restrictions in diet. Such stimulants as tea and coffee should also be taken in strict moderation, inasmuch as they have a marked diuretic action.

In all forms of chronic renal disease the amount of liquid ingested should be moderate, owing to the tendency to the development of hydræmic plethora in chronic tubal nephritis, and the high tension present in granular kidney, and in certain forms of chronic diffuse nephritis.

Moderate purgation, frequently repeated, is of the utmost importance in the routine treatment of all forms of chronic renal disease. The vicarious elimination of harmful substances, together with the elimination of water, is thereby promoted, and the absorption of possible toxic substances from the bowel is also hindered. Further, purgation is one of the most efficient means we possess for producing a diminution in arterial tension. Care should be exercised that the purgatives ordered do not cause griping and straining at stool, as this may be exceedingly harmful, owing to the degeneration of the arterial system and the high arterial tension. Although moderate purgation is essential, it is equally important to avoid producing any irritation of the bowel, because of the ease with which enteritis may be produced in renal disease, and also of the not infrequent occurrence of one form of ulcerative colitis, the so-called uræmic ulcers of the bowel. Purgatives acting on the large bowel are especially useful, and, as in the treatment of acute Bright's disease, saline purgatives are the most valuable. It is frequently necessary to use, in addition, some other purge, in order to produce a free evacuation, and small doses of calomel may be used for this purpose, notwithstanding the theoretical objections to the use of mercurial salts where renal lesions are present. Mercury, in large doses, or given for long periods, may unquestionably be harmful, not only from the point of view of possibly aggravating the renal lesions, but also possibly owing to its excretion by the bowel, with the consequent development of enteritis. This, however, would not occur as a result of the occasional employment of small doses, and in order to produce a purgative result, it is not necessary to employ calomel in large ones ; half a grain will often produce quite as beneficial an action as a full dose of two or more grains. The administration of calomel or of blue pill should always be followed by a saline draught. Jalap resin is commonly used in this malady, and is a valuable purgative ; but the compound jalap powder so often prescribed owes a great part of its efficacy to the acid tartrate of potash contained in it. Cascara and aloin are also useful simple purgatives for the relief of any constipation that may be present. For routine purposes, however, the administration of salines is to be recommended for the reasons already given. In many cases, some simple purgative mineral water is all that is required. But where it is desired to produce marked effects on the circulation, to relieve plethora and high tension, the saline purges should be given in a concentrated form, and in small doses frequently repeated, since in this manner not only can a greater hydragogue effect be produced, but the action can be kept more under control. Powerful purges like elaterium, croton oil, and colocynth, should if possible be avoided, owing to the irritation they may produce on the bowel, and such drugs are rarely required unless some complication, such as uræmia, is present, and the constipation is exceedingly obstinate.

In most cases of chronic renal disease, where complications are absent, the treatment consists mainly in the regulation of the diet along the lines indicated above, but not uncommonly, further treatment is required especially directed to the anæmia and cachexia so frequently present. In chronic tubal nephritis and in the contracted white kidney (a form of chronic diffuse nephritis), the anæmia and cachexia often reach a very high degree of development ; whereas, on the other hand, in the true granular kidney the malady may frequently advance greatly without these effects being marked. The anæmia is most commonly marked in chronic tubal nephritis ; it must be treated, not only by the administration of drugs, but also by the regulation of the diet, and it is

precisely such cases that frequently improve by allowing a relaxation of diet and the giving of red meat. They also usually require iron, but there may be some difficulty in the administration of this owing to intolerance, perhaps associated with some gastric and intestinal disturbance. The best results are obtained by the giving of iron in the dry form, in pills or cachets, rather than in mixture. There is little evidence to show that the organic preparations are superior to the ordinary inorganic; still, patients may tolerate the one while they are intolerant of the other. The iron should be administered freely, much as in the treatment of chlorosis, although the improvement cannot be so marked as in the latter disease. The sulphate still remains one of the best forms in which to give it, and it is certainly superior to the more or less corrosive preparations, such as the perchloride and the pernitrate. Carbonate of iron is also of value, although not equal to the sulphate, and the same applies to reduced iron. It may be necessary to order some of the milder preparations, and the tartrate is one of the most useful of these.

The administration of iron, even in large doses, is not always successful in the treatment of the anæmia in Bright's disease, and better results are not infrequently seen to follow the giving of iron in association with arsenic. Arsenic is undoubtedly of value in the treatment of this disease, provided it be given in small doses, and its administration not continued for any great length of time. Arsenic has a very marked action on the blood-forming organs, especially on the marrow of bones, and its combination with iron is often followed by very marked improvement in the anæmia present. The iron and arsenic may be given separately, the one in the form of a mixture and the other as a pill, and this is probably the more suitable method of prescribing these drugs, or a mixture of liquor arsenici hydrochloricus and the perchloride of iron may be ordered. This, however, is somewhat more irritating than Fowler's solution or the arsenate of soda solution. It is better to prescribe arsenic for short periods, such as ten days or a fortnight, with the subsequent intermission of a week, than to order it for continuous periods. *J. Rose Bradford.*

NEPHRITIS, CHRONIC.—The two most important forms of chronic Bright's disease are chronic parenchymatous nephritis, or the later stages of acute nephritis, and granular kidney. Amyloid disease is not a simple kidney disease, but a widespread degenerative affection involving many other organs, and dependent for treatment upon the removal of the causes which have produced it. The gouty kidney is either granular kidney, or a mixed condition of interstitial change and cellular degeneration associated with arterio-sclerotic changes, the result of the repeated irritation of the kidney by the recurrent attacks of gout. What has been called the surgical kidney, again, includes various renal lesions consequent on calculus, stricture, or septic inflammation of the urinary passages.

The term chronic Bright's disease is thus practically restricted to the two forms mentioned, I.—*Chronic Parenchymatous Nephritis*, and II.—*Granular Kidney*. These two affections stand in marked contrast clinically and pathologically with one another, and in respect of treatment must be dealt with separately.

I.—CHRONIC PARENCHYMATOUS NEPHRITIS.

In chronic parenchymatous inflammation we have to do generally, not with a slowly progressing, i.e., still active inflammatory process, but with the results of an inflammation previously acute but not any longer active.

As the two stages pass gradually into one another, and it is impossible to say exactly where the acute stage ends and the chronic begins, so the treatment of

acute nephritis gradually merges in that of chronic, and the question arises, when and in what way the treatment of the acute stage may be modified, its restrictions relaxed, and the treatment of convalescence be commenced.

In acute nephritis the circulation in the kidney is disordered, the cells are disorganized, and the tubules obstructed by disintegrated cells and exudation.

The treatment at this stage is to relieve the kidney of work by modifying the diet. keeping the skin and bowels active, and avoiding all renal irritation.

In the later or so-called chronic or post-nephritic stage, the circulation has more or less recovered itself except for the hyperæmia necessary for active cell-growth. The obstruction to the tubules is relieved, and new cells are actively growing to take the place of those which the inflammation has rendered useless. Thus cell-growth is the chief phenomenon of convalescence. For healthy cell-growth the body must be in a good state of nutrition, and the delicate young cells formed must be nursed and protected until they are seasoned and robust.

The problems, then, of treatment in chronic parenchymatous nephritis are to promote the growth of healthy cells, to avoid fresh irritation, and to relieve the weak and delicate organ.

One of the first signs of improvement is the disappearance of œdema. In the early stages, when the inflammation is active, the œdema is universal, and probably of local origin, but in the later it is often cardiac, i.e., due to weak circulation.

Another sign of improvement is the disappearance of the high tension of the acute stage. The pendulum often swings the other way, and the tension falls much below normal. For this, tonics and stimulants are necessary, and probably the use of such drugs as digitalin, strychnia, and adrenalin.

The more the functions of the kidney are impaired, the more actively must the complementary organs be worked, viz., the skin and bowels. Conversely, as the kidneys regain their functional powers, the less energetic need this complementary treatment be, and thus, active diaphoresis, bathing, and purgation become unnecessary—more than that, these methods are all lowering and depressing, and therefore, when the acute stage is past, they are contra-indicated. All that is necessary is that the skin should be kept gently active, the bowels gently moved, a Turkish bath ordered once or twice a week, or a hot bath on going to bed. The milder purges are sufficient, such as salines or rhubarb and aloes, but mercurials are now best avoided.

In the urine, the most important indications of convalescence are given by the return to the normal of the amount of urine and of its specific gravity. It is well from time to time to make an estimate of the amount of urea and of the total solids passed. An increase in the amount of urine during early convalescence is normal, and need not be controlled. As the specific gravity is usually normal, it probably means that there is an accumulation of effete substances to be gradually worked off.

The amount of urea, i.e., of nitrogen, passed, is the great indicator of the excretory activity of the kidney. The amount of urea depends largely upon the diet, and as this is usually low in nitrogen, the urea percentage is generally small. Such a low percentage of urea is sometimes used as an argument for the use of diuretics; but they are likely to be harmful, for the kidney cells play an active part in elimination, and being still delicate must not be worked too hard. They will work well as soon as they are sound, if not hurried.

The gradual reduction in the amount of albumin in the urine is rightly regarded as the best indication of the progress of the disease towards recovery, and when it is permanently absent, the case may be regarded as cured.

Albuminuria is really *a symptom*, and an indication, but it is often regarded and treated as if a disease in itself.

The mere causing of the albuminuria to disappear, if that could be done successfully, without curing the disease upon which it depends, would be of no use—indeed, it would only mask the disease, and deprive us of one of the most useful indications of the course it is running.

The significance of albumin depends upon its relation to other conditions of the urine, e.g., the quantity, the specific gravity, the amount of urea, etc. If these are normal, the presence of some albuminuria is of little real importance; the filtration of albumin from the vessels into the renal tubules is prevented by the cells. If the tubes contain no cells, or the cells are not normal, albumin will filter through.

In acute nephritis the whole of both organs are affected; and in recovering, the whole of both organs may get well. But recovery may well be partial. Thus, one kidney only may get quite well and the other not, or patches of incomplete resolution may be left in one or both, and from any of these the albumin may come, although the complete examination of the urine shows that the kidneys are on the whole doing their work well.

To treat albuminuria as a disease is a mistake; too much is often made of it, to the detriment of the patient. The actual amount of albumin lost is insignificant. Even 1 per cent in 1500 cc. of urine amounts to less than ½ oz. of albumin in the day, or what could be easily made up by the taking of an extra pint of milk, or the white of two eggs.

Moreover, clinical experience proves that patients after acute nephritis may continue to pass albumin for years even in considerable amount, and yet remain in good health and lead active, strenuous lives.

Recovery from acute nephritis is therefore largely a question of the growth of cells. The old cells have to be removed, and new ones produced. The kidney cells are highly specialized, and therefore are very slowly regenerated. When grown, they still take some time to become seasoned and resistent. Till then the kidney remains delicate, and will not stand over-work or irritation. The problem, then, in convalescence from renal disease, is to get the cells well grown and seasoned.

The first important question in the treatment of chronic parenchymatous nephritis is that of *Diet*. When and in what way may that be improved? Patients are often kept upon a milk diet so long as albumin is present in the urine. Milk is good enough for little children, and in acute disease adults have to be treated like little children. Yet for both alike, in time the diet must be strengthened, for if kept on milk alone, the nutrition suffers, the tissues become flabby and soft, and though life may be maintained for a long time on milk alone, especially if supplemented by starchy foods, still the body is not vigorous and the general tone is poor. Fortunately, adults get so tired of milk alone that they often take the matter into their own hands and modify the diet for themselves. The benefit of change of diet in chronic parenchymatous nephritis is a matter of daily experience. The patient's condition often remains stationary till a more liberal diet is given, and then improvement begins at once. There are certain articles that should be avoided in all cases of kidney disease. These are especially *alcohol* in all forms, and *meat extracts*, whether in the form of soups or broths, or of the much advertised and popular extracts of meat. So also, fruits and vegetables which are rich in irritating salts, e.g., tomatoes, asparagus, gooseberries, etc., and for a similar reason salted and preserved meats.

Why *eggs* are taboo I cannot understand, for they yield a very easily assimilable form of albumin and form an excellent supplement to milk. Nor can I see any reason for the prejudice which exists against *red as distinguished from white meats*, unless it be that some patients may find the one more easy of digestion than the other. Red meats contain no more extractives than white. In both cases, boiled meats are better to begin with than roast, as in boiling some of the extractives are dissolved away. The patients often crave for a little red meat, and I do not know any good reason for refusing their wish.

The order of change of diet might be tabulated somewhat after this fashion:—

1. Milk.
2. Milk, with farinaceous foods.
3. Milk, farinaceous foods, with an egg or two.
4. Ditto, with beans, peas, potatoes, and green vegetables
5. Ditto, with the addition of fish.

6. Boiled meats (white or red), fresh pork, etc.
7. White or red meats, roast or broiled.

The effect of any change of diet may be judged from the urine, but a single examination on the day after the change must not be regarded as conclusive, for any sudden change is associated with a general disturbance of chemical equilibrium, which would betray itself in the urine for a few days, until equilibrium re-establishes itself. Thus, I have seen the addition of a single egg lead to the sudden increase in the urine of the percentage of urea from 1·5 to 3·5, though in three or four days' time the percentage gradually returned to the normal 1·5, in spite of the offending egg being continued all the time. Still less can albumin be taken as the test, for even if the amount should be temporarily increased by the change, the improvement in the patient's condition occurs and is maintained; but, as a matter of fact, the change of diet is often unaccompanied by any alteration whatever in the amount of albumin passed.

The next practical question that arises is, *When may the patient leave bed* and get about? The risk is that of catching cold, and every precaution must be taken to avoid this. The difficulty of doing this with children is often so great that bed is regarded as the safest place. So it might be with a careless adult, but prolonged confinement to bed affects the health injuriously, though children bear it better than adults.

The change from the recumbent to the erect position is very likely to be accompanied at first by an increase in the amount of the albumin, which, however, may slowly decrease again as the body accommodates itself to the altered conditions.

Fresh air is a very important factor in the treatment of the convalescent stage, though in kidney disease it is often not thought of, the patient being confined to one room which is often kept too warm, and not sufficiently ventilated. Even if the patient be in bed, the windows may be opened and as much fresh air given as possible, provided there be no draught. In suitable weather, kidney cases may even be carried in the bed out of doors, and lie all day in the sun. The *open air cure of nephritis* is as important and advantageous as in many other forms of inflammation, provided draught and exposure be avoided.

The *drugs* useful for the later stages of parenchymatous nephritis are chiefly of the nature of tonics. Of these, iron comes first and is the most valuable. The more astringent preparations, such as the perchloride, are the best.

Digitalis may be associated with the iron, and in small doses assists the heart and raises the vascular tension, which, in the convalescent stage, is low.

℞ Tinct. Ferri Perchlor. ℥xv | Sp. Chlorof. ℥x
Glycerin. ʒj | Aq. destill. ad ʒj

Ter die, post cibum. Or with Tinct. Digit. ℥x.

Sulphate of magnesia may be added if the medicine has a constipating effect.

Where the anæmia is that of convalescence, and not of toxic origin, arsenic is to be avoided, as it is an irritant to the kidney.

Diuretics are unnecessary, for the amount of the urine is generally already above normal, and diuretics are for the most part renal irritants. The most useful of these is caffeine, because it is a good cardiac stimulant also.

℞ Caffein. Citr. gr. v | Aq. Chlorof. ad ʒj

Ter die.

Many of the patent and popular remedies, such as diuretin, are only preparations of caffeine or theobromine in different combination.

The administration of drugs with the object of causing the disappearance

of the albumin is based upon an incorrect theory. The nephritis persists, even if the albumin be induced to disappear. Thus tannin and other astringents, fuchsin, and similar preparations, have been tried and found wanting. So, too, no doubt, will calcium and its salts, which have been recently recommended.

The drug treatment, then, of chronic parenchymatous nephritis is that of convalescence from any severe disease, and needs to be modified only as far as the organ which has been attacked, in this case the kidney, requires.

When convalescence is established, the question will arise of going away, or *change of air*. In this country, during summer, the choice is ample. There are many places, inland or on the sea-coast, that are suitable; but in winter the selection is more difficult. The object is to obtain as equable a climate as possible, with the maximum of sunshine, and protection from cold winds. The choice will generally fall upon some sea-side place on the south-west coast. Many of the places in the west where the Gulf stream touches the coast are suitable. Unfortunately, though warm, they are often wet.

Even when convalescence has been complete, great care should be taken during the next cold season which follows. The next winter should be spent, if possible, in a good climate abroad. Madeira, the Canaries, the Azores, are within easy reach of England. Algiers and Egypt have the advantage of a dry climate, but the changes in temperature are considerable. The Riviera is unsuitable, on account of the violent changes of temperature. The West Indies can be greatly recommended, and as to climate seem to leave little to be desired.

The treatment of chronic parenchymatous nephritis has so far been considered on the assumption that the case is progressing towards recovery. When the course is in the downward direction, the treatment must be modified to deal with fresh symptoms as they arisee.

Chief among them is increase in dropsy. It is extraordinary how extremely dropsical a patient may be, and yet recovery take place in time. Ascites must be treated on general principles, and tapped whenever necessary. Any attempt to get rid of it by violent purgatives or diaphoresis will be disastrous. Such methods are ineffectual, and will, besides, produce great depression, the very thing to be avoided.

If the legs become so much swollen that the skin is greatly distended, they may be tapped. Pricks or incisions of the skin are undesirable, for the running from them is difficult to keep under control, and the insertion of fine or capillary tubes are preferable. These are best inserted at the side of the calf. The greatest care must be exercised to avoid septic infection, for once started, an infective inflammation round the puncture may soon reach appalling dimensions. Death even may result, in consequence either of extensive sloughing of the skin, or of a clot forming in a vessel and becoming detached. Still, with care and strict antiseptic precautions, great relief may be given by draining. The legs should, after puncture, be wrapped up in plenty of aseptic cotton-wool, through which the india-rubber tubing may pass to a vessel beneath the bed.

The treatment of acute uræmia will be discussed later. It will be sufficient to say here that the prognosis, though worse than in acute nephritis, is not as bad as in granular kidney. In the last affection it is almost invariably fatal. In acute nephritis many, perhaps half, recover, and in chronic parenchymatous nephritis perhaps 20 per cent, or one out of five.

II.—GRANULAR KIDNEY.

This is a progressive disease, of insidious origin, and of long duration. It is usually not recognized until far advanced, i.e., until pronounced symptoms arise, and then the end is not far off. Yet the origin of the disease dates far back, probably to early adult life, or even to childhood. Some cases of

so-called physiological albuminuria prove to have been granular kidney, and though albuminuria of itself is not a necessarily alarming symptom, yet if it be associated with thickened arteries it should always, even in the young, be regarded with grave suspicion.

Whether the prime cause lie in the vessels or elsewhere, the chief lesion in the kidney is the development of fibrous tissue, which, by its contraction, causes degeneration of the cells, and compression of the tubes. This connective tissue cannot be removed by drugs from the kidney, any more than it can from the liver or skin. Therefore, of cure in the strict sense of the term, there can be no hope. Still, if the disease cannot be cured, the patient can be treated, and many of the symptoms, of which complaint is made, relieved.

It is in the early stage of any disease that treatment is most successful, for then, though the mischief already done cannot be repaired, progress may be delayed, if not arrested. The importance, then, of early diagnosis is evident. The condition can often be easily diagnosed in its early stages, but it is often overlooked because it is not thought of, and not because there are not sufficient signs for diagnosis.

As we do not yet know the primary or exciting causes, prophylaxis, or prevention, is at present beyond our powers. But some of the contributory or aggravating causes are known, and these can be removed or treated. The relation of granular kidney to acute and chronic parenchymatous nephritis need not be discussed. If some few cases of granular kidney can be traced to acute parenchymatous nephritis, clinical evidence conclusively proves that the majority owe their origin to entirely different causes.

Granular kidney is often associated with lead poisoning, chronic alcoholism, gout, syphilis, mental strain, overwork, and worry. Yet it is not so clear that it is actually produced or caused by any of them. For instance, lead, gout, and granular kidney stand in close clinical association with one another, so that lead and gout are often spoken of as if proved causes of granular kidney. Yet the only fact established is their common association. It is equally possible that patients are specially prone to gout or lead poisoning because the kidneys are already granular. So with the other associated conditions. But as they may be, if not exciting, at any rate contributory or aggravating causes, it is clear that they should be treated, and, if possible, removed. Thus all exposure to lead should be avoided, and if necessary, the occupation changed; everything that tends to gout dealt with; syphilis treated; alcoholic habits corrected; and over-work, mental strain, and worry, as far as possible, provided against.

With these general introductory remarks we may now turn to the more special questions of treatment.

The objects to be held in view are:—

1. To relieve the damaged organ in every way possible, and to prevent the disease being aggravated.

2. To guard against the accidents likely to occur. Chief among these are failure of the heart and rupture of vessels.

3. To relieve symptoms as they arise. These symptoms are extremely variable, and the treatment must correspond; but it is often surprising, when the cause upon which these symptoms depend has been recognized,—that is to say, when granular kidney has been correctly diagnosed,—how much may be done to give relief.

The course of the disease may be divided into *three periods*: (1) The Early stage, in which, though the diagnosis is clear, the symptoms are few or none; (2) The Late stage, in which the symptoms are pronounced and may be urgent; (3) The Intermediate or middle stage, in which the symptoms vary in kind and degree.

I.—The Early Stage.

In the Early stage the patient believes himself, and appears, to be in good health, and the disease is revealed by accident—examination for insurance for example, or some other accidental cause which takes the patient to the doctor—albumin is discovered in the urine, and the other signs establish the nature of the case. Then the patient rushes into one of two extremes, either refusing to believe there is anything wrong, and that care is necessary, or is greatly alarmed and becomes a renal hypochondriac. The doctor's difficulty is to steer the patient between these two extremes: to alarm him sufficiently to make him careful, without making him unduly nervous.

Patients often resent being condemned as unsound when they believe themselves to be robust. Yet surely it is to their advantage, if they have a weak organ, to know, so that they may spare it.

Early diagnosis is not difficult, and it is in the early stage that the disease is to be arrested if that be possible, or at any rate retarded, as there is every reason to believe it may be, with care and good management.

Albuminuria is not the disease, but the sign or indication, and it is the difficulty of excluding granular kidney that makes the diagnosis of so-called physiological albuminuria in the young adult so uncertain.

Patients not infrequently come to the physician, who have been thoroughly frightened, and, because of the albuminuria and the diagnosis of chronic kidney disease, have been placed upon an extremely strict regimen and made to live an invalid life, with the only result that their health, which was as they thought good, had become impaired, and their life, previously enjoyable, made a burden. No wonder they think the discovery of albuminuria a misfortune. In the early stage of granular kidney such a strict regimen is unnecessary. The removal of the extreme restrictions is followed by improvement in health, and in renewed enjoyment of life. The treatment of albuminuria as if it were the disease, and as if its disappearance would cure the disease, is not only theoretically unsound but mischievous in practice.

At this stage, the patients must live moderate, careful, and temperate lives, be properly clothed, avoid chills and exposure, keep the skin in good action, and the bowels regular; must avoid alcohol, especially spirits, eschew dissipation of every kind, and live as much as possible in fresh air and sunlight. Even their recreations need not be seriously restricted, provided they are not such as to lead to risky exposure or fatigue. Bathing, of course, in the open must be absolutely forbidden; so also fishing, so far as it involves wading, and shooting, except in fine weather, and hard hunting; but riding, and all forms of gentle exercise, if chill and exposure and over-fatigue are avoided, may be allowed and are beneficial. The early stage spreads itself over many years, and the strain of the disease is usually not felt until the age of forty or fifty. Till then, or till other symptoms develop, with care and good management, life may be active and enjoyable, both in work and play.

During the early stage then, the general health should be maintained in every way by appropriate dieting, by avoiding exposure, over-work, and worry, and by fresh air and regulated exercise. All this is compatible with an ordinary life, and though medical supervision and care are requisite, this need not be in special institutions or particular places.

The first great indication is to relieve the damaged organs in every way possible.

There is a very close physiological relationship between the kidneys, skin, and bowels, and we know that when the elimination by the kidneys is defective, it is naturally supplemented by the skin and bowels. The treatment of the skin and bowels is recognized as the most potent means we possess of relieving the kidneys in attacks of acute nephritis, and it is of course equally important in the treatment of granular kidney. Everything must be avoided which would check the action of the skin, and everything done which would promote it.

Clothing.—The body should be properly clothed. The patient should wear flannel next the skin, winter and summer, day and night; if not flannel and all wool, at any rate merino, or a mixture of wool and cotton, or wool and silk.

The clothing should be varied with the weather, for it is a great mistake to be too warmly clad, on account of the perspiration it causes, and the risk of a chill. A flannel band should be worn round the loins, as is the habit in the tropics; and with women, low evening dresses should be prohibited.

It is most important to keep the feet and legs warm, as well as the body.

This is often neglected, for the body is wrapped up warmly while the feet and legs are kept cold, yet the legs form in bulk nearly half the body, and more chills are caught through exposure of the feet and legs, perhaps, than of the body.

The socks worn, in summer and winter, should be of wool or thick merino ; the boots substantial, and lined with cork or felt socks. Cold or chilled feet especially should be avoided, and above all things, if the feet get damp, the boots or shoes and socks should be at once changed. These may seem trivial details, but they are really of great importance, and it is astonishing how greatly they are neglected.

Avoid Chills.—Everything must be done to avoid chill. Thus, care must be taken not to check the perspiration abruptly when the body has been heated by exercise, or during hot weather ; and great care should be taken of draughts after sitting in warm rooms, especially in the case of women who are lightly clad in evening dress. More chills are acquired, perhaps, in hot weather than in cold, on account of the free action of the skin, and the draughts to which people expose themselves without sufficient protection. Many of these precautions will depend upon the climate or season. Abrupt changes of temperature are especially to be avoided, particularly if the air be damp. It is for this reason, and to search after a more equable and drier climate than we have in this country, that patients with kidney disease are so often advised to spend the winter abroad.

Climate.—The best that could be devised would be the one in which there were fewest changes, whether the air were moist or dry. Madeira, the Azores, and the Canary Islands, have an equable climate, which is warm but is very moist, and often too relaxing, so that patients do not feel well in it. The Riviera, which is a less relaxing climate, is not altogether suitable, on account of the violent changes of temperature between the sun and shade, and between the morning and evening. The mountain resorts of California have been advocated. Perhaps, the dry climate of Egypt and Algiers is the best of all, but even these require care, on account of the difference between the day and night temperatures. In my experience patients who have spent the winter in these last places have benefited most. It must be remembered that, with kidney disease, changes of temperature are felt of which the strong are not sensible, and it is on this account that care is always necessary, and a good climate desirable.

Skin Toilet.—Everything must be done to keep the skin in good condition. For this purpose, baths of every kind are useful, whether hot-water, Turkish, or vapour, provided that no chill be taken after. A hot bath regularly, two or three times every week on going to bed, is advisable. Turkish baths are excellent if not found too lowering, and not taken too frequently.

The permission to take a sponge bath on rising in the morning must depend, to some extent, upon the patient. It is best, as a general rule, not to allow the bath to be taken quite cold, but with sufficient warm water added to take the chill off. A cold bath should be followed by a condition of reaction in which the skin glows, and the whole body feels warm and comfortable, but, if the opposite occur, and the fingers become chill and dead, and need an hour or two to recover, it is evident the bath is unsuitable. Many patients who cannot take a cold bath, find benefit from a hot one ; but, as a rule, if a sponge bath does not suit, it is better to be content with a rapid sponging over with tepid water, followed by a rubbing with a rough towel.

Bathing in the open, or even in swimming baths, is on all accounts to be prohibited. It may produce temporary albuminuria even in those who have nothing the matter with the kidneys, and it is fraught with mischief in every case where the kidneys are not sound.

Muscular Exercise.—There is no better way of promoting healthy action of the skin than by muscular exercise, if this can be borne without fatigue. It should be of such a kind and amount as to produce gentle action of the skin rather than violent perspiration. If there has been much sweating, a warm bath and a good rub down afterwards, is an excellent procedure.

Diet.—The next most important principle of treatment is diet. As it is by the kidneys that the products of nitrogenous waste are chiefly got rid of, and as the amount of nitrogenous substances in the urine depends largely upon food, the amount of nitrogenous food should be limited. In acute nephritis, this indication is met by placing the patient upon a diet which consists chiefly of milk; but this kind of diet—milk and farinaceous food—should not be too long continued, even in acute nephritis, and in the later stages, where that disease tends to become chronic, or where convalescence is delayed, a change to a more liberal regimen is often attended with very remarkable improvement.

In a protracted disease such as granular kidney, too strict a diet cannot be insisted on, and it must be, in order to maintain the patient in good health, a properly mixed one. Milk, though a very useful diet for children and for adults when ill, is not a good food for adults for any length of time.

Although it is highly desirable that the amount of nitrogenous food should not be too great, it is possible to err on the other side, and make it too small. It is impossible, also, to prescribe one dietary which will suit everyone; idiosyncrasy must be considered in every case. The forms of albuminous food most especially to be avoided, are the various meat extracts which are so popular. These contain a large amount of extractive substances, which are of little use as food, and have necessarily to be excreted largely by the kidney; the administration, therefore, of such things gives the kidney more work to do. The albumin is far best supplied in the ordinary form of well-cooked meat, fowl, and fish, but it should be in moderate amount. Meat once a day is sufficient; of the three ordinary meals—one should be fish, one farinaceous, and the other only meat.

There is no reason why red meat should be forbidden. If digested well, it produces no more irritation to the kidneys than white meat, and does not contain any more extractives.

Fruit, vegetables, and salads, are all good, provided they do not contain too much acid. On this account, tomatoes, gooseberries, and such-like, should be avoided. Nor is there any reason why an egg or two should not be taken, either raw or lightly boiled.

Even a strictly vegetarian diet has been advocated, but few patients can stand it. Farinaceous foods of every kind are clearly indicated, and milk and cream can be taken in quantities; for such fattening things tend to counteract the loss of flesh, which is one of the tendencies of the disease as it progresses.

As the patients pass an excessive quantity of urine, they are often more or less thirsty, and may be allowed to drink pretty freely of water; but as a rule excess of fluid is to be avoided. Three pints in the day is ample. A good and popular remedy is a glass of hot water from time to time during the day, to which water may be added a little lemon juice, citric, or tartaric acid. Stimulants, as far as possible, should be avoided, and above all, the rich and sweet wines of every kind. Dry sherry, Marsala, or light and sound claret are all admissible, but port, champagne, and the heavier Burgundies should be avoided. On the whole, perhaps, a little well diluted whisky, taken with the meals, is the most suitable beverage, but if the patient can do entirely without stimulants it is best of all.

The Digestive System.—The digestion should be carefully watched, especially

if the patients are on a modified diet. The digestion, stomach and intestinal, is easily disturbed, and when imperfect, leads to the production of substances, many of which are toxic and very irritating to the kidneys. It is important that the bowels should be kept in regular action every day, and perhaps have a tendency to be somewhat loose. This is best provided for, if necessary, by the use of one of the aperient waters, or of Epsom or Carlsbad salts, taken in the early morning. If stronger aperients are required, the favourite remedies are the compound jalap powder, 20 or 30 gr. in cachets or confection, or pills containing jalap, or a little elaterium.

Or,

℞	Pulv. Jalap. Co.	gr. xv	Potass. Tart. Acid	gr. xxv
℞	Pulv. Elaterini Co.	gr. j–iv.		
℞	Pulv. Jalap. Co. Tinct. Sennæ Potass. Tart. Acid	gr. xx	Syr. Zingib. Aq. Menth. Pip.	āā ℥j ad ℥jss

Every morning or every other morning

A course of purgatives or purgative waters is distinctly to be avoided, for it lowers the tone and reduces the general health too much.

To sum up : The general health should be maintained in every possible way by appropriate dieting, by avoiding exposure, over-work, or worry, by fresh air and exercise. All this requires medical supervision and care, but not necessarily in special institutions or places ; for if patients would only carry out the instructions given, they could often derive as much benefit by treatment at home as at the fashionable baths of this country or abroad, except, of course, so far as climate is concerned. It is because they submit to rules abroad which they will not listen to at home, that it is so desirable, in many cases, to send these patients now and then to foreign places for a course of treatment.

2.—The Middle Stage.

At this period, when the heart is markedly hypertrophied and the arteries much thickened, the treatment has to be directed, in addition, to guarding against the accidents that are now especially liable to occur. These are chiefly failure of the heart, rupture of vessels, and inflammatory affections of the kidney itself.

A hypertrophied heart has diminished reserves, and therefore is rightly regarded as a pathological condition. It lacks the margin of power which the healthy heart possesses. Its reserves have been swallowed up in growth, and thus a hypertrophied heart will give way under a strain that would not affect a healthy heart at all. It is therefore especially necessary in this stage to avoid physical or mental strain and fatigue, to watch the heart very carefully during any intercurrent illness, and especially during convalescence from it.

The *cardiac treatment* is of the usual kind, but it is necessary to be careful with digitalis, because of its effect upon vascular tension ; for if the tension be already high, digitalis will increase it further and throw extra work upon the heart. Even if the tension be low, it will raise it, and in this way assist the circulation. It may therefore do harm as well as good. Citrate of caffeine is a better drug ; it is a mild diuretic as well as a cardiac stimulant. When the heart once becomes weak, failure is often very rapid, and if the heart be much hypertrophied, how much margin of reserve is left cannot be easily estimated.

The changes in the vessels are degenerative in type ; the walls become brittle, and are likely to rupture. A man is often said to be as old as his vessels. Certainly the amount of arterial thickening is a good guide to the prospect of life.

Many cases of granular kidney at the age of forty have arteries as thick as those usual at the age of seventy. Consequently, the risk of hæmorrhage is as great as at the latter age, and the same precautions must be adopted in each

case. All physical straining, as well as mental fatigue and excitement, must be avoided; but with care and common-sense, hæmorrhage may be staved off for a long time.

Hæmorrhage into the brain is dangerous, because of its seat rather than of its amount; but hæmorrhage from a surface is risky, because of the loss of blood and of the exhaustion that will follow. Thus, copious epistaxis may be the beginning of the end, and the patient never recover from its effects, but die soon after of cardiac or general failure.

The ease with which the vessels may give way is often seen in the conjunctivæ, where chemosis may occur spontaneously, or from simple straining, as in coughing or defecation, or again in the retina, where the hæmorrhages may be numerous, and sometimes of considerable size, though they may produce little or no defect of vision. Hæmaturia is not uncommon, and is often misinterpreted. Many cases of granular kidney have been operated on in the belief that there was a calculus or growth in the bladder, yet the only lesion found post mortem was granular kidney, for most of these cases die if operated on.

All these complications must be treated on general lines, and little can be done in the way of precaution against them, except by guarding against worry and mental excitement, violent physical effort and straining, so far as possible. In the hæmophilic condition which develops in the latest stages, the hæmorrhage, which is rather a general oozing from the mucous spaces than free bleeding, often yields to opium and digitalis, and especially to ergot and adrenalin.

The Vascular Tension may supply indications for treatment. The tension is normally raised in a granular kidney. It is best that a patient should not have granular kidney; but, having granular kidney, it is better that the tension should be somewhat raised. It is a mistake to attempt to reduce it if only moderate, for granular-kidney patients are not so well when the tension is low. Yet the vascular tension may be too high as well as too low, and should then be treated.

The tension can be easily raised by a richer and more stimulating diet, by stimulants, and by drugs, especially by digitalis and adrenalin. Where the heart is feeble and the tension low too, the following combination is useful :—

℞	Tinct. Digit.		Sp. Armoraciæ Co.	℥j
	Tinct. Strophanth.	ää ♏v	Aq. destill.	ad ℥j
	Caffeine Hydrobrom.	gr. ij		

Three times a day.

Adrenalin may safely be given in much larger doses than are usually prescribed, up to 1 or 2 dr.

It is not so easy to reduce a high tension without affecting the general health as well. Nitroglycerin may be given regularly, and in full doses; nitrite of amyl is useful for an emergency, but its action is evanescent. Nitrite of soda, or a mixture of nitrate and nitrite, has more prolonged action.

℞	Sod. Nitritis	gr. ij	Aq. destill.	ad ℥ss
	Sod. Nitratis	gr. x		

Three times a day.

Iodide of potassium is more suitable for prolonged administration, and may be given in full doses, from 10 to even 20 gr. three times a day; but this is often attended with much depression. Veratrum viride has also been employed in doses of 10–15 min. three or four times a day. It powerfully affects the tension, but at the same time acts as a cardiac depressant. It requires watching and care.

The reduction of tension is most simply attained by diminishing the amount of stimulants, placing the patient upon a bland or somewhat reduced diet

regulating the bowels, and keeping up the action of the skin. For a case of this kind a course of baths and laxative waters, under proper supervision, is frequently very beneficial.

In intercurrent diseases, especially if acute, it is most important to watch the weak spots, especially the heart and the vascular tension. Thus, should a patient with granular kidney be attacked with pneumonia, it would be necessary from the beginning to use stimulants freely, such as alcohol and strychnia, as well as stimulating cardiac drugs like digitalis and, especially, caffeine. The association of granular kidney with pneumonia is a very serious matter, but if the treatment be directed to the weak spots it is often successful.

Surgical Operations.—In cases where surgical operations have to be performed upon patients with granular kidney, a good deal of care is necessary. The patients require to be carefully prepared, and got into as good a condition of health as possible before operation; but if this be done, an anæsthetic may be safely given, and the operation satisfactorily performed. A great deal depends in these cases upon choosing the proper time, but now that operations are attended with so much less risk than formerly, the importance of properly preparing the patient is often forgotten, and thus risks are incurred which might be avoided. On the other hand, with proper care and preparation, operations may now be safely performed in chronic renal cases to which, not long ago, the renal disease would have been considered a fatal objection.

The operation of decapsulation, or splitting the capsule of the kidney, is quite out of place in granular kidney, whatever may be said in its favour in acute nephritis.

That granular kidney is a predisposing cause of acute nephritis in the adult is not generally recognized. Yet there can be no doubt of the fact. It is not at all uncommon to find acute nephritis in the adult associated with such an amount of thickening and degeneration of the arteries and of hypertrophy of the heart, as could not have been produced by an acute nephritis of short duration. Even the degenerative changes in the retina may be present, which are conclusive proof of the pre-existence of granular kidney for a long time. This relation between granular kidney and acute nephritis has important clinical bearings. It affects the prognosis, for though the acute inflammation may subside, the patient cannot lose the pre-existent renal disease, and complete recovery is impossible. This no doubt partly explains why, speaking generally, acute nephritis in the adult is of less favourable prognosis as regards cure than in the child. Indeed, while acute nephritis in the child suggests enquiry as to some recent specific fever, such as scarlet fever or diphtheria, in the adult it suggests the previous existence of granular kidney. This association has also a theoretical importance, for if an adult after an attack of acute nephritis is found some time later to have granular kidney, it does not follow that the last was consequent on the first: it may be, on the contrary, that the granular kidney was the antecedent disease, and itself the cause of the acute attack.

We know that it is only in a very small percentage of cases of granular kidney that clinical evidence of antecedent acute nephritis is obtained, and the value even of this is to be discounted if it be true that acute nephritis not infrequently occurs as an intercurrent affection in the course of granular kidney.

3.—The Late Stage—Chronic Uræmia.

In the third or latest stage, the symptoms are pronounced, and are often described as chronic uræmia, or chronic renal toxæmia. They are very variable, and may point to almost any part of the body except the kidney as the primary seat of mischief. Yet symptomatic treatment is often unsatisfactory and unsuccessful, until the cause, i.e., the renal condition, is recognized and treated.

In this respect treatment rests, as it always should, upon accurate diagnosis.

Gastro-Intestinal Symptoms.—The gastro-intestinal symptoms are often pronounced, and may be very misleading.

Dyspepsia.—Obstinate dyspepsia, especially if associated with pain, might suggest ulcer of the stomach, and this might be attributed, if there were much

cachexia, to malignant disease, a suspicion which would be strengthened if hæmatemesis also occurred. As a matter of fact, hæmatemesis is rare, for the hæmorrhage is not likely to be profuse, and unless it were profuse the blood would not be vomited.

Vomiting.—Vomiting is often a source of difficulty, for it is very obstinate, and does not stand in relation to the taking of food. If the vomiting is associated with profound asthenia and deepening of the tint of the skin, it may suggest Addison's disease. When to the vomiting, optic neuritis is added, confusion with intracranial disease, such as cerebral tumour, abscess, or meningitis, is only to be expected. The vomiting may occur only, or chiefly, in the morning, and might then suggest pregnancy, or potus. Cases of granular kidney have been confused with all these conditions.

Diarrhœa.—The symptoms in connection with the bowels are not, as a rule, so puzzling. Diarrhœa is common with any form of kidney disease, but there are cases in which diarrhœa, extremely obstinate, or almost uncontrollable, is practically the only symptom.

Cachexia.—Patients with granular kidney may for a long time preserve their normal appearance of health, and that even when the signs of granular kidney are well marked; but more commonly as the kidney disease advances the nutrition suffers greatly. The complexion loses the transparency of health, and becomes thick, muddy, earthy. The patients become feeble and anæmic, lose health and strength, and often flesh.

Failure of health and strength in persons of middle life, without any evidence of malignant disease, should always excite the suspicion of granular kidney.

The cachexia stands in direct relation to the kidney wasting, and, when it is extreme, is an indication that the destruction of the kidney substance has approached dangerously near to the limits compatible with life.

The cachexia of granular kidney is characterized by anæmia and asthenia, and to some extent by loss of flesh, but emaciation is rarely carried to that degree which is met with in malignant disease.

It is often out of all proportion to the other symptoms, or may even exist alone. In some cases the anæmia predominates, and in others the asthenia.

Affections of the Skin in Renal Disease.—These fall into two groups, according as there is general œdema or not.

Rashes associated with Œdema are for the most part erythematous in nature, transitory in duration, produce but few symptoms, and when localized have but little clinical importance. If widespread, the prognosis is graver, and becomes the more unfavourable the more general the eruption is.

Rashes without Œdema occur almost exclusively in granular kidney. Generally widespread, or even universal, they are of great obstinacy and of grave significance. Localized eruptions similar to those already described occur also in granular kidney, but these are not of much importance, except so far as they may be the commencement of the general eruption.

The general rashes vary in character. They may be described as :—

1. Erythema multiforme.
2. Pityriasis.
3. Dermatitis exfoliativa.
4. General eczema.
5. A discrete, papular eruption, sometimes lichenous, sometimes resembling chronic urticaria.

Hæmorrhagic Eruptions.—It is strange, considering the frequency with which hæmorrhage occurs in connection with granular kidney, that hæmorrhagic skin-eruptions are so rare.

Prognostic Value of Skin Affections.—Rashes of these kinds in granular kidney

seem almost invariably to end fatally. They occur only late in the disease and when the symptoms are well marked, so that the diagnosis of granular kidney is usually obvious, if thought of. In some cases, where the diagnosis is not so obvious, the patients come under treatment for the skin affection, and the essential disease is frequently overlooked; or if albuminuria is discovered, it is regarded as the consequence of the affection of the skin, and its significance missed.

The association of a generalized skin eruption with albuminuria is of great importance, and justifies a much more cautious prognosis than might otherwise be given. Evidence of granular kidney is often found if it is looked for, and then, I believe, a very grave prognosis is justified, for the patients die, either shortly with the rash still out, or if the rash disappears, of other symptoms connected with the disease.

Affections of the Nervous System.—*Headache, Giddiness, and Vomiting.*—These symptoms are sometimes the first to cause the patient to seek advice, and when they are associated with optic neuritis, the resemblance to cerebral tumour becomes very close. Headache is a very common and prominent early symptom; it is often of a neuralgic character, occurring in the most intense paroxysms, and is occasionally diagnosed as hemicrania—that is to say, its association with granular kidney is overlooked.

The vomiting is often of cerebral or nervous origin, for it stands in no relation to food, and is often periodic.

Respiratory Disturbances.—The respirations in uræmic states vary much. Thus they may be very slow, or they may be rapid, noisy, and panting, not unlike what is sometimes seen in diabetes; in this form, again, there is no true dyspnœa. Cheyne-Stokes breathing is usually of cardiac origin. Dyspnœa, even if paroxysmal, is often cardiac; and if not, is frequently due to emphysema and its attendant bronchitis, but the bronchitis itself may be of toxic origin. Any attack of the nature of true spasmodic asthma is very rare.

Peripheral Neuritis is a rare condition in granular kidney.

Fits (Epileptiform Convulsions).—Fits are, of course, the common form in which acute uræmia manifests itself; but epileptiform convulsions are not rare as one of the early symptoms of the late stage, independent of what is commonly understood by uræmic fits. This is an important point, for it is not generally recognized.

Cerebral Irritation.—In connection with fits may be placed the curious attacks of cerebral irritation, which are not at all uncommon. They may take the form of outbursts of general nervous irritability, of emotional excitement, or of almost maniacal delirium. They may last a few days only, or be prolonged for some weeks, and in this condition patients have been certified as lunatics. These attacks, like the fits, are at first separated by long intervals; but gradually they become more and more frequent, and finally end in a condition of chronic mental perturbation of either the excited or melancholic type.

In this connection it is interesting to recall the great frequency with which granular kidney is found in patients who die in lunatic asylums.

In all these cases, when the correct diagnosis is made, and the relation of the symptoms to granular kidney recognized, the adoption of appropriate renal treatment in addition to the general measures indicated, is likely to be, and as a matter of fact is, in many cases, followed by very beneficial results.

In the later stages of granular kidney the arterial tension gives many useful indications for treatment. A patient with granular kidney ought to have an arterial lesion which is above normal. From this pathological normal the tension may vary by way of excess or deficit. If too low it must be raised, and here is the value of digitalis, which, besides raising the tension, stimulates the

heart and improves the circulation ; but if the tension be not low, still more if it be really excessive, digitalis can do nothing but harm. Other drugs which may be used to raise the tension are adrenalin and ergot, supplemented by more liberal diet and some stimulant. If the tension be excessive, it must be lowered : with this object the diet may be reduced, all stimulants cut off, a purge given, and the skin made to act freely by baths and diaphoretics. Of drugs, nitroglycerin is useful, and may be given regularly in doses of 2 to 3 min. two or three times daily, supplemented, it may be, with full doses of iodide of potassium.

If it is desirable to increase the quantity of urine, caffeine, or theobromine and its combinations, such as diuretin, are useful, as having a stimulating effect upon the heart as well as on the kidneys.

℞	Caffeinæ Citrat.	gr. v	Tinct. Cimicifugæ		℥ xx
	Tinct. Cacti Grandiflor.	℥ v	Aq. Chlorof.		ad ℥ss

Three times a day.

Of all drugs for chronic renal disease, I think pilocarpin the most useful. I cannot understand the prejudice that seems to exist against it in some quarters. I have used it very largely, and have never seen any disadvantage follow its administration ; on the contrary, nothing but good. Apart from its general action, many of the symptoms are distinctly controlled by it. Thus headache, and the exhausting restlessness so common in the later stages of the disease, may be relieved by pilocarpin more immediately and persistently than by any other means, and even threatened uræmia staved off. I consider it the most useful renal remedy of all. I generally give it by the mouth two or three times a day in a dose of $\frac{1}{6}$ gr. of the nitrate ; sub cutem $\frac{1}{12}$ gr. is enough to begin with. This produces nothing more than a gentle action of the skin. The profuse sweating or discharges from other parts of the body, often described, is not produced by such doses, even when repeated two or three times a day. Nor have I seen anything like collapse or fainting follow them.

Restlessness, sleeplessness, or even delirium, often call for treatment in the later stage of the disease. Chloral and bromide of potassium are advocated by many writers, but I am not very fond of these remedies, because of their depressing after-effects if persisted with. Chloral, in these cases again, often produces rashes, which however are of no special import.

All hypnotics which are but slowly eliminated, such as sulphonal, trional, and veronal, are best avoided.

Opium and its preparations may be employed without the risks formerly supposed to attend their use. Indeed, if this drug seems indicated, morphia by the mouth, or sub cutem, may be given without fear, and often with striking benefit, especially at night-time. It is probably safer in granular kidney than in acute nephritis, but it can be given without much risk even in the latter.

As a hypnotic and general sedative in granular kidney, I attach the highest value to cannabis indica. This is best given in the form of the tincture, in doses of 30 min. or more at the time of sleep.

℞	Tinct. Cannab. Ind.	℥ xx–xxx	Aq. Pimentæ		ad ℥j
	Sp. Chlorof.	℥ x			

At bedtime.

The asthenia, anæmia, and general failure of nutrition, as well as the many other symptoms described above which develop in the later stages, are often referred to chronic toxæmia, i.e., to a condition due to the toxic effects of some substance of which the kidneys ought to get rid but cannot. But they bear so close a clinical resemblance to the conditions which arise from the failure of some internal secretion as to suggest that the kidney has also an internal secretion. Moreover, these symptoms stand in direct relation with the amount of destruction in the kidney. They do not develop until the degeneration of the kidney is far advanced, and they bear a resemblance to the condition which has been produced experimentally by the gradual removal of portions of the kidney in animals.

So far, we have no actual proof that the kidney has an internal secretion, however much inclined we may be by other considerations to believe that such is the case. But the connection between the thyroid and myxœdema was not conclusively established until it was shown that the administration of the gland substance cured the disease. The relation between disease of the suprarenal gland and Addison's disease is clinically established, but so far, the administration of the gland or its derivative adrenalin has not cured the condition. There is the same sort of relation established clinically between the symptoms of granular kidney and wasted kidney.

The administration of *renal substance or extracts* is in the experimental stage: *à priori* that treatment deserves serious trial. The results are so far inconclusive. For this there may be several reasons:—many of the patients come too late for treatment of any kind whatever to do much good: the suitable cases would be those in the earlier stages. Then again, stable renal extracts cannot as yet be prepared, and the extracts must be made fresh as required: many have been made from the kidneys of sheep, which are vegetable feeders. It may be that the kidneys of omnivorous animals like the pig would be more efficacious. As it is, using such preparations as I could make or get made, I think I have had results sufficiently encouraging to justify further experiment.

Samuel West.

NERVES, PERIPHERAL, SURGICAL DISEASES AND INJURIES OF.

Introductory.

Peripheral nerves may be injured in penetrating wounds, or subcutaneously by stretching, contusion, or compression. The injury may produce anatomical solution of continuity, complete or incomplete, or may lead to interruption of conduction, the naked eye continuity of the nerve being intact—physiological division. This may be complete, when the injury is of sufficient severity to lead to degeneration in the portion of nerve below the lesion; or incomplete, if the interruption of conduction be temporary or the symptoms obviously due to partial interference with the functions of the nerve.

The symptoms produced by interruption of continuity from any of these causes are identical; that is, it is impossible to say from the symptoms whether the division, be it partial or complete, is anatomical or physiological.

The following is therefore the most satisfactory classification:—

Complete division { *Anatomical* / *Physiological*

Incomplete division { *Anatomical* / *Physiological*

Symptoms of Complete Division.—When a mixed nerve is divided, a change takes place in the sensibility of the parts supplied by it, and the muscles it innervates are paralyzed. But difficulties arise in the interpretation of these results, and a clear understanding is necessary of the nature of this sensory change and of the supplementary movements which may conceal the paralysis of individual muscles.

After section of a mixed nerve, such as the median, at the wrist, if no tendons have been divided at the same time, the patient may be able to appreciate those stimuli commonly used as tests for tactile sensibility. A touch with a pencil, a piece of paper, or the finger if applied with sufficient pressure to deform the skin, are not only well appreciated, but are usually localized with astonishing accuracy. These stimuli are appreciated through the nerves subserving deep sensibility.

When lightly touched with cotton wool, it is found that the patient is insensitive to this stimulus within an area which is readily marked out by testing in all directions toward the sound portion of the limb. Within this anæsthetic area the patient can distinguish ice from water at 45° C., but can detect no difference between water at 22° C. and at 38° C. (intermediate degrees of temperature). He is also unable to recognize as two the points of a pair of compasses when separated to many times the distance necessary over the corresponding part of the sound limb (compass test). (Loss of epicritic sensibility.)

The patient fails to appreciate all degrees of temperature and to recognize the sharpness of a prick within an area smaller than that insensitive to light touch. (Loss of protopathic sensibility.) If deep touch be present, the patient appreciates the prick as a touch; this may lead to confusion and errors in diagnosis unless remembered.

The area of loss of sensibility to light touch is well defined and varies little, that of the loss of sensibility to prick has usually ill-defined boundaries, and varies from patient to patient.

Deep touch may be present over the whole affected portion of the limb; that is, the fibres subserving this form of sensibility have widespread anastomoses.

After division of certain nerve branches, e.g., the musculospiral below the point at which its external cutaneous branches are given off, the radial, and some cervical anterior primary divisions, no sensory change can be detected; this will be referred to under the heading of the appropriate nerves.

It is evident then that the examination must be so conducted as to ascertain the presence or absence of three forms of sensibility: (1) *Deep sensibility;* (2) *Sensibility to light touch;* (3) *Sensibility to prick.*

The muscles supplied by the divided nerve are paralyzed, but the movements with which their contraction is usually associated may be performed by other muscles (supplementary motility). The action of the individual muscles must therefore be ascertained, not the ability of the patient to perform movements believed by the observer to be carried out by the muscles to which the affected nerve gives motor fibres.

The electrical reactions of the muscles undergo a change; the paralyzed muscles cease to respond to stimulation with the interrupted current in from four to seven days. On about the tenth day a change has occurred in the response given by the muscles to a constant current; the stimulus necessary to promote a contraction is greater than in health, and the contraction so produced is sluggish. It can be seen to spread in a wavelike manner from the point stimulated, and is more easily produced by the anode than the cathode (polar reversal). These changes are spoken of as the reaction of degeneration.

If the nutrition of the part is not kept up by systematic massage, the skin becomes thin, red, and often shiny; the fingers become tapering. Ulcers may make their appearance if the part is ill cared for, or may originate spontaneously, as I shall mention more fully later. Unless precautions are taken, contractures ensue in the opposing muscles, and the ligaments of the joints maintained in an abnormal position become shortened.

Symptoms of Incomplete Division.—It has long been the recognized teaching that "contusions" of mixed nerves affect the motor more than the sensory fibres. I have shown in my Erasmus Wilson Lectures that this teaching is erroneous, and applies only to subcutaneous injuries of those nerves the division of which produce little demonstrable effect on sensibility. Elsewhere the lesion affects motion and sensation to a corresponding extent; indeed the sensory affection is often more marked and more enduring.

Many cases of subcutaneous injury do not come under the care of the surgeon at the time of the accident. If seen at once it may be impossible to diagnose between complete and incomplete division; conduction through the whole nerve may be abolished, and the loss of sensibility and motion as widespread and marked in degree as after section of the nerve. Time alone enables us to complete the diagnosis.

Contrary to the usual teaching, I believe it is possible to diagnose the fact of incomplete division from the electrical reactions. After complete division, whether anatomical or physiological, the reaction of degeneration develops in about ten or twelve days. If conduction through the nerve be interrupted or abolished without leading to degeneration of the peripheral segment of the nerve (incomplete division), these changes do not ensue. The muscles, though paralyzed, may retain their irritability to the interrupted current, but as a rule the lesion is more severe. As the case usually presents itself to the surgeon, the muscles do not react to the interrupted current, but react to the constant current, in a manner which I consider typical. The muscles respond to a smaller current than those on the sound side (reactions should always be compared with those given by the muscles of the unaffected limb), the contraction given, while not the short, sharp twitch seen in healthy muscles, is far from being the sluggish response noticed when the reaction of degeneration is present, and polar reversal is usually absent.

It must not be forgotten, that in certain situations the injury may completely divide the fibres passing to one branch of the nerve, and thus incomplete division of the nerve trunk causes the symptoms of complete division of a branch. (See also below, under Brachial Plexus.)

Recovery after Complete Division.—Restoration of sensation and motion follows the same lines after both primary and secondary suture. After complete division of a nerve, no change in sensibility ensues except that due to regeneration; the opinion held that restoration of sensibility takes place by encroachment on the affected area by the surrounding nerves is erroneous. No change in sensibility is to be expected before five or six weeks have elapsed. Primary union, that is, restoration of function without preceding degeneration in the peripheral end, has been proved clinically and experimentally to be impossible.

Complete recovery of function is often observed after primary suture, and the part may be restored to a condition indistinguishable from the normal. It is rare to find this after secondary suture.

The time necessary for the commencement of recovery of sensibility varies little, no matter at what level the nerve is divided, but the complete restoration of sensibility and the restoration of voluntary power occupies longer, the further the point of section from the periphery.

Sensory recovery follows three stages :—(1) At a period varying from four to twelve weeks, usually about seven, the area insensitive to prick begins to diminish in extent, and may become everywhere sensitive to this stimulus in four to twelve months after suture. This is the first stage of recovery. During the whole of this stage the area insensitive to light touch remains as extensive and well-defined as immediately after the injury. (2) Gradually, at a time varying with the distance from the periphery, the area anæsthetic to light touch diminishes in extent, and about twelve months after primary suture of one of the nerves at the wrist, is everywhere sensitive to stimulation with cotton wool. This constitutes the second stage of recovery. (3) But the part, although sensitive to all the tests usually employed, is still deficient in accurate localization, and the patient is unable to use the hand for fine work. This power of localization is tested by means of the compass test employed in the manner described by Dr. Head and myself. Restoration of this is the third stage of recovery, and the time necessary for its restoration varies enormously, the condition of the wound, the variety of suture, and the age of the patient being factors of importance. Perfect restoration of sensibility is unusual after secondary suture.

The muscles regain voluntary power and electrical excitability at a time which varies with the distance from the periphery at which the nerve is divided ; those nearest to the point of suture first regain their voluntary power. After division of a nerve at the wrist, the muscles may be expected to contract voluntarily in about twelve months, irritability to the interrupted current being restored at about the same time. Thus, a year after suture of one of the nerves at the wrist, if uncomplicated by sepsis, the patient may be able to appreciate all ordinary stimuli and have regained voluntary power, but a considerably longer time is necessary before recovery is complete.

Recovery after Incomplete Division.—After incomplete division both forms of sensibility (protopathic and epicritic) return together ; as sensibility to prick begins to be restored, so sensibility to light touch improves, and shortly even the compass test is perfect.

Restoration of voluntary power to the affected muscles follows the same march as after complete division, those muscles nearest the seat of the lesion first regaining their voluntary power. After *complete* division, irritability to the interrupted current and voluntary power usually reappear on the same date ; after *incomplete*, voluntary power usually returns some time, often many weeks, before contraction to the interrupted current is restored.

GENERAL TREATMENT OF NERVE INJURIES.

The treatment of a case of nerve injury consists in keeping up the nutrition of the parts supplied by that nerve and in the prevention of contractures in the opposing muscles until the conductivity of the nerve is restored, by nature alone or aided by the surgeon.

Treatment of Nerve Injuries in Wounds.—Primary suture should be carried out whenever possible. Careful examination is essential, especially in wounds in the neighbourhood of the wrist, for here the fact of nerve injury is often overlooked. Exploration of the wound should never be relied on to reveal a nerve injury ; this should be established by examination before operation.

Rigid asepsis is necessary for complete recovery ; in no branch of surgery does suppuration, even in a slight degree, so militate against success. The full recovery of the nerve is hindered, but not necessarily abolished, by suppuration ; it is delayed and incomplete.

After free exposure of the damaged structures, the nerve is identified, the original incision being enlarged, if necessary. If the nerve be found completely divided no preliminary treatment of the ends is necessary unless they are lacerated. If this be the case they must be trimmed *with a sharp scalpel* ; scissors should never be used for the purpose. The suture should be passed with a round needle through the substance of the nerve, and tied with sufficient tightness to bring the ends in apposition without causing strangulation of the tissue. One suture is, as a rule, sufficient. If it is found that the nerve has been incompletely divided—and it is usually impossible to ascertain this immediately

after the accident, apart from exploration—the gap should be carefully trimmed, if necessary, and closed by a suture inserted with a curved needle. Catgut should be used as suture material in all nerve cases ; in primary suture without tension there is no necessity to use *prepared* catgut, but if any strain is likely to be thrown on the stitch, catgut hardened so as to resist absorption is advisable.

It occasionally happens that the nerve is divided at two or more levels, a portion of it being loose ; this should be sutured in ; at other times it is found that a portion of the nerve is destroyed, so that a gap is left that cannot be bridged over ; for the treatment of this complication the reader is referred to the section below on secondary suture.

In all accidentally inflicted wounds of this nature it is advisable to insert a drainage tube ; this can usually be removed in twenty-four hours. The limb, with the joint or joints over which the nerve passes, must be put up in such a position as will avoid tension on the suture ; this position, which is usually flexion, should be maintained by a splint until the wound has soundly healed.

Secondary Suture.—This procedure should become more and more rare. It may be unavoidable in cases of subcutaneous injuries, but where a nerve has been divided in an open wound, treatment should be adopted at the time.

It is necessary first to consider how long after the division of a nerve secondary suture can be carried out with any hope of success. Up to three years from the time of injury the interval which has elapsed is of no moment. Cases of suture at more remote periods have been recorded, but in no case are the reports satisfactory. This applies especially to the motor side, for it is uncommon to find a patient seeking operation for sensory recovery only. But it may occasionally happen, for example after division of the sciatic, that the patient develops perforating ulcers : it is then worth operating on the nerve in order to prevent their further formation, even although no muscular recovery is expected. Dr. Head and I have shown that the return of protopathic sensibility prevents the formation of these ulcers, and also that this form of sensibility is restored under conditions which prevent the restoration of other forms of sensibility.

Before operation, careful examination should be made to ascertain the electrical excitability of the affected muscles ; the prognosis will to a certain extent depend on the result of this. The condition of the opponent muscles and of the ligaments of the joints of the affected part must be ascertained. To take a common example : after division of the ulnar nerve, if the fingers are in the ulnar position, with contraction of the flexor and extensor muscles and palmar ligaments, it is extremely unlikely that the hand will ever regain its normal condition, although the function of the affected muscles may be restored. I have pointed out that the prognosis depends to a great extent upon the manner in which the original wound healed. Suppuration in the wound makes the chance of recovery doubtful. A complete examination is therefore necessary before expressing any opinion as to what can be expected from the operation.

The operation may be divided into stages : first, identification of the ends of the nerve ; second, freeing them ; and finally, uniting them. The incision should be made over the line of the nerve, and must be of sufficient length. The nerve should be found above and below the seat of injury, and traced into the mass of fibrous tissue with which the ends are usually incorporated. After freeing, the greater part of the bulb on the central end should be removed, in order to obtain normally coursing nerve fibres. From the distal end only the fibrous upper extremity need be removed ; the whole of the lower end of the nerve will be found in the same condition, so that it is useless cutting section after section in the hope of reaching a portion which looks less like fibrous tissue and more like nerve.

The ends of the nerve should never be trimmed with scissors, always with

a sharp knife. Catgut should be used if possible for suture material; if there is any tension, catgut which has been treated to resist absorption. If it has been necessary to free the nerve from surrounding fibrous tissue, care must be taken that it does not again become adherent; for this purpose chromicized Cargile membrane is excellent; it should be wrapped around the point of suture and as much of the nerve above and below as has been freed. After closure of the wound, the limb must be put up as after primary suture. This position must be released gradually after the wound has healed.

It is often the case that the ends do not come so readily into apposition as after primary suture. Preliminary stretching will gain an inch in the arm or leg quite readily; this, combined with relaxation of the joint or joints over which the nerve passes, will rarely fail to enable the ends to come into apposition.

If the ends of the nerve do not come into apposition, we have a choice of methods that have been used from time to time, more or less successfully, to bridge over the gap left; I shall only mention those of proved value. These are, the transplantation of nerve from another source; union of the nerve by catgut threads combined with tubular suture, that is, surrounding the ends of the nerve and the catgut with a tube composed of some material which will resist absorption for a sufficient length of time to prevent the ingrowth of fibrous tissue between the ends of the nerve; the union of the nerve to a neighbouring sound nerve; and finally, shortening the limb by removal of bone.

The nomenclature at present in general use requires simplification. The same terms have been used by different surgeons to denote dissimilar operations, with results which are bewildering, not only to the practitioner and student, but also to those engaged in research. I have suggested and use the following:—*Nerve transplantation*; *Nerve anastomosis*; *Nerve crossing*. I consider that the term "nerve grafting" should be discarded: it has always meant to the English-speaking surgeon the insertion of a portion of nerve between the ends of a divided nerve, but with the recent extension of the field of operations on the peripheral nerves, it has also been employed to denote the anastomosis of one nerve to another, a meaning it conveys to Continental surgeons.

If the ends of the nerve cannot be brought together, transplantation is the operation of choice. The portion of nerve employed must be obtained from the patient or from an amputated limb. The results, both clinical and experimental, obtained when a portion of an animal's nerve is used are unsatisfactory. The nerve most often requiring this operation is the musculospiral. Here the operation is simple, the incision is prolonged downwards, the radial nerve exposed, and an adequate portion resected and sutured into the gap without tension. This nerve may be used in a similar way in injuries of other nerves. Removal of the upper two-thirds of the radial nerve produces no demonstrable effect upon sensation.

But this method may be impossible for anatomical reasons, for example, after division of the facial nerve in the middle ear; or from the size of the nerve, for example, the great sciatic; or the distance between the ends of the nerve: if this exceeds four inches, it seems probable that no operation of this nature will succeed: nerve anastomosis offers the best chance of success. In cases in which the gap between the ends is less than four inches, and yet, because of the size of the nerve or other reason, the radial nerve cannot be used, and no sound nerve is available for anastomosis, tubular suture should be performed.

Nerve anastomosis is divided into central and peripheral, and either may be partial or complete (*Figs.* 24–27, in which the shaded lines show the affected nerves). In complete anastomosis the whole of the nerve to be implanted is divided; in peripheral anastomosis the distal end of the affected nerve is

anastomosed to the sound nerve; in central, the sound nerve is divided and its proximal end anastomosed to the affected. In the case of small nerves, a vertical slit in the sound nerve divides enough of its nerve fibres, but when the nerve is of large or medium size, a transverse cut should be made into it or a flap raised. Our aim in all these operations is to bring the axis cylinders of the affected nerve into end-to-end contact with some of those in the sound.

The complete peripheral operation is the one which is most often applicable to the cases we are now considering.

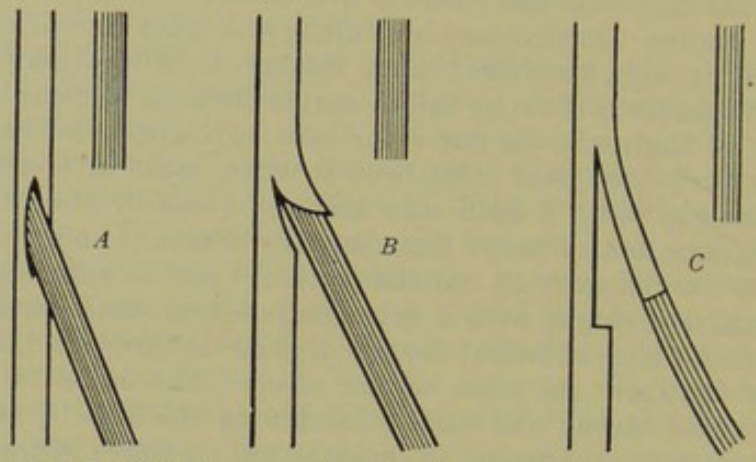


Fig. 24.—Complete Peripheral Anastomosis, showing the three methods of union.—*A*. Insertion of peripheral end of affected into vertical slit in sound nerve. *B*. Insertion of peripheral end of affected nerve into a gap in the sound nerve, produced by an oblique incision. *C*. End-to-end union with flap raised from sound nerve.

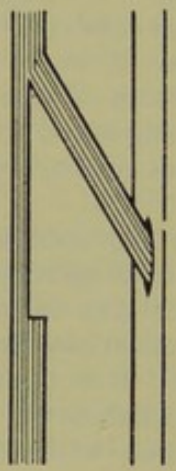


Fig. 25.—Partial Peripheral Anastomosis. Can also be carried out by methods *B* and *C*, *Fig.* 24.

Fig. 26.—Complete Central Anastomosis. Can also be carried out by methods *B* and *C*, *Fig.* 24.

Fig. 27.—Partial Central Anastomosis. Can also be carried out by methods *B* and *C*, *Fig.* 24.

Complications arising during Recovery after Complete Division.—Complications may arise during the progress of recovery. Pain as a rule is present in the distribution of the nerve during the first two or three days after suture. This is due to irritation of the central end, and is rarely of sufficient severity to need treatment. If severe, it usually points to an infective neuritis; the wound should be inspected, and, if showing signs of infection, opened up and drained. If this has been necessary, the condition of the nerve should be explored as soon as the wound has healed (see also below, under *Hyperalgesia*). In other cases, in which suppuration takes place, gradual deterioration of function

occurs after a period of improvement due to involvement of the junction in fibrous tissue. This may arise also from inflammation around a silk suture used to unite the ends of the nerve. It is for this reason that the use of silk is unwise, particularly in accidental wounds. In both cases the nerve should be exposed and dealt with.

Ulcers may arise at two periods: during the stage of complete insensibility to cutaneous stimuli slight injuries pass unnoticed; the patient burns himself not infrequently, or, if engaged in manual labour, may seriously injure the affected limb, causing ulceration. These ulcers heal readily when the part is kept at rest and the usual means are adopted to render the ulcers healthy. To this group belong the so-called perforating ulcers which arise after division of the sciatic nerve. With the first sign of returning sensibility to prick, the patient not infrequently experiences pain shooting into the affected part; at this time blisters are liable to form spontaneously, the patient noticing them not uncommonly on rising in the morning. If not carefully treated these burst, leaving a raw surface, which readily becomes infected: the blisters must be protected from injury, and, under these conditions, dry, leaving a scab. After complete restoration of sensibility to prick, all tendency to ulceration ceases.

Tenotomy or tendon lengthening may be necessary in cases in which the limb has been allowed to get into a bad position.

Treatment of Cases of Subcutaneous Injury.—As the result of a subcutaneous injury, all the signs of complete division—loss of sensibility, and the development of the reaction of degeneration in the muscles—may ensue; there is no sign which can tell us whether the nerve is anatomically or physiologically divided, that is, whether the nerve is ruptured or in anatomical continuity. These cases are not uncommon; they may result from pressure, suddenly applied or long continued, or from traction.

As I mentioned in speaking of the symptoms produced by incomplete division of a nerve, it may be impossible to diagnose between complete and incomplete division until ten or fourteen days after the injury. If at this period the signs of complete division are present, no time should be lost: the condition of the nerve should be explored, and the appropriate treatment adopted. If physiological division is found, in most cases it will be necessary to resect the damaged portion and perform end-to-end suture. If this is not done, recovery will be incomplete. If on exploration the nerve seems little altered, although the reaction of degeneration is present, it is wise to leave it, wrapping it in Cargile membrane to prevent adhesions to surrounding structures.

If the muscles still react to faradism at the end of a fortnight, recovery will ensue in the course of a few weeks if careful treatment is adopted. When the reactions which I have described as being typical of incomplete division are present, no operation should be done in a recent case, and the nutrition should be kept up, as I shall describe when speaking of after-treatment. If the nerve has become secondarily involved, or if improvement does not take place with careful treatment, operation should be performed and the nerve released from pressure of fibrous tissue, bone, or whatever the agent may be. Whenever this operation (neurolysis) is performed, the nerve should be wrapped in tissue to prevent it from again becoming adherent; failure to do this has necessitated repeating the operation.

Treatment of Nerve Injury complicating Fractures and Dislocations—Nerves may be injured as the result of fractures; this is particularly liable to occur in fractures of the middle and lower thirds of the humerus, next in frequency the external popliteal in fractures of the head of the fibula, and rarely the median in fracture of the lower end of the radius. The nerve may suffer at the time of the accident, or from involvement in callus or the pressure of displaced

bone; the latter may occur years after the fracture. Primary injury is probably more common than suspected. If at the time of the first examination of a recent fracture, particularly of the humerus, symptoms of nerve injury be present, operation should be performed if there are no general causes contra-indicating it. The condition found should be dealt with according to the rules I have laid down, and precautions taken to avoid the involvement of the nerve in fibrous tissue. If the fact of nerve injury be discovered, as it usually is, when the splints are removed, and examination reveals complete division, operation should be performed. If on the other hand the symptoms point to incomplete division, the appropriate non-operative treatment must be carried out; if no improvement takes place after several weeks, the nerve must be exposed and the lesion dealt with. But if the signs of nerve injury develop later, when the patient begins to use the limb, operation must not be delayed.

In some instances, as will be mentioned when speaking of the ulnar nerve, interference with the function of the nerve takes place many years after the original injury. If the symptoms are slight, rest will undoubtedly relieve them for a time, but they are likely to recur. Operation is the most satisfactory treatment, removing the compressing agent.

It occasionally happens that nerves are injured as the result of dislocations, either by direct violence or from faulty treatment. This occurs most often in dislocations of the shoulder. The whole plexus may suffer injury, but most often the inner cord. (See also under BRACHIAL PLEXUS, *infra*). In subglenoid dislocations the circumflex nerve sometimes suffers. These cases are to be treated on the lines laid down in speaking of subcutaneous injuries in general.

COMPLICATIONS ARISING DURING RECOVERY AFTER INCOMPLETE DIVISION.—Although in a large proportion of the cases, recovery steadily advances and at length becomes perfect, occasionally, after a period of improvement, gradual deterioration of function takes place, the result of fibrous changes in the nerve. The nerve should be exposed and the condition dealt with, resection of the damaged portion being required in most cases.

Hyperalgesia.—Pain is more often associated with incomplete than with complete division. It may arise in cases of anatomical or physiological division, more often in the former, and is referred to the " full " distribution of the affected nerve. In many cases it is accompanied by tenderness of the skin, the pain and tenderness involving a larger area than that which becomes insensitive after complete division of the nerve ; in a few cases it is accompanied by glossy skin.

The symptom-complex of pain, tenderness, and glossy skin—first described by Paget, later and more fully by Weir Mitchell, Morehouse, and Keen—is rarely seen in civil practice, and occurs most often after gunshot wounds. The history is usually as follows. The wound suppurates, and two or three weeks later pain appears and gradually becomes worse ; it is accompanied by tenderness, and in some cases by glossy skin. This condition is best described in the words of Weir Mitchell : " The surface of all the affected parts was glossy and shining, as though it had been skilfully varnished. . . . In most cases the part was devoid of wrinkles and perfectly free from hair. Mr. Paget's comparison of chilblains is one we often used to describe these appearances ; but in some instances we have been more strikingly reminded of the characters of certain large, thin, and polished scars." The term " glossy skin " should only be used in connection with this as described by Paget and Mitchell, Morehouse and Keen. Employing it to describe the atrophic skin seen so commonly after complete section of a nerve leads to confusion.

The typical case of causalgia as described by Mitchell is fortunately rare, but in lesser degree these cases are common. They are all characterized by the

latent period which exists between the injury and the onset of pain and tenderness. These symptoms sometimes arise as the result of wounds of nerves accidentally inflicted during the course of a surgical operation, and from the position of the tender area probably come under observation most often after kidney operations in women. The extent and degree of the sensory loss varies with the injury and the nerve involved, but is never complete.

In all cases the treatment is the same: the nerve is exposed, the damaged portion resected, and end-to-end suture performed. Neurotomy alone is futile: the pain returns on regeneration of the nerve; neurectomy alone leaves an area in which the sensibility may be permanently affected.

Involvement of Nerves in Scar Tissue.—The symptoms of the involvement of the trunk of a nerve in scar tissue have already been dealt with in referring to incomplete and subcutaneous injuries and hyperalgesia.

Irritation of one of the terminal branches of a nerve may cause pain and tenderness in the whole of the area supplied by the parent nerve, with twitching in the muscles in the case of a nerve containing motor fibres. These symptoms occur most often in connection with the fifth nerve, but are also seen elsewhere as the result of the involvement of the nerve filaments in scar tissue.

Treatment consists in excising the scar, together with the involved nerve twig.

After-Treatment.—The patient, and occasionally the surgeon, is prone to consider that when a nerve has been united nothing more remains to be done; but the final result depends on the thoroughness with which the treatment is carried out after suture, it may be for several years. That nerves regenerate when their ends are in contact is known, but it too often happens that by the time motor recovery has taken place, the muscles have been allowed to waste and contractures have taken place in muscles and ligaments.

The parts supplied by the nerve must be kept in a state of good nutrition, and care taken to prevent the occurrence of contractures, by the application of suitable splints. Massage is invaluable in keeping up the nutrition of the skin and the muscles, and perhaps in cases of musculospiral or external popliteal injuries it is enough; but in ulnar injuries it should certainly be supplemented by daily stimulation with the both constant and interrupted currents. This should always be done under medical supervision. Complications must be treated as they arise, and with patience most cases of nerve injury will give a good result. Incomplete injuries not needing operation are treated in this manner. (See Electrotherapeutics.)

Prognosis.—There are a few general points which must be referred to in regard to prognosis. In order that complete recovery shall ensue, healing must be by first intention, and care taken that the nutrition of the muscles is kept up and contractures prevented. If these rules are followed, perfect recovery will take place in the majority of the cases of primary suture. In cases of secondary suture, the prognosis depends on the condition of muscles at the time the patient comes under observation and the manner in which the original wound healed. With regard to time, up to three years from the injury it makes little difference to the regeneration of the nerve, but it may make all the difference in the amount of contracture which has taken place. It is unlikely that *perfect* recovery will ensue after secondary suture; if a patient is unfortunate enough to require secondary suture of the ulnar nerve it is improbable that the hand will be restored to its normal condition. But after secondary suture of the musculospiral or external popliteal, imperfect sensory recovery is immaterial, and the contractures are slight and easily dealt with, so that the functions of the part, from the point of view of the patient, are completely regained.

SPECIAL METHODS OF TREATMENT.

Nerve Stretching.—This operation, at one time widely performed, has now fallen to a certain extent into disrepute in this country. On the Continent it has been lately brought into prominence in connection with the treatment of chronic ulcers of the leg, particularly by Chipault.

Nerve stretching temporarily abolishes conduction through the nerve, but this effect is as a rule too transient to be of much benefit in treatment. At first employed in many cases of spasmodic tic and neuralgia, it is now rarely used for this purpose. In certain patients with sciatica it is of benefit, but in these it acts by freeing the nerve from adhesions in cases of perineuritis.

It has a temporary effect upon the nutrition of the parts supplied by it. This side of its action was first brought into prominence by Bastian as long ago as 1861, in connection with cases of infantile paralysis. Good results have been reported by many surgeons from its employment in cases of chronic ulcers of the leg. The usual treatment of the ulcer by rest to the part, etc., is supplemented by stretching the nerve or nerves supplying the area in which the ulcer is situated.

Neurotomy and Neurectomy.—The operations of dividing a nerve (neurotomy) and of removing a portion of it (neurectomy) have been chiefly employed in connection with the treatment of various painful and spasmodic affections.

Neurotomy has been superseded in the treatment of neuralgia by neurectomy, and the latter in many cases by division of posterior roots or removal of the posterior root ganglion. In certain cases, as pain following a nerve injury, neurectomy is employed, the damaged portion being removed and the continuity of the nerve re-established by suture.

In performing neurectomy for neuralgia, as much as possible of the nerve should be removed, to prevent the possibility of reunion; in some cases the nerve may be pulled out (avulsion or neuraxeresis). The same operation may be employed in cases of spasmodic affections, but where possible, nerve anastomosis should be carried out.

Nerve Anastomosis.—The varieties and indications for the employment of this operation in injuries of nerves have already been described. But the operation is also of value in the treatment of paralyses due to central causes, particularly infantile paralysis, and also in the treatment of various spasmodic affections.

The suitable cases of infantile paralysis are those in which a group of muscles supplied by one nerve is affected, such as the peroneal group, or the Erb-Duchenne; or, single muscles, as the tibialis anticus, soleus and gastrocnemius or quadriceps extensor cruris. From three to six months after the onset is the most suitable time for operation; sufficient time has then elapsed to disclose those muscles which will be permanently affected, and serious contracture of the opponent muscles will not yet have occurred. But no time seems too advanced to try this operation with good hope of a successful result, providing muscle substance is left and the limb can be brought into a normal position.

In all the cases which have been so far reported in which sufficient time had elapsed between operation and publication, some voluntary power has been restored to the paralyzed muscles.

The form of anastomosis suitable to the majority of the cases is the complete peripheral (*Fig.* 24). Our aim in this operation is to bring as many as possible of the axis cylinders of the nerve supplying the affected muscles into end-to-end contact with cut axis cylinders in the sound nerve, at the same time preserving the muscles supplied by the latter nerve. In the case of small nerves, such as those supplying the tibialis anticus or muscles of the calf, a vertical slit in the sound nerve divides sufficient axis cylinders (*Fig.* 24, *A*). For example, in a case

of paralysis of the tibialis anticus, the anterior tibial nerve is exposed, the branches given to the muscle identified and divided close to the nerve, and inserted into a vertical slit in the musculo-cutaneous nerve.

In the case of larger nerves, for instance the external popliteal, a flap consisting of about one-third should be raised from the sound nerve, and the peripheral end of the divided nerve supplying the affected muscles either sutured into the gap or united end to end with the flap—the latter is probably the best method (*Fig.* 24, *B* and *C*). In paralysis of the quadriceps extensor cruris, complete central anastomosis may be performed, the superficial division of the obturator being divided and inserted into the deep portion of the anterior crural nerve.

Similar operations may be carried out in paralysis due to other central lesions and in spasmodic affections.

The after-treatment must be carried out patiently, the nutrition of the affected muscles being kept up by means of massage and the constant current. When the first sign of voluntary power returns, the patient must be instructed to exercise the muscles systematically; in this way co-ordinate movements will be gradually restored.

The time at which the first sign of voluntary power is discovered depends upon the distance of the point of anastomosis from the nerve-endings in the muscles. Where this is short, as in the tibialis anticus or calf muscles, improvement should be noticed in three or four months; but in the case of the external popliteal or roots of the brachial plexus, twelve or eighteen months may elapse.

Injuries of Special Nerves.

The Median Nerve.—This nerve is most often injured in penetrating wounds in the region of the wrist; it may be wounded in injuries at the bend of the elbow, involved in fracture in this situation or at the wrist, and occasionally compressed by muscle in golf enthusiasts. Complete division of this nerve is often overlooked or considered to be incomplete.

If the nerve be divided at the wrist and no tendons are severed at the same time, deep touch may be recognized over the whole of the affected portion of the hand. Prick and the extreme degrees of heat and cold are not appreciated over an area which varies somewhat in each case; it may be almost as extensive as the loss of sensibility to light touch, or, as is more often the case, be lost only over the index and middle fingers (*Fig.* 28). Light touch and the intermediate degrees of heat and cold are lost over the palmar surfaces of the index, middle, and half of the ring fingers, and on the palm to the radial side of a line drawn upwards through the axis of the ring finger. The palmar surface of the thumb is also insensitive to light touch. The anæsthetic boundary on the radial side runs from the radial edge of the thumb-nail upwards to the thenar eminence, and then curves round, as in the figure, to meet the line continued up on the palm. On the dorsum, the last two phalanges of the index and middle, and half of the last two phalanges of the ring fingers, are insensitive to light touch; the dorsal surface of the thumb is never affected. The level at which the nerve is divided does not increase the extent of the loss of light touch and of prick, but an area insensitive to deep touch may make its appearance.

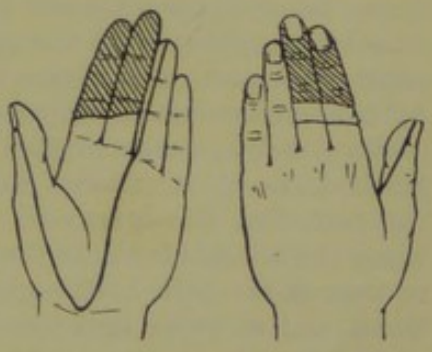


Fig. 28.—The shaded area represents loss of sensibility to prick and the extreme degrees of temperature. The area unshaded is that insensitive to light touch and the intermediate degrees of temperature, but sensitive to the extreme degrees and to prick.

After division of the nerve at the elbow, the patient may experience little discomfort from the paralysis; the impaired mobility affects chiefly the thumb and, to a less extent, the index finger. The terminal phalanx of the thumb cannot be flexed owing to the paralysis of the flexor longus pollicis, the index finger can only be flexed at its metacarpo-phalangeal joint by means of the interossei, both the long muscles supplying it being dependent on the median for their innervation. After division of the nerve at the wrist these muscles escape, and the abductor and opponens pollicis only are paralyzed. It is essential that the surgeon should have a clear idea of the action of these muscles. Abduction of the thumb takes place in a plane at right angles to the palm; this is the action which is lost and can only be feebly imitated by the extensor longus and extensor ossis metacarpi pollicis. In opposition, the thumb is rotated so that its anterior surface looks towards the palm; for the perfect performance of this movement the opponens pollicis is necessary, but it is often difficult to tell if this muscle is taking part in the action. Inspection alone is in many cases useless; it is only palpation over its insertion into the outer surface of the first metacarpal bone that enables us to say whether the muscle is contracting.

Ulnar Nerve.—The ulnar nerve is liable to injury in three situations—at the elbow, and at the wrist above and below the point at which its dorsal branch is given off.

Division at the elbow produces paralysis of the flexor carpi ulnaris, of the ulnar half of the flexor profundus digitorum, of all the interossei, the two inner lumbricales, and the adductors of the thumb. The hand takes up a characteristic position, and it is easy to say that the ulnar nerve has been injured, but difficulty is sometimes experienced in making out if the individual muscles are paralyzed. The little and ring fingers can be flexed to a slight extent by the tendons of the flexor sublimis digitorum attached to them and supplied by the median. Paralysis of the flexor carpi ulnaris is often compensated for by the action of the palmaris longus, and careful palpation over the insertion of the former muscle into the pisiform bone is necessary. Little difficulty should be experienced in discovering the paralysis of the intrinsic muscles of the hand supplied by this nerve. The fingers are extended at the metacarpo-phalangeal joints, the little and ring finger being hyperextended in consequence of the paralysis of their lumbrical muscles in addition to the interossei. All the fingers are flexed at the inter-phalangeal joints, this flexion being most marked in the little and least in the index. All true movement of adduction and abduction is lost, but false abduction can be performed by means of the common extensor tendons. This is easily distinguished, as it is always accompanied by extension, and palpation reveals the fact that the interossei are flaccid. The adductor muscles of the thumb bring the thumb towards the second metacarpal bone in a plane at right angles to that of the palm. This movement can be well simulated by means of the long flexor and extensor muscles of the thumb, but the movement is always accompanied, in the former case by extension of the terminal phalanx and outward rotation, in the latter by flexion of the terminal phalanx and inward rotation. Careful examination will always reveal these supplementary movements.

Sensibility to light touch is lost over one and a half fingers back and front and the corresponding portion of the palm and dorsum of the hand (*Fig.* 29). Prick, and the extreme degrees of heat and cold, are unappreciated over the little finger and a portion of the ulnar side of the hand, varying from a strip on its extreme border to an area almost as extensive as the loss of sensibility to light touch. Deep touch is usually lost over an area as extensive as the loss of sensibility to prick, but, as elsewhere, there is a great deal of variation in the extent of this area.

The nerve is most often injured at the wrist, rarely without division of tendons. When many tendons are divided at the same time, the loss of sensibility corresponds to that found after division of the nerve at the elbow, but if no tendons are divided, or only that of the flexor carpi ulnaris, deep sensibility may be present over nearly the whole of the area. Sensibility to light touch and to prick are lost over the area in *Fig.* 29. Wounds at the wrist frequently divide the nerve below the point at which its dorsal branch is given off. The loss of sensibility following division at this position is easily overlooked, even by those used to the examination of these cases. Light touches with cotton-wool cannot be appreciated over an area on the palm (*Fig.* 30) corresponding exactly to that which is affected after section of the whole nerve. Its boundary towards the radial side is well defined, but at the ulnar border of the hand it gradually merges into the normal sensibility of the dorsum. The dorsal surface of the two terminal phalanges of the little, and half of the two terminal phalanges of the ring finger, become insensitive to light touch; deep touch is everywhere appreciated. The extent of insensibility to prick varies greatly: in some instances there is no portion of the affected area over which this stimulus cannot be appreciated; usually the terminal phalanx of the little finger is affected, but in rare instances the area may be as extensive as the loss of sensibility to light touch. It is evident that unless the cotton-wool test is used, instances of division in this situation may be overlooked.

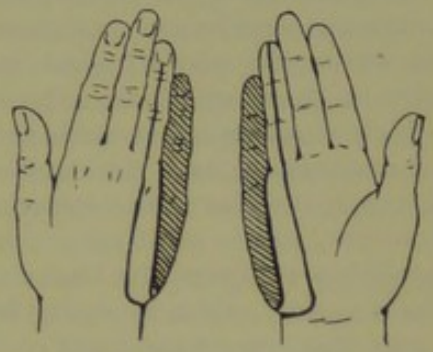


Fig. 29.—Loss of sensibility resulting from division of the Ulnar Nerve. Shaded area represents loss of protopathic sensibility; area unshaded, loss of epicritic sensibility.

There are two affections of the ulnar nerve that need special mention: interference with the functions of the nerve coming on late, it may be twenty or thirty years after an injury, usually fracture in the region of the elbow joint; and dislocation of the nerve from its groove behind the internal condyle.

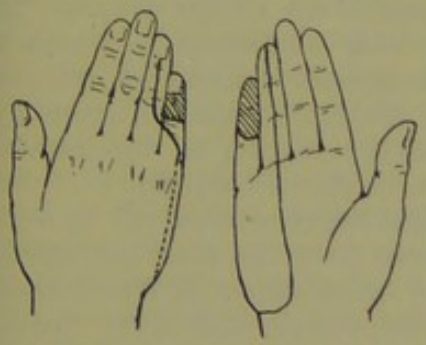


Fig. 30.—Loss of sensibility resulting from division of the Ulnar Nerve below the point at which its dorsal branch is given off.

Division of the Ulnar Nerve in Connection with Old Injury in the Region of the Elbow.—This is a condition not infrequently overlooked. The injury may have been in childhood, and entirely forgotten. Sometimes after extra exertion, at other times, and more often, without any known cause, the patient complains of a feeling of pins and needles in the ulnar area and of weakness of the hand. This should always lead the surgeon to suspect pressure on the nerve or on one of the anterior primary divisions of which it is composed. The course of the nerve should be traced upwards and the elbow joint examined; in the cases we are now considering, considerable deformity will usually be found in the situation of the internal condyle, often with partial or complete obliteration of the groove in which the nerve lies. The nerve can often be felt thickened in a spindle-shaped manner. As in all pressure injuries, the motor and sensory fibres are equally affected.

If signs of complete division are present, operation must be performed without loss of time. The nerve should be exposed, and the damaged portion resected; before uniting the ends, the humerus should be examined and,

if necessary, a groove made to receive the nerve. After suture, the nerve must be wrapped in Cargile membrane or gold foil to prevent the formation of adhesions, the wound closed, and the arm put up in extension to avoid traction on the nerve junction. Appropriate after-treatment must be carried out. In cases in which the lesion is incomplete, rest will often relieve the symptoms, but there is a great liability to recurrence as soon as the patient resumes the use of the arm. It will save time if, in every case in which definite signs of interference with the functions of the nerve are present, operation is performed. The nerve must be exposed and the cause of the pressure removed, a new groove being cut for the nerve behind the internal condyle when necessary.

Dislocation of the Ulnar Nerve.—Abnormal mobility of the ulnar nerve is of common occurrence, and gives rise to no symptoms; it is found in individuals in whom the physiological cubitus valgus is more marked than usual, occasionally in those in whom cubitus valgus is the result of injury. This condition, which may be called subluxation of the ulnar nerve, is the predisposing cause of dislocation, and this name should be reserved for those cases in which the nerve travels over the internal condyle. This can only occur in flexion of the forearm, and in most cases a fall on the flexed elbow is given as the cause. This probably ruptures the fascia which keeps the nerve in position. The condition occurs most often in males between the ages of twenty and thirty. In most cases the symptoms come on immediately after the injury; occasionally some time elapses, the frequent injuries to which the nerve is subject in passing over the internal condyle causing fibrosis. In a few instances the condition originates without injury; in these patients the fascia which keeps the nerve in place is gradually stretched.

In a large proportion of cases it will be found that operation is necessary; if symptoms are present pointing to interference with the functions of the nerve, treatment must not be delayed. A long incision is made to expose the ulnar nerve in its groove behind the internal condyle, the groove deepened after freeing the nerve, which should then be wrapped in membrane to prevent it becoming adherent, and finally the groove formed into a canal by stitching a portion of the fascia of the triceps over it. In cases that have been neglected, in which a diffuse fibrosis is present leading to all the signs of complete division, it will be necessary to resect the damaged portion of the nerve; this will, however, rarely be required.

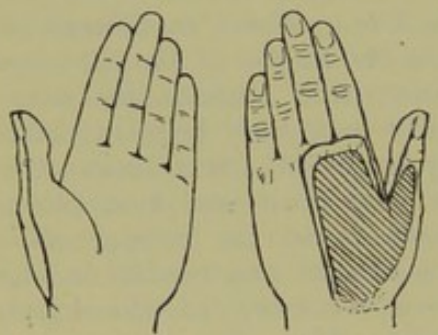


Fig. 31.—Loss of sensibility resulting from division of the Musculospiral Nerve above the origin of its external cutaneous branches.

The Musculospiral Nerve.—After the median and ulnar, this nerve is the one most frequently injured. It most often suffers in fractures of the humerus in its middle and lower thirds, and is the nerve commonly involved in crutch, sleep, and anæsthetic paralyses.

Division of the musculospiral nerve below the point at which its external cutaneous branches are given off produces, as a rule, no appreciable loss of sensibility; when affected above this point, an area insensitive to light touch and to prick makes its appearance on the dorsum of the hand (*Fig.* 31); deep touch is everywhere appreciated.

Characteristic motor symptoms are present: wrist-drop, with inability to extend the wrist and the thumb. The terminal phalanges of the fingers can be extended by means of the lumbricales and interossei, but, owing to the paralysis of the common extensor, the basal phalanges remain flexed. On attempting to extend them the wrist becomes more flexed, owing to the synergic action of the carpal flexors.

During recovery, whether from complete or incomplete division, the carpal extensors first regain power, then the extensors of the fingers, and finally those of the thumb.

The Circumflex Nerve.—This nerve is liable to injury at the point at which it turns round the neck of the humerus. In subglenoid dislocations, in sleep, crutch, and anæsthetic palsies, or as the result of fracture of the surgical neck of the humerus, it may suffer damage. It is said also to suffer injury in miners who lie for long periods on their left side, and to be secondarily involved in inflammatory process from the shoulder joint or the subdeltoid bursa.

Injury to the circumflex nerve is by no means so common as is usually supposed. It has been said to follow direct blows on the point of the shoulder; it is perhaps possible that the fibres of the nerve as they lie under the deltoid are injured, but in most cases the injury is to the anterior primary division of the fifth cervical nerve, and careful examination will show that the spinati also are affected. In other cases the wasting of the deltoid on which the circumflex injury was diagnosed is found to be in common with all the muscles around the joint, the result of a traumatic arthritis.

After section of the circumflex nerve, an area of loss of sensibility to light touch and to prick make their appearance on the outer surface of the arm (*Fig.* 32). Deep touch is everywhere appreciated. The deltoid is paralyzed, and, if seen within a short time of the accident, the patient is unable to abduct the arm. But in time other muscles take on this action: the clavicular fibres of the pectoralis major, the supraspinatus, trapezius, and serratus magnus. Careful palpation over the deltoid is the only means to avoid error in these cases.

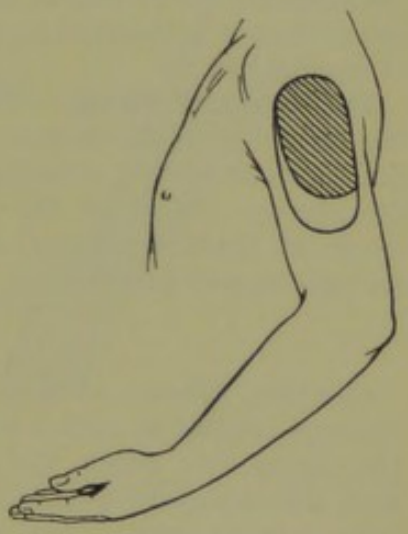


Fig. 32.—Loss of sensibility resulting from division of the Circumflex Nerve.

The most careful examination is necessary before coming to a decision with regard to treatment; the testing must be carried out for all forms of sensibility. If there is no loss of sensibility, and there is paralysis of the deltoid with the reaction of degeneration, it is extremely improbable that the circumflex nerve is injured; if the signs are those of complete section of the nerve, the age of the patient and his occupation must be taken into consideration. In most cases operation can be avoided by training the neighbouring muscles to take the place of the deltoid. If it is essential that perfect movement be obtained, operation must be resorted to. The nerve may be exposed through an incision half an inch behind and parallel to the posterior border of the deltoid muscle.

The Long Thoracic Nerve (Nerve of Bell).—This nerve supplies the serratus magnus muscle. It is most often injured in males between the age of twenty-five and forty, and usually on the right side. Generally caused by prolonged pressure in the supraclavicular region, it occasionally follows violent muscular efforts and direct violence applied to the shoulder. Paralysis of the serratus magnus is rarely isolated, but is usually combined with paralysis of the lower trapezius.

Winging of the scapula is produced by paralysis of the serratus magnus alone, and becomes more marked when an attempt is made to push in an upward and forward direction; there is also inability to raise the arm above the horizontal in front of the body. Paralysis of the lower trapezius also produces slight

winging of the scapula, which becomes more prominent when attempts are made to push in a downward and forward direction, but the winging at once disappears on raising the arm in front of the body. In the combined lesion the winging is more marked, and there is inability to perform any forward pushing movements with the affected arm.

Careful examination is necessary in order to enable a prognosis to be made. If the case is seen early, avoidance of all injurious pressure in the supraclavicular region, and absolute rest to the arm, must be ordered. This must be followed by massage and stimulation with the interrupted current applied to the muscle.

If the paralysis persists, and the reaction of degeneration develops, nerve anastomosis should be performed; it is impossible to deal with the damaged portion of the nerve or the branches of which it is composed.

The Musculocutaneous Nerve.—Isolated paralysis of this nerve is of great rarity. It may follow a gunshot wound, a crush in the upper arm, or extirpation of a tumour. Most of the so-called cases are due to dislocation of the humerus, with a partial injury to the outer cord of the plexus.

Division of the musculocutaneous nerve produces an area of loss of sensibility to light touch and to prick on the preaxial (radial) side of the forearm; deep touch is everywhere retained. The biceps and part of the brachialis anticus are paralyzed, but in spite of this the patient is able to flex the forearm with considerable force, and it is only by careful palpation over the position of the biceps that it is found to be paralyzed. The chief disability arises from weakness of supination.

The Brachial Plexus.—The plexus may suffer injury (1) above or (2) below the clavicle; in the former case it is usually the anterior primary divisions of the cervical nerves entering the plexus that suffer; in the latter, the cords of the plexus. Most of the injuries are subcutaneous: above the clavicle the result of traction; below, usually the result of pressure. Penetrating wounds are rare in civil practice.

1.—*Supraclavicular Injuries.*

Complete Plexus.—The majority of cases of injury in this situation follow violence applied in such a way to the head or shoulder as to stretch the plexus. The injury first affects the fifth and then the other primary divisions in order, from above downwards. Of isolated root lesions, the fifth and the first are the only common ones. The latter may be due to traction on the arms when extended above the head, or to the pressure of a cervical rib.

If the whole plexus is involved, sensibility is lost to light touch and to prick over the area shown in *Fig.* 33. Deep touch is lost below the elbow. The arm and forearm remain flaccid.

Anterior Primary Division Fifth Cervical Nerve.—As a result of traction, the fifth cervical nerve is put on the stretch. The resulting division may be incomplete; in these cases the muscles are affected in a very definite manner. The injury affects first the spinati, then the deltoid, and finally, if the division be complete, the biceps, brachialis anticus, supinators, and occasionally the radial extensors of the wrist and the pronator radii teres. It is important to recognize that the deltoid and spinati may be completely paralyzed and develop the reaction of degeneration without any of the other muscles being affected. No loss of sensibility results from complete division of this nerve.

Division, in addition, of the sixth anterior primary division, in most cases does not increase the extent of the paralysis, but in some cases the subscapularis, the pronators, and part of the pectoralis major and serratus magnus are affected. No marked loss of sensibility results from section of the sixth division in addition

to the fifth. I have thus been able to confirm the researches of Harris and Low that Erb-Duchenne paralysis may result from division of the fifth anterior primary division alone.

Anterior Primary Division First Dorsal Nerve.—The first dorsal anterior primary division is sometimes affected from traction or as the result of pressure. All the intrinsic muscles of the hand are paralyzed by division of this root, the hand being a true "claw" hand and not in the position seen after division of the ulnar nerve. Sensation is usually affected along the ulnar border of the forearm and hand. In addition there may be pupillary symptoms. The dilator muscle of the iris and the muscle of Müller are paralyzed, the palpebral fissure is narrow, the eye appears sunken, and the pupil does not dilate to shade.

The presence of a cervical rib is the usual cause of symptoms resembling those just described as resulting from division of the first dorsal root. But in these cases the pressure falls upon the inner cord, so that the pupillary fibres escape

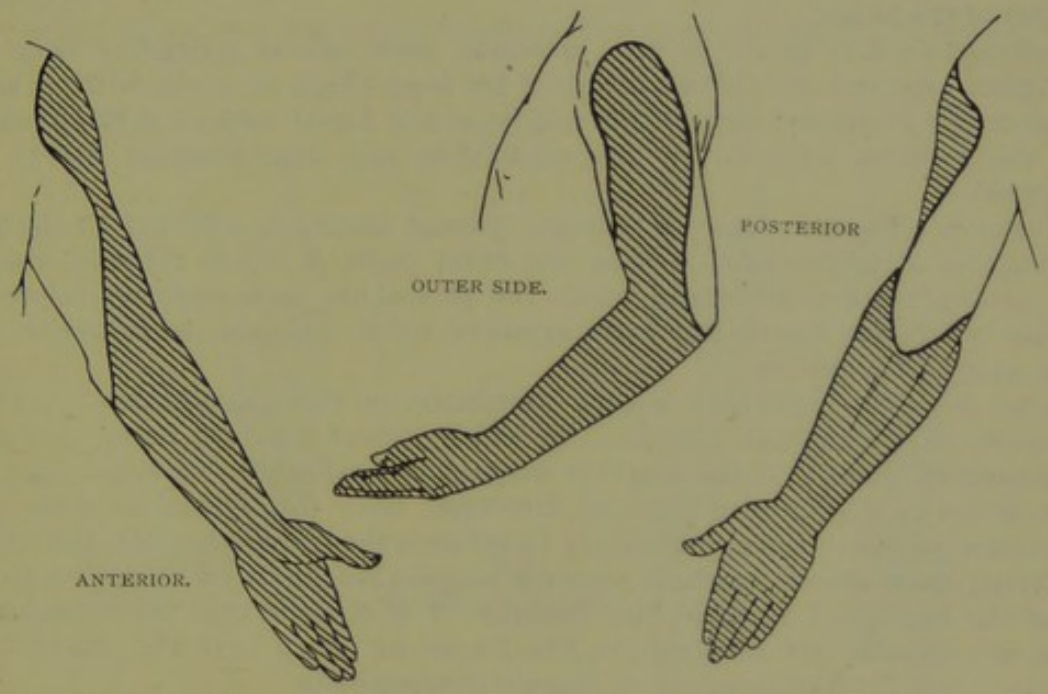


Fig. 33.—Loss of sensibility resulting from section of the whole Brachial Plexus. Note that the boundaries of the area of loss of sensibility to light touch and to prick are coterminous.

and the eighth cervical may be interfered with. Pain is felt over the inner side of the arm, forearm, and hand, and there may be ill-defined loss of sensibility over the inner side of the forearm and the little and ring fingers. It is rare that the symptoms are those of complete division.

Treatment consists in removal of the supernumerary rib and the periosteum covering it.

Among supraclavicular injuries must be included injury to the long thoracic nerve.

2.—*Infraclavicular Injuries.*

In the majority of cases these are the result of pressure, most often from the head of a dislocated humerus, occasionally from reduction of the dislocation by the "heel in axilla" method. In other cases they may be due to fracture of the humerus or of the neck of the scapula.

The whole plexus may be injured. The result on sensibility is in most cases the same as that seen in supraclavicular (*Fig.* 33), but when due to direct violence applied from without, the lesser internal cutaneous nerve is also

involved, and the sensitive area on the inner side of the arm is not present. Pupillary symptoms are absent, and the serratus magnus muscle often escapes.

The inner cord of the plexus is most often affected, then the posterior, and finally the outer.

Inner Cord.—In injury of the inner cord of the plexus, sensation is affected over the ulnar half of the forearm and hand; it is only when the division is complete that the loss is to both light touch and prick. The muscles affected are those supplied by the ulnar, with, in addition, those intrinsic muscles of the hand supplied by the median. This lesion has to be diagnosed from injury to the first dorsal root, which is done by noting the absence of pupillary symptoms and the presence of paralysis of the flexor carpi ulnaris and the abductor and opponens pollicis.

Outer Cord.—When the outer cord is injured, loss of sensibility may be present over the radial half of the forearm, with paralysis of the muscles supplied by the musculocutaneous nerve and those of the median except the intrinsic muscles of the hand.

Posterior Cord.—Injury to the posterior cord affects sensibility over the circumflex area and the radial portion of the hand (*Figs.* 28 & 29), with, in some instances, an ill-defined strip in the middle of the dorsal surface of the forearm, and the muscles supplied by the circumflex and musculospiral nerves are paralyzed.

Diagnosis.—In every case of brachial plexus lesion, in addition to the fact of complete or incomplete division, the exact point of injury must be worked out; cases are not unknown in which the plexus has been explored below the clavicle when the lesion has been supraclavicular. Careful examination will alone avoid this mistake.

There are four important leading symptoms in this examination: (1) The condition of the scapular muscles. It will be found that the nerve of Bell is an important guide; if the serratus magnus is unaffected, we know that the lesion is not of the anterior primary divisions; next the spinati muscles—it is sometimes possible to locate an injury to between the points at which the nerves supplying these muscles and the serratus magnus are given off. (2) The grouping of the paralyzed muscles; for instance, it is obvious that no combination below the clavicle will paralyze the Erb-Duchenne group. (3) The condition of the pupil, and (4) The presence or absence of anæsthesia.

After diagnosis of the exact spot, treatment must be carried out along the lines already laid down; complete injuries must be explored and the appropriate treatment adopted. There is, however, an exception to the rule that incomplete injuries should not be treated as a routine by open operation. I have already pointed out that an incomplete division of the fifth root may be followed by the development of the reaction of degeneration in the deltoid and spinati. This should always be treated by operation, and the damaged portion, which will be found on the upper and outer aspect of the nerve, resected and a portion of the radial nerve transplanted; or this damaged portion may be anastomosed to the anterior primary division of the sixth cervical nerve.

With regard to prognosis of injuries of the brachial plexus, this is unfavourable, and is due in the first place to the nature of the injury. In a large proportion of cases the nerves are overstretched, and this results in hæmorrhage into the sheath and consequent fibrosis; in addition, if it leads to rupture, the fibres give way at different levels; hence spontaneous recovery is unusual when the signs of complete division are present, and is apt to be imperfect in cases of incomplete division. Again, it is possible that the injury in some cases tears the roots away from the cord. Even after operation the prognosis is not so good as, for example, after secondary suture of the median at the wrist or the musculospiral. This

has to do to a great extent with the length of time necessary to complete recovery: in many cases the patient ceases to attend for efficient after-treatment, and when recovery of the nerve has finally become complete, the muscles are atrophic, and contractures of the opponent muscles render the regeneration of the nerve futile. Careful treatment at the time of the injury, and unceasing, patient after-treatment, will improve the prognosis. It cannot be too strongly impressed upon the patient that the operation only puts him in a condition favourable to recovery, and that possibly years of patient treatment must be carried out if success is to be obtained.

Sciatic Nerve.—Injuries of this nerve are rare in civil practice. Penetrating wounds of the upper part of the thigh are uncommon, but injury has followed traction, the result of the bloodless method of treating congenital dislocations of the thigh. Lesions of this nature usually result in incomplete division, and the external popliteal portion of the nerve suffers most, sometimes exclusively.

Complete division of the sciatic results in loss of sensibility as in *Fig.* 34; deep

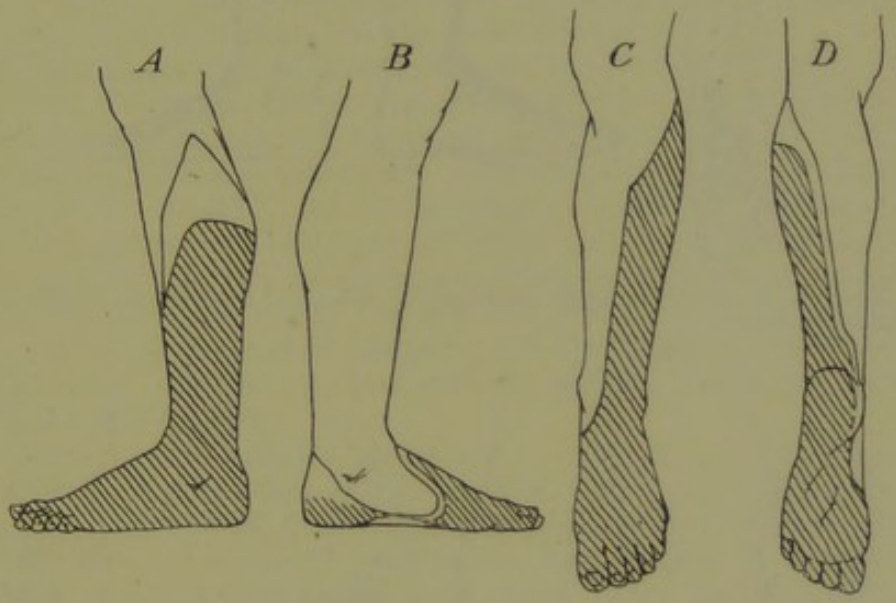


Fig. 34.—Loss of sensibility from division of the Sciatic Nerve. *A*, Outer surface; *B*, Inner surface *C*, Anterior surface; *D*, Posterior surface.

sensibility is only lost over the foot. Light touch and prick are lost over an area which is almost identical. All the muscles below the knee are paralyzed, together with the biceps, semi-membranosus, and semi-tendinosus, and the flexor half of the adductor magnus. But in spite of this, the patient is able to flex the thigh, and, to a slight extent, the leg on the thigh, by means of the gracilis; if this is borne in mind, no difficulty should arise in diagnosis.

Treatment is carried out along the usual lines, but it must be remembered that an incomplete injury of the sciatic may be a complete injury of the external popliteal, so that it may be necessary to expose the great sciatic nerve and deal with its external popliteal half.

External Popliteal Nerve.—This nerve is the most often injured of the nerves of the lower limb. Usually as the result of subcutaneous injuries, it may suffer in tenotomy of the biceps tendon. It may be injured as the result of direct violence applied to it as it turns round the neck of the fibula with or without fracture of the bone, and not infrequently suffers as the result of the application of Clover's crutch or the pressure of puttees.

Just before it reaches the neck of the fibula it gives off a large cutaneous

branch to the skin of the outer surface of the leg; it is most often injured below the point at which this branch is given off. Slight sensory change results from division in this situation, so slight, indeed, that it is often overlooked. Deep touch is everywhere appreciated, but over the dorsum of the foot is an area insensitive to light touch and to prick; this merges into an area on the outer surface of the leg in which light touch is lost but sensibility to prick retained; the borders here are well defined. After division above its lateral cutaneous

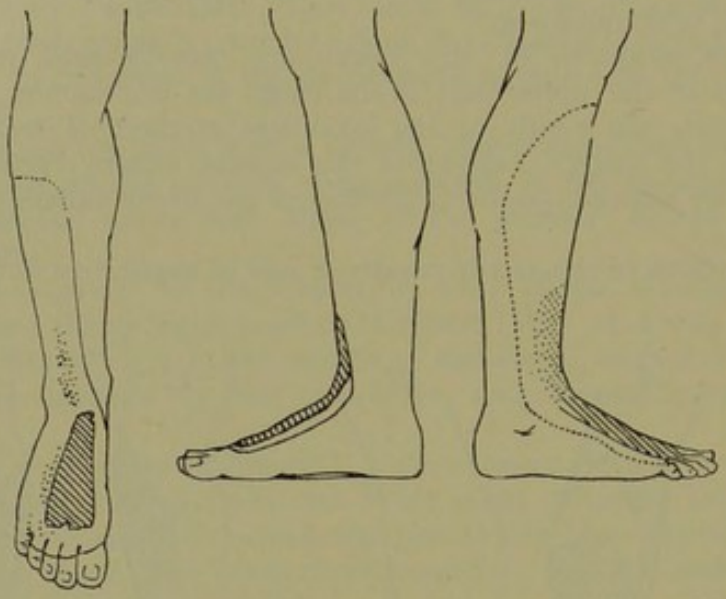


Fig. 35.—To show the loss of sensation produced by division of the External Popliteal Nerve below its lateral cutaneous branch.

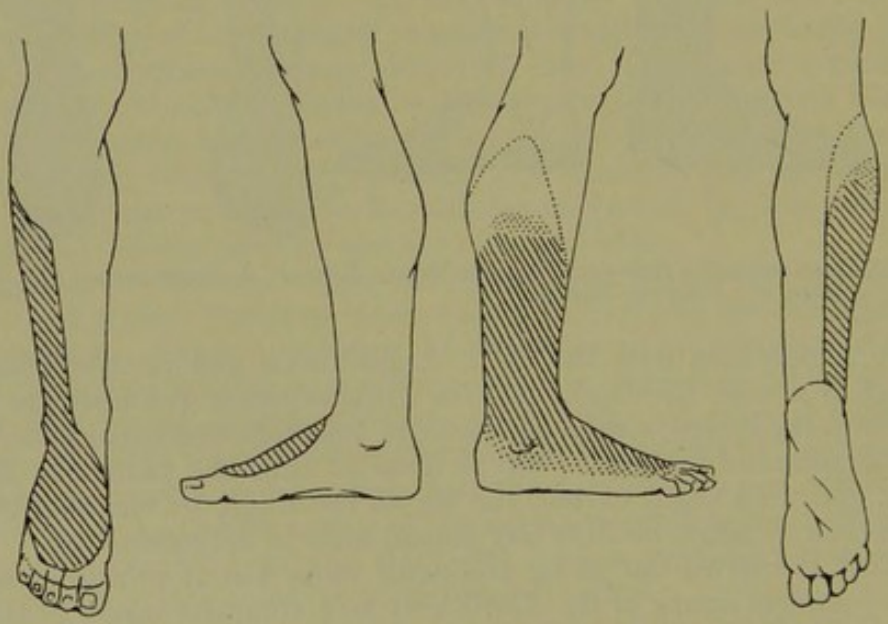


Fig. 36.—Loss of sensibility from division of the External Popliteal Nerve above its lateral cutaneous branch.

branch, a well-defined area insensitive to light touch and to prick is present on the outer surface of the leg, but deep touch is retained (*Figs.* 35, 36). After division in both situations the paralysis is well marked and cannot be mistaken; there is foot drop, and the toes cannot be extended or the foot dorsi-flexed or everted.

The internal popliteal, anterior crural, and obturator are too seldom injured to merit separate description.

The External Cutaneous Nerve.—It is but rarely that this nerve is divided; it sometimes suffers section in opening a psoas abscess, but the resulting anæsthesia causes little inconvenience. This nerve is of importance from its involvement in disease; Bernhardt's disease, or **Meralgia Paræsthetica,** is characterized by pain in the distribution of the external cutaneous nerve of the leg, usually with alteration in sensibility. It is most common in males, and many patients give a history of injury. Symptoms begin with a feeling of tingling or of coldness in the distribution of the nerve; this increases, and pain is experienced on standing or walking, which disappears on resting. A tender spot is sometimes present just where the nerve issues from under Poupart's ligament, and the area supplied by the nerve shows changes in sensibility. As a rule it is tender, and sensibility to touch and pain is defective.

Treatment is unsatisfactory; rest should be first tried, and operation not resorted to unless there is a distinct history of injury, or a thickening of the nerve is felt. In these cases excision of the damaged portion of the nerve is likely to relieve the condition, but in some of the patients submitted to operation the cause of the condition was not discovered; excision of a portion of the nerve afforded relief for a short time, but the pain recurred.

The Facial Nerve.—Facial paralysis may result from a lesion above or at the nucleus of the nerve, between the nucleus and the internal auditory meatus, during its passage through the temporal bone, and externally. In lesions at or above the nucleus, the orbicularis palpebrarum escapes. Its course below this point can be divided into three stages, above the geniculate ganglion, between the ganglion and the point at which the chorda tympani is given off, and below the chorda. In all these situations division of the nerve produces complete facial paralysis, but in the first and last taste is not affected, while if divided between the geniculate ganglion and the origin of the chorda, that is in the middle ear, taste will be lost over the anterior two-thirds of the corresponding half of the tongue.

Apart from the so-called "rheumatic" affections of the nerve, Bell's palsy, which is the common cause of facial paralysis, interference with the function of the nerve in the middle ear is the most usual. This may result from disease, or from operation. The nerve may suffer in fractures of the base of the skull primarily, or more often from involvement in callus. Outside the skull it is often injured during operations in the parotid region or in the removal of tuberculous glands; in most of these cases the nerve injury is incomplete and recovery ensues.

In every case of facial paralysis, the site of the lesion should be discovered; this is often obvious from the history of middle-ear disease or operation. In other cases, attention to the symptoms given above will lead to diagnosis of the seat of the lesion. The degree of the injury sustained by the nerve must next be ascertained, whether complete or incomplete division, by testing the reactions of the affected muscles.

In cases of incomplete division the usual treatment directed towards maintaining the nutrition of the paralyzed muscles must be adopted. When due to middle-ear disease the complete mastoid operation must be carried out; facial paralysis is an indication for this operation. When the reaction of degeneration is present, showing that complete division, either anatomical or physiological, has occurred, the treatment to be adopted depends on the cause. If it follows a radical mastoid operation, the sooner treatment is carried out the better; in cases of Bell's palsy it is justifiable to wait for six months before operating. If the nerve is divided during the course of an operation, primary suture should be carried out; if the ends cannot be brought into apposition, then nerve anastomosis.

In the larger proportion of the cases of facial paralysis submitted to operation, end-to-end union is out of the question, and a neighbouring nerve must be utilized. The nerves that have been used are the spinal accessory or one of its branches, and the hypoglossal; they have been completely divided, and end-to-end union performed with the peripheral end of the facial (nerve crossing), or united to the side of the nerve (anastomosis). The hypoglossal is the nerve of choice; dissociated voluntary movement is restored more quickly after anastomosis to this nerve than when the spinal accessory is used. Nerve anastomosis, and not nerve crossing, should be performed; there is no necessity to sacrifice the hypoglossal nerve: emotional dissociated movement will return without. It is probably better to make an incision into the hypoglossal nerve, and not simply a vertical slit, for return of co-ordinate voluntary movement is more rapid when axis cylinders in the affected nerve are divided. (See *Figs.* 24–27.)

In order to carry out the operation, a long incision should be made extending from the mastoid at the level of the external auditory meatus down to the great cornu of the hyoid. The anterior border of the sternomastoid is pulled back, and the posterior belly of the digastric identified after separation of the parotid. The digastric is then pulled backwards, and if large it may be necessary to divide its upper border. The facial nerve is next identified, this being most easily done by feeling for the styloid process of the mastoid; the nerve passes out immediately in front of this and enters the parotid gland. The nerve is freed, and an attempt is made to pull the stump out of the foramen, in cases in which there is reason to believe that the nerve was divided in the course of an operation on the middle ear. If this cannot be done the nerve is divided in the foramen as high as possible with a tenotomy knife. The hypoglossal must next be identified; the transverse process of the axis is first felt, then the occipital artery is sought, which usually runs upwards and outwards across this process. The internal jugular vein is next found and retracted inwards: this exposes the hypoglossal nerve. With it is running the vagus, but the hypoglossal is easily identified from the course it is taking. It is freed, and brought towards the facial; an oblique cut should be made through about one-third of its trunk and the peripheral end of the facial sutured in with fine catgut. If there is any tension it is better to raise a flap consisting of one-third of the hypoglossal and unite it end to end with the facial. The raw surface and the junction should be surrounded with Cargile membrane. The wound should now be closed, putting in a tube for twenty-four hours if necessary.

The after-treatment must be patiently carried out. The nutrition of the muscles must be kept up by means of massage and the application of a constant current until such time as voluntary power begins to be restored. As soon as power of voluntary movement returns to each group of muscles, they must be exercised systematically until the patient regains complete control.

The prognosis varies with the cause of the paralysis, being better when the division results from injury than when it is the result of neuritis. Suppuration of the operation wound renders success doubtful. If the case is to recover, the first sign usually appears about the third or fourth month, the face while at rest becoming more symmetrical, although there is no return of voluntary power. Within a few weeks it is noticed that the angle of the mouth can be moved, at first only with movements of the tongue; then the muscles of the upper lip, and finally those of the forehead. With exercise, the movements become dissociated, and finally emotional movement returns.

For a few weeks after operation, the side of the tongue supplied by the hypoglossal nerve which was used, is paralyzed, causing difficulty in speech and deglutition; this passes off in a few weeks, but the affected side of the tongue remains smaller for a considerable time.

The Fifth Nerve.—Injuries of this nerve or of its branches are rare. It has been injured in fractures and as the result of penetrating wounds, and involved in or pressed upon by growths. It is chiefly of importance in connection with trigeminal neuralgia, for which many operations have been devised.

Lingual Nerve.—It is occasionally necessary to resect a portion of this nerve for neuralgia involving the tongue, or for the relief of pain in inoperable carcinoma.

The nerve should be exposed through a trephine opening in the ascending ramus of the lower jaw, the centre of the opening being at the meeting of a line drawn backwards from the alveolar margin with one drawn vertically upwards from the angle of the jaw. The nerve will be found lying in front of the inferior dental nerve ; about an inch should be resected.

Division of the nerve through the mouth should be avoided ; it is uncertain, and the wound is liable to become infected.

Cervical Sympathetic.—The sympathetic cord in the neck may be injured as the result of penetrating wounds, surgically or accidentally inflicted. It may be pressed upon or involved in tumours of various kinds, or its white rami communicantes injured as they pass out in the first and second dorsal roots. (See BRACHIAL PLEXUS, *supra*.)

Section of the sympathetic in the neck produces slight enophthalmos and pseudo-ptosis (the upper lid droops but can be elevated voluntarily). The pupil is smaller than on the sound side, and does not dilate when shaded, or in response to cocaine or to pinching the side of the neck (ciliospinal reflex). The affected side of the face does not flush or sweat. Stimulation of the cervical sympathetic is sometimes observed as the result of the pressure of tumours or the traction of adhesions. It results in exophthalmos, widening of the palpebral fissure, and dilatation of the pupil.

The cord and ganglia may be removed through an incision along the posterior border of the sternomastoid. The carotid sheath and its contents are exposed and drawn forwards and inwards, and the sympathetic found behind it.

Resection in whole or in part has been performed with results that are open to question in cases of idiopathic epilepsy, glaucoma (here the results are more encouraging), Graves' disease, and epileptiform neuralgia. The surgery of the sympathetic is still in the experimental stage.

Spinal Accessory Nerve.—The external or spinal portion of this nerve is not infrequently divided during the course of operations upon the neck, particularly during the removal of tuberculous glands. It must not be forgotten that the spinal portion of the nerve may be involved in the vertebral canal. It supplies the sternomastoid, together with branches of the second and third cervical nerves and the trapezius, with the aid of fibres from the third and fourth cervical nerves.

Many of the cases of accidental section, particularly those due to extensive operations upon tuberculous glands, affect the branches of the cervical nerves to the trapezius at the same time, producing its complete paralysis.

On looking at a patient with paralysis of the trapezius, the point of the shoulder is seen to be dropped and rolled forward ; the whole scapula is further from the mid-line than on the sound side, and its lower angle is nearer the mid-line than its upper one. In addition, the lower border of the rhomboideus major is seen standing out prominently, coursing downwards and outwards. The patient is unable to abduct the arm to more than a right angle ; there is slight winging of the scapula, which becomes more marked when attempts are made to push in front below the level of the shoulder, and this movement is weak. Complaint is made that the whole upper limb feels weak.

The extent of supply of the spinal accessory and the cervical nerves to the trapezius varies; as a rule the upper trapezius is paralyzed by division of the spinal accessory alone.

If the nerve be divided during the course of a surgical operation, it should be immediately sutured. The deformity resulting from paralysis of the trapezius is marked, and an attempt should be made in every case to deal with it by operation. The spinal accessory nerve should be exposed through an incision along the anterior border of the sternomastoid, and an attempt made to perform secondary suture. If it is impossible to bring the ends into contact or to find the upper end, the peripheral end should be anastomosed to the anterior primary division of the third or fourth cervical nerve. When the cervical branches are divided in addition, an attempt must be made to obtain the nerve supply again from the third and fourth cervical by suture or anastomosis.

To expose the spinal accessory nerve, an incision is made along the anterior border of the sternomastoid with its centre opposite the angle of the jaw. The border of the muscle is defined and pulled outwards, and the nerve is often seen entering it. If this fails to bring it into view, dissection at the posterior border of the digastric, remembering the direction of the nerve, will expose it as it passes out from under the muscle. (See also BIRTH PALSY; FACIAL SPASM; NEURALGIA; NEURALGIA, EPILEPTIFORM; NEUROMATA; PALSIES, CEREBRAL, OF CHILDHOOD; WRY NECK.)

James Sherren.

NEURALGIA.—The commonest manifestation is that which occurs in the distribution of the trigeminal nerve from dental irritation, the pain being referred to any of the three divisions of the fifth nerve. Other forms of irritation in the distribution of the sensory division of the fifth will give rise to neuralgia, as for instance irritation about the nose, pharynx, eyes, and ears, and exposure to cold and injury. Brachial and intercostal neuralgia are also relatively common manifestations of the disease.

Neuralgia may be due to rheumatic, gouty, diabetic, malarial, and syphilitic conditions. Anæmia—by whatever cause produced—will often provoke an attack. The successful treatment depends on finding the source of the peripheral irritation, which is by no means always in close relation to the seat of the pain. In neuralgia of the face, the teeth have to be carefully examined, not only for caries, but also for other abnormalities of the roots and gums. The possibility of an impacted wisdom tooth must always be borne in mind. The eyes have to be carefully examined, not only for the more marked degrees of errors of refraction, but also for the lesser degrees of hypermetropia, which readily escape observation. Other more obvious conditions of the eye, such as iritis and glaucoma, may be the cause of "neuralgia."

Suppuration in the antrum and sinuses also gives rise to neuralgia; or again, it may be the earliest symptom of intracranial disease and of tumours, syphilitic or otherwise, situated at the base of the brain. Brachial neuralgia may be due to the presence of a cervical rib. In many cases, however, after the most careful examination, no cause can be ascertained; such cases need symptomatic treatment.

The treatment of neuralgia may be dealt with under two heads: (A) *Local Treatment;* (B) *General Treatment.* Under the former, the application of heat and cold, the local application of drugs, counter-irritants, electricity, hypodermic injection of drugs, and surgical treatment, will be considered. Under the latter, the administration of drugs, diet, massage, and change of climate.

A.—**Local Treatment.**

1. *The Application of Heat* over the affected nerve, or the "tender point," will often afford considerable relief. The application of heat by

means of a hot-water bottle is simple and often effective. The heat produced by the electric current in an electrotherm is easy of application, and the temperature can be regulated and maintained at a constant for any length of time desired. After removal of the hot application the part should be covered with dry wool.

Cases of brachial neuralgia are best treated by a hot-air bath in which the required temperature is attained by means of the electric current—a temperature of 300° to 400° F. may be used. After the bath, the arm should be carefully and firmly bound up in a flannel bandage, and kept at absolute rest by means of a sling. Cold may be applied by means of an ice-bag, or by the spray of ether or ethyl chloride ; but is seldom so serviceable as heat in the relief of neuralgia.

2. *Local Application of Drugs.*—Drugs may be applied locally, either on account of their sedative action, or to act as counter-irritants. Under the former category would come such remedies as belladonna, aconite, and opium, whilst under the latter may be mentioned turpentine, mustard, chloroform, camphor, iodine, mesotan. Mesotan should be diluted with equal parts of olive oil and painted over the affected part, but should not be rubbed in, as in certain individuals it gives rise to considerable irritation of the skin.

3. *Counter-Irritants.*—The application of two or more leeches is a most valuable remedy in acute attacks of neuralgia, but is of less service when the symptoms recur with comparative frequency. In these cases a blister is more useful ; such may be produced by the application of the ordinary liq. epispasticus or collodium vesicans, or by the application of the actual cautery. For intercostal neuralgia the cautery is to be preferred, two small strokes being made on one or other side of the spine, and the application repeated on a fresh place every other day.

4. *Electricity.*—Faradism, galvanism, high frequency, and the vibration produced by the rapid revolution of a small motor have all had an extended trial. In individual cases some success has been attained by the use of the galvanic current. The positive pole should be applied to the tender spot, and a weak current from 2 to 5 milliampères allowed to pass for five to ten minutes. This should be repeated every day for fourteen days at least. In the case of brachial neuralgia, the current may be used in a bath.

5. *Hypodermic Injection of Drugs.* — The local hypodermic injection of drugs has been used in some cases. Cocaine in doses of $\frac{1}{8}$ to $\frac{1}{4}$ gr. may be of some service, but seldom gives the marked relief afforded by injections of morphia. On the other hand, the probability of producing a morphia or cocaine habit is equally great with either drug, and this should be borne in mind when recommending this form of treatment.

6. *Surgical Treatment.*—Nerve section or stretching may afford temporary or permanent relief when the pain lies within the territory of the branch of one nerve. In severe trigeminal neuralgia the removal of the Gasserian ganglion affords relief in cases in which all other remedies, medical or surgical, have failed. In brachial and intercostal neuralgia the division of the posterior root, or excision of the posterior root ganglion, may afford relief.

B.—**General Treatment.**

1. *Drugs.*—Many of the milder forms of neuralgia yield to simple medical treatment. The administration of iron, arsenic, strychnine, quinine, and cod-liver oil, by improving the general health, cure the anæmia and remove the neuralgia. In other cases, sodium salicylate, salicin, and aspirin, in 5- to 10-gr. doses given three times a day, are of service. For the immediate relief of the more severe paroxysms, phenacetin, phenozone, acetanilide, butyl-chloral may be given.

Other drugs, such as caffeine, aluminium chloride, belladonna, valerian, and

phosphorus should also be given a trial. Gelsemium, in doses of 10 to 15 min. given every four hours, is often successful, the quantity being gradually increased until the pain is relieved or toxic symptoms are produced.

2. *Diet.*—This should be carefully attended to, but no one form is applicable in all cases. In patients who are thin and pale a generous diet may be advised, milk, cream, and butter being important elements. In those who show a tendency to gout or rheumatism, a modified diet suitable for such conditions should be ordered. With the object of improving the general health, alcohol may be given, but the resort to alcohol for the relief of pain should be carefully guarded against.

3. *Massage.*—Carefully regulated exercises, short of fatigue, in the fresh air are most beneficial, and the health may be greatly improved by general massage. Local massage to the affected part may be used in long-standing cases, but in the acute cases it often increases the pain.

4. *Change of Climate.*—A warm dry climate is most beneficial, and cases which have for a long time hung fire, rapidly improve and get well when placed under such conditions. Various forms of warm, salt, and mud baths may be used.

In short, it may be said that the treatment of neuralgia should be directed (1) To improvement of the general health and removal of any source of possible irritation; and (2) To the relief of pain by the application of heat, counter-irritants, electricity, drugs (locally or by hypodermic injection), and failing a successful result from these remedies, the adoption of surgical measures. (See also ELECTROTHERAPEUTICS.) *F. E. Batten.*

NEURALGIA, EPILEPTIFORM (Tic Douloureux, Major Neuralgia).—This disease must be separated from the minor neuralgias so common in the face, and relegated to a place by itself. It is a disease which attacks adults and appears without apparent cause. The sufferers are, as a rule, in perfect health, and are not the subjects of neurotic inheritance. The disease usually manifests itself in the distribution of the second or third divisions of the nerve; the first, so frequently affected in minor neuralgias, usually escapes or is involved late in the disease. The attacks of pain are paroxysmal, and occur at first at long intervals, but the severity of the pain tends to increase and the intervals between the attacks to diminish. The pain tends to spread in a definite order, branch after branch becoming involved in a regular march. As time goes on the paroxysms of pain are excited by any stimulus, so that eating, speaking, or a loud noise may be sufficient to start an attack. As a rule, before the patient comes under the care of the surgeon, teeth will have been extracted, and all drugs, except perhaps morphia, employed; the latter is the only means of combating the pain, short of surgical measures. The severity of the disease is such that suicide or the morphia habit is the end of those patients who are not surgically treated; the disease does not cease spontaneously, and medical treatment is of no avail.

This is the disease to which the following treatment refers. It must be first settled that the case belongs to this group. When the condition has existed for some time there can be no mistake; the appearance of the patient, together with the history, leave no doubt that we are dealing with a case of true trigeminal neuralgia. In the milder instances this may not be so easy; but the onset of the disease without apparent cause, the absence of anæsthesia such as is met with in cases in which the nerve is pressed upon by growth, and the absence of all exciting causes in the teeth, jaws, and sinuses, should lead to the correct diagnosis.

TREATMENT.—While we are still unacquainted with the cause of this complaint, the best form of treatment is a matter for discussion. All the evidence at our

disposal seems to point to the disease being situated, at first at any rate, distal to the ganglion. No definite pathological changes can be demonstrated in the Gasserian ganglion in early cases uncomplicated by previous peripheral neurectomies. Extracranial section of the affected nerves abolishes the pain for a time, depending upon the amount of nerve removed and the distance from the periphery of the point of section. Pointing to the same conclusion is the fact recorded by Cushing that peripheral neurectomies are of no value in post-herpetic neuralgia, a disease which the researches of Head and Campbell have shown to be due to changes in the ganglion of the posterior root.

The problem of treatment resolves itself in early cases into the best means for preventing the passage of afferent impulses from the territory supplied by the branches involved.

When the disease has been present for some time, and has spread from one branch to another, operation intracranially is necessary. The question is more difficult in cases in which the disease is limited to one branch, for instance the second division of the nerve or the infra-orbital branches, for it is impossible to be certain, in any peripheral operation, if the whole of the diseased portion has been removed. Sir Victor Horsley has pointed out that in some patients the pain recurs, although there is no regeneration of the divided nerve, due, in his opinion, to the continuance of changes in the stump left.

In early cases in which one branch only is involved, it might be advisable to inject alcohol into the trunk of the nerve at its foramen of exit, but the relief given by this method is likely to be fugitive.

Mr. Hutchinson has laid down rules which are an advance upon the usual teaching and simplify the operative surgery of the fifth nerve. He recommends resection of the infra-orbital nerve, if the neuralgia is limited to that nerve, by following it back in its canal in the floor of the orbit. If the palatine branches are also affected, intracranial resection of the superior maxillary trunk should be carried out. If the inferior dental nerve be affected, resection should be performed through a trephine opening in the lower jaw. If the whole of the inferior division of the nerve be affected, intracranial resection of the trunk and adjacent part of the ganglion should be carried out; in all other cases removal of the two lower divisions, together with the corresponding part of the ganglion. With these forms of operative treatment I am in agreement, but in the case of intracranial resection of the second division of the nerve, rubber tissue should be interposed at the foramen rotundum, as recommended by Abbé, to prevent reunion. Removal of the whole ganglion is unnecessary unless all the branches are involved. In resection of the lower part of the ganglion only, there is less shock, injury to the cavernous sinus and the nerves in its wall is avoided, and corneal complications need not be feared. Theoretically, section of the sensory root posterior to the ganglion is the ideal operation. It may be possible to spare the motor root or, if it is divided, regeneration is possible, as it has the structure of a peripheral nerve.

With regard to the best route through which to perform the intracranial operation, considerable difference of opinion exists. Practically all operators are agreed that the temporal route is the best, but are by no means unanimous which one. Cushing's direct temporal, infra-arterial method, with removal of the zygoma, gives the most direct access with least disturbance of the parts.

The results of removal of the Gasserian ganglion are good; recurrence does not take place. With regard to the removal of the lower two-thirds, no recurrence occurred in Mr. Hutchinson's series of cases, two of which were watched for seven and seven and a half years. The mortality in skilled hands is extremely small, and will compare favourably with any major operation.

Out of 120 cases Sir Victor Horsley only lost 6, and of these 2 cannot be ascribed to the operation.

Other and less radical methods have been advised and practised from time to time, and good results published. Relief has been afforded by deeply injecting 80 per cent alcohol mixed with $\frac{1}{6}$ gr. stovaine into the foramina of exit of the affected branches. This is a method well worthy of trial in cases of neuralgia before proceeding to more radical methods. Bardenheuer considers the cause of trigeminal neuralgia a hyperæmia of the nerve which may be caused by peripheral local or by general causes. This venous hyperæmia extends upwards, and at length reaches the bony foramen of exit of the affected branch. This leads to œdema, perineuritis, or adhesions to the wall of the canal, and the onset of the symptoms. On this hypothesis he has treated cases by chiselling away the outer wall of the canal, removing the nerve from it, and embedding it in soft tissues. He has watched one case so treated for fourteen months without recurrence. The operation is one that cannot now be recommended; the operative procedure is far more difficult than those mentioned earlier, and the result is problematical. Considering the disease to be of vascular origin, the superior cervical ganglion of the sympathetic has been resected, with, it is said, favourable results. (See also NERVES, PERIPHERAL.)

James Sherren.

NEURASTHENIA.

This is one of the affections of the nervous system in which no structural changes in the nerve elements have been discovered to account for the symptoms complained of. The malady is accordingly classed among the functional affections of the nervous system, but as this often conveys to the lay mind the idea that there is nothing the matter, and that all the symptoms of which such patients complain are imaginary, it is well that so erroneous an impression should be removed.

Neurasthenia is as truly a disease as is locomotor ataxy or any other organic affection, the only difference being that in the latter maladies pathological investigation has permitted us to determine certain structural changes in the nervous system, whereas in neurasthenia we are still without the means of detecting changes, which are probably too minute to allow of their being revealed by any of the methods at present in use.

In a large number of people who fall victims to neurasthenia, it is clear that a congenital weakness of the neurons of which their nervous systems are composed is the primary and essential cause of their illness; but in many cases some added factor, such as undue strain, to which the nervous system has been subjected, seems necessary to produce the exhaustion which is responsible for the symptoms. In some patients no such exciting causes can be determined, and in spite of the most favourable conditions of life the symptoms of neurasthenia appear, and make the patient unaccountably miserable. Where exciting causes can be discovered, they are commonly such as hundreds of other people are similarly exposed to without injurious effects, which makes it clear that there must be some inherent weakness in these patients, which permits of the harmful effects which result in them.

In other cases, however, it is abundantly evident that the patient has made calls on the endurance of the nervous system beyond anything that could reasonably be expected not to result in harm, so that even the most robust neurons might naturally be expected to give way under the excessive strain. Even under these circumstances, however, many other people, equally foolish in the way in which they squander their nerve energy, yet enjoy immunity from neurasthenia.

Physical strain rarely produces the condition, and even mental overwork would not claim as many victims as it does, were it not that, intimately connected with and inseparable from the overwork, are mental anxiety and worry. These last are the most potent causes of neurasthenia. Prolonged grief or sudden shock act in a similar way, and it is the mental shock that accompanies a physical injury which gives rise to the train of symptoms forming the clinical picture of traumatic neurasthenia. The physical injury may be trivial, or altogether absent, after an accident, and yet the symptoms of neurasthenia arise. Indeed, those with the most serious physical injuries often escape from the subsequent development of nervous exhaustion—a fact that suggests the probability that their consciousness was so blunted by the original injury as to allow the accident to have little or no mental effect on them—whereas those who escape such serious physical injuries are in possession of all their faculties, and thus painfully alive to the horrors of the situation, which cause great shock to the nervous system.

It cannot be too strongly insisted upon that, before a patient is treated for what

appears to be simple neurasthenia, the greatest care should be exercised in excluding the possibility that some organic disease underlies the condition. Not only must organic diseases of the nervous system be carefully sought for and excluded, but organic disease of other organs may also account for the symptoms which are so commonly met with as a result of uncomplicated nervous exhaustion.

A large number of patients suffering from neurasthenia are strongly convinced that their condition is unique, and that no one else has ever had to consult a doctor for symptoms of a similar kind. Moreover, they are so impressed with the intricate nature of their case that they wish to enter into most minute details in regard to their various complaints. This state of things makes a severe call on the patience of the medical man, but nevertheless, if he wishes to be successful in his treatment he must conceal any anxiety he may feel in regard to the possible length of the interview. The patient cannot believe that a doctor who is hurried in dealing with his case can possibly master the intricate details; he thus loses all confidence in him, and, without this, treatment must fail. It is better to interrupt the interview, and make another appointment for a day when more time can be given to the very careful consideration of the case, than to show any signs of hurry or desire to cut short the consultation. Although it is a mistake to appear hurried, and it is best to listen with patience and attention to the history, it is often wise to interpose a well-directed question now and then, or to suggest a few of the symptoms in a way that makes the patient feel that the person who is being consulted has grasped the nature of the case, and is familiar with many of the features of the illness. The patient is thus inspired with the necessary confidence. To ignore the symptoms, to treat them lightly, or in an off-hand manner, or perhaps even jokingly to try to belittle them, is worse than useless. The proper course is to assure the patient that you fully appreciate the severity of his sufferings, but that you are equally certain they do not depend on any organic disease of the nervous system. The fears these patients usually harbour are, that they are going to die; to lose their reason; that a tumour is forming in the brain; or that they are liable to a stroke of paralysis. They must be reassured as much as possible, and told that none of these things is in the least likely to happen, but that their symptoms are due to an exhausted condition of the nervous system, a state of things from which they can and will make a satisfactory recovery, although the illness may be tedious, and convalescence prolonged.

In the treatment of every case of neurasthenia it is of importance that the cause should be diligently searched for and corrected; but intimately connected with this question is the need for exercising prophylactic measures when there is reason to suspect a congenital weakness of the nervous system, owing to known hereditary influences, for which neurasthenia itself, or some allied neurosis, may be responsible. Such individuals must, of course, be protected as far as possible from the prejudicial influences which are known to beget neurasthenia, but in spite of every precaution, they may inevitably drift into this unfortunate state of ill health from no fault of their own.

In searching for causes of this affection, and in attempting to correct them, some discrimination must be exercised, or more harm than good may result. It would be obviously harmful and cruel to tell the unfortunate City clerk that he must stop all work for a long period, and go away for rest and change, when he has a wife and family to be supported on a salary so slender that monetary anxiety has already had much to do with producing his unfortunate illness. The knowledge that it is impossible for him to do what is essential to get well plunges him into greater despair, and aggravates his condition. Far more good will be done in such a case by trying to so arrange matters as to permit him to continue his work, and yet take steps to improve his health.

It is not only by medicines that such patients can be helped. Much can be done in teaching them how to utilize their leisure to the best advantage for the improvement of their health. Some exercise is of course necessary; but where there are symptoms of physical exhaustion, it is best to be content with light dumb-bells, or the use of a Whiteley's or Sandow's exerciser in the morning before dressing, rather than that they should walk part of the way to and from business, and wander about the streets during a portion of the time that they have for their mid-day meal. When this is feasible, the outside of a bus is the best way in which they can travel to and from their work, and such time as is

not required for actual eating should be spent in resting rather than in roaming the city streets. On reaching home at night, the patient should go to his bedroom and lie down quietly for an hour before the evening meal, provided he does not return from the City too late to permit of this. In the summer, the rest may be taken in the open air, if the conditions are such as to make a real rest possible in this way. Saturday afternoons and Sundays are best spent quietly in the country or by the sea, when either is possible without entailing great physical labour or financial strain. For those who have the opportunity and can afford it, golf is much the best form of exercise in the open air, as the amount can be regulated not to cause undue physical fatigue, and the game demands an amount of attention that is well calculated to take the patient's thoughts away from his anxieties and worries, and prevent him from analysing his symptoms. Gardening and other out-door pursuits are advantageous; but long walks for walking's sake, similar bicycle rides, and long tiring days on the river, do no good. Lawn tennis, although an excellent form of exercise, is too severe for patients in whom the symptoms of physical exhaustion are prominent, and the strain put upon the heart in cases of the kind may do serious harm. But when the mental symptoms are chiefly in evidence, and the physical state presents little that is amiss, lawn tennis, rowing, and other forms of active exercise may be indulged in with advantage.

These patients must be strongly advised to give up all philanthropic and other work, apart from the business upon which they have to depend for their livelihood. They must also be encouraged to make a supreme effort to finish all they have to do while at work, and neither to allow arrears to accumulate, nor to take work home with them with a view to its being done in the evenings, or on Sundays. It is similarly important that they should not attempt any study in the evenings with a view to making themselves more proficient at their work. All reading at home should be, as far as possible, for recreation and amusement. While light literature of the right kind has the advantage of abstracting the mind from self, it is important that it should not be of an exciting character too near to bedtime, as this is calculated to interfere with sleep, which these patients oftentimes find difficult to secure. For the same reason, exciting games in the evening are best avoided.

The wife of the man who is unable to afford to send her away from home for the rest and change, or other treatment, that she may require, can be similarly assisted to make her life more endurable, even if she cannot be cured, by the half measures that may be possible to her. How much of the following she can carry out, depends on the number of children she has to care for, and on what help she can get from relatives and friends.

If possible, she should remain in bed for breakfast, and so order her day's duties as to allow of her getting out for fresh air some time in the morning, and again in the afternoon. She should lie down in her bedroom for an hour before her mid-day and evening meals, and should rest in the semi-recumbent posture, on a sofa or in a comfortable chair, for half an hour to an hour after the mid-day meal. When the rests before the meals are impossible, an attempt should be made to obtain a longer rest in the bedroom in the afternoon.

Where the patient's circumstances will permit of it, complete rest from all work is an important factor in the treatment of a large number of cases of neurasthenia. How the leisure is to be spent, and what special form of treatment is likely to do most good, varies in different cases, but in a large number the best results are obtained by a course of Weir-Mitchell treatment, otherwise known as the "rest cure." Experience has proved that this treatment can rarely be conducted with advantage in the patient's own house, and it is most important that the details should be thoroughly understood in the nursing home that is

selected, it success is to attend its use. The treatment can be as well conducted in a good nursing home in a town as in one in the country, and infinitely better than in many of the indifferent homes that exist in country places. Quiet is, however, an essential in many cases, especially when there is much nervous irritability, hyperacuity of hearing, headache, or insomnia. A home where no surgical cases are received is best, but the treatment can be satisfactorily conducted in a surgical home, provided the patient can be placed in a room where the sounds of preparation for operation and the odour of anæsthetics cannot reach them ; and provided also, that the nurses be properly trained to keep silent tongues, and to avoid giving the patient news of what is going on in the house.

Important as it is to select a good home, it is still more so to secure that the nurses in charge should be thoroughly competent to deal with such patients. This experience can only be gained by previous training with similar cases.

The patient should be completely isolated from all outside influences, and left entirely to the care of the nurses. No visitors must be allowed, and no letters received or written by the patient. Such restrictions prove vexatious to many patients because the reasons for them have not been adequately explained. Above all things, it must be made quite clear that the treatment is not recommended because of any idea that the condition is hysterical, or that any of the symptoms are due to fancy. It must be pointed out that the object of the various restrictions is to endeavour to obtain the maximum amount of physical and mental rest possible, and that without them it is impossible to prevent accidental outside influences operating prejudicially during the treatment. Moreover, patients must be made to understand that they are not prisoners, but free agents, and that they can interrupt the treatment whenever they think fit, if they feel unable to tolerate the restrictions it imposes. Another point about which there must be no ambiguity is, that a compact has been formed between them and their medical adviser, in which they undertake to do all in their power to co-operate with him in his endeavours to help them, while he on his part undertakes not to keep any important information from them, the ultimate knowledge of which might reasonably be expected to undo any good that may have resulted from treatment. Thus, the husband must be assured that any serious illness of his wife, or of one of the children, would mean that his treatment would at once be interrupted, and the news conveyed to him ; while a like assurance must of course be given to a wife. A man of business must similarly be assured that any unforeseen eventuality involving momentous questions on which it is imperative that he should be consulted, would mean that he would be informed of the circumstances, and allowed to discontinue the treatment. In these ways, the patient's mind is set at rest on points that might otherwise prove worrying.

The degree of exhaustion may be such as to make it necessary to enforce absolute rest in bed during the whole of the twenty-four hours, except perhaps when the bed is being made at night or in the morning. It is, however, not often necessary to insist on such absolute rest as to make it inadvisable for the patient to get up to go to stool. In the majority of instances, a commode should be used in the room, and even when the lavatory is so conveniently situated that the patient can be allowed to go there, it is best for a commode to be used, so as to allow the nurses and medical man to examine the stools. In less severe cases, and towards the end of a course of treatment, patients who have been kept absolutely in bed at first, may be permitted to sit up at a table for the mid-day and evening meals. Later still, before leaving the home, the patient may go for drives in the afternoon, but must return to bed or lie on a comfortable sofa for a long rest, on coming in. It may often be advisable to

allow the patient to have a short walk in a park before driving home, but no shopping must be permitted, and crowded and busy thoroughfares should, as far as possible, be avoided during the drive.

In severe cases, the patient must be content to do nothing, and it may not even be advisable to allow the nurse to read to him, in which case the less talking that goes on between them the better. It does not frequently happen that such rigid rules are necessary, so that the nurse may read to the patient from time to time, and in a good many cases the patient may be allowed to look at picture papers, and read a little, provided light literature is selected. Nothing requiring any mental effort should be allowed, and as to whether the daily paper is permitted or not, must largely depend on whether news of a character that is likely to be disturbing to the mental repose of the patient is to be expected from this source. It is usually best not to allow the daily paper in the case of business men, and even when allowed, the page which deals with stocks and shares should be first extracted, an essential when the patient is connected with the Stock Exchange, as so often happens. Exciting literature must also be forbidden. Many novels and other works of fiction are unsuitable for such patients. Writing must not be permitted, but some patients who sketch or paint may be allowed to indulge in these pastimes in moderation. Any serious work of the kind cannot, however, be allowed, and the artist who depends on his pencil or brush for a livelihood must of course be advised not to attempt any pictures or studies of these during the cure. Fine needlework, or any form of work that requires close application, should be avoided, but netting, knitting, and any form of coarse fancywork, may be permitted in moderation. Games of all kinds must be very carefully regulated when the patient is well enough to be allowed to indulge in these, as the element of excitement, which is inseparable from most games, is harmful. Even patience, which is so commonly allowed, is not without its drawbacks, so that the patient must be enjoined not to try to worry out complex problems, but to be content with the simplest examples of the game, and always to desist if the slightest feelings of mental effort are induced. Much discretion is needed in deciding how much or how little patients may be allowed to attempt, but it must be remembered that when they are intensely bored by doing nothing, or get into a state of restlessness and irritability, more harm may be done by too many restrictions than if a few concessions are judiciously granted.

Diet is a very important item, and requires great care if harm rather than good is not to be the outcome of the attempts to improve the patient's nutrition. A great many people suffering from neurasthenia have lost weight, and one of the essentials in the treatment is to restore this. But no greater mistake can be made than that of indiscriminately pouring large quantities of milk into such patients, and otherwise attempting to improve their nutrition by a process of stuffing without any regard to the state of their digestive tract, and their powers of assimilating the large amount of nutriment with which they are being crammed. When milk is well borne, no better article of diet can be found, and the best plan is to begin by placing the patient on milk alone for twenty-four or forty-eight hours. Commencing at 8 a.m. and continuing until 10 p.m., a glass containing five ounces of milk should be given every two hours, and a rusk may be allowed with every other glass. On each successive day, one ounce of milk must be added to each glass until the patient is taking ten ounces every two hours, in addition to three good meals daily. The milk may be diluted if necessary, when barley-, lime-, or ordinary water may be used. Even soda-water may be allowed, but is best avoided, as the effervescing waters are calculated to increase flatulence, which is often troublesome enough without this. Solid food should be commenced at the end of the first twenty-four or forty-eight hours, and the meals should be small and light at first, and gradually increased

day by day until the patient is taking three good meals in addition to the milk. All made-up dishes and indigestible foods must be avoided, and the chief meat meal should be taken in the middle of the day, when some form of butcher's meat, such as steak, chop, or a cut from the joint, should be given, unless there are any reasons against this. The evening meal should be light, and should consist of fish, poultry, or any form of game that is not too rich or indigestible. A milk pudding of some kind should be given at one of the meals, and stewed fruit and cream at the other; and unless there are indications to the contrary, uncooked fruit may be taken, and is especially to be recommended at breakfast. Constipation is often troublesome, which the fruit proves helpful in counteracting, and thus lessens the need for aperients.

No alcohol is usually required. Indeed, it is often contra-indicated, as the patient has been relying on alcohol to increase his energy, to remove the mental depression, and oftentimes as a substitute for food, for which there has been no appetite. Even tea and coffee are best avoided, except that a small cup of black coffee often proves helpful when given in the early morning. Coffee after dinner must be strictly forbidden, and afternoon tea is best avoided.

The times for giving the milk should, if possible, be arranged so that part is taken with the three meals. Indeed, it often happens that a patient who is unable to take ten ounces of milk every two hours is nevertheless able to drink the same total amount by taking more than ten ounces at the meals, notably at breakfast, when as much as a pint may sometimes be comfortably dealt with. Plasmon may be added to the milk, and when milk is badly borne, Benger's food, sanatogen, plasmon cocoa, or some form of meat extract may be substituted between meals. In any case, ten ounces of raw meat-juice may be given with advantage twice a day, as a substitute for two of the glasses of milk.

The fewer drugs that are given during the course of Weir-Mitchell treatment the better. The bowels must, however, be carefully regulated by cascara, aloin pills, or a saline in the early morning. In any case it is well to commence the treatment by a dose of 2 or 3 gr. of calomel, or blue pill, followed by a saline, and this should be repeated about once a week. It is also usually best to prescribe a simple alkaline mixture before meals, to prevent the stomach from becoming rebellious, in which case the following will be found most effective :—

℞	Acid. Hydrocyan. dil.	℥iij	Tinct. Card. Co.	℥xx
	Sodæ Bicarb.		Aq. Chlorof. or Infus. Gent.	
	Sodæ Sulpho. Carbol.	āā gr. xv	Co.	ℨj

Three times a day twenty minutes before meals.

When the patient's condition calls for a little bromide, 10 to 15 gr. of the sodium salt may with advantage be substituted for the sulpho-carbolate of soda.

Insomnia is often a distressing symptom in neurasthenia, but should, as far as possible, be counteracted by massage and measures other than the administration of drugs. When, however, all other means fail, and it becomes imperative to have recourse to drugs, veronal (5 to 15 gr.) or trional (10 to 20 gr.) usually proves the best hypnotic in these cases, and it rarely happens that these drugs fail to effect what any drug other than morphia can; morphia should be avoided at all costs in the treatment of neurasthenia, for the danger of the morphia habit being acquired is much too great.

Massage is an essential in the treatment. The nurse on day duty may be a masseuse, and may carry out this treatment in the case of female patients, but even with them, it often happens that it is better to introduce another masseuse, who comes to the patient twice a day. This makes a pleasing break in the monotony of the day; but individual cases must be treated on their own merits, and in any the masseuse must be carefully selected, and must clearly understand

that she is not to be the bearer of news which could not otherwise reach the patient. In the case of male patients it is always well to introduce a masseur in this way, with the same injunctions.

It is well to arrange for the patient to be massaged between breakfast and lunch, and at some time in the afternoon, except when insomnia is troublesome: the massage may then be better given in the evening instead of in the afternoon. The former plan has the great advantage of dividing up the day for the patient, and thus helping to pass the time. The massage, however, must not be given too soon after a meal, and at least an hour should elapse, after the treatment, before the next meal is taken. Ten or eleven in the morning, and four or five in the afternoon, are good hours for this treatment. It is usually possible to commence by giving massage for half an hour twice a day, but this may be too much in cases of extreme nervous exhaustion, when it may be only possible for the treatment to be given once a day. The amount is gradually increased, so that, as a rule, in favourable cases it occupies an hour twice a day, by the end of the first week. During the second week, passive movements may be added, and by the third or fourth week, resistance movements may be commenced, assuming that the patient's condition is such that a course of six weeks' treatment is all that is needed. In more severe cases this may be too soon for the resistance exercises to be commenced, and indeed in some this part of the treatment has to be omitted altogether.

In some patients general faradism may be added with advantage during the third week of treatment, when the interrupted current should be substituted for half an hour's massage in the morning, and the electrical treatment should be immediately followed by the massage, so that any chilling effect from the exposure during the electrical treatment may be counteracted. In many cases, however, electricity in any form proves too stimulating, and is best avoided, as far more good is derived from the massage alone than when it is combined with electricity.

After the treatment the patient should be left wrapped in the blankets in which the massage has been carried out, and should be encouraged to sleep. The room must be darkened, and whether sleep is obtained or not, the patient must lie quietly resting for at least an hour after the treatment, during which time no talking, reading, or any other form of occupation is to be permitted.

Towards the end of the course of Weir-Mitchell treatment, when the patient is being allowed to go out for drives, massage should only be given for an hour every morning, and if electrical treatment has been hitherto carried out, it should now be omitted. It sometimes happens that it is desirable to have the patient massaged for half an hour in the evening instead of in the afternoon, but in no case should the afternoon massage be continued after the patient has begun to go out, although a little massage to the head and spine may be permitted at bedtime, if required, as an aid to secure sleep.

After a course of treatment of this kind, the patient should be sent to the seaside or to some bracing inland place for a few weeks; in some cases a more prolonged rest is needed, when one of the health resorts in Switzerland, or a sea voyage, is to be recommended, and if the degree of nervous exhaustion be but slight, this indeed may be all that is needed. As a rule, however, patients who are ill enough to require a sea voyage or a long rest at a mountain resort, do best if they commence their cure by a course of Weir-Mitchell treatment.

In sending patients to the mountain cures, due regard must be paid to the state of the heart, and as to whether insomnia is a notable symptom. Neurasthenics with weak irritable hearts do badly at high altitudes, and insomnia is aggravated under like conditions; so that, whereas St. Moritz, Mürren, and Caux are excellent places for many patients, the altitudes are too great for others, who do infinitely better at places like Montreux and Territet.

When the patient is well enough, the out-door pastimes of skating, tobogganing, etc., should be indulged in, but care should be taken not to overdo these, as it is essential that all exercise should be indulged to a point short of undue fatigue.

Other health resorts to be recommended are places like Pau and Biarritz, but in most cases the patients must be under conditions that permit of their seeing all that is going on around them without its being necessary for them to take too active a part in the life and amusements, as this may be too fatiguing for them. Golf is the best outdoor exercise for patients at both these places.

When too ill to tolerate the active life going on at resorts like the foregoing, then Argelès and St. Jean de Luz supply the conditions of restful repose that many of these people need.

Others, not ill enough to make a "rest cure" necessary, do well under a course of hydropathic treatment. On the season of the year must largely depend which establishment is selected for the cure, but it is as a rule best to avoid a hydropathic during the usual holiday season in the summer, as these places are then much too crowded to secure for the patients the restful conditions that are so necessary if the hydropathic measures are to succeed.

Baths of various kinds do good, notably electric baths and the needle bath, while the alternate hot and cold douche to the spine is especially efficacious in many cases. When baths and douching prove too exhausting, wet packs often do good, and in any case packs for the liver are especially advantageous when it and other organs of digestion are in a torpid state, as so often happens. Hydropathic measures may with advantage be followed by ordinary rubbing, or skilled massage.

Irrespective of the particular form of treatment, it is essential that the patient should be made to rest in the recumbent posture for at least an hour after it. Without this rest, the treatment aggravates rather than ameliorates the condition of many patients.

In like manner, treatment at many spas proves advantageous to certain people suffering from neurasthenia, and a case eminently unsuited to the Weir-Mitchell treatment may do well at Karlsbad, Marienbad, or other similar places. Many neurasthenics require treatment that is directed towards aiding in the elimination of deleterious products from the system, rather than rest in bed and overfeeding. Indeed, overfeeding, excess in alcohol, and want of exercise, have much to do with the neurasthenic state into which many such patients have fallen. Homburg will do far more for such a case than the most carefully conducted "rest cure." Care is, however, required not to deplete these patients too energetically and rapidly. Due regard should be paid to the fact that the element of nerve fatigue has to be contended with as well as the effects of effete products, which are acting harmfully on the system. The Turkish bath is a useful measure in this class of case, and patients who are unable to go to a spa may take one or two Turkish baths a week with advantage. The Russian bath, which may be taken in the patient's own house, is a good substitute, and radiant heat baths of various kinds are of like advantage. In addition to these, light baths have a sedative effect in many cases, but it may not be desirable to continue them to the stage of causing very profuse diaphoresis. The stimulating influence of the carbonic acid baths of Nauheim is most useful, and a cure at this spa is especially to be recommended in cases in which the heart is weak. When a good reaction is obtained after it, a cold bath in the morning is excellent, but in many neurasthenics the circulation is too feeble to permit of this, in which case a tepid bath may be taken, followed by a cold sponge, or spray, down the back. If insomnia is one of the symptoms, a hot bath at night is often most successful. When an ordinary bath of this kind

does not have the desired effect, the patient may be advised to remain immersed in the water for about half an hour, as this plan may succeed when an ordinary bath fails.

Various applications of electricity are recommended in neurasthenia, and do good, notably when combined with other forms of treatment. It is, however, exceptional for electrical treatment to do all that is required unaided. Static electricity and high-frequency currents prove successful in some cases. Usually, however, all that the latter effects is a temporary sense of refreshment and a feeling of well-being, without any permanent good resulting. Faradism, combined with massage, in the Weir-Mitchell treatment, has already been referred to, as have the good effects of the electric bath among hydropathic measures that have been found of service.

The Swedish method of treatment by massage, exercises, and vibration proves beneficial in some cases, as do the mechanical methods of the Zander Institute. But these procedures are apt to prove too fatiguing, except in the slighter cases, or those which have reached a certain stage in their recovery under more restful measures, and who now require some new form of treatment to help them further. Change of method is often essential if the patient is to be helped to get well, so that those who have to deal with neurasthenia cannot have too great a variety at their command when dealing with obstinate cases.

Suggestion plays a large part in the good that is effected in many cases ; so that where one method of treatment fails to impress the patient, another may succeed. Suggestion and hypnotism both find a legitimate place in the cure of neurasthenia, provided they be judiciously employed in suitable cases. In suggestion we have a means of dealing with the fixed ideas and obsessions that haunt many of these unfortunate patients, that cannot be equalled by any other method of treatment, and in hypnotism we have a means that may succeed in procuring sleep when drugs have failed to do so. The latter method cannot be so lightly undertaken without risk of harm as the former ; but even hypnotism, properly conducted, and in suitable cases, has its place among the therapeutic measures that may be employed to relieve such patients of their distressing symptoms.

What has been said in regard to the Weir-Mitchell treatment gives a good idea of what is needed in the dietary of a patient, but it is necessary to refer again to the fact that in many cases the neurasthenia has been largely produced by overeating and excessive indulgence in alcohol. In many patients of this class, much good is effected by total abstinence from all stimulants, and it is often advisable not only to reduce the total quantity of food taken, but to withhold butcher's meat altogether for a time. Fish, white meat, vegetables, and milk puddings supply most of what such people need. What vegetables are to be permitted, and whether farinaceous puddings are to be allowed must depend on the individual case, and be decided by the usual rules, irrespective of the neurasthenia.

Drugs play but a minor part in this malady, but they can rarely be dispensed with at some time or other during the treatment. Enough has been said of the need there is for aperients, and of the value of calomel. Many patients suffer from dyspepsia, when the alkaline mixture that has been recommended in connection with the Weir-Mitchell treatment is most useful. In other cases good is effected by a mixture of strychnia and hydrochloric or nitro-hydrochloric acid after meals. Great caution is however needed in the use of strychnia in neurasthenia, as in many cases it increases the nervous irritability, and when insomnia is a feature it aggravates this symptom. When the drug is otherwise well borne, but disturbs sleep, a good plan is to give a dose in the morning and after lunch, but none later in the day. Nux vomica may be added to the alkaline

mixture before meals, with advantage in many cases, provided the same precautions are observed. Arsenic is excellent in many cases, and has the advantage that it does not interfere with sleep, although it may have to be discontinued owing to intolerance by the stomach. Phosphorus is another tonic that is recommended, and iron does good when there is anæmia, if the stomach is not intolerant of the drug, and constipation is not troublesome. The glycerophosphates alone, or combined with arsenic or strychnia, are most useful, and the combination of acid glycerophosphates with formates deserves a trial, as do the preparations of the polyformates. Two to four tabloids, each containing 5 gr. of the polyformates, may be given three times a day before food. The remedy is supposed to be especially serviceable in increasing nerve energy, and in thus improving the symptoms of physical exhaustion, which are often so prominent. Neurosin is another much vaunted remedy which deserves a trial. The bromides are most useful if judiciously employed, and under their influence, not only may insomnia be combated, but the nervous irritability may be subdued, and even mental depression removed. The sodium or ammonium salt should be employed, and except when given for insomnia, it is well to combine the bromide with arsenic alone or with nux vomica also. Belladonna or sumbul are useful additions in some cases, and when there is an emotional tendency, the inclusion of valerian in the prescription is beneficial. Bromocarpine is an excellent substitute when the bromide salts are not satisfactory. Heart weakness may call for the use of drugs like digitalis or strophanthus, but more usually strychnia does all that is needed. When strychnia is contra-indicated, however, either of the other two drugs may be given to improve the condition of the heart. The addition of nitroglycerin is sometimes of advantage in aiding the circulation, but apart from this, a few doses of this drug alone, or in combination with strychnia, may remove the feeling of cloud in which the neurasthenic's brain so often seems involved, and the most refreshing sense of well-being may follow this plan of treatment. When other measures fail to secure sleep, the best hypnotics are veronal or trional, though any of those commonly in vogue may be tried if these fail. It cannot, however, be too strongly insisted that morphia should be avoided, as these patients so readily acquire the drug habit. For the same reason it is most inadvisable to prescribe cocaine, although it is certain that a sense of well-being may often be secured by the use of this drug.

J. S. Risien Russell.

NEURITIS.—Under this term many conditions have been included which differ markedly, not only in their clinical manifestations and pathology, but also in their treatment. The following principles may be laid down as applicable to the treatment of the disease in general.

1. *Removal of the Cause*, whether due to metallic, organic, or other forms of poison. Workers in lead, painters, artists, should give up their work, or take precautions to prevent the metal entering the system. Possible poisoning by lead or arsenic taken as a drug or in beer, must be borne in mind. Chronic discharges should be treated, and infected wounds attended to.

2. *Rest.*—This is of the first importance; in most cases the patient should be kept in bed, but in cases of a localized neuritis, rest to the affected part may be sufficient.

3. *Diet.*—The use of alcohol in any form should be prohibited. A full and generous diet is in most cases advisable, but in gouty and rheumatic neuritis a diet suited to these conditions should be advised.

4. *Massage, Baths, and Electricity.* — These remedies should not be used during the acute stage, but later they are most valuable in promoting and restoring the function of the muscles.

Passing from such general considerations, the treatment of peripheral neuritis due to alcohol and metallic poisons may be taken as an example, and will be considered in detail. Since, however, the treatment varies with the course of the disease, it will be dealt with under three headings, according to the stage of the disease.

1st Stage.—Cases seen and recognized early, when there is pain and tenderness of the muscles, with but little loss of power, and the reflexes are still present, if not actually exaggerated, generally respond well to treatment. This should consist in placing the patient at rest in bed, diet being carefully regulated and alcohol in any form absolutely excluded. It is especially important to see that these patients take their food well, and have what they like and can digest, for it not infrequently happens that by cutting off alcohol they lose their desire for food, and under such depressing conditions no improvement can be looked for. The exhibition of strychnine with some diluted phosphoric acid will often be sufficient to stimulate the appetite again, but in other cases some tincture of capsicum in an alkaline mixture with a small amount of sodium bromide seems to act better. It is advisable also to give the patient a small dose of calomel ($\frac{1}{6}$ gr.), or blue pill, at bedtime. Sleeplessness is best treated by one of the salts of bromine, but paraldehyde, veronal, or trional, or chloral may be given if necessary. It will be found that early cases rapidly respond to this form of treatment, and after a few days' rest in bed, gentle massage and exercise is beneficial. These patients, however, usually require prolonged supervision. They do well under the routine of hydropathic treatment, and the regulated mode of life enforced in such institutions is most beneficial.

2nd Stage.—In this stage there is considerable loss of power in the muscle, with very marked tenderness not only of the muscles but also of the nerve trunks, with blunting of sensations over the peripheral portion of the limbs and changes in the vasomotor condition of the skin: the patient should be kept absolutely at rest (preferably on a water-bed), not only on account of the condition of the limbs, but also because of the liability to sudden syncope. He should not be allowed to sit up or strain at stool. The limbs should be wrapped in cotton-wool, and for the relief of pain hot fomentations or dry heat may be applied. During this stage also, the prohibition of alcohol should be made absolute, and other cardiac stimulants, strychnine, digitalis, and carbonate of ammonia should be used to combat the depression which the withdrawal of alcohol is certain to produce. The legs should be placed on splints as soon as the acutest stage of the disease is over, in order to diminish as far as possible the tendency to muscle contraction; this can be most conveniently accomplished by a well-padded leather splint with foot-piece at right angles, kept in that position by two elastic springs. Diet is of the greatest importance, and great care has to be exercised in selecting suitable articles of food and such as are easy of digestion, for vomiting not infrequently occurs, and may be attended with considerable prostration In persistent vomiting, it may be necessary to have recourse to rectal feeding. Massage and passive movements are now not only useless, but give rise to great pain and discomfort, and should not be employed. It is difficult to say exactly when massage may be begun, but as a rule when gentle pressure on the calf muscle can be borne, it is safe to begin a modified massage. Two to three weeks of complete rest may in some cases be sufficient, but a longer period is usually required. With regard to drugs, few are of much service, except those above mentioned, to which bromide may be added. Morphia may be necessary in some cases, to relieve pain.

3rd Stage.—In this stage of the disease, when there is marked wasting of the muscles, often with considerable contraction, massage, active and passive movements, and electricity in its various forms, should be employed. If the muscles

no longer respond to faradic stimulation, or respond very feebly, a galvanic current is the most suitable application, and may be made direct to the skin or by means of a bath. If considerable contraction of muscle has taken place, tenotomy may be necessary, but it is surprising how much relaxation can eventually be obtained by the use of hot-air baths and passive movements.

In certain cases of peripheral neuritis in which there is loss of the sense of position to a considerable degree—so-called "neuro-tabes"—the use of Frænkel's exercise board is of great service in re-educating the muscles in the exact performance of their work, and similarly, the use of a cribbage or solitaire board for the hands is of great educational value.

The outlines of treatment above indicated are applicable to neuritis due to metallic poisons, such as arsenic and lead, but it is important in these cases to supplement the treatment by drugs. It is generally held that iodide helps the elimination of lead from the body, and hence this drug is often given. Cod-liver oil, malt, iron, and hæmoglobin are also valuable adjuncts in treatment.

Two of the most troublesome symptoms in neuritis are pain and sleeplessness. With regard to the former, much can be done by careful support of the limbs, cradling the limbs so that the bed-clothes do not come in contact with them, and by a water bed. In addition, it is often necessary to use such drugs as phenacetin, aspirin, acetanilide, exalgin and citrate of caffeine. Morphia should if possible be avoided, but there is no doubt that it has more effect in diminishing pain than any other remedy.

In the treatment of sleeplessness, paraldehyde is a useful drug, and it is to be preferred to chloral, veronal, trional, and sulphonal, especially at the period when there is danger of cardiac failure.

Apart from the general condition above described, neuritis may be and often is limited to a single nerve, such for instance as the ulnar or external popliteal, the former giving rise to wasting of the small muscles of the hand, the latter to a localized foot-drop. Such a neuritis may be due to a traumatic or local condition, or may occur in association with some general toxic condition, such as rheumatism or gout, and it is of special importance in these cases to search for the local cause. An ulnar neuritis may, for instance, become manifest many years after an old fracture of the elbow; or again, wasting of muscles and alteration of sensation in the distribution of the ulnar nerve may develop in association with the presence of a cervical rib. The above instances are given to enforce the point that a local cause should always be most carefully sought for in cases of local paralysis. The general lines of treatment above laid down should be adopted in these cases. Rest and warmth are of the greatest importance. Massage should be applied locally, and the nutrition of the muscles maintained by faradism and galvanism. The local hot-air bath is also of service. (See also ELECTROTHERAPEUTICS.)

F. E. Batten.

NEUROMATA.—Under the term neuromata, all conditions which lead to tumour formation are included. They can be divided into the true and the false. A true neuroma is made up of nerve cells and nerve fibres; it is an extremely rare tumour, and in four out of the five authentic cases recorded was connected with the sympathetic system. The false neuromata can be divided, as suggested by Alexis Thomson, into the circumscribed and the diffuse, and again into the innocent and malignant. The circumscribed include all forms of innocent tumour growing from the connective tissue of the nerve, the so-called neurofibroma, myxoma, and also the painful subcutaneous nodule.

The symptoms are those of a tender tumour, the pain on pressure being referred to the peripheral distribution of the nerve. Sensation and motion are as a rule little interfered with; if anæsthesia and muscular wasting are

present, we should think at once of diffuse fibrosis of the nerve due to long-standing irritation, or of sarcoma.

The diagnosis rests on the discovery of a sensitive tumour in the course of a nerve, usually movable laterally, not in the direction of the course of the nerve ; in the painful subcutaneous nodule the tumour originates around one of the terminal filaments of the nerve, and the diagnosis is made by the symptoms which correspond to its name.

The painful nodule should be excised, the other tumours shelled out from the connective sheath of the nerve ; this is rarely impossible ; if it is, the tumour must be resected and the continuity of the nerve restored.

Under the heading of neuroma are also included the end bulbs formed on divided nerves. After amputations these may give rise to trouble. Their formation is physiological, and it is not until pressure or traction is brought to bear on them that they give rise to symptoms. Pain brings the patient under observation ; it is usually of a shooting character, and may be referred to the absent limb or be accompanied by muscular spasms. The bulb should be freed and excised as high as possible.

Localized malignant neuromata belong to the group of sarcomata, and grow from the sheath of the nerve. Unlike the innocent tumours, they cause progressive interference with the functions of the nerve. They are met with most often in connection with the sciatic nerve or one of its primary branches, but are fortunately rare. Conservative treatment has been of little avail. If it is considered a suitable case in which to try this, a large extent of the nerve must be removed and its continuity restored by one of the methods previously mentioned. In the case of the sciatic, amputation is the best treatment.

Under the term diffuse neuroma are grouped the conditions known as multiform neuromata, molluscum fibrosum, plexiform neurofibromata, etc., and the secondary sarcomata which are liable to originate in them. Surgical interference in these cases should be entirely symptomatic, nothing being done unless individual masses are painful or in other ways interfering with the well-being of the patient. It has been repeatedly noticed that operative interference has been followed by increase in the size and number of the tumours.

James Sherren.

NIGHTMARE.—(See also NIGHT TERRORS.) A patient who suffers from recurrent nightmare should sleep on a hard mattress with few bedclothes, and should keep the feet warm either with bed-socks or a hot bottle. He should avoid lying on the back, if necessary by having recourse to some such device as tying an empty reel over the sacrum, and should eschew heavy suppers. If there be any tendency to constipation, 5 gr. of compound rhubarb pill should be taken at bedtime. If he wakes after the nightmare, he should get up and swallow half a tumblerful of hot water to which a teaspoonful of sal volatile has been added.

Robert Hutchison.

NIGHT TERRORS.—Bad dreams always indicate ill-health, which may be trivial and temporary, or serious and lasting. They should not be regarded merely as humorous consequences of over-eating.

Night terrors and nightmare only differ in the degree of intensity of the fears which they inspire. Stolid, unimaginative children may suffer from *nightmare*. They awake screaming, in consequence, but are little the worse next day. But neurotic children with active brains are afflicted by *night terrors* which haunt them during waking hours. Their dread of "witch-ridden pillows"—dread which they often keep to themselves—may destroy their health of mind and body. Even when the nature of the frightful dream-hallucination is forgotten, its effects may remain. Possibly chronic nervous dyspepsia and a large

proportion of functional neuroses are traceable to repeated but unsuspected night terrors.

The classification of night terrors into "idiopathic" and "symptomatic" is artificial. All are probably symptomatic, in the sense that they are excited by local, dimly-felt, external or internal impressions. All are idiopathic, in the sense that the interpretation of such impressions is entirely the dreamer's own.

TREATMENT.—Night terrors, being the result of dimly felt external or internal impressions upon a morbidly excitable brain, should be treated by correction or removal of exciting causes, and by endeavouring to quiet the emotional temperament of the child. In addition to bad atmosphere in the bedroom, and uncomfortable beds and heavy bedclothes, the chief exciting causes are adenoid vegetations, perhaps errors of refraction, and bodily pain of any kind. Many sufferers are undoubtedly rheumatic, and of the so-called gouty or uric acid diathesis; many are subject to what has been called "mucous disease," in which the bowels are constipated or relaxed, the motions contain excess of mucus, threadworms are often present, and complaint is made of abdominal pain or discomfort. In other cases, also, cyclical albuminuria is met, with all its curious vasomotor disturbances. In many, delirium caused by pyrexia accounts for terrifying visual hallucinations. All such conditions require treatment, but it must be remembered that neither one nor all of them constitute the whole cause. Removal of adenoids, scybala, intestinal mucus, and parasites, correction of refractive errors, anti-rheumatic remedies and tonics, will not in all cases provide a cure. Children who brood all day over the recollection of some frightful dream, are apt at night, as Charles Lamb expressed it, to "wake into sleep, and find the vision true." The idea that they can be taught not to be afraid of darkness by exposing them to it, cannot be too strongly condemned. Yet many parents and guardians still persist in thinking that a neurotic child's plea for a night-light should be met with derision and scorn.

It is necessary to correct their morbid tendencies to gloat over terrors seen and unseen, to protect their active, sensitive brains from educational over-pressure, to shield them as far as possible from thoughts, words, sights, and deeds which are calculated to increase their emotional proclivities.

Treatment by Drugs.—Bromides are always essential. A dose of 5–10 gr. bromide of potassium, given an hour or so before bedtime, is often sufficient to secure a night's rest. Chloral hydrate, 2½–5 gr., may be added. Fright usually upsets digestion, gastric and intestinal, and indigestion of either kind excites nightterrors. When it can be ascertained that chronic fear and dread complete the vicious circle, bromides, besides wholesome consolation, suitable diet, and drugs which aid digestion and elimination, are needed. Bromides may be combined with bismuth, gentian, rhubarb, castor-oil emulsion, in gastro-intestinal troubles; with ferri et ammonii cit. in anæmia; with strophanthus, digitalis, citrate of caffeine, when cardiac stimulants are required; or with nux vomica and hypophosphites in emulsion of cod-liver oil in debility. In rheumatic cases, salicylate of quinine is a valuable drug. Quinine as a rule is not well borne by highly neurotic children; when given, it should be with hydrobromic acid.

In cases of mucous diarrhœa, citrate of potash often acts well, and is also useful when night terrors are associated with enuresis and the presence of concentrated, highly acid urine.

Leonard G. Guthrie.

NIPPLE, DISEASES OF THE.

Cracks, Fissures, Eczema.—These conditions occur mainly in those with retracted or imperfectly developed nipples, and during the first lactation. They cause the patient much pain, interfere with suckling, and may give rise to acute mastitis or abscess. If the nipples are retracted, the child has difficulty in

seizing and retaining them, and its repeated attempts to do so lead to excoriation of the epithelium.

Treatment.—During the later months of pregnancy careful attention must be paid to the cleanliness of the nipples. All dried secretion must be regularly removed, and the nipple washed with a weak alcoholic solution, or eau de Cologne and water, in order to harden the epithelium. If the nipples are retracted, the patient should be taught to gently draw them out each day. This procedure will usually put matters right before lactation commences, but if it should fail, the best plan is to regularly draw them out with the exhausting pump. Care must be taken to see that the corsets do not irritate the nipples.

If cracks or fissures form, they should be treated at once, as the inflammation is liable to spread to the breast. One of the following applications should be used: (1) Equal parts of glycerin acid. tannici and a solution of 1–20 of carb. acid.; (2) Glycerin borac.; (3) Sol. 1–1000 biniod. merc.; these should be washed off with warm water before the child next takes the breast.

If one nipple is sore, it should be rested for two or three days. If both are slightly sore, an attempt should be made to continue suckling. If both are severely affected, suckling should be stopped; for three or four days the nurse should milk the breasts, so that their secretion is not arrested; if, however, after this, the nipples have not recovered, the child must be weaned.

Obstinate fissures should be treated by the application of pure carbolic acid on a fine probe.

Paget's Disease of the Nipple.—This is a cancerous disease, and in almost all cases cancer of the mammary tissue is also present or develops later. The treatment is that of malignant disease of the breast; the "radical" operation described elsewhere (see Breast Tumours) should always be performed. Less extensive operations involve a proportionately greater chance of recurrence. Caustics, ointments, and other local remedies are useless.

T. Crisp English.

NOCTURNAL INCONTINENCE.—(See Enuresis.)

NOMA.—(See Stomatitis.)

NOSE, ABNORMALITIES OF.—(See Septum Nasi.)

NOSE, ACCESSORY SINUSES OF.

Acute Suppuration.

In cases of severe nasal catarrh, if suppuration in one of the accessory sinuses be suspected, prompt and energetic treatment should be carried out to hasten the cure and to minimize the risk of the affection becoming chronic. The patient should be confined to a warm room, when possible kept in bed, and treated energetically as for a severe cold (see Rhinitis, Acute). Local pain may be relieved by the application of moist or dry heat to the affected area. Hot steam inhalations are often useful.

If there are symptoms indicating the retention of pus in a sinus, measures must be adopted to reduce the swelling round the outlet of the cavity and thus to obtain a free escape for the discharge. This may usually be secured by the local application of cocaine and suprarenal extract. Small pledgets of wool soaked in a solution of these drugs are packed up into the nose as near as possible to the opening of the sinus. After five to ten minutes these pledgets are removed and others inserted still further in. By this means it is usually possible to reduce the swelling around the ostium of the sinus, when a free flow of discharge at once commences, with immediate relief to the symptoms. When this has been secured, an attempt should be made to keep up the astringent effect by frequently

washing the nose with a warm alkaline solution to which a few drops of hazeline have been added. The nose should also be sprayed frequently with a 2 per cent solution of menthol in oil, which is not only astringent but soothing.

If these means fail, local blood-letting should be tried. Incisions should be made along the under surface of the middle turbinate and along the outer wall of the nose. These incisions are usually followed by free bleeding, which relieves the congestion.

If, after applying cocaine, polypi or œdematous hypertrophies are seen in the middle meatus, they must be removed. Also, if the middle turbinate is greatly enlarged and pressing against the septum, it will be necessary to remove its anterior end in order to clear a free approach to the middle meatus, but this should never be done until other means have failed.

When once a free escape for the discharge has been obtained, the natural tendency of acute cases is to heal spontaneously, although the discharge may continue for some days or even weeks. Occasionally there may be recurrence of the swelling with retention of the discharge, and yet ultimately complete recovery.

When there is a purulent discharge from a sinus, of recent origin, without any symptoms of retention, the treatment as for acute rhinitis should be pursued for a time, and when the patient's general condition improves, he should be given a tonic and sent away for change of air. For how long it is wise to continue this treatment is a most difficult question, and depends largely upon the patient's circumstances, and also upon the sinus which is affected. For example, if the antrum is affected, it is wiser to take active measures to evacuate the cavity far earlier than would be done if the frontal sinus is affected. It will therefore be convenient to discuss the treatment of each sinus separately.

Antrum.—If the discharge from the antrum still continues a week after all signs of acute inflammation in the nose have passed off, it is, in my opinion, safest to puncture the cavity and to wash it out. It is true that spontaneous recovery may still take place ; yet there is a certain, if small, risk of the disease becoming chronic, and the longer the pus is allowed to remain in contact with the delicate lining membrane of the antrum, the greater the chance of its being permanently damaged. On the other hand, puncture of the antrum is exceedingly simple, gives rise to little inconvenience at the time and to no subsequent ill-effect, and often one puncture is sufficient to effect a permanent cure.

If the trouble is probably *nasal in origin*, and there are no carious teeth in proximity to the floor of the antrum, the puncture is best carried out through the inferior meatus. Pledgets of wool soaked in a solution of cocaine and suprarenal extract are packed under the inferior turbinate close against the outer wall of the inferior meatus. When the parts are anæsthetic, a small trochar and cannula, such as Lichtwitz's, is pushed through the thin antro-meatal septum, and the antrum irrigated through the cannula with warm boracic lotion. In recent cases one puncture is usually sufficient to effect a cure, but the operation may have to be repeated after an interval of two or three days if there is sign of re-accumulation of the discharge.

If the disease be apparently due to *dental trouble*, the best plan is to remove the offending tooth, and to perforate the antrum through the tooth socket. The method is described in connection with chronic antral suppuration (q.v.). Irrigation is carried out with warm boracic lotion, and it is better to maintain the opening for a day or two by inserting a small tube until it is quite certain that all the discharge has ceased. The prognosis is exceedingly good : practically all cases recover if treated properly and in time.

Frontal Sinus.—In acute sinus suppuration the treatment depends to a large extent upon the nature and severity of the symptoms. If the patient complains

of great pain, continuous or recurring daily, and so severe as completely to incapacitate him, when the means above described have definitely failed, external operation must be carried out. If the pain and other symptoms are not very severe, the anterior end of the middle turbinate should be removed and the patient treated with nasal sprays and lotions, with general tonics and change of air. If this treatment fails, external operation is necessary. In the still milder cases, which are commonly seen, in which the patient has a headache or feeling of severe discomfort for an hour or so every morning, followed by nasal discharge, expectant treatment should be adopted. The patient should be given a plentiful, nutritious diet, a strong tonic, such as iron and strychnine, and if possible should be sent away for change of air. Any dry, warm, healthy place may be chosen, but a sea voyage, if it can be taken in comfort, is especially to be recommended.

Ethmoidal Cells and Sphenoidal Sinus.—The treatment of acute ethmoidal or sphenoidal suppuration is essentially similar to that of chronic (q.v.). If there is no immediate danger, the disease should be treated through the nose; if orbital, cerebral, or other urgent complications are present, an external operation is necessary.

Chronic Suppuration.

Although it is convenient to describe the treatment of each sinus separately, it must be remembered that frequently many sinuses are simultaneously involved, and the disease must be treated as a whole rather than as a series of unconnected affections. The cure, even the diagnosis, of suppuration in one sinus often depends upon the recognition and treatment of suppuration in the others. The treatment is essentially surgical, and its objects are: (1) The removal of any intra-nasal disease, and especially the removal of any polypus or œdematous hypertrophy, so as to make a free approach to the nasal opening of the affected cavity; (2) The evacuation of the discharge and the cure of any pathological condition within the cavity, such as disease of the lining mucous membrane or bony walls of the sinus. When these means fail: (3) The provision of permanent free drainage; or (4) The obliteration of the affected cavity. In the first place the milder measures, (1) and (2), should be tried, and if these fail, the more radical treatment should be recommended. It need hardly be added that every means should be adopted to keep the patient in good general health. General treatment will not only expedite a cure, but will often render successful a smaller operation than would otherwise be necessary.

When many sinuses are affected, in the absence of any urgent symptoms indicating a particular sinus, the order in which they should be treated must be considered. If the anterior set of sinuses are involved, it is generally best to open the antrum first; then, if pus still continues to come from the nose, the anterior ethmoidal cells should be attacked, and finally the frontal sinus should be explored. If, on the other hand, there is extensive polypoid degeneration, it is best to commence the treatment by performing a radical operation upon the ethmoidal region. As this requires general anæsthesia, the opportunity should be utilized of exploring the antrum, and of draining it if necessary. Lastly the frontal sinus is opened. If, after the antrum is punctured, much pus still comes from the nose, it is advisable to operate upon the ethmoidal cells, and frontal sinus also if necessary, before performing a radical operation upon the antrum, as the cure of these sinuses will often effect a cure of the antrum. If all the sinuses are affected, it is best to treat the anterior set first, then the posterior set.

Antrum, Maxillary.—If there are no external complications indicating disease of the walls of the sinus, one of the simpler methods should be invariably adopted in the first instance.

When carious teeth are present, and especially when it seems probable that the suppuration is of dental origin, the affected tooth should be removed and the antrum punctured through the tooth socket. It is easier to puncture the antrum through the inner socket of the first molar, but the operation may be equally well performed through the socket of the second molar, of the second bicuspid, or even of the first bicuspid.

Nitrous oxide anæsthesia is sufficient. The gum is grasped by the left fore-finger and thumb, and a small antrum drill is pushed upwards and inwards with a rotary motion until the floor of the antrum suddenly gives way. Care must be taken to avoid injury to the floor of the orbit, by having a guard upon the instrument or by steadying it with the tip of the right fore-finger. The cavity is syringed out with a solution of boracic acid or other mild antiseptic lotion. If pus be found, the opening is kept patent by inserting a small silver tube, such as Ellis's spiral wire tube, or a dentist may make a special gold tube and fix it to a neighbouring tooth. Twice daily the tube should be removed and boiled, the antrum syringed out with boracic lotion, and the tube replaced. As the discharge lessens it will be sufficient to syringe once a day, and then if all goes well the intervals are gradually lengthened. If no pus is obtained after the syringing has been omitted for a week, the tube may be left out and the opening allowed to close.

If after careful treatment pus is still found in each washing, various other lotions may be used. Peroxide of hydrogen is one of the best; about two ounces should be introduced into the antrum and then quickly washed away with boracic lotion, as it gives rise to much smarting. A weak solution of sulphate or chloride of zinc or sulphate of copper (1–3 gr. of either to the ounce) may be used in a similar way. These injections should not be repeated more than twice a week.

The prognosis is always uncertain, but if the operation be reserved for cases of dental origin, at least fifty per cent are cured, and the more recent the disease the more frequent and the more rapid the cure, but no case is too chronic to be cured by this means. In cases of nasal origin the prognosis is less favourable. Lastly comes the question, for how long should the syringing be continued when it is apparently not successful? If there is much pus in each washing after three months, and certainly after six months' careful treatment, a cure cannot be anticipated. Under these circumstances a radical operation may be recommended, but if a patient be averse to this he must continue the daily syringing, and with this small inconvenience may live comfortably for years with slight, if any, risk of complications.

When the teeth are sound or the disease is obviously of nasal origin, puncture through the inferior meatus of the nose should be performed. Pledgets of wool soaked in cocaine and adrenalin solution are packed in under the anterior end of the inferior turbinate and against the outer wall of the meatus. When the parts are anæsthetized, a small trochar, such as Lichtwitz's, is directed about half-an-inch behind the anterior end of the inferior turbinate, as high above the floor of the nose and as strongly outwards as possible, and pushed gently into the antrum. The trochar is withdrawn, and the cavity washed out through the cannula with boracic lotion. If pus be found, the operation may be repeated daily, or as often as necessary. Prolonged treatment by this means is impossible, but three, four, or more punctures should be made before resorting to more severe measures. Most recent and a few chronic cases may be thus cured.

A radical operation is necessary when there is disease of the bony walls of the sinus, when there are polypi in the antrum, when it is impossible to syringe through the cavity owing to some obstruction of the natural ostium, or when the simpler measures above described have failed to effect a cure. The cure

depends upon establishing a large communication between the nose and the antrum, so as to secure permanent free drainage of the latter cavity. The operation, as usually performed, consists in making an incision in the canine fossa at the junction of the gum with the mucous membrane of the cheek, in reflecting the periosteum off the anterior wall of the antrum, and making a large opening through this wall. The interior of the antrum is examined and any polypus or obvious disease removed. The next and most essential part of the operation is to remove the whole of the bony wall between the antrum and the inferior meatus. The opening in the canine fossa is allowed to close, and the after-treatment is conducted entirely through the nose. The patient is taught to wash out the antrum daily with a mild antiseptic lotion until all discharge ceases.

It is much better to carry out this operation entirely through the nose. The anterior third of the inferior turbinate is removed, a large opening is broken through the antro-meatal septum with burrs, and the fragments removed with forceps and curettes. The interior of the antrum can now be explored with the finger, and any polypus or other gross disease removed. The large opening thus made remains permanent, and the after-treatment consists in daily syringing as above described.

The results of these operations are good. By the latter method a more speedy cure is obtained, there is less reaction, and the painful swelling of the cheek and other inconveniences attached to the operation through the mouth are avoided.

Frontal Sinus.—Intra-nasal treatment should be adopted in the first instance, with the object of establishing a free outlet for the discharge into the nose by clearing the way to the lower end of the infundibulum. The anterior end of the middle turbinate and any polypus or other obstruction in the middle meatus should be removed. The anterior ethmoidal cells should be cut away under cocaine, or freely curetted under general anæsthesia. The case is now left for a time, provided no urgent symptoms are present, and every means should be taken to improve the patient's general health.

Occasionally, as the result of disease, a wide communication exists between the sinus and the nose, and a cannula may be passed up the fronto-nasal duct and the sinus irrigated. This is not an easy matter, and must always be carried out by one who is skilled in the work. No force must be used, as fatal damage may result. Daily treatment is necessary, and unfortunately the result is rarely successful.

If intra-nasal treatment fails, if the patient is simply suffering from the inconvenience of a little purulent discharge from the nose, he may be well advised to leave it alone, and the nose should be inspected from time to time, so as to prevent or remove any obstruction to the outflow of discharge. If, however, the patient is suffering from urgent symptoms or serious inconvenience, external operation must be considered. There may be severe and frequently recurring headaches completely incapacitating the patient, or the general health may suffer from excessive discharge or chronic septic absorption ; there may be disease of the bony walls of the sinus or an external fistula, when an external operation should be strongly advised. The objects of operation are to obliterate the sinus, or to establish free drainage and allow it to return to its original healthy condition. The former method leads to the most certain and speedy cure, but is liable to produce considerable deformity. The steps of the operation are briefly as follows :—

A curved incision is made in the line of the eyebrow from the supra-orbital notch, downwards and inwards, round the inner angle of the orbit. The periosteum is detached from the inferior wall of the sinus, and an opening is chiselled into it at a spot about the junction of the inner wall and roof of the

orbit, immediately above the inner canthus. The mucous membrane is incised, the interior of the sinus inspected, and its extent gauged. If the sinus be large, the affection recent, with no sign of bone disease, and if the prevention of deformity be of importance, simple drainage may be resorted to. If the sinus be small, it is best to obliterate it. If the sinus be large, and obliteration seems desirable, Killian's operation may be recommended.

When it is intended to drain the sinus, the opening into it is enlarged sufficiently to enable the interior to be examined, and all gross lesions are removed. The infundibulum is freely enlarged with burrs, and a large drainage tube is passed down from the sinus into the nose. This tube is removed daily and the sinus syringed. After ten days it is replaced by a silver tube or rubber plug shaped like a small tracheotomy cannula, which must be worn until all discharge ceases.

Obliteration leads to a more rapid and certain cure. The skin incision is prolonged outwards to the outer limit of the sinus, and inwards and downwards well below the inner canthus, so as to give free access to the infundibulum. The periosteum is detached from the whole of the anterior and inferior walls of the sinus, and these walls are cut away with strong bone-cutting forceps. Great care must be taken to open up every recess, and then the entire mucous membrane is removed with curettes. The infundibulum is freely opened up, and the anterior ethmoidal cells exposed and curetted. The wound is sutured, but a tube should be passed down the infundibulum and worn for three or four weeks, or until all discharge has ceased.

When the sinus is large, the deformity resulting from the sinking in of the soft parts after obliteration may be greatly lessened by leaving a bridge of bone running from the inner to the outer side of the sinus in the line of the eyebrow. The operation takes longer to perform, and healing is delayed, but maintenance of the line of the eyebrow greatly improves the æsthetic result.

Ethmoidal Cells.—The treatment depends upon the number of cells affected, and upon whether external complications are present.

1. When one or two cells only are involved, a small operation under cocaine is sufficient. The anterior end of the middle turbinate is removed. The affected cells are carefully located by probing, and their walls broken into with a Hajek's hook and cut away with Grünwald's forceps. This little operation may be repeated if necessary, and gives good results in cases of limited disease, but when many cells are diseased it is impossible to effect a cure by this means.

2. When numerous cells are affected, and when there is extensive polypoid degeneration of the ethmoidal mucous membrane, it is better to give the patient a general anæsthetic and to curette thoroughly the whole of the ethmoidal region. The operation is performed with Meyer's ring knives, and the diseased mucous membrane and bone are thoroughly curetted until firm bone is reached. The greatest care must be taken to avoid injury to the cribriform plate, and for this reason the curette should never be directed upwards, but the cutting blade should always be turned outward towards the orbit, and all force should be avoided.

The operation is accompanied by free bleeding, and therefore must be performed under very light anæsthesia and with the patient lying on his side. If the hæmorrhage persists it may be necessary to pack the nose, but this should never be done unless absolutely necessary. The healing may require one to two months, but ultimately the whole upper part of the nose becomes lined by thin white membrane, and all discharge ceases. Should pus still continue to come down into the nose, if it appears anteriorly it must come from the frontal sinus, and if posteriorly from the sphenoidal sinus, which cavities should next be opened.

3. When an ethmoidal cell is bulging into the orbit, when there is abscess or

cellulitis of the orbit depending upon ethmoidal disease, or when an external fistula is present, it will be necessary to perform an external operation upon the ethmoidal cells. A curved incision is made around the inner angle of the orbit, commencing near the supra-orbital notch and terminating well below the inner canthus. The periosteum is reflected from the inner wall of the orbit, thus exposing the orbital plate of the ethmoid. The ethmoidal cells are opened by cutting away this plate with chisels, and then systematically broken down and removed with curettes or cutting forceps. The wound should be sutured and drainage provided as described in the after-treatment of operations on the frontal sinus.

Sphenoidal Sinus.—This, in spite of its apparently inaccessible position, is commonly one of the easiest sinuses to treat. Unless the nose is unduly wide, as in atrophic rhinitis, it will be necessary to remove the whole of the middle turbinate. The patient should be seated in the usual rhinoscopic position, or he may lie on his side. Suprarenal extract should be applied to the parts fifteen to twenty minutes before the operation, and nitrous oxide administered. A spokeshave is passed over the posterior end of the turbinate and drawn sharply forwards, usually bringing away the whole structure. A few days later the sphenoidal region of the nose is carefully packed with pledgets of wool soaked in cocaine and suprarenal extract to enable a good view of the part to be obtained. A probe with hooked end is passed into the sphenoidal sinus to ascertain its extent, and then the anterior wall is broken down with a Hajek's hook. When the opening has been sufficiently enlarged, a pair of sphenoidal sinus forceps are introduced and the whole of the anterior wall of the sinus cut away. The interior is now inspected and any polypus removed, but the lining membrane should on no account be curetted. The subsequent treatment consists in irrigating the sinus with weak antiseptic lotions until a cure has taken place.

In a few cases it is sufficient simply to irrigate the sinus without enlarging the opening as above described, but as the operation is very simple, is free from risk, and gives rise to little or no pain, it is much better to carry it out in the first instance. *H. Lambert Lack.*

NOSE, ATROPHIC OR PERFORATING ULCER OF THE SEPTUM OF.—(See also RHINITIS SICCA and EPISTAXIS.) This ulcer usually occurs in connection with dry rhinitis. It is essentially traumatic, being due to the adhesion of dust and mucus to the anterior part of the septum, and the detachment of these crusts by forcibly blowing or by picking the nose. The essential part of the treatment therefore is to prevent the crusts collecting on the anterior part of the septum and to warn the patient against picking the nose, a habit which soon becomes involuntary. The nose must be cleansed two or three times a day with a simple alkaline lotion, and the anterior part of the septum should be well smeared over with a mild antiseptic ointment—lanolin or vaselin containing a little boric acid (20 gr. to the ounce) or very dilute nitrate of mercury ointment. Strong applications such as caustics only do harm. In this way the ulceration may frequently be made to heal, and a perforation may be prevented ; even if a perforation have already formed, the treatment will prevent its extension. *H. Lambert Lack.*

NOSE, FOREIGN BODIES IN.—Foreign bodies in the nose are most common in children, and comprise such small articles as boot buttons, fruit stones, fragments of wood, rubber, paper, and so on. Whenever a unilateral, purulent, fœtid nasal discharge is met with, the presence of a foreign body should be suspected, and the diagnosis completed by making an attempt to remove it.

The removal is best effected by means of a small blunt hook such as a strabismus hook, or a probe with its end bent at a right angle, a quarter of an inch from the tip. The hook is gently passed through the middle meatus of the nose, over and beyond the foreign body, which almost always lies in the anterior third of the inferior meatus ; its point is then lowered on to the floor of the nose, and it is drawn gently forward. With care the hook can usually be placed in position without frightening or hurting the child, and then, even if the child draws backward, it only helps the removal of the foreign body. If this manœuvre is unsuccessful, or if the child is very frightened, a little chloroform may be given, and the removal attempted in the same way. Attempts at removal should never be made with forceps. It is very difficult to grasp a foreign body accurately without obtaining a good view of it, and owing to the purulent discharge and swelling in the nose it is generally impossible to get a view ; moreover, forceps are very apt to slip off and push the foreign body further in. Attempts to remove a foreign body by syringing are dangerous, as much force is often required, and the fluid is apt to be driven into the Eustachian tubes and cause acute otitis.

Rhinoliths, or nasal stones, may occur in children or adults and give rise to symptoms similar to those caused by foreign bodies. Their treatment is essentially the same, but if the stone is very large it may be necessary to crush it or to cut off pieces before it can be extracted. *H. Lambert Lack.*

NOSE, SYPHILIS OF.

Tertiary Syphilis.—Both general and local measures are required. The general treatment consists in the administration of anti-syphilitic remedies in large doses. If a gumma is seen in the nose or extensive ulceration is present, the patient should be given large doses of iodide of potassium (20–25 gr. three times daily). If this is not successful, mercury should be given in addition, a drachm of the liq. hydrarg. perchlor. being added to each dose of the iodide. If the case still prove intractable, which usually means that the patient is in bad general health or is addicted to alcohol, it is best to keep him in bed, to feed him up by giving him three or four pints of milk daily in addition to plain ordinary diet, and then, after three or four days, to commence the iodide treatment again. Under these circumstances it will usually succeed. After healing has taken place it is advisable to send a well-to-do patient to some foreign health resort, such as Aix-la-Chapelle, to undergo a thorough course of mercurial treatment.

The local treatment consists in cleansing the nose three or four times daily with a mild antiseptic lotion, such as a solution of boric acid. If very exuberant granulations are present, they may be cauterized, or a little calomel and starch applied. If a loose sequestrum be found, it must be removed with forceps or with a blunt hook (see NOSE, FOREIGN BODIES IN). It may be necessary to divide a large sequestrum with bone forceps to facilitate its removal. When healing has taken place, if there is much deformity a plastic operation may be performed.

Inherited Syphilis.—The general treatment consists in the administration of mercury, either by the mouth or by inunction. Half-grain doses of hydrarg. cum creta may be given to an infant three times a day, or a few grains of mercurial ointment may be rubbed into the abdominal walls. If the affection does not rapidly yield to this treatment, one or two grains of iodide of potassium may be administered three times a day in milk. Every effort should be made to maintain the infant's general nutrition. If the nasal obstruction prevents the administration of food in the usual way, spoon feeding must be adopted.

In addition to these measures, local treatment must be carefully carried out. The nose should be syringed regularly once or twice a day. The infant should be held face downwards over a basin, and the fluid injected very gently into

the nose by means of a small glass syringe with a short length of rubber tubing attached. The best lotion is a warm solution of salt and water (1 dr. to the pint), to which ½ oz. sanitas or 5 gr. potassium permanganate may be added. This treatment, if regularly carried out, greatly hastens the cure and diminishes the risks of subsequent ill results. Clearing the nose aids the administration of food and thus lessens the danger of malnutrition. The chief ill results that may follow severe or neglected cases are ozæna or atrophic rhinitis, the direct result of long-continued suppuration, and a falling-in of the bridge of the nose, apparently due to arrested development of the nasal bones. This deformity, the so-called "saddle-backed" nose, has recently been treated with varying success by subcutaneous injections of paraffin wax. *H. Lambert Lack.*

NOSE, TUBERCULOSIS OF (Lupus.)—In treating this affection general and local measures should as far as possible be combined. The patient should be placed under the most favourable hygienic conditions. He should live as much as possible in the fresh air, and should take a plentiful and nutritious diet. Any disturbance of the general health must be rectified. The internal administration of arsenic frequently acts beneficially on lupus of the upper air passages, and is well worthy of a trial. Three to five minims of liquor arsenicalis should be given three times a day immediately after food, and the dose slowly increased, provided no gastric symptoms or other evidences of poisoning are produced, until 10 to 15 minims are taken three times a day. Recently injections of tuberculin have been tried, apparently with some success, but sufficient time has not yet elapsed to speak positively of their value. The patient's opsonic index to the tubercle bacillus is estimated, and if the index is found to be low, it is raised by the injection of very small doses of tuberculin. (See BACTERIOTHERAPEUTICS.)

Local treatment depends upon the extent and nature of the lesion. The most common forms of tuberculosis are an extremely slow but progressive superficial ulceration of the mucous membrane, which frequently commences on the septum, and a hypertrophic form, characterized by the formation of exuberant, pale, fleshy granulations. More rarely a tuberculous tumour is met with, or a large typical tuberculous ulcer with thin undermined edges.

When the disease is superficial and limited, cocaine should be applied and the affected area destroyed with the cautery. The electric cautery, or a strong caustic such as chloride of zinc or chromic acid, may be used. Zinc chloride may be applied in the form of paste on a wooden holder; chromic acid should be fused on a probe. Two or more applications may be necessary.

If the affection be extensive, and accompanied by exuberant granulations, it will be better to give the patient a general anæsthetic and to curette the diseased parts thoroughly. An ordinary sharp spoon may be used, but Meyer's ring curette will be found very convenient. The bleeding is usually profuse, and when the disease has been scraped away as much as possible, it is advisable to pack the nose with strips of gauze soaked in glycerin and iodoform emulsion. The insertion of the gauze not only arrests the bleeding, but prevents any tendency to adhesions. The gauze should be changed daily and the nose syringed. After a few days the parts should be carefully examined under good illumination, cocaine should be applied, and any suspicious areas thoroughly cauterized. After the first week the packing may be omitted, and the nose should be syringed twice daily with a mild antiseptic lotion, such as boric acid solution, and oil, such as the fluid nitrate of mercury ointment, applied with a brush (for formula see RHINITIS, CHRONIC).

The patient should be inspected about once a month at first, and subsequently at longer intervals, so that any sign of return may be promptly treated. In

this way the affection can generally be eradicated. If the disease has been extensive, considerable deformity may result ; the nostrils may be more or less obstructed by adhesions or by cicatricial contractions. The scarred surfaces consist of fibrous tissue with squamous epithelium, and are apt to be covered by dry, crusty secretion.

If a tuberculous tumour be present, it should be removed with a snare. Cocaine anæsthesia is usually sufficient. If there is much bleeding after removal, the nose should be packed, and a day or two later the base of the growth should be anæsthetized with cocaine and thoroughly scraped and cauterized. This usually results in a cure, although occasionally an intractable ulcer is left. It must be remembered that this form of the affection is usually associated with pulmonary tuberculosis, and that these patients do not stand operation well.

If an extensive superficial ulcer with undermined edges is present, perhaps surrounded by miliary tubercles, phthisis may be suspected. If the patient's condition be sufficiently good to permit of operation, the base and edges of the ulcer should be thoroughly scraped, and then a strong caustic should be applied. If a general anæsthetic is not admissible, the ulcer may be cauterized under cocaine. In both these last conditions the association with general ill-health must be borne in mind, and general treatment must be carefully carried out. (See also LUPUS VULGARIS.)

H. Lambert Lack.

NOSE, TUMOURS OF.

Benign Tumours.—With the exception of nasal polypus, which is described elsewhere, benign tumours of the nose are all rare, and may be very briefly dealt with.

Papillomata, when growing from the vestibule, should be snipped off with scissors, and the base dried and thoroughly cauterized with a strong caustic, such as nitrate of silver. If the growth is sessile, and especially if it occurs in a middle-aged or elderly patient, it is better to give a general anæsthetic and to excise it freely, together with a margin of healthy tissue. Pedunculated growths springing from the mucous membrane may be removed with a snare under cocaine, and their bases cauterized ; small sessile growths may be destroyed with the electric cautery.

Fibromata must be removed. The exact method of doing this depends greatly on their size and position. If the growth is small and pedunculated, it may be removed with the snare under cocaine or under general anæsthesia. A strong snare threaded with thick wire must be used, as the growth is generally tough. The growth should be slowly cut through, so as to lessen the danger of hæmorrhage, and the base of the growth should be freely cauterized. If a large growth with extensive attachment is present, it will be necessary to adopt more surgical measures in order to explore the growth and to secure its thorough removal. It may be necessary to open up the nasal cavity by an operation such as is required for malignant disease of the nose.

Enchondroma and *Osteoma* are very rare ; they usually spring from the ethmoidal region, and project into the orbit or one of the nasal accessory sinuses. They always require removal, and it is generally necessary to perform an extensive operation, the exact nature of which depends upon location. If the ethmoidal region be involved and the growth projects into the orbit, a free incision curving round the inner side of the orbit should be made, and the neoplasm freely exposed and removed. A growth involving the frontal sinus requires an operation on that sinus similar to the radical operation for frontal sinus suppuration (see NOSE, ACCESSORY SINUSES OF).

Fibro-angeioma of the septum is a rare tumour growing from the anterior part of the septum just behind the vestibule. It must be thoroughly removed,

as it has a considerable tendency to recur. The best plan is to anæsthetize the parts with cocaine and suprarenal extract, and then, under good illumination, an incision is made with the cautery point through the healthy mucous membrane all round the growth at a slight distance from its attachment. The mucous membrane and perichondrium of the septum are then, together with the growth, detached from the underlying cartilage. The after-treatment consists in applying oil or ointment to the wound, until complete healing has taken place.

Malignant Tumours may be either sarcoma or carcinoma. In either case the treatment is the same and the result equally unsatisfactory. Even when the growth can apparently be removed, recurrence almost invariably follows and proves fatal. However, surgery offers the sole chance of cure, and therefore the first point to be decided is the advisability of attempting to remove the growth. This depends largely upon its site and extent.

A growth springing from the floor of the nose or involving the septum or inferior turbinate is most favourably situated for operation. It may be freely exposed by Rouge's operation. An incision is made through the gingivo-labial junction from opposite the first molar tooth on one side to the same point on the other side of the jaw, and then the upper lip, soft parts of the face, and nose are raised by detaching them from the bone. This gives free access to the anterior part of the nose. The antrum may be opened through the canine fossa, and the inferior turbinates, the outer wall, the floor, and the septum of the nose may be cut away as freely as necessary. After removing the growth the parts are allowed to fall naturally into position again, and as a rule there is no ultimate deformity. An epithelioma in this region is often of very slow growth and not very malignant. It rarely gives rise to secondary growths in the glands or elsewhere, and hence is particularly favourable for operation. Even partial operations, such as scraping, are occasionally successful in relieving the patient and in considerably prolonging life.

Growths involving the ethmoidal region are less favourably situated. They are usually sarcomata or cylindrical-celled carcinomata. If not too extensive, they may be removed by a combined internal and external operation. A long curved incision is made round the inner side of the orbit, and the periosteum along the inner wall of the orbit separated as far back as possible. The entire ethmoidal region is now removed piecemeal, partly through the nose and partly through the external incision.

Malignant growths involving the posterior part of the nasal cavity or springing from the sphenoidal region, are usually inoperable, but a few cases of spindle-celled sarcoma, the so-called " recurrent fibroma," which has a low malignancy, may be successfully dealt with. The best method of exposing these growths is to perform a laryngotomy, gag the mouth well open, plug the back of the throat with large sponges, and then split the soft and hard palates in the middle line, and to chisel away as much of the bone of the hard palate as is necessary to give a good view of the tumour. An incision is made all round the growth, which is then cut or gouged away, and afterwards the wound in the palate is carefully sutured and readily heals.

Occasionally more extensive operations are required. Thus, if the growth involve the antrum, removal of the upper jaw is necessary. As a rule, however, when a nasal tumour is so extensive that the operations above described are useless, the case is too far advanced for any operation to be successful.

When a growth is inoperable, all that can be done is to relieve the most distressing symptoms. Pain can be kept in check by opiates. The nose can be cleansed by syringing with boracic lotion, sanitas, or permanganate of potash ; and bleeding, if excessive, must be checked by packing the nose with strips of

gauze. If the growth projects into the mouth or pharynx, and causes much obstruction to breathing or swallowing, the best plan is to break away pieces of it with the finger. The growths are usually friable and break down easily, and this treatment is preferable to performing a tracheotomy or to subjecting the patient to tube feeding. *H. Lambert Lack.*

NYSTAGMUS AND HEAD-NODDING—(Spasmus Nutans).—These affections, with rotary, horizontal, vertical, or oblique movements of head and eyes, appear to be due to want of correlation between the action of ocular and cervico-cranial muscles. They have been attributed to residence in dark rooms in which there are one or more spots of bright light, the fixation of which exhausts the retina, also to intestinal toxæmia, rickets, and of course to dentition. The evidence of such causation is in each case insufficient. In a few instances, nystagmus and head-nodding are associated with feeble-mindedness, and may be persistent; but in the majority the movements cease spontaneously, without special treatment, towards the close of the first dentition.

Bromides and antipyrine, which have been recommended, are quite unnecessary, and indeed are contra-indicated if the condition is, as maintained, an instance of imperfectly established co-ordination.

All that is necessary in most cases is attention to general hygiene, and provision of diet suitable to the ordinary child. The subjects of these affections are usually nervous and hyper-sensitive to noise. *Leonard G. Guthrie.*

OBESITY.—In the majority of cases which present themselves for treatment, those namely in which the condition has supervened in the later part of middle life, the accumulation of fat is due to a disproportion between the intake of energy in the form of food and its output in the form of muscular work. The proper way of dealing with such cases, therefore, is to cut down the diet, and to recommend the taking of more exercise. It is true that cases of obesity are sometimes met with in young subjects in which there seems to be a tendency to the formation of fat even in the absence of any undue consumption of food. Such cases are difficult to explain, and may depend upon some congenital vice of metabolism; at all events they do not readily lend themselves to treatment.

1. **Dietetic Treatment.**—Of the different nutritive constituents of food, it is the carbohydrates and fats, especially the former, which most contribute to the formation of adipose tissue, and it is the consumption of these which it is most necessary to restrict. Various schemes of diet have been devised, which differ chiefly in the degree to which each of these constituents is reduced. The following are examples:—

	Proteid. Grams.	Carbo-hydrate. Grams.	Fat. Grams.	Calories
Normal Standard	125	500	50	3027
Banting	172	81	8	1110
Oertel (max.)	170	120	45	1600
,, (min.)	156	75	25	1180
Ebstein	102	47	85	1300
Hirschfeld (max.)	139	67	65	1400
,, (min.)	100	50	41	1000
Von Noorden	155	112	28	1366

It will be observed that in most cases the proportion of proteid, as being least likely to form fat, is increased, whereas the carbohydrates and fats are reduced below the normal, although in varying ratio.

The arrangement of some of these schemes into meals is as follows:—

BANTING.

Breakfast.—4 or 5 oz. of meat or fish; 1 oz. of toast; tea without sugar or milk.

Dinner.—5 to 6 oz. of lean meat or fish; any vegetable except potatoes; 1 oz. of dry toast; some stewed fruits; 2 or 3 glasses of claret.

Tea.—2 or 3 oz. of fruit; a rusk or two, and a cup of tea.

Supper.—3 or 4 oz. of meat or fish.

EBSTEIN.

Breakfast.—2 oz. of bread with plenty of butter; a large cup of tea without sugar.

Dinner.—Soup; 4 to 5 oz. of meat; green vegetables; fresh fruit, and 2 or 3 glasses of light wine.

Afternoon.—Same as breakfast.

Supper.—1 egg; meat, ham, or smoked fish; 1 oz. of bread with plenty of butter; a little cheese; fresh fruits.

VON NOORDEN.

8 *a.m.*—3 oz. of cold lean meat; 1 oz. of bread; a cup of tea or coffee, with a spoonful of milk but no sugar.

10 *a.m.*—1 egg.

Noon.—A cup of strong soup without fat.

1 *p.m.*—A small plateful of clear soup; 5 oz. of lean meat or fish; 3½ oz. of potatoes; green vegetables; 3½ oz. fresh fruits.

3 *p.m.*—A cupful of black coffee.

4 *p.m.*—7 oz. fresh fruit.

6 *p.m.*—A glass of skimmed milk.

8 *p.m.*—4½ oz. of cold lean meat; 1 oz. of whole meal bread; 2 or 3 spoonfuls of fruit, cooked without sugar.

In adopting one or other of these plans, the patient's tastes must be consulted, but Banting's system has the great advantage of being simple, and easy to carry out. One should make sure, however, that the kidneys are in a healthy state before recommending it, owing to the large excretion of waste nitrogenous matters which its adoption entails. It must be remembered, too, that they are all more or less "starvation diets," and should therefore not be persisted in for more than a few weeks at a time, during which the patient must be kept under strict observation, and the weight not allowed to run down too rapidly; three pounds a week is a sufficient rate of loss.

In slighter cases, or in more pronounced examples of obesity, after the weight has been reduced by one or two stones, a "subsistence diet" should be adopted for permanent use. This will resemble an ordinary diet, except that sugar, potatoes, sweets, and all rich or fatty articles or dishes are absolutely forbidden and the consumption of bread restricted to about 4 oz. a day.

In every case the patient must be instructed to live by rule and measure, and to weigh out the food he eats until such time as he can be trusted to estimate it approximately from experience. Too great variety should be avoided as tending to increase appetite, and for the same reason the use of pickles, condiments, and all articles that increase the desire for food, should be forbidden.

The use of Particular Articles of Food.—Sugar, it need hardly be said, should be forbidden altogether, and saccharin employed as a sweetener instead. Milk also is a very fattening food. Visible fat should be removed from meat, and the richer meats, such as pork, goose, duck, etc., and the fatter fishes (e.g., salmon, herring, and mackerel) avoided. Puddings must be unconditionally forbidden.

Bread is only allowable in weighed quantities, and toast, in spite of the popular impression to the contrary, is even more dangerous. There is an advantage in selecting the coarser sorts of bread, such as whole-meal, as being more "satisfying" in proportion to their bulk. Potatoes are not so harmful as bread, but, on the other hand, are less missed. Green vegetables may be allowed freely, and have the advantage, owing to their bulk, of producing a feeling of satisfaction. Dried fruits are too saccharine for the corpulent. Fresh fruits may be allowed in moderation, but if cooked should be sweetened with saccharin.

All beverages which contain sugar (e.g., the sweetened aerated drinks) should be forbidden. Alcohol, being a great sparer of fat, is best avoided altogether by the corpulent. If indicated on other grounds, it should be given in the form of plain spirit. Malt liquors are never permissible.

The belief that the restriction of fluids has a direct influence in reducing obesity is probably erroneous. Such a restriction only acts by making it more difficult for the patient to consume his customary quantity of solid food. Limitation of fluids should be insisted upon, however, when any of the following conditions are present: (1) Weakness of circulation; (2) Excessive sweat secretion; (3) Where it lessens the patient's desire for fatty foods. Where a Banting or any other very highly nitrogenous diet is being practised, the restriction of fluids is dangerous as being opposed to the free elimination of waste products.

The treatment of obesity, in its milder forms at any rate, is often more easily and more conveniently carried out at a health resort than at the patient's own home. Carlsbad, Homburg, and Marienbad are the best resorts for the purpose, although none of them is available in the winter or spring months.

2. **Exercise.**—If the patient is able to take active exercise, the treatment of obesity is greatly simplified. If the degree of corpulency renders this impossible, massage may be used at first as a substitute. Any form of active exercise is good, but gentle hill-climbing is particularly advantageous if the state of the patient's heart permits of it. It may be well to point out that riding is of little use in reducing obesity, for, as it has been well remarked, "It is the horse that gets thin, and not the man."

Turkish baths are helpful in many cases, but they are directly contra-indicated if there be any weakness of the circulation.

3. **Drugs.**—Thyroid is the only medicinal substance known which has the power of increasing the destruction of tissue in the body. Unfortunately, however, it acts upon the nitrogenous as well as upon the adipose tissue, and for this reason it must be used, if at all, with great caution, and if employed, care must be taken that the amount of proteid in the diet is in no way restricted. Five grains of the dried gland twice a day would be a sufficient dose. Of the drugs which have been recommended, such as fucus vesiculosus, none is at all trustworthy; of the many patent and proprietary remedies for obesity which are sold, some contain fucus vesiculosus, others citric acid or sulphur, some, in all probability (although this has not been proved), thyroid.

Robert Hutchison.

ODONTOMES.—(See JAW, TUMOURS OF.)

ŒSOPHAGUS.

1. **Cancer of.**—The diet must consist of nutritious liquids, such as eggs beaten up with milk, soup, and starchy food in the form of thin gruel. As a rule, a sufficient quantity of food to maintain life can be swallowed throughout the course of the disease, for the wasting and loss of strength that ensue depend as much upon the cachexia of the disease as upon actual inanition. As liquid diet is bulky, and the quantity which can be swallowed at any time

is limited, food must be given every hour, or every two hours, during the daytime. The quantity aimed at should be 4 pints of milk, 1 pint of soup, 1 pint of gruel, and 2 eggs. The patient may take thin purées of potato as a change from the gruel, and should be allowed tea or coffee with sugar, milk and cream; koumiss or kefir may be tried, but is often objected to on account of its taste; somatose or plasmon may be added to the milk or soup.

It may be difficult to give a full amount of food in this way, in spite of every expedient; the tables in books make up the deficiency by recommending an impossible quantity of fat, in the form of butter or cream. Repeated small quantities (1 to 2 dr.) of cod-liver oil may be tried, but not more, as it is doubtful whether larger doses are fully absorbed, and if this is true of cod-liver oil, it is still more likely with less easily assimilated fats.

Up to the present there is no trustworthy means of treating cancerous growths, the hopes held out by the numerous "sera" invented during the past few years having proved delusive. We are, therefore, reduced to using means to relieve pain and spasm, of which hypodermic injection of morphine ($\frac{1}{6}$ to $\frac{1}{3}$ gr.) is the best. This may be combined with atropine ($\frac{1}{120}$ to $\frac{1}{60}$ gr.) which is held to diminish spasm. Where swallowing causes pain, and is consequently performed with difficulty, it has been suggested to try a teaspoonful of a solution of cocaine or eucaine just before food, but only weak solutions (1 per cent) can be employed, on account of the toxic action of these substances, and unfortunately the analgesic power of such weak solutions is very limited. Doses of olive oil before food are said to assist deglutition. Mechanical treatment of all kinds should be avoided, including the use of even the soft stomach tube, as accidents may easily happen.

In those cases in which the obstruction is so great as to prevent a sufficient supply of food being taken, a gastrostomy should be performed, but it should be undertaken so soon as the power of swallowing liquid nourishment is seriously impaired; it is useless when the patient is moribund.

Nutrient enemata may be used to supplement the nourishment taken by the mouth, but cannot be relied upon to any great extent, or for any length of time. The best nutrient enema is composed of one or two eggs beaten up with milk and a pinch of salt; the total bulk should not exceed 5 or 6 oz.; this should be injected slowly into the rectum at the temperature of the body; the milk may be peptonized. In order to favour the retention of the enema, the hips should be elevated, the patient lying on the left side, and a folded towel should be pressed against the anus for twenty minutes to half an hour after the injection.

Among reputed remedies for cancer which still possess some slight reputation, probably because in some cases they have only recently been recommended, are violet leaves (*viola odorata*),—of which the dose of the liquid extract is a teaspoonful, or a decoction prepared from the fresh green leaves may be given,—X rays, and radium. In the absence of any other indication, it may be worth trying the effect of a short course of red iodide of mercury ($\frac{1}{12}$ gr.) with iodide of potassium (5 gr.), which at least can do no harm. The advantage of some medication is that it satisfies the natural desire of the patient and his friends that something should be done, and prevents his resorting to quack remedies, which may be injurious.

2. **Ulceration of.**—The only specific remedies are in the case of syphilitic ulcer, when red iodide of mercury ($\frac{1}{12}$ gr.) and iodide of potassium (5 gr.) should be given. In the others, the treatment must be mainly palliative and dietetic; injections of morphine ($\frac{1}{6}$ to $\frac{1}{3}$ gr.) and atropine ($\frac{1}{120}$ gr.) may be necessary to relieve the pain or spasm, and liquid diet should be ordered, as described for cancer. Olive oil in tablespoonful doses may be administered before each

meal to facilitate deglutition. Where swallowing causes pain, nutrient enemata may be given instead, so as to give complete rest to the œsophagus. The use of enemata is much more satisfactory here than in cancer, as the patient's general condition is usually good, and his strength is not being undermined by any grave disease, so that he may go on for two or three weeks if necessary with only rectal feeding.

3. **Simple Stricture of.**—The usual treatment is mechanical, that is to say, the gradual dilatation by means of sounds. MacCormac's dilator, with its set of olive-shaped terminations, is an excellent means for effecting gradual dilatation, but is not applicable in cases of impermeable stricture. If no instrument can be passed through the stenosis, gastrostomy should be performed, and an attempt made to penetrate it from below.

Prof. Klemperer speaks favourably of the use of hypodermic injections of thiosinamine, as a means of softening the cicatrix, and facilitating the process of dilatation. The solution he employs is—thiosinamine 10, glycerin 20, distilled water 70, of which from a half to the whole of a syringeful is to be injected under the skin of the back three times a week.

4. **Fusiform Dilatation of.**—The treatment consists in dilating the cardiac opening by means of sounds, and feeding the patient upon the fluid diet already described.

5. **Saccular Dilatations.**—The only satisfactory treatment is by surgical operation.

6. **Spasmodic Stricture of.**—Is, as a rule, readily and completely cured by the passage of a large-sized œsophageal sound. *Robert Saundby.*

ONYCHIA.—(See WHITLOW.)

OPIUM POISONING.—(See COMA, DRUG HABIT, and POISONING.)

OPHTHALMIA NEONATORUM.—(See CONJUNCTIVA.)

OPHTHALMIA, SYMPATHETIC. (See also GONORRHŒA.)

PREVENTIVE TREATMENT.—It must be borne in mind that all eyes with a penetrating injury are liable to excite sympathetic disease in the fellow eye.

Such injuries are especially dangerous: (1) If the injury produces entanglements of any part of the uveal tract (iris, ciliary body, choroid) or lens capsule, and when covered only by a thin layer of epithelium; (2) If the injured eye contains a foreign body; (3) If the injury results in a chronic iridocyclitis. (Eyes in which *suppuration* has taken place as the result of the injury, practically never give rise to sympathetic ophthalmia, and need cause no anxiety.)

All eyes which have been so severely injured that the sight is irretrievably lost should be excised at the earliest opportunity.

When there has been a perforating wound with entanglements, and the eye has not quieted down in two, or at the very latest three weeks, and if there is haziness of the cornea, muddy iris, and keratitis punctata, the question of removal must be seriously considered.

When sympathetic ophthalmia has already shown itself, as evidenced by circumcorneal flush, keratitis punctata, posterior synechiæ, and vitreous opacities, the question as to whether the exciting eye should be removed is often extremely difficult to decide. (1) If the exciting eye is blind, or practically so, and is painful, or contains a foreign body, it must be removed forthwith. (2) If the exciting eye has moderate sight, or an operation at a later period is likely to give useful vision, and if the sympathetic disease in the fellow eye is extremely acute, with intense iridocyclitis, it is wise to leave the exciting eye, which may finally retain the better vision of the two.

The treatment of the disease, once developed, must be both general and local.

General Treatment consists in a course of purging, diaphoresis, and the administration of mercury. A brisk purge must be given at the commencement of the attack, and care taken to secure a free daily action of the bowels. Diaphoresis is best promoted by the hot-pack, fortified, if necessary, by subcutaneous injections of pilocarpine nitrate, $\frac{1}{12}$ to $\frac{1}{8}$ gr. Mercury must be pushed to salivation, and, failing this, aspirin and acetozone may be tried.

Local Treatment consists in the protection of the eyes by dark glasses, the use of atropine, hot applications, and leeching.

Every effort must be made to dilate the pupil with atropine, and if the weaker solution (4 gr. to the ounce) fails to attain this object, the strength must be increased to 8 gr. to the ounce, careful attention being paid to the possibility of toxic symptoms developing. If the atropine gives rise to marked local irritation, a substitute must be tried. (See Iritis.)

The application of two leeches to the temple, repeated every other day if necessary, will assist the atropine in dilating the pupil, and at the same time greatly relieve the pain and congestion of the eye. Heat in the moist or dry form must be persevered with regularly, either by means of frequent hot boracic bathing, by the application of the Japanese muff-warmer, or the Maddox electric pad.

In spite, however, of every care and attention, many cases of this terrible disease end in complete blindness.

Ilbert Hancock.

ORBITAL CELLULITIS may result from :—(1) *Injuries ;* (2) *Extension of the inflammation from surrounding structures*, e.g., periostitis, empyema of the accessory nasal sinuses, more especially the ethmoidal, etc. ; (3) *Metastases*, e.g., pyæmia, meningitis, etc.

Treatment.—In the subacute and chronic forms, surgical interference is seldom necessary. With attention to the bowels, hot fomentations, leeches to the temple, and quinine and iron internally, these cases generally end in resolution.

In the acute form, on the other hand, which is ushered in by a rigor, followed by fever, with great pain, brawny swelling of the parts, and marked proptosis, early operation is imperative to prevent extension to the meninges, and to save the eye from panophthalmitis or optic atrophy. It is not advisable to wait for the abscess to point, and its situation can often be inferred from the direction in which the eyeball is displaced. Thus if the eye is displaced down and out, the abscess will probably be found up and in.

If there is no indication as to the position of the abscess, the incisions should be made through the skin of the upper and lower eyelid close to the orbital margin. A straight narrow bistoury must be used, and the knife plunged deeply into the tissues close to and parallel with the wall of the orbit, carefully avoiding the eyeball. Even if no pus is found, the operation, by relieving the tension of the parts, will often succeed in arresting the inflammation, speedy resolution following. The wounds must be efficiently drained, either by aseptic gauze or drainage tubes, until the discharge has entirely ceased, and hot fomentations applied until the swelling of the parts has subsided.

The general condition of the patient must be carefully attended to, and quinine and iron given internally. If panophthalmitis is present, the anterior segment of the eyeball should be completely divided and its contents evacuated. This is a safer procedure than enucleation, which may lead to meningitis from opening and infecting the vaginal sheath of the optic nerve.

Ilbert Hancock.

OSTEO-ARTHRITIS.—(See Rheumatoid Arthritis.)

OSTEOMATA.—(See BONE, TUMOURS OF.)

OSTEOMYELITIS.—(See BONE, INFLAMMATIONS OF.)

OTITIS MEDIA.—(See EAR, AFFECTIONS OF.)

OVARITIS.—(See SALPINGO-OÖPHORITIS.)

OXALURIA.—(See GRAVEL.)

OZÆNA.—(See RHINITIS, ATROPHIC.)

PAGET'S DISEASE OF NIPPLE.—(See NIPPLE, DISEASES OF THE.)

PALMAR AND PLANTAR ABSCESS.—(See ABSCESS.)

PALPITATION.—Palpitation is in every case a sensori-motor disturbance. The causes do not centre so frequently in structural changes of the heart as is the case in arhythmia; yet attacks of palpitation are found in connection with almost every kind of lesion, especially when pericardial adhesions are associated with valvular diseases. Any weakness of the myocardium may undoubtedly produce palpitation by bringing about increased irritability, so that stimulus production is increased. Physical strain leads to rhythmic irritability, and toxic agencies acting upon the heart muscle bring about the same condition. Nervous influences have a powerful effect in the causation of palpitation. Cerebral lesions interfering with the inhibitory centres, or causes operating upon the vagus nerves, do not, as a rule, cause palpitation, but simple decrease or increase of rate, and it is therefore probable that in palpitation there must be an exaltation of the augmentor as well as a depression of the inhibitory nerves. Emotional disturbances are frequent causes of palpitation, apparently by bringing about interference with both these sets of nerves. Reflex disturbances of every kind, not only connected directly with the vagus nerve—e.g., lung or stomach—but arising in organs only indirectly connected with it—such as the kidney or ovary—frequently give rise to palpitation. Toxic agents often produce a most troublesome and very obstinate form of the affection. The symptoms are extremely common at the menopause, and at the corresponding period of life in men.

TREATMENT.—In cases due to simple weakness of the myocardium, the employment of effervescing baths and general massage should be enjoined, while the administration of formic acid, strophanthus, and strychnine will be found beneficial (see HEART, IRREGULARITY OF). When palpitation depends upon graver structural changes in the myocardium, one of the iodides along with digitalis or strophanthus will give good results, or hydrobromic acid, along with hydriodic acid may be administered, as in the following prescription :—

℞ Acid. Hydrobrom. dil. ℥j | Aq. ad ℥vj
Syr. Acid. Hydriod. ℥iij |

A dessertspoonful in a sherryglassful of water three times a day after meals.

The combination of arsenic and strychnine is also of considerable importance, and the following will be found a useful formula :—

℞ Liq. Arsen. Hydrochlor. | Aq. ad ℥iij
Liq. Strychn. Hydrochlorat. āā ℥ij |

A teaspoonful in a sherryglassful of water three times a day after meals.

When the condition is more serious, and heart failure is present, the treatment must be such as is recommended in the appropriate part of this work.

In cases of toxic origin, as from tobacco, tea, or alcohol, the further use of the poison must be prohibited. Here, as in regard to microbic poisons, every effort must be made to brace up the nervous system, and to favour elimination by all channels. In all these cases the combination of strychnine with hydrobromic acid will be found of the greatest importance.

Gastro-enteric catarrh is frequently associated with palpitation, even in cases where some mental cause is responsible for the cardiac disturbance. In such cases it is advisable to use one of the bromides every night, as in the following :—

℞ Ammon. Brom. ℥vj | Aq. Camphor. ad ℥vj

A tablespoonful in a claretglassful of water at bedtime.

At the same time remedies intended to correct the catarrhal condition will be necessary. When the tongue is flabby and indented by the teeth, the following prescriptions will produce excellent effects :—

℞ Pil. Hydrarg. gr. xxiv | Extr. Bellad. gr. iv
Extr. Aloes Socotr. gr. xij |

Divide in pilulas xij. One every evening.

℞ Acid. Nitrohydrochlor. dil. ℥iij | Inf. Chirat. ad ℥vj

A tablespoonful in a claretglassful of water three times a day, ten minutes before meals.

If, on the other hand, the tongue is coated on the surface and irritable round the edges, the following combination will be beneficial :—

℞ Sod. Bicarb. ℥iij | Inf. Calumbæ ad ℥vj
Tinct. Rhei ℥iv |

A tablespoonful in a claretglassful of water three times a day before meals. Shake the mixture.

In all such cases of abdominal origin, or associated with abdominal disturbances, it is well to be careful that no renal mobility or other mechanical cause of reflex disturbance is present. It is scarcely necessary to add that if the patient is anæmic, one of the preparations of iron must be employed, along with gentle aperients and thorough attention to hygiene. In certain anæmic cases of palpitation, the subcutaneous administration of iron and arsenic is invaluable. The formula which is most useful is :—

℞ Ferr. Ammon. Cit. Virid. gr. xx | Aq. Destil. ad ℥j
Sod. Arsenat. gr. j |

Twenty minims to be injected deeply into the gluteal muscles every second day.

If palpitation makes its appearance during the menopause, in addition to employing remedies of the different types referred to above, it may be found advantageous to use ovarian extract ; in analogous cases in men, didymin is sometimes useful. *G. A. Gibson.*

PALSIES.—(See Birth Palsy and Craft Palsies.)

PALSIES, CEREBRAL (of Childhood).—Under this heading are included the spastic paralyses of childhood, such as diplegia, hemiplegia, and so-called congenital spastic paraplegia. They divide themselves into three great classes :—(1) *Those due to natal or pre-natal conditions ;* (2) *Those due to acute disease,* with an onset in early childhood ; (3) *Those which are due to pathological processes,* slowly acting but progressive in character.

Cases belonging to groups Nos. 1 and 2 tend to improve ; those belonging to group No. 3 to run a progressive course.

1. These cases show an amount of paralysis and rigidity ranging from a slight spastic condition of the legs to a condition of extreme hyper-extension of the legs,

inward rotation of the arms, and retraction of the head. In the latter case, but little can be done to relieve the symptoms ; in the former, patience and perseverance may accomplish much.

Children suffering from this affection commonly come under observation during the second year of life, owing to their inability to walk ; such a child may show other signs of cerebral and mental deficiency, but in many cases the condition is limited to the lower extremities.

Treatment is simple, but must be continued over a long period. It must in the first instance be directed to remove the rigidity which is present ; this is accomplished by regular *passive movements*, which have for their object the overcoming of the spasmodic contraction of certain muscles. As a rule the adductors of the thigh are markedly contracted, and abduction and rotation outwards of the thighs are movements of especial importance. Again, the foot tends to assume a position of equinus, with which is often associated some cavus. Dorsiflexion movements of the foot are especially required in such a case. Warm baths preceding the passive movements are often of the greatest service. These movements should be carried out twice a day, and for periods of 15 to 30 minutes.

No less important are the *resistance movements* which a child can usually be taught to perform. These are carried out by making the patient alternately flex and extend the leg against the resistance of the hand. Co-ordination is educated by making the child perform exercises similar to those described by Fränkel. For the legs, a double board with round holes at the distance of 3–4 inches into which the heel can be placed, serves for simpler forms of exercises. For the hands a solitaire or cribbage board, on which the pegs are moved up hole by hole, is all that is required. Simple rubbing is useful, but is not nearly so important as the exercise above indicated.

The child should be encouraged to walk, and considerable aid may be obtained by a go-cart with a sufficiently broad base and easily running wheels. Tenotomy may be required in some cases. Faradism, galvanism, and various forms of electrical treatment are of little service. Drugs also are of little use except to meet special symptoms.

For the more severe cases, in which there is retraction of the head and marked rigidity with hyper-extension of the limbs, very little can be done in the way of treatment, and it is a matter of careful nursing to keep the skin of these children free from sores.

2. In the second class of case, in which the cerebral condition has followed on some acute disease, treatment should be carried out on the lines laid down for cases in group No. 1, but with even more prospect of success, and especially in those cases in which the lesion is of the nature of polio-encephalitis superior.

3. For the third group little or nothing can be done to arrest the progress of the disease. In cases due to specific disease, mercury and iodide may be given, and the latter drug in drachm doses three or four times a day has been recommended. I have tried these, and there is no difficulty in giving this amount, but I have never seen any beneficial result follow. Cases presenting hemiplegic symptoms are treated in a similar manner to those presenting bilateral symptoms.

F. E. Batten.

PAPILLOMATA.—(See WARTS.)

PARALYSIS AGITANS.—This is an affection which severely taxes the resources of the physician. The disease pursues a very chronic course. The symptoms may remain stationary for long periods of time, but it is very doubtful whether an actual " cure " has ever been effected. While there is no conclusive evidence that any of the therapeutic measures hitherto employed have permanently arrested the disease, it is at the same time to be remembered

that the very chronic course which it pursues, renders judgment as to the effects of remedies upon its progress extremely difficult.

Treatment consists in attention to the general hygiene, and the avoidance of influences which have been observed to exert a deleterious effect, together with the administration of drugs, and the adoption of other therapeutic measures which have been found by experience to benefit the individual symptoms, and may perhaps help in retarding the progress of the disease.

The patient should lead a quiet, restful life, free, as far as possible, from excitement and all cares and business worries. Fresh air seems undoubtedly beneficial; an outdoor life, with exercise graduated to meet the individual's capabilities, is therefore to be recommended. A carriage drive, it is worthy of note, will often assist materially in lessening the patient's discomfort for the time being.

Alcohol and stimulants, such as strong tea and coffee, are to be avoided. A glass of whisky and hot water at bedtime may, however, be permissible in cases of sleeplessness. A warm, but not very hot bath, sometimes has an appreciably soothing effect upon the subjective symptoms.

In the later stages, restlessness, and an inability to remain for any length of time in one position, are among the most troublesome manifestations of the disease. A hard bed, by enabling the patient to alter his position more easily, will be found preferable to a feather mattress when these symptoms exist. Gentle massage often helps to allay discomfort in the affected limbs. Observers are almost all agreed as to the uselessness of electricity in this disease; although Oppenheim considers that he has seen some benefit from weak bipolar baths.

Distinct benefit may accrue from exercises, as Friedlander has recently pointed out. Thus, in early cases, where the tremors can be for a short time controlled, the patient should practise his power of voluntary control two or three times a day. Temporary lessening of the tremor, and, it may be, after a time a more permanent beneficial effect, is sometimes attained in this way. The same author strongly advocates the value of slow passive movements of extension at the various joints. The limb should be fixed, and while the patient does his best to relax his muscles, the operator carries out five to ten movements at each joint. Even in severe cases, improvement may be obtained by this procedure. Active movements of the extensor muscles against varying degrees of resistance, carried out systematically with the purpose of overcoming the flexor rigidity, will also be found of service. Again, the patient's attention should be directed to the necessity of constantly trying to correct the abnormal attitudes which the limbs, head, and trunk tend to assume. While walking, for instance, he should pause after each step and extend the trunk and vertebral column as the advancing foot is placed upon the ground, and should practise at the same time taking longer steps. Great improvement cannot be expected from these exercises, but the amount of benefit which may be derived thereby is ample justification for their systematic use.

Suspension, nerve stretching, and the " jolting chair " of Charcot, are methods of treatment which are no longer employed.

Many drugs have been credited with producing benefit in this disease, but few have justified their vaunted reputation.

Arsenic is a medicinal remedy which is generally regarded as of some service. Fowler's solution, 2 min. three times a day, the dose being gradually increased to 8 or 10 min., is the usual method of administration. If an arsenical erythema or gastro-intestinal symptoms appear, the dose should be reduced. Pigmentation of the skin may be produced when arsenic is given in large doses. Where it is deemed desirable to continue the administration of large doses, the possible development of an arsenical neuritis is to be kept in view.

Strychnine is another drug which appears in some cases to do good. It may be combined with arsenic, or it may be given as Easton's syrup, beginning with a dose of half a teaspoonful three times a day, and gradually increased.

The merits of hydrobromate of hyoscine, originally recommended by Erb, in this disease, have been advocated by Williamson, who points out that this drug diminishes the tremor and general restlessness, while the patients often sleep better during its administration. Williamson advises that the drug be given in chloroform water, commencing with an initial dose of $\frac{1}{150}$ gr., which may be gradually increased up to $\frac{1}{100}$, or even *with due caution* to $\frac{1}{50}$ gr. two or three times a day. The same preparation of hyoscine should be used to ensure constancy.

℞ Hyoscin. Hydrobrom. gr. $\frac{1}{8}$ | Aq. Chloroform. ℥vj
Two teaspoonfuls twice a day, the dose to be increased as directed by the physician.

The first dose should be given after breakfast, the second shortly before the patient retires to rest. The action of the drug appears to wear off in a few days, but if it is discontinued and again renewed, the effect is usually as marked as at first. The dose should be reduced if dryness of the mouth supervenes. Hyoscine sometimes produces gastric symptoms which interfere with its administration.

Sulphate of hyoscyamine ($\frac{1}{100}$ gr.) and sulphate of duboisin ($\frac{1}{75}$ gr.) are sometimes of benefit. For pains in the limbs which are giving rise to discomfort, phenacetin or some of the other analgesics may be employed. (See also CRAMP.)

Edwin Bramwell.

PARAMYOCLONUS MULTIPLEX.—(See MYOCLONUS.)

PARAPLEGIA.—(See also NEURITIS, POLIOMYELITIS, AND PALSIES OF CHILDHOOD.)

Paraplegia may be due to many causes, the nature of which, in conjunction with the special characters of the paralysis, will determine the treatment of the individual case.

The treatment of paralysis of the lower limbs consequent upon disease of the peripheral nerves, or from acute anterior poliomyelitis and the spastic paraplegias of childhood (Little's disease), are dealt with in special articles.

A rapid survey of the paraplegias from a pathological standpoint is necessary as an introduction to our subject.

Conduction in the spinal cord may be interfered with or abrogated by lesions within its substance, such as acute myelitis, hæmorrhage, tumour, syringomyelia, and disseminated sclerosis.

Again, pressure upon the spinal cord may interrupt the transmission of impulses to and from the parts below the level at which the cord is pressed on. Among the lesions which may be instanced in this connection are malignant and simple tumours growing from the spinal membranes or from the bone, hydatids, pachymeningitis, which may be syphilitic, tuberculous, or simple, tuberculous disease of the spine, and aneurysm of the abdominal aorta, which has eroded the vertebral bodies and invaded the spinal canal.

Further, the paraplegia which results from direct violence in association with a fracture dislocation of the spine may with advantage be separated from the pressure paraplegias just referred to.

Another group includes those cases in which the paraplegia is dependent on systemic disease affecting primarily the motor neurons, although in addition, other tracts may be involved. Examples of this type are to be found in amyotrophic lateral sclerosis, the combined degenerations of the spinal cord, familial spastic paralysis, etc.

Lastly, there are the hysterical paraplegias. In this connection the paralysis dependent upon a fixed idea, a functional paralysis taking the place of a recovering organic paralysis, is deserving of special mention, since its true nature is especially apt to escape detection.

The type of the paralysis may vary. Thus, a paraplegia is often referred to as spastic or flaccid, according to the presence of spasticity or flaccidity in the paralysed limbs.

Since the character of the paraplegia is important in relation to treatment, a few words in explanation of these terms are necessary.

The spinal centres for the movements of the lower limbs are situated in the lumbo-sacral region of the spinal cord (L2 to S2); hence any lesion which destroys this region will produce a flaccid paralysis of the lower extremities associated with wasting of the muscles, impairment or loss of their excitability, and abolition of the reflexes in the region of the body supplied from the segments which are destroyed. On the other hand, if the lesion is situated at a higher level—in other words, if the pyramidal fibres and not the spinal centres are implicated—a condition of muscular spasticity, with increase of the deep reflexes, is met with. If, however, the lesion is so complete as to totally interrupt upward and downward conduction through the cord, notwithstanding that the lumbo-sacral region of the cord remains intact, a flaccid palsy, with wasting, impaired electrical excitability, and abolition of the deep reflexes results. For instance, in cases of complete localized destruction of the spinal cord due to a fracture dislocation of the spine, this form of flaccid paraplegia is met with. Cases may be observed in which a tumour pressing on the cord, at first produces a spastic paralysis, the spasticity gradually increasing until conduction in the cord becomes impossible, when a flaccid palsy takes the place of the previous spastic state.

At this juncture it will be convenient to refer to certain of the paraplegias, the causative treatment of which calls for special emphasis.

The Primary Treatment (Treatment directed against its Cause).—From the preceding remarks it will be seen that the treatment of paraplegia necessitates a recognition of its cause. This may at once be obvious ; on the other hand, the solution of the diagnostic problem may be attended with the greatest difficulty, and is sometimes, especially in the early stages of a case, impossible. If the physician is unable to come to a positive conclusion as to the exact nature of the case, he must at least attempt to exclude those various forms of paraplegia which urgently demand a special line of treatment.

If the paraplegia is *hysterical*, and if, as the result of a confident opinion as to the absence of organic disease, no immediate improvement takes place, the patient should be promptly removed from her relatives and treated in isolation by psychotherapeutic methods, either in a hospital ward or nursing home. Decisive measures are to be adopted from the first if a good result is to be obtained, for dilatory temporizing diminishes the prospect of cure in these cases. Needless to say, the measures above advocated are only to be adopted when the physician is perfectly certain of his diagnosis.

When a history of previous *syphilis* is obtained, or when objective evidence of that disease is forthcoming, a course of mercurial inunctions and potassium iodide internally should be immediately instituted. Details as to the method in which these drugs are to be administered will be found in the article on syphilis. Here, again, temporizing is inexcusable. Potassium iodide should be given in doses of 10 to 15 gr. three times a day, and rapidly increased until 100 gr. or more are taken in the twenty-four hours. If a gumma or gummatous meningitis is responsible for the symptoms, the beneficial effects of treatment will probably be evident in the course of a few days. Even should the symptoms entirely disappear, the possibility of their recurrence must be kept in view, and the remedies continued in smaller doses, with intermissions, over a considerable period. The nature of the symptoms and the order of their development, as in the case of Erb's syphilitic spinal paralysis, may suggest the necessary line of treatment. If there is any reason for suspecting syphilis, neither a denial of infection and of the usual later symptoms of the disease, nor a negative family history, nor the absence of a scar upon the penis, is to be regarded as a contra-indication to the therapeutic test. The amount of improvement which follows in a case of syphilitic paraplegia, even when the paralysis is of considerable standing, is often most surprising if the remedies are continued over a long period.

Is the spinal cord pressed on by a *tumour* ? If so, is the neoplasm a secondary

deposit, is it a malignant tumour growing from the membranes or the bone, or is it a localized simple growth arising from the membranes? When the facts point towards the latter diagnosis, a syphilitic gumma has in the first instance to be excluded. Large doses of iodide should be given for a few days, and the effect carefully noted. If after a week no very marked improvement has ensued, the question of operation must be carefully considered, and without delay, for it must be remembered that, as a consequence of pressure, a softening of the area of cord in immediate relation to the tumour may at any time take place, after which no relief of symptoms is to be anticipated as a sequel to removal of the tumour. In any case of progressive paraplegia, associated with severe pain in the back which corresponds to the upper level of the symptoms, with, it may be, root pains, and especially if there is a tendency to the Brown-Séquard syndrome, an abdominal aneurysm and syphilis having been as far as possible excluded, and there being no evidence of disease of the bone or of tumours elsewhere, an operation should be undertaken without delay, provided that there are no special contra-indications. The brilliant results which have been obtained in a large number of cases by the removal of a simple tumour pressing on the cord, afford ample justification for this procedure in any case of progressive paraplegia in which there is a distinct possibility that the symptoms may depend upon a growth of this nature. In some of these cases the operator may find localized tuberculous disease of the bone, of which there was no previous indication, with, it may be, tuberculous granulation tissue or a pachymeningitis; in others he may light upon an extensive and irremovable sarcoma; but the possible presence of these lesions, of which no evidence exists, constitutes no contra-indication to the surgical procedure. It is not proposed to consider here the segmental location of the tumour; on this point, and that of vertebrospinal topography, the reader must consult special neurological and surgical works; but it may be noted, that the constant tendency is to locate the tumour rather too low than too high in the spinal canal.

Tuberculous disease of the spinal column, often apparent at the first glance, is in some cases extremely difficult or impossible to distinguish from the other forms of pressure paraplegia, and notably from tumour. The condition having been diagnosed, if there is no evidence pointing to a tuberculous abscess as the cause of pressure, absolute rest in bed is to be enjoined. Extension should be applied, with counter-extension to the head if the disease is situated in the cervical region. (See SPINE, CARIES OF.) If there is reason to suspect a tuberculous abscess as the cause of the paraplegia, it is probable that operation will prove the only effective mode of treatment. It is especially in the case of children that a favourable result is to be anticipated as a consequence of operation in these cases. Caries sicca (dry caries), a condition which occurs specially in adults and elderly people, is very occasionally benefited by operation.

The *traumatic paraplegia* associated with fracture dislocation of the spine deserves notice, since early operation is attended with some hope of relief, if it so happens that the cord is pressed on by a piece of bone which is removable.

No treatment is known which has a direct influence on the paraplegias which result from systemic disease, syringomyelia, and disseminated sclerosis.

Symptomatic Treatment.—Under this heading it is proposed to describe the measures to be adopted in the symptomatic treatment of a case of paraplegia more or less irrespective of its origin.

In cases of *paraplegia of acute onset*, certain precautionary measures are at once necessary.

1. In the event of the patient being unable to pass urine, as is usually the case, the next point to determine is whether the bladder is distended. If there is distension of the bladder, the *urine should be at once drawn off* with the strictest

aseptic precautions. A catheter is to be passed three times a day until the patient is able at will to pass water freely. Statements to the effect that urine is being passed are to be accepted with caution, since an overflow incontinence may delude the patient into believing that all is well.

2. The patient should at once be placed upon a *water bed*, with the special object of avoiding bedsores.

In order to prevent the development of bedsores, it is of primary importance that the patient should be kept absolutely dry and clean. If there is incontinence of urine, male patients should be provided with a receptacle for the urine, care being taken that a trophic ulcer does not form on the penis in consequence of pressure. Absorbent wool, which should be repeatedly changed, is to be placed between the thighs of female patients to catch, so far as possible, every drop of urine which escapes. The buttocks and back should be carefully washed with soap and water at least twice a day; methylated spirit is then to be rubbed into the skin, which may afterwards be dusted with some bland non-irritating powder. The heels may be allowed to lie in nests of cotton wool as an additional precaution against bedsore formation. The danger of burns, as a consequence of hot bottles coming in contact with the insensitive skin, is to be borne in mind.

Whether the case be one of hæmorrhage or acute myelitis, on theoretical grounds it has been suggested that the patient should be placed in the *prone position* until the acute process has ceased to progress. It seems reasonable to suppose that in this position gravity may to some extent deplete the vessels in the neighbourhood of the lesion, a result which in the supine position is probably reversed. Two pillows placed beneath the abdomen will help to diminish any discomfort the patient may experience in assuming this unwonted posture. Absolute rest should be enjoined. If the patient finds this to be impossible in the prone position, it is probably well to let him lie upon his back.

Ice applied over the situation of the lesion is recommended by most authorities in cases of acute myelitis. A sponge bag filled with ice will be found convenient for this purpose.

It is improbable that ergot is of any use in arresting the inflammatory process in a case of acute myelitis; if, however, hæmorrhage has been diagnosed, or even if its presence is suspected, full doses of this drug may be administered with possible advantage. When there is much pain, as there is very apt to be in cases of hæmorrhage, 10 gr. of phenacetin may be given. Should this prove ineffectual, $\frac{1}{4}$ gr. of morphia, injected subcutaneously, will probably bring relief.

Constipation, a constant accompaniment unless treated, is to be guarded against by a daily soap and water enema.

Small doses of iodide of potassium (5 to 10 gr.) may be administered internally, in the hope that they may aid in promoting absorption of the inflammatory products.

The nursing of these cases requires the greatest care, and whenever practicable, the services of one, or better, two, trained nurses should be secured.

In cases of *chronic paraplegia*, or in those of sudden onset in which the acute stage has passed off, the patient should be given every encouragement to use his limbs, with due caution as to the avoidance of fatigue.

When the paraplegia is of the flaccid variety, a consequence of destruction of the lumbosacral cord or nerve roots of the cauda equina, the paralyzed muscles should be massaged every day. The application of faradism—or, if the muscles will only react to galvanism, the latter form of electricity, may be recommended as soon as the acute process has passed off. Strychnine may be given hypodermically with advantage in the flaccid paraplegias, although contra-indicated where spasticity exists.

In treating the flexor spasms, the jumping of the legs of which paraplegics so often complain, a specially annoying symptom, since it is apt to interfere with sleep, veronal in doses of 5 to 10 gr. may be of value. Extension applied at night-time, the necessary weight to be determined by experiment in the individual case, may also prove of service.

Pain in the back is sometimes relieved by the application of the Corrigan button over the spine in the region where it is experienced. In some cases of malignant disease of the vertebral column the pain is so severe that the condition well deserves the epithet "dolorosa" which has been applied to it. There is no object in withholding morphia in the treatment of those cases in which a fatal termination is to be looked for in the near future.

One of the most common causes of death in cases of paraplegia is the development of a cystitis, with a subsequent spread of the infection to the kidneys, producing a pyelonephritis. Should cystitis exist, the bladder should be washed out two or three times a day with weak boracic lotion, while suitable remedies, such as salol, urotropin, and acid phosphate of soda, may be given internally, as indicated by the condition of the urine. Other associated lesions and complications, such as anæmia, are to receive the necessary treatment which their presence demands. (See also ELECTROTHERAPEUTICS and SPINE, CARIES OF.)

Edwin Bramwell.

PARASITES, INTESTINAL.—(See INTESTINAL PARASITES.)

PAROSMIA.—The majority of patients who seek advice because of an unpleasant smell in the nose will be found to be suffering from some local disease. The most careful examination must be instituted to discover any cause, such as suppuration in the accessory sinuses (especially in the antrum), syphilitic ulceration, or necrosis. The mouth, throat, and even the lungs must be examined as a possible source of the trouble. The chief causes of true parosmia are hysteria, neurasthenia, influenza, and central nervous diseases. The treatment must be directed towards the removal of the cause. The prognosis in the majority of cases is good.

H. Lambert Lack.

PAROTID, TUMOURS OF.—(See SALIVARY GLANDS.)

PAROTITIS.—(See SALIVARY GLANDS and MUMPS.)

PASSIVE CONGESTION.—This method of treatment was originated by Bier. He has already been working at it himself for many years, but the very interesting results of the treatment, especially since its recent application to acute infections, have now secured for it widespread use. The fundamental principle of the method is that the symptoms of inflammation (swelling, redness, and heat) should not be subdued, seeing that they represent the salutary reaction of the body against the infection, but should, on the contrary, be carefully stimulated in order to aid the body in its struggle against the infecting organisms and their poisons.

In order to stimulate the inflammation, Bier has recourse to an artificial increase of the hyperæmia already existing in the inflamed region, selecting the predominating venous hyperæmia; he exactly imitates in this the natural process of inflammation, which shows an increase of the volume of blood with a slackening of the rate of flow. It therefore follows that a cessation of the circulation *should never occur with Bier's treatment*, but that with an unchanged arterial supply, only a very slight interference with the venous return should be brought about. It is especially important to emphasize this, because beginners often understand by passive congestion a tight strapping, similar to that of an Esmarch bandage. This notion is absolutely erroneous.

A very soft, broad rubber bandage is used to produce the engorgement. It is wrapped loosely and with wide intervals over the limb above the seat of disease, mostly on the upper arm or on the upper part of the thigh ; the bandage must never be applied to the diseased region itself. A distinct swelling of the veins appears, followed by some œdema of the engorged part ; the colour should be bluish-red, never cyanotic or anæmic ; the part must remain warm, and the pulse entirely unchanged and strong ; the best criterion of the right technique is when no pain results from the engorgement, but on the other hand the pain existing in the inflamed region subsides after a short interval.

It is found by experience that, as a general rule, acute inflammations require engorgement for from twenty to twenty-two hours daily, while the resulting œdema should disappear within the short interval of from two to four hours. In all chronic and other fever-free cases (especially in cases of tuberculosis) the bandage is applied only once or twice daily, for two hours.

The above treatment by the application of the bandage can, with certain modifications, be applied not only to the extremities, but also to the head, the scrotum, and the shoulder-joint. In places where this method cannot be employed, e.g., on the trunk, hyperæmia should be brought about with the help of cupping-glasses. The latter are manufactured in all shapes and sizes, and can therefore be applied to all parts of the body. Their edges should be smeared with vaselin, and the air exhausted either by means of an india-rubber ball or a syringe. The glasses should be used for three-quarters of an hour daily, being applied five minutes at a time with intervals of a few minutes.

This method of hyperæmia should in no case be carried to excess, and must be always completely painless.

A general and important rule of the hyperæmia treatment is, that any abscess must be evacuated as soon as it has formed ; but very small incisions are sufficient in nearly all cases when combined with the simultaneous, correct application of the Bier treatment ; and no scraping is undertaken. There is a great advantage in thus avoiding large incisions, and the entire period of treatment is much shortened. The treatment is also painless and prevents suffering, because the large incisions, packing, and drainage are dispensed with, and because the function of the diseased region is kept in a better condition than was possible before. The functions of joints and tendons especially can be maintained by this means, for from the very outset active and careful passive movements can be allowed with the hyperæmia treatment.

The principal indications for treatment by passive congestion are the following : Tuberculosis of the joints ; tuberculosis of the tendon-sheaths ; acute infections of the joints—traumatic, metastatic, and especially gonorrhœal ; cellulitis of the hand, of the tendon-sheaths, and of the arm ; middle-ear suppuration ; testicular tuberculosis ; and septic wounds.

The principal indications for the use of the suction apparatus are boils, carbuncles, buboes, abscesses of the sweat glands, tuberculous abscesses, dental fistulæ, abscesses in the floor of the mouth, and especially puerperal mastitis.

A special application of the hyperæmic method, where it is more a question of arterial hyperæmia, takes place with the hot-air chamber and with the hot-air douches described by Bier, which latter can be combined with massage. The hot-air hyperæmia is used in synovitis in the early stage ; otherwise its employment is only indicated in chronic processes, especially in the rheumatic or dry forms of arthritis, as well as in the conditions which result from disease of the joints, and from fractures in their neighbourhood ; further, in the case of effusions of blood, of sprains and twists, and finally—with great caution—in gangrene. The hot-air douche is employed with good results in sciatica and trigeminal neuralgia.

Victor Schmieden (Berlin).

PAVOR NOCTURNUS.—(See NIGHT TERRORS.)

PEDICULOSIS CAPITIS.—It is not enough to bring about the destruction of the active pediculi. That is easy, and may be accomplished by the free application of any antiseptic, or by simple prolonged soaking in water. If the embryos in the nits are not also destroyed, the relief is only temporary. The best and surest method is the application of common paraffin oil. The hair is soaked at night with the oil, and strips of rag, dipped in the oil, are plaited up with the hair into a chignon, over which a bathing cap is applied. The soaking is repeated, morning and evening, on the next day. On the following morning the head is washed with soap and water. If these directions are faithfully carried out, one may feel confident of the destruction of all the embryos, and thus of complete cure. The nits, however, still remain adherent to the hairs in large numbers, acting as unpleasant reminders of the past. Many methods have been recommended for their removal; probably the best is the diligent use of the old-fashioned tooth-comb dipped in warm vinegar. It may not be out of place to emphasize the importance of the fact that pediculosis capitis occurs in the children of all classes, and in the most fashionable and expensive of schools.

Norman Walker.

PEDICULOSIS CORPORIS.—The pediculosis corporis, though usually found on the vestments, deposits its eggs on the fine downy hairs of the trunk, and it is therefore not sufficient, as some have taught, to disinfect the clothes and bathe the patient. In addition to these most desirable procedures, some antiparasitic ointment, such as sulphur or stavesacre, must be thoroughly applied to the body surface for two or three days. Allan Jamieson recommends that elderly persons whose habits are such as to "predispose" to pediculosis should wear a little bag filled with sulphur, like a charm, round the neck. The vapour of the sulphur is repulsive to the pediculus.

Norman Walker.

PEDICULOSIS PUBIS.—The crab louse does not restrict itself absolutely to the region which is suggested by its scientific name, but is found occasionally on the hairs of the axillæ, eyebrows, and eyelashes: in these latter situations, only in greatly neglected children. In the usual situation on the pubis it is easily destroyed by the regular application of some antiseptic ointment. Blue ointment, the usual chemist's prescription, is not a desirable antiseptic to use, for two reasons: first, the readiness with which the mercury is absorbed into the system from this warm moist region, and second, the frequency with which a mercurial dermatitis is set up. This, in its turn, causes irritation; the unfortunate victim attributes this to the pediculi, and in his anxiety he applies more and more of the ointment, which has probably already destroyed the parasites, and now merely aggravates his sufferings. White precipitate ointment is as efficacious and less injurious; warm vinegar, with a little sublimate is a favourite application in France; and in very severe cases the parts may be shaved.

Norman Walker.

PEMPHIGUS.—Many bullous conditions, especially impetigo contagiosa, are incorrectly diagnosed as pemphigus, and results of marvellously successful treatment are recorded. True pemphigus is a very grave disease, and fortunately a rare one, for treatment is far from satisfactory. Arsenic is the most useful remedy, and should be given as freely as the patient's general condition permits. As soon as it has obtained control of the disease, the dose should be reduced till just enough is given to maintain the improvement. No other drug has so specific an influence as arsenic, but strychnine and other tonics are sometimes useful when, for one reason or another, one is compelled to suspend the administra-

tion of arsenic. The cacodylate or other organic compounds of arsenic may be tried, but their effects are just the same as those of arsenic, while they impart a very marked garlic odour to the breath.

Locally, treatment consists in letting the contents out of the bullæ, and the application of some simple antiseptic ointment. *Norman Walker.*

PERICARDITIS.—(See RHEUMATISM, ACUTE.)

PERIOSTITIS.—(See BONE, INFLAMMATIONS OF.)

PERIPHERAL NEURITIS.—(See NEURITIS and PARAPLEGIA.)

PERITONITIS, ACUTE GENERAL.

TREATMENT.—It is admitted on all sides that if a case of acute general peritonitis is allowed to run its course without surgical interference the termination is always a fatal one ; the rare exceptions that occur only serve to emphasize the importance of this rule. Ever since the modern development of abdominal surgery, the consensus of opinion has been fairly general that the treatment of this condition was outside the pale of discussion, the only difference of opinion in any given case being due to the extreme difficulty in determining whether the trouble will remain localized or not. If the surgeon brings much hesitation to bear upon these cases, he will find sooner or later that an operation has been delayed too long to save the patient's life. There is in my opinion only one way out of the difficulty ; namely, as soon as the diagnosis of acute general peritonitis has been made, operation must always be performed, providing the condition of the patient justifies the procedure ; further, if it is impossible to say whether the condition is general or local, the surgeon is justified in operating. In dealing with these cases, one must bear in mind how difficult it is to gauge the resisting power of the patient : a case apparently hopeless in every respect, with every indication of advanced poisoning and with distended bowel, may recover rapidly after an operation judiciously carried out ; while a patient with a good pulse, and no definite symptoms that can be said to be serious, may succumb within a few hours of an operation, however carefully performed.

The importance of gauging the resisting power of the patient is concerned not so much with the advisability of operation, as with the extent of the operative treatment. In forming an opinion on this point it is necessary to know whether the patient has been taking any drugs which may give a false appearance of strength : this is especially the case with opium and morphine. In the treatment of acute general peritonitis, whether operated upon or not, opium and morphine are most valuable agents during the serious stages of the disease ; and they are almost universally given as a routine practice : it is, therefore, very important to ascertain whether the condition of the patient may appear better than it really is owing to the influence of these drugs.

Success in the operative treatment of this condition depends largely upon the knowledge and skill of the surgeon, who has to consider whether a thorough attempt to deal with the case can be made, or whether the least possible operative interference is advisable. Upon this decision depends whether the patient is to have a general anæsthetic, followed by flushing and drainage of the peritoneal cavity, or whether a local anæsthetic, followed by an incision and a minimum amount of drainage, will suffice. Many a case too bad for a general anæsthetic can be saved by abdominal section with local anæsthesia.

During the past year or two a method of producing anæsthesia has been tried which, in my opinion, will have a most important bearing upon the treatment of this disease : I refer to the injection of stovaine, novocaine and allied drugs into the structures surrounding the lumbar spinal cord or cauda equina. This

is not the place to enter into a discussion of this matter, but there are certain features in it which are very important in relation to abdominal disease : (1) With care it is quite possible to obtain sufficient anæsthesia for any operation upon the abdomen ; (2) One avoids the harmful influence of chloroform and ether upon the respiratory tract primarily, and upon the excretory organs secondarily,—beyond a headache of variable duration and extent, stovaine, etc., have no bad consequences ; (3) By paralysing the peripheral nerves no impulse can pass up to the central nervous system, and shock is largely if not entirely abolished.

It is the immunity from shock which renders this method so valuable for abdominal operations. I have employed it in several almost hopeless cases of acute general peritonitis, and have been astonished at the success gained, especially in the absence of surgical shock.

It is not within the scope of this article to describe in detail the surgical treatment of this disease, but I will shortly indicate the main points.

The choice of Anæsthetic.—Apart from local anæsthetics and lumbar anæsthesia, there is considerable diversity of opinion among surgeons concerning the best anæsthetic for abdominal operations. From the patient's and the surgeon's point of view it seems to the writer that chloroform is the best, both for a rapid and comfortable performance of the operation and for the absence of pulmonary disturbances so common to ether. From the anæsthetist's point of view, which is concerned solely with the patient's safety during the actual operation, the consensus of opinion in London is in favour of ether. With a competent chloroformist, the writer considers that the safety of the patient during the operation, and a few days succeeding, is better guarded with chloroform than with ether.

The operations may be divided into three groups : (1) Laparotomy—removal of any localized gangrene, such as appendix, fallopian tube, etc.—systematic flushing and drainage ; (2) Rapid laparotomy, with drainage ; (3) Laparotomy with local anæsthesia or lumbar anæsthesia.

1. **Laparotomy, Flushing and Drainage.**—The patient is given a general anæsthetic, preferably chloroform, and a free incision is made in the middle line below the umbilicus. The abdomen having been opened, search is made for the source of the trouble ; the right iliac fossa is the best starting-place. If the appendix is the offending organ, it should be removed either through the median incision or by a second one if necessary. In the case of a perforated ulcer of the stomach, the perforation is remedied and gastro-enterostomy performed if considered necessary : if possible, all traces of local suppuration should be removed, and the region of the local trouble carefully sponged. In whatever part of the abdomen, whether in the region of the stomach or of the appendix, in all cases the pelvis should be flushed out with normal saline solution until it returns clear. If it has been possible to completely remove the local mischief, it is best in my opinion to sew up the wound or wounds in the abdominal wall without drainage ; if, however, it is doubtful whether the local mischief has been removed, a drainage tube should be left in, with or without some gauze, so that any further pus can be drained away.

Drainage of the Peritoneal Cavity.—This is a subject upon which a great deal of discussion has been expended, and even now surgeons are agreed to differ : some operators consider it necessary to make a number of openings for drainage, two or more in each flank, as well as to place tubes in the original wound ; some use tubes, others gauze, others again a combination of the two. If a drainage tube which has been placed in the iliac fossa so that about six inches lie in contact with the intestine is carefully examined at the autopsy of a case which has survived for twenty-four hours, it will be seen that the tube is surrounded by coils of intestine sealed together by the exuded lymph, which

prevents the tube from receiving any marked amount of the inflammatory effusion. The surface of the coils surrounding the tube exudes some turbid serum which fills the test-tube-like cavity; if the liquid be removed by a syringe, it is replaced by more, the tube simply acting as a foreign body, and giving passage only to that fluid which is exuded from the surface of the intestine around it: any fluid in the general peritoneal cavity seldom finds its way into the tube, and then only in inefficient quantity. A drainage tube used in this way is only of value when its end rests against a septic focus, such as the stump of a sloughing appendix—the tube is then able to carry away any pus that may collect in the neighbourhood of this gangrenous spot. Drainage tubes can only assist by keeping up a channel through the coils of intestine through which some septic focus can discharge its pus direct to the exterior: no number of tubes can effectually drain the peritoneal cavity.

There is, of course, one exception to this statement; namely, the pelvis being the dependent part of the whole of the abdomen, any fluid tends to collect there in a pool, and it is most important that this pool should be emptied. It can be done by placing a good-sized drainage tube right down to the bottom of the pelvis, the contents of the tube being removed at intervals by the syphon apparatus or a syringe. When dealing with women, some surgeons prefer to make an incision through the vagina into Douglas' pouch, and with a tube to drain by this route—a method necessitating additional shock, and scarcely necessary if drainage is secured by a tube. Some surgeons state that it is necessary to drain each flank: formerly I drained a large number of cases in this way, but nearly always found that the tubes were practically dry at the first dressing. If the septic focus is near the flank, as in some cases of appendix trouble, it is advisable to place a tube in the right flank; but in my experience this is seldom necessary. To sum up, therefore, efficient removal of the fluid, whether serum or pus, is obtained by flushing, and by making sure that the original focus is either effectually removed or placed in connection with the exterior by means of suitable drainage.

In order to make doubly sure that the fluid in the abdominal cavity shall collect in the pelvis, it is advisable to so prop the patient up in bed that the pelvis is obviously the lowest point. This position has the further advantage of relieving any pressure exerted by the distended abdomen on the thoracic organs, especially in men, in whom abdominal respiration is so important. In America this is often termed Fowler's position.

2. **Rapid Laparotomy, with Drainage.**—The patient is quickly anæsthetized and a median incision is made, any inflammatory fluid being allowed to escape. If rapid examination reveals the focus of origin, a tube and gauze drain are inserted down to the suppurating spot; if the seat of origin cannot be found promptly, a gauze drain may be left in the peritoneal cavity and a drainage tube in the pelvis, and the wound partially closed; if the intestine is much dilated, the distended coil most easily reached should be opened and a T-shaped glass tube inserted.

3. **Laparotomy with Local Anæsthesia.**—Anæsthesia is produced by means of stovaine, novocaine, or β-eucaine injected into the skin of the abdomen in the middle line. The incision is made, and as much should be done as the patient can bear. It is important to remember that the parietal peritoneum is very sensitive, and is easily rendered anæsthetic by a weak solution of any of the above drugs; the peritoneum over the abdominal organs is nothing like so sensitive. In these last methods, which are only resorted to when the patient is very ill, it is most important for the surgeon to commence operations without delay, to have everything ready that he can possibly require, and to carry out the details of the operation with decision and speed—every additional minute

of exposure in a case of abdominal section diminishes the chances of the patient's recovery in *geometrical ratio*.

Distension of the Intestines.—One of the most disturbing symptoms in the surgical treatment of general peritonitis is distension of the intestines, especially of the small gut; indeed this is the most serious complication that the surgeon meets with. Sometimes the distension is so great that at the end of the operation it is impossible to return all the coils, or they can be returned only after very serious damage. At first sight it would seem that the difficulty might be solved by opening the intestine, but over and over again I have been disappointed, the particular coil opened, say from eighteen to twenty-four inches long, collapses rapidly, but it is very difficult to empty any other coil through the same opening. The distension is due to paralysis or paresis of the muscular coat, and therefore it is only the pressure of the surgeon's hands that can get rid of the gas. In cases of intestinal obstruction where the obstruction has not existed long enough to paralyse the gut, a small aperture made in one distended coil will often be sufficient to empty the whole intestine. If the intestines are much distended, one of the longest coils visible should be incised, and a T-shaped glass tube inserted with a thin india-rubber tube attached to it. Very often after a few hours the distended coils will begin to recover their tone and will expel the contents, although at the time of the operation the distension could not be overcome. In these serious cases the main point is to save the patient's life; if successful, the surgeon can at a later date easily close the artificial anus which is formed.

After-treatment.—1. *Restlessness.*—This is often a marked symptom after laparotomy for acute general peritonitis, and it is generally necessary to give a hypodermic injection of morphia ($\frac{1}{4}$ gr.); very often there is much collapse, in which cases hypodermic injection of strychnine ($\frac{1}{30}$ gr.) is often of great service. If the pulse become very weak, normal saline solution should be injected into a vein, great care being taken that the solution is warm enough; it should be at least 99°–100° as it enters the vein. I prefer it to be a degree or two higher than the patient's temperature, rather than run the risk of the temperature of the fluid being lower than that of the body. In moderate cases of collapse $\frac{3}{4}$ pint of saline injected into the rectum every hour or two is generally sufficient. In cases where there is considerable toxæmia, it is advisable to inject saline solution continuously into the cellular tissue; as a rule a pint an hour is sufficient, until about 24 pints have been given.

2. *Food.*—It is most important that the alimentary canal should be kept quiet, and therefore food given by the stomach should be prohibited, all feeding should be per rectum, the best being peptonized beef-tea and small quantities of brandy; by this means the patient obtains quite sufficient nourishment to tide him over the crisis of the disease. If the patient is alive and improving on the fourth day after the operation, he will probably recover.

3. *Thirst* is a very constant and distressing symptom. The general sensation is best satisfied by injections of warm water per rectum; but for the local condition of thirst, where the patient craves for something by the mouth, a little warm water—or with some patients a little iced water—is effective.

4. *Toilet of the Mouth.*—Care on the part of the nurse in scraping away debris from the tongue and dried lips and mucous membrane of the cheeks affords the patient great relief. Bicarbonate of soda (20 gr. to 1 oz. of water) is a good solvent of the decomposing material, followed by some weak carbolic lotion (1–80) as a disinfectant.

5. *Aperients.*—After the operation nothing should be given for the first twenty-four hours; if, however, there is much distension of the intestines, an enema of water combined with tincture of valerian (1 dr. to the pint) is very useful. If

at the end of twenty-four hours there is no especial contra-indication, small doses of mag. sulph. and sod. sulph. may be given (1 dr. of each) every three hours, or small doses of calomel (½ gr.) at the same intervals.

Non-operative Treatment.—There is no reasonable method of attempting to cure acute general peritonitis by medicinal means. An exception to this strong statement may be made in cases in which there is no apparent local cause, such as an inflamed appendix, gastric ulcer, etc.; for example, a case of gonorrhœal peritonitis by extension from the uterus might subside without operative interference. Such cases, however, are very rare, and it would be impossible to recognize them before opening the abdomen. For patients who are too much collapsed for surgical interference, the treatment must be directed to the alleviation of the distressing symptoms. A method of treatment which has gained considerable ground on the Continent, especially in France, is the subcutaneous and intravenous injection of saline solution. It consists of introducing into the circulatory system saline solution with a view of washing out the lymphatics, thus enabling the liver and kidneys to get rid of the toxin. This is best done by injecting normal saline solution into the cellular tissue. When this is impracticable, it should be injected into one of the veins most easily exposed, such as the median basilic. This method, combined with operative interference, is undoubtedly an excellent one, and is perfectly rational; indeed, many of my patients have several pints of saline solution injected if their condition after the operation is sufficiently serious. Some French surgeons, however, look upon the treatment as sufficient in itself, and state that remarkable improvements and cures have been obtained.

Acute Localized Peritonitis.—Acute inflammation of a portion of the peritoneum spreading from some lesion of an organ it is covering is a common occurrence. When present in the liver it may spread to the lower surface of the peritoneum covering the diaphragm. It may occur in the peritoneum covering the stomach in the neighbourhood of a gastric ulcer. Of all the abdominal organs, by far the greatest sinner in producing local peritonitis is the vermiform appendix. In women the fallopian tubes and uterus frequently give rise to inflammation in the surrounding peritoneum, a condition usually termed pelvic peritonitis. In cases of acute localized peritonitis, the question of counter-irritation arises. In the stages anterior to pus formation counter-irritants, properly used, may stop or modify the process leading to the formation of pus. When pus is once formed, the surgical treatment consists in reaching the pus by the quickest route and the one that does least damage to the structures through which the knife or other instrument must pass.

Subphrenic Abscess.—As a rule subphrenic peritonitis spreads from the abdominal organs, chiefly the liver and stomach, although inflammation may spread from the pleural cavity through the diaphragm to the abdomen. When the inflammation spreads from the liver, and suppuration occurs, the abscess is situated between the right half of the diaphragm and the upper surface of the liver, and is often mistaken for an empyema. On the other hand, when the subphrenic peritonitis spreads from the stomach, the abscess is situated on the left side in the region of the spleen, sometimes termed a perisplenic abscess, the spleen itself being healthy or only affected secondarily.

Treatment.—When pus is suspected in the region of the diaphragm, an exploring needle should be used. If the result is positive, some idea is obtained as to the position of the pus, and the distance from the surface; if, however, the exploring needle brings away no pus or serum, it is necessary to make careful dissection through the skin down to the diaphragm to the region where it is thought that the pus is nearest to the surface. Sometimes the pleural cavity overlaps the diaphragm considerably; in these cases the pus would have to

pass through the pleural cavity, and would very likely infect that region. If there seems no other way of reaching it, and if the condition of the patient will allow, a piece of rib should be removed, and the wound plugged with iodoform gauze for twenty-four hours, so that the parietal pleura may become adherent to the pleura on the upper surface of the diaphragm ; at the end of this time adhesions will have formed, and the diaphragm may be penetrated with impunity through the spot where the two pleural surfaces are adherent. If possible, however, a piece of rib should be removed opposite the point where the reflection of the pleura takes place ; the pleura may then be pushed upwards, and gauze should be tightly packed in the upper part of the wound ; if evacuation of pus is necessary immediately, the diaphragm must be incised, the pus quickly evacuated, and the edges of the incision in the diaphragm stitched to the edges of the skin wound. There is of course considerable risk of infecting the pleural cavity by this proceeding, either at the time of the operation or during the succeeding twenty-four hours. One must remember that the infection of the pleura often takes place apart from the operation altogether ; if therefore an empyema should develop after the evacuation, it by no means follows that it was due to the operation.

It is very difficult to lay down concise statements as to the treatment of subphrenic abscess, cases differ so much one from another, and each must be considered by itself ; the following suggestions however may be found useful :—

1. If pus is found by an exploring needle, an incision should be made with its centre at the spot where the needle entered.

2. If no pus is obtained by the exploring needle, an incision should be made in the lower part of the suspected area, a common point being the tenth rib in the mid-axillary line.

3. If there be no great urgency, the exposed pleura or pleural cavity should be packed with sterilized gauze, and the diaphragm incised at a later period, say two or three days, if the patient's condition will allow,—from twenty-four to thirty-six hours would be the minimum time sufficient for the purpose.

4. If the pus must be evacuated at once, the lower reflection of the pleura should be exposed, pushed upwards, and packed tightly with gauze, the diaphragm incised, pus evacuated, and the edges of the incision in the diaphragm stitched up to the skin wound, making sure of drainage with a large tube.

H. P. Dean.

PERITONITIS, TUBERCULOUS.—In this, as in all forms of tuberculosis, hygienic treatment is of the first importance. Whilst active symptoms (e.g., fever) are present, the patient must be confined to bed, but care should be taken to see that he gets as much fresh air as possible, and as soon as may be he should be taken out-of-doors. If the patient be a child, he can be wheeled about in an invalid perambulator, preferably by the seaside—Margate and Broadstairs being specially suitable localities.

The diet should be abundant, and should contain plenty of the more easily digested forms of fat, such as bacon, butter, and cream, besides minced meat, pounded chicken or fish, eggs, and abundance of good milk. Unless the latter can be guaranteed to be free from tubercle bacilli, it is safer to boil it. Starchy foods should be given sparingly.

Locally, ½ dr. of one of the following preparations should be rubbed into the abdomen night and morning : equal parts of iodoform ointment and olive oil, oleate of mercury ointment (10 per cent), linimentum hydrarg., blue ointment or croton oil. The abdomen should also be covered with a firm flannel binder.

Internal medication must first be directed to the state of the bowels. If, as is so often the case in children, there be a tendency to diarrhœa with offensive motions, 1 min. tinct. opii should be given for each year of the child's age,

three times a day, along with full doses of bismuth or chalk. When the diarrhœa has been overcome, cod-liver oil or oil and malt may be given, and, if there be anæmia, 20 min. of glycerin. ferr. iodid. thrice daily. Small doses of arsenic are also useful. Guaiacol carbonate or creosote may be given (see PHTHISIS), or iodoform (though cautiously). The following is a convenient formula for the administration of the latter :—

R	Iodoform	gr. ss	Emuls. Ol. Morrh.		3j
	Tinct. Lavand. Co.	℥viiss			

If pain be troublesome, Dover's powder (4 gr. thrice daily for a child of five) is the best analgesic.

Ascites need not be interfered with in acute cases unless it is causing distress. It is then most safely dealt with by incision.

If, after a persevering use of these measures for six weeks, no improvement is observed, the propriety of surgical interference should be considered ; but it must be pointed out that the results of medical treatment are, on the whole, so satisfactory that operation is less often resorted to in such cases now than formerly. The cases most favourable for operation are those in which there is considerable ascites. In such circumstances evacuation of the fluid by laparotomy, with or without irrigation of the peritoneum, is often followed by cure. Cases in which there is little free fluid and much matting do not give nearly such good results. It need hardly be pointed out that operation should not be recommended when there is evidence of tuberculosis elsewhere, e.g., in the lungs ; for in that case the abdominal affection is merely part of a general tuberculosis.

Robert Hutchison.

PERITONSILLAR ABSCESS.—(See ABSCESS.)

PERNICIOUS (ADDISONIAN) ANÆMIA.

1. **General Considerations.**—The treatment of this severe disease is greatly influenced by the view taken of its pathology. Next to the profound degree of the anæmia, the two most prominent features presented by the blood are : (1) The extraordinarily severe and pernicious character of the blood destruction—hæmolysis ; (2) The no less striking powers of recovery. Both these features are more marked than in any other form of anæmia. It is not uncommon to find a patient's blood reduced from the normal standard of 90 to 100 per cent to 20 or 30 per cent in the course of a few weeks, accompanied by all the clinical evidences of intense blood destruction, viz., high colour of urine, urobilinuria, lemon colour, biliousness, and occasionally jaundice. No less striking is the rapid recovery of the blood when the hæmolysis is arrested. The percentage of corpuscles and hæmoglobin often rises from 20 to 30 per cent up to 80 or 90 per cent within a month or two, in some cases in the course of three to four weeks.

This remarkable power of recovery is a natural feature of the disease, and its most hopeful one. From the point of view of treatment, however, it is often misleading, since the particular treatment in use at the time of its occurrence is wrongly credited with having produced it—with having cured the disease. It misleads, moreover, in another way, with unfortunate results. For so remarkable is the recovery that doubt is cast, both by the doctor and the patient, on the accuracy of the original diagnosis. The patient feels and looks so well that he resumes his ordinary occupations and habits of life, and gives up all treatment. There follows, in a period varying from six to nine months, the usual relapse, fatal in about three-fourths of the cases. In a certain number, however, recovery again takes place, although more slowly, and less complete in character ; the patient remains well for another

period of three to six months, when a second relapse occurs. A certain number recover even from this, and the writer's experience satisfies him that under suitable treatment this number is steadily increasing.

The above features of the disease are very striking and constant. They have an important practical bearing: (1) On the importance of early diagnosis; (2) On the importance of continuous systematic treatment and management of each case, both prior and subsequent to the first severe invasion of the disease.

In the writer's experience the disease can be diagnosed with certainty in its early stages, prior to the first severe attack, by the following features:—(1) Glossitic, gastric, and intestinal symptoms; accompanied by (2) Hæmolytic symptoms—lemon colour, biliousness, with or without jaundice (generally referred to "congestion of liver"); (3) Febrile and nervous disturbances—the former often referred to "influenzal" attacks; and lastly (4) In these early stages, if examination of the blood be made, by a remarkable degree of anæmia, out of all proportion to the severity of any symptoms present—the corpuscles often being found reduced by 30, 40, or 50 per cent in the course of a few weeks in a patient who has only felt "out of sorts," and is still at work. This is the *stage of onset* of the disease; it lasts from three to twelve months, or in some cases even longer. (See *Fig.* 37, 1898-9, on page 624.)

The *stage of invasion* is marked by a severe aggravation of all the foregoing features—alimentary, hæmolytic, febrile, and nervous—and by so pronounced a degree of anæmia, and such severe blood changes, that the nature of the disease is for the first time suspected. (*Fig.* 37, 1900.)

The course of the disease from this time onwards is that already described—of longer alternating *remissions* and *relapses* (*Fig.* 37, 1901–2–3), with shorter periodic remissions and relapses occurring with great regularity at intervals of every three or four weeks; the chief feature of these relapses being the recurrence of gastric or intestinal symptoms.

The course of the disease is therefore not that of an anæmia, but of a *chronic febrile infective disease*, with characteristic symptoms and course; the success in treatment is directly proportional to the recognition of this fact. The earlier the diagnosis is made, and the sooner the antiseptic measures hereafter described can be carried out, the more successful the result. The writer's experience of the last seven years satisfies him that the prognosis has been materially altered for the better, and that with early recognition and suitable treatment this disease—while always grave—need not necessarily be either progressive in its course or pernicious in its result.

The treatment to be adopted to this end includes not merely the administration of blood tonics, such as arsenic, or the combating of individual symptoms, especially those of gastric and intestinal nature, or the adoption of a particular régime of diet. If these measures could individually or collectively check the disease, it would long ere this have lost the character of perniciousness which so fatally distinguishes it.

Treatment includes a *general management* of the case, with close observation of all its features, especially of its gastric and intestinal symptoms, of its fever, and of its hæmolytic symptoms—extending not merely over the period of acute illness, but also for many months and years subsequent to the first remission.

According to the course pursued by the disease, three types may be distinguished—acute, subacute, and chronic.

The *acute* form is very severe; it is fortunately the rarest. It terminates in its first attack—the course of the disease from first to last being only from three to six months.

The *subacute* forms, slower in onset, milder in course, recover from the first severe attack in a most remarkable way, but relapse after some six to eight

months, and end fatally—the course of the disease from first to last being a year to a year and a half from the onset, and about the same period after the first invasion—a total duration of two to three years.

The *chronic* forms recover, not merely from the first attack, but also from the second, and sometimes even from a third, the total duration of the disease from first to last being three to four years.

A fourth type of the disease—which one would fain hope will become more common as the result of the antiseptic and antitoxic treatment recommended by the writer—is represented very recently by two of his cases, who have continued to enjoy good health now for seven years after their first attack. One of them has had 100 per cent of corpuscles and 120 per cent of hæmoglobin for the past three years. (See *Fig.* 37.)

General Management and Diet.

During acute attacks.—The symptoms in severe cases are those of an extremely severe acute febrile disease, added to those of severest anæmia. The characteristic symptoms are the fever, often reaching 102°, 103°, or even 104° F., sickness, vomiting, or diarrhœa, very severe general disturbance—headache, drowsiness, sometimes semi-unconsciousness. These are accompanied by a marked lemon-colour—almost jaundiced—appearance.

When these severer symptoms subside, they continue in a milder and modified form, sometimes for two or three months at a stretch ; varying slightly at intervals of two or three weeks, and accompanied by a slight irregular fever, ranging from subnormal in the morning to 99° or 100° F. in the evening.

During this period the general treatment to be adopted should be that for a case of typhoid fever. The patient should be strictly confined to bed, and fed at intervals of every four hours with food in small quantity. The basis of such food should be milk—either alone, or peptonized, or half-peptonized—milk puddings, junket with cream, beef tea or various forms of meat juices, bread and milk, tea and milk, or coffee and milk, raw beef juice, pounded chicken or meat, and bone marrow when tolerated. Experience shows that no absolute rules of diet can be laid down suitable for all cases. Individual patients display the most variable likes and dislikes for particular foods ; and show, moreover, a most remarkable tolerance for foods which would appear unsuitable. One of the chief objects in treatment is to ascertain for each case the particular diet which he can tolerate with the least gastric discomfort.

Such discomfort, often marked by retching and sickness, forms one of the most distressing features of the disease. The sickness usually occurs in the early morning—on awaking—and before food is taken. In severe cases, in the later stages of the disease, it may occur at any time, and often does so two or three times a day over many weeks. It is entirely independent of the character of the food or medicine given.

This fact is an important one ; for it is often referred quite erroneously, both by patient and doctor, to the food or medicine, and this leads to unnecessary changes. The sickness is due, partly to infective inflammatory lesions of the mucosa of the stomach, which tend of themselves to heal up after a time, and partly to toxæmic influences. The gastric symptoms may best be relieved by an occasional mustard-leaf or poultice over the stomach, and by administration by the mouth of sedatives—especially bismuth—with soda, or hydrocyanic acid, or nepenthe. When very severe, all food given should be peptonized.

The toxæmic character of this vomiting is best evidenced by the remarkably sudden way it subsides, when the acute character of the disease passes off, as it often characteristically does, with great suddenness. The patient, who has been lying at the point of death, œdematous all over, delirious, vomiting nearly everything he takes, suddenly takes a turn for the better—gets a " crisis." He

wakes up conscious, calls for food and drink, takes everything without discomfort, and makes a rapid recovery.

Medicinal Treatment.—All tonics—hypophosphites, malt, strychnine—capable of affecting the blood beneficially, may from time to time be found of use in the treatment of this anæmia in suitable cases. The only one, however, which has any special effect is *arsenic*. Its use is attended in most cases—for a time at least—with marked benefit. Until recently, when the antiseptic and antitoxic treatment presently to be described was introduced, it has been almost the only remedy capable of producing benefit in any considerable proportion of cases. It is best given in the form of Fowler's solution (liquor arsenicalis) in doses of two to three minims thrice daily after food. It may also be given subcutaneously in the form of arsenate of iron (Martindale), or in the form of arsenical waters.

Many observers recommend that the larger the dose, and the more rapidly it is pushed, the better. The writer does not share this view. On the contrary, it is his experience that cases which respond to arsenic do equally well with smaller doses. Large doses have this great disadvantage, that they induce an intolerance of the drug; and this militates greatly against its use in the subsequent relapses which invariably occur. The object to be aimed at is, then, to keep the patient on small doses of arsenic (2–5 min.) as long as improvement continues; to continue the arsenic in 2–3-min. doses for periods of months subsequent to apparent recovery. By careful regulation of dose in this way, the writer has found it possible, with occasional intermissions, to keep a patient on arsenic for a period of several years, without the slightest disturbance.

Bone Marrow.—The other remedy from which benefit may from time to time be got, is ox-bone marrow, administered either fresh on toast, or in the form of tabloids. First introduced by Sir T. Fraser, of Edinburgh, it has been found useful by various observers, who speak strongly in its favour, and recommend that it should be persevered in, and its administration pushed to a much greater extent than has hitherto been done. In many cases it cannot be tolerated.

Antiseptic Treatment.—The conclusions arrived at by the writer as to the infective nature of this disease, and the part played by sepsis in connection with it, have suggested new lines of treatment with regard both to its prevention and possibly even to its permanent arrest.

The course of the disease is marked, not only by slight variations from time to time, but usually by one or more periods of distinct improvement, lasting sometimes many months, and in some cases even a year or two—sometimes occurring independently of treatment, but without doubt greatly due to the beneficial effect of arsenic.

The special feature of this anæmia, however, is its great tendency to relapse, inexplicable on the view held by many that it can be produced by the ordinary causes of anæmia, if only severe enough. For these relapses occur without sufficient cause to account for them—sometimes, indeed, after the slight causes alleged to have produced it in the first instance have been removed. This tendency to relapse is, according to the present writer's observations, in reality due to the remarkable persistence of the specific hæmolytic infection underlying the disease, since it is always accompanied by a recrudescence of the lesions in the tongue, stomach, or intestine, and by the glossitic, gastric, or intestinal symptoms connected therewith.

The great liability to relapse may, however, be due to the fact that—the important part played by oral, gastric, and intestinal sepsis not having been recognized — the patient has hitherto been left, not only with his specific hæmolytic infection, but also with the local sepsis which facilitates the con-

traction of this infection, and favours its continued persistence. When he first drew attention to this matter in 1900, the writer expressed the hope that this had been the case. His subsequent experience satisfied him that it has been so, and that the prognosis of this disease can be materially affected by the line of treatment he then recommended, based upon the above considerations. This treatment aims at :—

1. The complete removal by local antiseptic measures in the case of the mouth, and by use of internal antiseptics in the case of the stomach and intestine, of the oral, gastric, and intestinal sepsis associated with the disease.

2. Special local antiseptic treatment of the infective glossitis present, supplemented by measures for raising the antitoxic power of the blood by a serum treatment — as he then suggested.

The line of treatment based on the above considerations is, then, the following in their order of importance : — (1) *Oral, Gastric, and Intestinal Antisepsis*, supplemented by (2) *Antistreptococcic Serum Treatment.*

I. Antisepsis.—The result of the writer's observations has been to locate the specific hæmolytic infection underlying the disease definitely to the tongue, stomach, and intestine, and to trace its source to drain infection. The contraction of this infection is favoured and facilitated by long-standing oral and gastric sepsis.

(*a*). *Oral Antisepsis.*—It is chiefly important in all cases of *commencing* anæmia to direct special attention to the removal of any sepsis, *however slight*, connected with the tongue, diseased teeth, or gums. Far more than ordinary care should be taken with regard to the condition of the teeth, not only by direct local antiseptic measures, but also, whenever practicable, by the removal of old stumps, black teeth, or teeth showing commencing cario-necrosis. These precautionary measures are necessary, irrespective of any statements made by the patient as to the degree of discomfort such roots and bad teeth are causing, or of the absence of any inflammation around them. As a matter of fact, however bad the degree of oral sepsis may be, it is rare to have attention drawn by the patient to his mouth, or to have any complaint made by him.

Discomfort and pain in the teeth are the result of local inflammatory reaction—periostitis and gingivitis. They indicate relatively healthy conditions, inasmuch as they denote that the local tissues still have the power to react more or less actively to septic infection. There is a stage, however, in severe anæmic conditions, as indeed in other forms of infections, when local reaction is absent, or at least insignificant, at the very time when the general septic effects are most marked. (See Septic Anæmia.)

(*b*). *Gastric Antisepsis.*—The chief seat of the infection is in most cases the stomach, and the first effect of the infection is an infective catarrh, followed later by deeper-seated changes of the nature of glandular atrophy, and gastritis, evidenced by intermittent vomiting of inflammatory streptococcal exudation.

The indications here are to remove or combat this catarrh, either by *washing out the stomach*, suggested on the view that many of the symptoms of the disease were due to abnormal fermentation of food products within the stomach, or, still better, by *administering local antiseptics* to diminish or destroy the infection underlying the catarrh.

Later observations have demonstrated the intensely infective (streptococcal) nature of the catarrh, and the progressive character of the gastric changes which it produces.

In all cases the use of local gastric antiseptics should be steadily persisted in. The one that has proved successful in certain cases against ordinary infective gastritis, has been salicylic acid. This drug was selected on general grounds as the antiseptic which appeared to be at once the most powerful and

the least harmful, and the result was eminently satisfactory. Improvement was noticeable at once, and salivation and sickness ceased from about the fourth or fifth day, with remarkable resulting improvement in the blood condition described in two weeks' time. Other observers have since reported favourable results with this drug.

Other useful antiseptics are the various bismuth preparations—especially bismuth salicylate,—perchloride of mercury, charcoal, carbolic acid.

(*c*) *Intestinal Antisepsis.*—In one group of cases the intestinal symptoms predominate, or occur from time to time. In this group the best disinfectants are perchloride of mercury, calomel, or small doses of grey powder or blue pill.

II. Serum Treatment.—It is obvious, however, that if once the infection gets firmly rooted in the mucosa, mere local antiseptic treatment—however much it may benefit by diminishing or removing catarrh and thus arresting the disease temporarily—may fail to arrest it permanently, even when aided, as when possible it ought to be, by the use of arsenic, and by dietetic measures; and experience proves only too fully that such is the case. The only indication for treatment, then, is to combat the action of the poison on the blood after its absorption. The writer has therefore given a sustained and systematic trial to a serum treatment based on the results above stated.

Antistreptococcic serum was selected, inasmuch as observations point to streptococcal organisms as always being concerned in the infection. Its use is based, not on any hypothetical considerations as to the nature of the anæmia, but on the series of observations which step by step served to trace the anæmia back to an infection arising in connection with the alimentary canal.

The first case treated on the lines then recommended, viz., oral and intestinal antisepsis combined with antistreptococcic serum, was that recorded by Dr. William Elder, of Leith (April, 1900). The case was a severe one of pernicious anæmia. The treatment was oral and intestinal antisepsis, with injection of antistreptococcic serum. None of the usual remedies for anæmia were given. The result was, that in forty-five days after the commencement of the treatment, the blood condition rose from 18 per cent of corpuscles with 24 per cent of hæmoglobin, to 96 per cent of corpuscles and 104 per cent of hæmoglobin. A month later "he reported himself as feeling fit and well, and looked in very good health." In all no fewer than eighteen injections were given in the course of six weeks, without any ill effects, either local or general.

The first systematic trial made of this treatment by the writer was in a case, very typical in its mode of onset, the character of its gastric symptoms, its urinary changes, its nervous symptoms, and its oral symptoms, and it was in a comparatively early stage. (*See Fig.* 37.)

The blood condition was 30 per cent of corpuscles and 35 per cent of hæmoglobin. The treatment was milk diet, oral and intestinal antisepsis, ammonium carbonate and tincture of digitalis as a cardiac tonic, and injection of antistreptococcic serum.

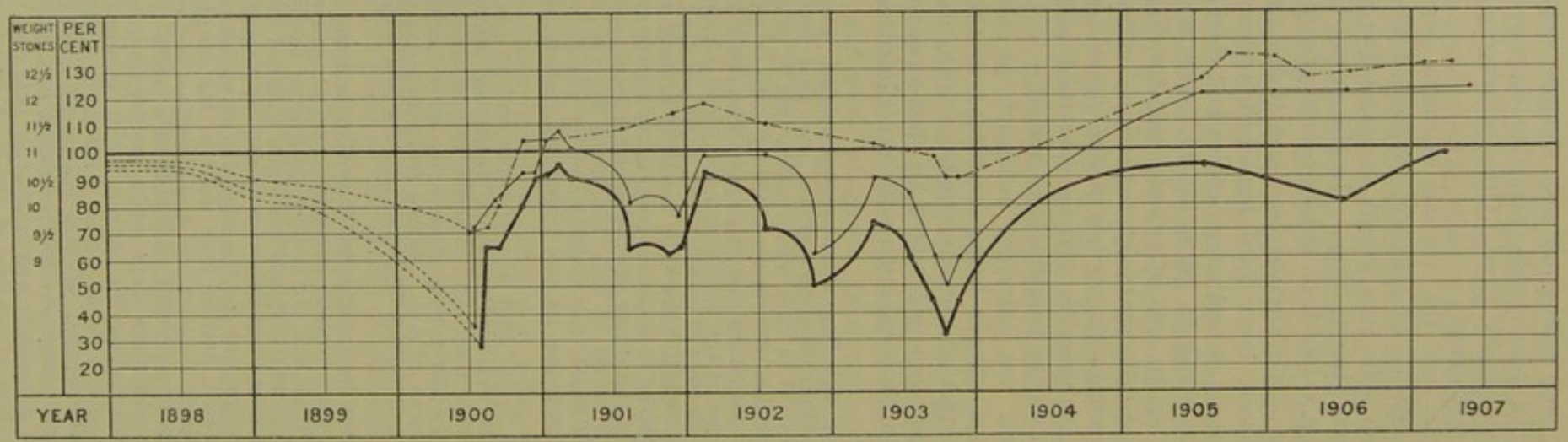
In all, four injections of the latter were given—viz., 10 cc. on the 9th and 13th July, followed later by two injections of 5 cc. Before treatment was commenced (July 7th, 1900) the blood condition had further deteriorated, the red corpuscles being reduced to 27 per cent.

Between the 9th July, when he got the first injection, and the 1st August (i.e., three weeks), the corpuscles had risen from 27 per cent to 65 per cent, and the hæmoglobin from 35 per cent to 75 per cent, and one notable feature of the blood at this time was the marked leucocytosis—leucocytes 17,000 per cmm (instead of the normal 5,000 to 7,000). He received a fourth and last injection (5 cc.) on August 1st.

The patient continued to improve for the next ten days, although his actual blood condition showed some relapse; and he then went to the country (Aug. 16th). The treatment was as before, namely:—strict oral and intestinal antisepsis, with in addition 1 oz. of the syrup of the hypophosphites thrice daily as a tonic. Arsenic was still withheld. He returned in six weeks' time (Sept. 26th) greatly improved in looks; and his blood showed red corpuscles 3,200,000 (64 per cent), and hæmoglobin 80 per cent.

He was now given liquor arsenicalis in 3-min. doses thrice daily, increased to 5 min. three weeks later. The result was that when he reported himself on Nov. 8th, 1900, his blood showed: red corpuscles 4,040,000 (80 per cent), hæmoglobin 90 per cent, and leucocytes 7,500 per c.mm.; his weight was 11 st. 3 lb. (157 lb.), an increase from the time he came under observation of nearly 2 st. (24 lb.); and his gastric and intestinal

Fig. 37.—A Case of Pernicious (Addisonian) Anæmia successfully treated for a Period of Seven Years.



The lower (thick) line = Percentage of Red Corpuscles. The middle (thin) line = Percentage of Hæmoglobin. The upper (interrupted) line = Body Weight.
The dotted lines, 1898-1900, indicate the history of onset of the disease prior to coming under observation in July, 1900.
The case is fully recorded in the *Transactions of the Royal Medical and Chirurgical Society, London*, 1901.

functions were in all respects normal. He still retained the feeling of numbness in his fingers, although this had recently greatly lessened

The subsequent history and course of the case is recorded in the chart (*Fig.* 37). He was kept under continuous observation and strictest antiseptic treatment the whole time. For the last seven years he has remained to all appearances a stout healthy man: but it will be seen how severe have been the relapses in the blood which have from time to time occurred. For the last three years even these have ceased: and his blood has remained at 100 per cent of corpuscles, and 120 per cent of hæmoglobin—weight 12 st. 7 lb.

In this case the diagnosis was made and the treatment begun early in the course of the disease, two years after the first onset of the anæmic symptoms, but within a few months of the first serious breakdown. In other words, the patient was seen before the recuperative powers of the blood had been exhausted time after time by repeated exacerbations of the disease. This is one of the few cases which the writer has been able to treat from the earliest stages onwards, since his usual experience is to see such patients only in the later stages of their illness, after their first or second relapse. In a recent case similarly treated the effect of serum treatment was even more striking. The blood, which had remained about 20 per cent for over two months, rose to over 60 per cent in the course of *seven days*, and to 80 per cent in three weeks; the opsonic power against *Streptococcus longus* rising from 0·65 to 0·85. The patient went out apparently a healthy woman in three weeks' time.

The important practical point arising out of this is early diagnosis and early treatment—an all-important point in the treatment of this disease. This diagnosis can be based, not on the blood changes alone, but on the combination of clinical features which characterize this disease from its commencement. The existence of these during a period of apparent recovery is a sure sign that the patient is still suffering from his disease, despite the absence of any blood changes whatever, and an important indication of the necessity for continuous observation and treatment.

In certain cases the serum caused a distinct general reaction, lasting usually for forty-eight or sixty-four hours. Whether its presence was connected with the character of the disease, or of the special serum used, it is impossible to state. But in view of its possible occurrence, it is, I consider, advisable to begin with small doses (5 cc.).

As has been said, the object of this serum treatment is not to replace the line of treatment by arsenic hitherto employed—and up to a certain point successfully— nor is it to replace the new line of treatment by combined oral and intestinal antisepsis which the writer has recommended. A far greater importance is to be attached to the latter than to arsenical treatment, inasmuch as it aims at the *removal of the combined infections—hæmolytic and septic*—which underlie the disease.

It is certain that the disease cannot be permanently checked by the use of arsenic alone. But that may possibly be due to the fact that up till now—the infective nature of the disease and the importance of sepsis not having been recognized—the infective lesions have been left undisturbed, and hence the patient, cured once by arsenic, has remained continuously exposed to fresh outbreaks of his infective trouble.

The prime object of the combined oral and intestinal antiseptic treatment is to remove both the original source of the infection and the conditions which favour infection. If this succeeds, there may be no necessity for further treatment other than by arsenic.

If both together fail to arrest the disease, the serum treatment is the one which appears to hold out most prospect of benefit, and the cases recorded certainly denote that it has markedly therapeutic properties. *William Hunter.*

PERTUSSIS.—(See WHOOPING COUGH.)

PES CAVUS.—(See TALIPES.)

PHARYNGITIS.

1. **Acute Catarrhal or Simple Pharyngitis** is generally due to an acute cold in the head, but often occurs alone in those of a gouty or rheumatic diathesis, without any implication of the nasal passages. Care must also be taken to eliminate the possibility of secondary syphilis.

TREATMENT.—When it occurs along with a cold in the head, besides treating the cold (see RHINITIS), the pharynx should be sprayed with an alkaline solution and painted with Mandl's throat paint, two or three times a day.

℞	Pot. Iod.	gr. viij-xv	Ol. Menth. Pip.		♏ij
	Iod.	gr. v-x	Glycerin.		ad ℥j

2. **Septic Pharyngitis** is nearly always associated with acute disease of the tonsils or larynx, and is due to infection by a pyogenic organism. There are, however, two forms which occur independently of tonsillar disease, viz., tuberculous ulceration, and that which occurs in the course of typhoid fever.

Abscess in the pharynx may be (*a*) Septic ; (*b*) Tuberculous.

(*a*). *Septic Abscess* occurs under the name of retropharyngeal abscess in young children between the ages of two months and two years. The child gets restless for no reason, and then difficulty of swallowing sets in. The diagnosis is made easy by the peculiar way in which the child holds its head back, with the chin protruded forwards as far as possible, and the mouth wide open, so as to make the passage into the lungs as short and straight as possible. The breathing is of a snorting character, thus differing from the stridor of laryngeal obstruction. On examining the throat for the cause of the stertor, the soft palate is seen to be red and pushed forward, and the posterior wall of the pharynx generally bulges more to one side than the other.

TREATMENT.—The abscess should be opened without delay. The child should be placed on a table with the head hanging over the end, but supported by a nurse or assistant. The mouth should then be kept open with a gag, and the abscess incised with a guarded bistoury. A spray of sanitas or Condy's fluid should afterwards be used until the wound is healed.

(*b*). *Tuberculous Abscess* is due to caries of the cervical vertebræ. When dyspnœa occurs in a case of cervical caries, accompanied by difficulty of swallowing and retraction of the head, retropharyngeal abscess should always be looked for. In these cases the abscess should be opened externally from the neck behind the posterior border of the sternomastoid muscle, with aseptic precautions.

3. **Chronic Pharyngitis** may be divided into three chief groups : (*a*) General ; (*b*) Granular ; and (*c*) Pharyngitis sicca.

(*a*). *General Pharyngitis* occurs in those who smoke or drink to excess, or use their voice much without knowing how to use it properly. It is also common in those of a gouty or rheumatic diathesis when they are exposed to damp or cold.

TREATMENT.—General treatment is necessary in all cases. If the nose be affected in any way it should be attended to, and smoking to excess or abuse of alcohol should be prohibited. In the cases due to gouty dyspepsia the diet should be regulated. If possible the patient should take a " cure " at Aix-les-Bains, Ems, Harrogate, or a similar watering-place. If unable to do so, he can carry out the " cure " at home by taking half a tumbler of Ems water filled up with hot water before breakfast, instead of the morning cup of tea, and the same in the afternoon, substituting hot milk for the hot water. If constipation be present, as it generally is, it must be treated.

The pharynx should be sprayed with the alkaline wash, or half a teaspoonful of common salt may be added to half a tumbler of warm water tinged a pale pink by a few drops of Condy's fluid, and used as a gargle. Carbolic acid lozenges (T.H.P.) may be used frequently. It is best to break one in half and take a half every two hours.

In the case of clergymen and others who are exposed to damp and cold, and are constantly getting attacks, especially if they have to use their voice, it is an excellent plan to grow a full beard and moustache, and wear their clerical collar as open as possible in order to protect and strengthen the throat.

(*b*). *Granular Pharyngitis*, often called "clergyman's sore throat," is characterized by little swellings of the lymphoid tissue surrounding the mouth of the mucous follicles dotted over the posterior wall. Sometimes the follicles are filled with muco-pus, and have swollen veins running into them. It usually occurs in those who use their voice professionally, and at the same time wrongly, and the various stages of the causation have been succinctly described as "constriction, friction, congestion, inflammation, and disease."

TREATMENT.—The first requisite is for the patient to learn to use his voice in a proper manner; otherwise, if the granulations are cauterized, others will appear as long as the cause continues. The writer has seen several throats which seemed to have had every bit of mucous membrane cauterized, with no good result, and as soon as the patient learned to produce his voice properly the granulations ceased to recur. Sometimes, however, one or two granulations only may be present, and give rise to a constant feeling of irritation and desire to cough. The application of the cautery to them generally removes all the symptoms for the time being. It is advisable, however, to paint the pharynx with Mandl's solution or spray it with a solution of aceto-tartrate of alumina (1–500), for some little time afterwards.

(*c*). *Pharyngitis Sicca*.—This condition is always dependent on disease of the nose or naso-pharynx, and disappears if the latter can be put right. Stuart-Low recommends spraying the nose and pharynx after cleansing them with a solution of mucin. It certainly keeps the throat moist for some hours after using it.

George C. Cathcart.

PHIMOSIS.—By phimosis is meant a condition in which the preputial orifice is too small, so that the prepuce cannot be fully retracted and the glans exposed. It may be congenital or acquired. When congenital it is associated with adhesions between the prepuce and glans. When acquired, it is either *temporary*, in which case it is the result of inflammatory swelling of the prepuce, and may disappear when the inflammation subsides, or *permanent*, when it is the result of repeated attacks of balanitis, or is due to the contraction of chanchroids occurring at the preputial orifice. Both in children and adults a slight degree of congenital phimosis may be aggravated by the presence of septic sores and inflammatory induration about the preputial orifice.

In infants and children phimosis is usually treated by circumcision, though this is not always necessary in the mildest cases. When the prepuce is of normal length and its orifice only slightly contracted, it should be forcibly retracted and the adhesions broken through. This manœuvre should be repeated daily by the nurse, a little simple ointment being smeared over the glans.

The following are the indications for circumcision in children with phimosis:—(1) Moderate or severe contraction of the orifice; (2) A long prepuce, whether the contraction of the orifice is considerable or not; (3) When the daily retraction of the foreskin is not being successfully carried out; (4) When the condition has given rise to masturbation or other signs of irritation.

In adults every case of phimosis, whether congenital or acquired, with the possible exception of some cases of the temporary inflammatory variety, should

be submitted to operation. It is unnecessary to enumerate here the various troubles of an inflammatory and even of a malignant nature which are aggravated or even indirectly caused by phimosis in the adult, and which may even call for the immediate relief of the deformity.

Two operations are available, viz., slitting up of the prepuce on the dorsum, and circumcision. In the presence of acute inflammation, particularly when the prepuce itself is much involved, the former operation is to be preferred, and should be performed without delay. The prepuce should be slit up as far as the corona, and the corners of the two flaps thus formed trimmed off. In all other cases circumcision should be performed.

The Operation of Circumcision.—A general anæsthetic should be administered to all children, and most adults, though in the latter cocaine or eucaine may be used in some cases. The parts having been cleaned up in the usual way, the penis is passed through a hole cut in the centre of a piece of sterilized lint. The extremity of the prepuce is seized in a pair of toothed catch forceps and gently drawn forwards. The prepuce is then grasped by a pair of long-bladed dressing forceps placed obliquely, from above downwards and forwards, opposite the anterior part of the glans, which is allowed to slip back as the forceps are closed. The prepuce is then cut away in front of the forceps with a knife or scissors. The late Mr. Davies Colley directed that "the incision should begin upon the dorsum, at a point corresponding to that part of the glans which is half way between the meatus and corona," and should leave "a sharp point in the middle of the under surface" to cover the raw area which would otherwise be left uncovered opposite the frænum. The mucous membrane is now slit up on the dorsum as far as the corona with a pair of scissors, a director being first used if any difficulty is experienced in breaking down adhesions. The two flaps of mucosa are then peeled off the glans till the whole of the corona is exposed, and all smegma cleaned away. The redundant mucosa is now cut away with scissors, leaving a sixteenth to an eighth of an inch all round, or just enough to carry the sutures and to cover the sensitive coronal papillæ.

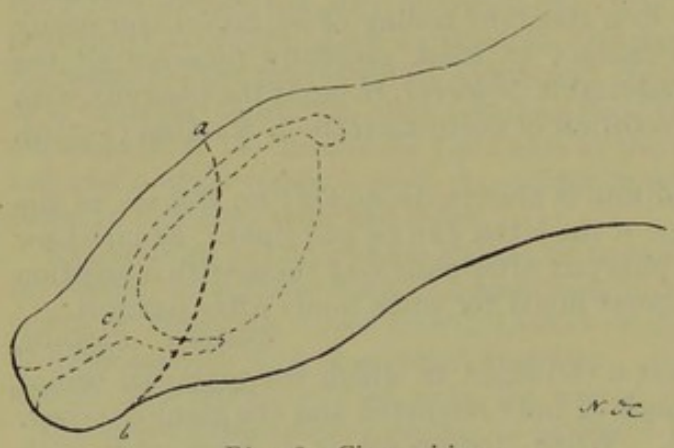


Fig. 38.—Circumcision.

The frænum itself must not be damaged. To prevent the œdema which so often occurs, particularly in the region of the frænum, a narrow strip of the loose areolar tissue lying between the mucosa and the skin should be pulled out and excised all the way round. It is important that all vessels which are bleeding, or are likely to bleed when reaction sets in as the child recovers from the anæsthetic, should be secured. This can usually be done by means of the sutures, but if any vessels continue to bleed they must be ligatured. A few interrupted sutures of silk or horsehair are inserted in all cases, even in infants. For the latter, three are quite sufficient, one being placed at the frænum and one on either side.

In young children the dressing should be a piece of gauze, soaked in lead lotion, and wound round the penis. This can be soaked off in a bath, and renewed by the nurse as often as necessary. In adults the same dressing may be used, or the penis may be simply wrapped in plain dry gauze, and in either case the dressing need not be disturbed till the fourth day, when it is soaked off,

some of the stitches are removed, and a fresh, dry dressing is put on. In adults the penis should be slung up to the abdominal wall with a handkerchief or triangular bandage, to prevent œdema. The patient should remain in bed for a couple of days, and should be on his feet as little as possible till the end of a week, when all the stitches should be out and the wound healed. Mr. Jacobson recommends a dose of bromide at night to prevent erection of the organ.

It is important that the operator should remember (1) To remove plenty of mucous membrane: if this is not done relapse may follow, as the deformity is caused by contraction of the mucosa, not of the skin; (2) Not to remove too much skin: he must leave enough to cover the corona; (3) Not to damage glans or frænum, though he should remove as much tissue as possible near the latter.

There is one more important point which should always be remembered while circumcising a child. The meatus should always be examined, as it is often too small, and is more often the cause of difficulty in micturition than is phimosis. Moreover, after circumcision, the glans becomes dry by exposure, and exhibits a tendency to the formation of scabs about the meatus, as well as further back where adhesions have been torn, so that the orifice is still further contracted. If the meatus is small it must be enlarged downwards, and a horsehair or fine gut suture inserted at the bottom of the cleft thus made, and left in for ten days or a fortnight, when healing will have occurred. The edges of the enlarged meatus should be separated daily, and a little ointment applied.

H. A. T. Fairbank.

PHLEBITIS.—Treatment depends upon the cause and extent of the phlebitis. An inflammation due to causes not actively septic and localized in a small vein runs a favourable course if the part is protected from injury and movement. The single risk is that of embolism through the detachment of clot from the inflamed and thrombosed vein, and this is to be minimized by securing that the clot shall be left undisturbed till it has either been absorbed, or has formed strong attachments to the vessel wall.

The most common example occurs in connection with varicose veins of the legs, and in such cases elevation of the limb, rest in the horizontal position for two weeks after the active mischief has ceased, and hot applications, are suitable treatment.

Where deeper veins are involved—for instance, the common femoral—the cause is more serious, and the extent of the clotting less likely to be limited. Preventive treatment therefore occupies a position of first importance. In all cases likely to develop this complication—and it is specially common in patients who have lost much blood and have undergone some pelvic traumatism such as fractured pelvis, difficult parturition, or operation for pelvic disease, and still more so if septic infection has been superadded—the lower limbs should be rubbed upwards three or four times daily in order to assist the venous circulation, and this should be commenced not later than a week after confinement to bed. This simple measure, which I have now advocated and employed for some years, rarely fails to prevent phlegmasia alba dolens, the classical name for phlebitis and thrombosis of the femoral vein.

The treatment of the developed condition is, to say the least, unsatisfactory. The pain may be relieved by elevation of the limb, complete rest of body and limb, and the use of hot fomentations containing opium or belladonna. Careful nursing and fever diet are necessary during the first two weeks. If all tenderness has then disappeared and there are no signs of further extension of the inflammation and clotting, gentle massage may be commenced, with the object of reducing swelling and assisting the anastomotic circulation in the limb. At a later stage more vigorous massage is employed, and when the patient gets up, as he may be allowed to do in favourable cases after the sixth week, an elastic

bandage aids in the reduction of that swelling of the limb which constitutes the most troublesome and rebellious of the inflammatory results.

In the most acutely septic cases, recognized always by their recurring rigors, the only treatment likely to be successful is arrest of the circulation through the infected vein by means of operation.

The most successful application of this method of treatment has been in septic phlebitis and thrombosis of the lateral sinus secondary to suppuration in the middle ear. In such cases operation has been the means of saving many lives.

Rutherford Morison.

PHOSPHATURIA.—An unnatural deposition of phosphates in the urine is seen under a variety of conditions, the most common being one where, owing to an alteration in the inter-relationship of its normal saline constituents, and a consequent diminution in the acidity of the urine, phosphate of lime in an amorphous form is present in the urine as passed, giving it a milky appearance. This condition is seen frequently in health, to a slight degree, in the urine passed immediately after meals, but it occurs not uncommonly to a greater extent in young men, in association with gastric disturbance. Such patients pass a more or less milky urine throughout the day, although that passed the first thing in the morning may be free from deposit. They generally suffer from some form of indigestion, are not uncommonly thin, and their general nutrition is bad; they frequently present marked neurotic or neurasthenic symptoms. The milky appearance of the urine not uncommonly gives rise to alarm, owing to its abnormal appearance. There is no evidence that in such cases there is any unnatural amount of phosphates excreted, the whole condition being merely dependent on the alteration of the relative amounts of soluble and insoluble phosphates in the urine. The condition can usually be treated by simple measures directed to increase the acidity of the urine, and this can be effected by alterations in the diet, e.g., the diminution of vegetables, and by the prescribing of acids and the treatment of the indigestion, and by encouraging the ingestion of considerable quantities of fluid.

Where the deposition of phosphates is associated with decomposition of the urine and the development of ammoniacal fermentation, the conditions are totally different. In such instances treatment must be directed to checking fermentation, either by local treatment of the cystitis, or by the administration of urinary antiseptics such as urotropin, and by measures directed to increase the acidity of the urine. This can often be brought about by giving acid phosphate of soda, and in this way the urinary fermentation can be greatly checked. In many cases of bladder and prostatic disease, where cystitis with ammoniacal fermentation is present, the administration of acid phosphate of soda is advisable for some time prior to operative procedures being undertaken, since by this means the local conditions can be rendered much more favourable to the success of such treatment. The acid phosphate of soda should be given in full doses.

In addition to these more or less common forms of so-called phosphaturia, there is another condition of genuine phosphaturia, in which the actual amount of phosphates excreted is increased. It is a condition which has sometimes been spoken of as phosphatic diabetes, and which has been described by some, as not only existing in diabetes, but also as occurring prior to the onset of glycosuria. In phosphatic diabetes unaccompanied by glycosuria, the nutrition would seem to be considerably affected, and much wasting may be present, the only treatment available is that directed to improving the general nutrition. In true diabetes, the excess of phosphates in the urine is probably largely dependent on the increased appetite.

J. Rose Bradford.

PHTHISIS.—In undertaking the treatment of pulmonary tuberculosis, three considerations must especially be kept in view.

1. *The great Curability of the Disease in its Earlier Stages.* Success in treatment is proportionate to earliness of diagnosis.

2. *The Constitutional Nature of the Disorder.*

Although the disease has a local seat, the significance of the local process is small compared with that of the constitutional disturbance which is speedily superadded. In invading the lung tissue, the tubercle bacillus interferes with the function of the lungs, and may lead to a variety of local accidents of varying degrees of gravity. But of still greater importance are the constitutional effects which are traceable to the influence of the bacillus and the toxins which it elaborates.

3. *The extreme Variability of Clinical Type.*

Cases differ much in clinical features, from the very early type with a limited local lesion, and little, if any, constitutional prejudice, to the hectic type—whether with much or little local lesion—with wasted frame, intractable, swinging temperature, and hardly countable pulse. There is an infinite variety of progress, from the galloping type, where death may occur in the course of a few weeks, to the sluggish fibrous type, where the patient may show little change for many years. Then there are groups of cases liable to special accident, notably those with recurrent hæmoptysis.

It is clear, that, in the application of the principles and rules which follow, much judgment is necessary. It is impossible to formulate a uniform line of treatment. Each case must be judged on its own merits. The determination, by physical signs or by bacteriological examination, that the lungs are affected, is only the first step to the completer diagnosis of the extent and special character of the involvement, both constitutional and local.

In most cases, it is wise to explain to the patient the nature of the disorder, and its curability when taken in hand sufficiently early and thoroughly. Thereby, from the first the co-operation of the patient is likely to be obtained, and all occasion removed for the statement frequently enough heard in the later stages, "If only I had been told in time." Recovery, even in early conditions, depends much on the patient's intelligent appreciation of what is needed.

Manifestly, for a considerable number of patients of excellent constitution, with only slight disturbance of an apex, the rigid discipline which is necessary for those with more widespread disorder may be much relaxed. Such relaxation will be possible in proportion as the patient appreciates the significance of the hygienic principles which govern successful treatment of all cases. Thus, in the case of a school-child slightly affected, the chief indications for treatment may be realized sufficiently, if the patient be removed from school, and allowed for a year or two, perhaps, to run wild, under suitable surveillance, in some country place, education in the ordinary sense taking a back seat. So, in the case of young adults affected in the course of a sedentary life, it may be sufficient to explain the nature of the disorder, the principles on which a natural cure depends, and the necessity for a changed mode of life. Such patients, while requiring wise direction for varying periods, according to the principles to be discussed, may not need the strict application in every detail.

It is another matter when the disease has got a more definite hold. In this case the treatment cannot be too careful and systematic. The patient must now be freed from all cares of work, and from social and even domestic ties. He should know that it is a hand-to-hand struggle in which he is engaged, and be made to realize that the programme of treatment is one which, to be effective, may involve much time, and perhaps sacrifice.

After an effective arrest—a so-called economic cure—has been attained, the patient should be thoroughly imbued with the notion that, in order to maintain health, he must be prepared to carry out, more or less fully, for the rest of his life, the physiological principles which have ensured his recovery.

From the point of view both of pathogenesis and treatment, it is convenient to distinguish between—(1) The Soil, (2) The Seed.

1. *The Soil.*—The liability to tuberculosis is not the same in all individuals or tissues. Certain individuals and families present a proneness, or at least a diminished resistance, to invasion by the tubercle bacillus. Such a diminished resistance may either be a more or less permanent attribute of the tissues in a given individual, or may be the expression of a transient condition resulting from precedent illness or other devitalizing influence. It must be the aim of all sound treatment to place tissue resistance to tuberculous invasion on as high a level as possible. In this way we oppose the tubercle bacillus by rendering the soil as unsuitable as possible for its growth.

2. *The Seed.*—Direct attack on the tubercle bacillus within the body is less easy and

effective than similar attempts on the bacillus *in vitro*. Within the body, consideration must be had, not only to the bacillus itself, but to the anatomical and physiological resultants of its life history.

The aim of rational treatment of pulmonary tuberculosis may be formulated as follows :—

I.—To Increase the Resistance of the Tissues.
II.—To Oppose the Tubercle Bacillus more directly, or Counteract its Effects.
III.—To Meet Symptoms and Complications.

I.—TO INCREASE THE RESISTANCE OF THE TISSUES.

This is the sound order of approach. Nature cures tuberculosis daily without the help of the doctor. Pathological statistics afford abundant proof of this. Probably 50 per cent of all dead bodies show some trace of tuberculosis, and, in a large proportion, the tuberculosis is cured. Such natural cures are frequently hindered by the prescription of unphysiological methods. The physician must be content to be an auxiliary of nature. He must remove obstacles as far as possible, and aid the natural tendency towards cure by every means in his power.

All prejudicial influences in the patient's life must be removed. The unphysiological must be replaced by the physiological. There must be a simple, trustful return to nature. The methods are few, and easy of application, provided there be a proper understanding of the *motif*. If this be rightly apprehended, the essentials can be attained anywhere. They comprise :—

1. *Open Air and Sunlight.*—This is the foundation on which all other procedure should rest. In proportion as this is sufficient, everything else becomes easier.

The patient should be bathed in fresh air throughout the whole twenty-four hours. Apart from complications which may require special treatment, this cannot be too complete. Experience, prolonged through many years in the treatment of very many patients in all stages of the disease, thoroughly justifies the statement that the fullest exposure of tuberculous patients to such influence, by day and night, is free from risk and followed by striking benefit in almost every case.

This applies both to pyrexic and apyrexic cases, and none the less to patients with bronchitic and pleuritic disturbance. It is a mistake, in presence of increased pyrexia or the signs of bronchitis or pleurisy, to limit the amount of exposure to the open air. Nor must it be lessened by reason of changeable weather. It is equally safe, if perhaps less certainly serviceable and pleasant, during rain and mist. In the denser fogs it is possible to screen the patient from smuts and other aerial impurities by means of a fine veil of gauze stretched over the widely-opened windows.

Where convenient, the patient is best outside entirely, resting either on a couch or reclining chair or other seat, for varying periods according to the stage of the illness. Chilling of the extremities can readily be obviated by suitable clothing and shelter. Where there is a garden, more formal *shelters* can readily be arranged. These should be shallow from front to back, say 4 ft. 6 in. They should be shelters, not rooms. The roof should slope from the back forwards and upwards, not downwards, so as to avoid the production of a *cul de sac* in the roof, where foul air would collect. The roof, which should be provided with some means of ventilation, and the sides of the shelter, are conveniently made of glass. Many of the shelters seen in sanatoria, and advertised commercially, are faulty in one or other of these respects. The shelters may either be fixed—when two or three may be necessary facing different directions—or they may be rotary. Simple folding screens, adjustable to any angle, may be attached to corners of buildings or elsewhere.

Open-air treatment is not to be used in summer only. It is a method for all

seasons. Indeed, the writer's experience is that, even in northern climates, the treatment is, as a rule, more efficacious during the colder than the warmer months of the year. At such times it is, of course, essential that due attention be given to the peripheral circulation. This is readily maintained by a sufficiency of woollen garments and warm wraps.

Although, for many reasons, it may be desirable to have patients indoors by night, there can be no doubt that the treatment is beneficially maintained during sleep. A large proportion of the writer's hospital patients sleep in open shelters : and this by preference. There is usually keen desire among the patients to be placed on the list of outside sleepers, no less in winter than in summer.

When, for any reason, it is necessary to keep the patient indoors, the room should be as fresh and free of furniture, carpet, and hangings as possible. The patient's bed should be close to the window, which should be made to open, and be kept open, as freely as possible. In dusty neighbourhoods—in the case of private houses—and in the presence of fog, the patient may be protected from noxious influence by the thin gauze screen already mentioned. The nonsense that used to be talked about draughts may be discounted if only the inlet of fresh air be rendered sufficient.

2. *Dietary.*—Loss of appetite and digestive disability are common complaints of the tuberculous patient at one or other stage. They are especially frequent in patients treated indoors on protective lines. Nothing is more remarkable than the rapidity with which healthy appetite and natural digestion return when the patient is transferred, so to speak, from the hothouse to the garden. Often the appetite becomes voracious. There is little call for forced feeding. The patient eats of his own accord. It is sometimes helpful to serve meals in the open air. With the disappearance of digestive troubles, and the return of a normal appetite, the quantity of food may be increased. To avert a tendency to sickness, which some patients manifest to an extraordinary degree, it is well to insist not only on prolonged rest before and after meals, but to feed the patient reclining.

The number and constitution of the meals must vary with the state of the patient. As to number, in most instances three meals of approximately equal value are sufficient and best. Thereby nutrition is ample, and the stomach is adequately rested between meals. This tends to the restoration of natural secretions, and activity of stomach and bowels.

The meals may be arranged as follows : Say breakfast at 9 a.m., luncheon 1 p.m., and dinner 7 p.m. In some cases it is advantageous to allow a slight snack on waking, say at 7 a.m., e.g., a little rum and milk, or a cup of tea and toast, and again, say at 4 p.m. In most cases, nothing should be allowed between meals or after dinner. The patient commonly sleeps better on an empty stomach. If, for any reason, something is desirable at bedtime, or through the night, a cup of thin meat tea, or diluted hot milk, may be allowed. The treatment of digestive disabilities will be considered later on.

If the patient manages the three meals well, they may be varied to please his palate, provided they include a sufficiency of nitrogenous food, fats, and carbohydrates. Much may be achieved by skill in cooking, and daintiness in serving the various dishes. In this way the kitchen replaces the dispensary.

The following may be taken as a suitable, comprehensive menu from which selections may be made from day to day.

Breakfast may include porridge (preferably made with half milk, and boiled for forty-five minutes), cream, milk, toasted stale bread, butter, eggs, mild bacon, well-hung underdone meat, raw meat in various forms, fish of different kinds, and tea, coffee, or chocolate, well diluted with milk.

Luncheon may include a cup of soup, to which may be added, just before

serving, a varying quantity of raw meat pounded, fish with simple butter sauce, well-hung underdone steak, roast beef or other meat, chicken, game, vegetables (e.g., potatoes, onions, spinach, peas, beans, etc.), farinaceous puddings, stewed fruit, cream, butter, cheese, and a glass or more of milk.

Dinner should be similar in character to luncheon, advantageously on the lighter side.

The question of *stimulants* must be decided in the individual case. Guides as to their use are the pulse, temperature, and the patient's custom. Many apyretic patients with satisfactory pulse are better without stimulants at all. On the other hand, stimulants are often serviceable, more especially in patients with feeble circulation and irregular temperature. They help to pick up a flagging appetite, and aid digestion. Under their use, tendency to flatulence and other gastro-intestinal discomfort is lessened.

The form of stimulant is similarly various, and depends in part on the taste of the patient. Most frequently, whisky (one or two tablespoonfuls added to a tumblerful of milk) is best. To other patients, an equivalent quantity of alcohol may be given in the form of sound wine (Hock, Moselle, Burgundy, Sherry, Port, Champagne, according to circumstances). Others prefer, and benefit by, an equivalent quantity of beer or stout.

Where such a regimen is accompanied by digestive disturbance — more particularly in patients whose nutrition is much disturbed—the diet is simplified with advantage.

It may then consist chiefly of raw meat—*zomotherapy*. The systematic exhibition of raw meat is a therapeutic as well as a dietetic procedure. Form and dosage require to be regulated as we regulate the exhibition of other therapeutic agents. It has been shown conclusively in the case of dogs inoculated artificially with tuberculosis, that such animals when fed in the ordinary way undergo progressive emaciation, while those fed on raw meat put on weight more or less rapidly. To be efficacious, the doses of raw meat must be sufficient in proportion to the weight of the animal. Under these conditions, raw meat treatment is effective even when the animals seem *in extremis*. Cooked meat has been found of no value in the case of tuberculous dogs. Zomotherapy is thus something more than a question of extra feeding. When systematically pursued, there follows increase of nitrogen retention, improvement in intestinal metabolism, an increase in hæmoglobin, and a striking increase in digestive leucocytosis (lymphocytosis).

Raw meat may be exhibited in several ways, thus (1) Pounded raw meat, i.e.,finely minced or bruised fresh beef (mutton may be used, if preferred), seasoned with salt, etc., according to taste, served *natural*, like mince collops, cold or gently warmed throughout, say ½ lb. twice or thrice daily. The meat may be served with salad, or along with aspic jelly, or in a variety of other ways. (2) Beef juice prepared as follows: Extract ½ lb. of meat in ½ pint of cold water plus ½ teaspoonful of salt, for 1½ to 2 hours at 100° F. Express the liquid through a cloth, and serve. Or, the juice may be squeezed from the meat directly by more powerful pressure, without the addition of water. Worcester sauce or other flavouring agent may be added. (3) Raw meat soup, prepared as follows: Take ½ lb. finely minced meat and mix in a bowl with sufficient milk to produce a thick, uniform paste. Immediately before serving, add ½ pint of milk at 150° F. In place of milk, the soup may be made in similar fashion with stock of beef, chicken, veal, or mutton.

In all cases the meat should be *as fresh as possible*. Meat juice especially must be freshly prepared *immediately before use*. Prepared juice speedily undergoes changes which both detract from its value and tend to irritate the gastro-intestinal tract.

In the same dietetic category may be included raw eggs. The patient's meals may be prefaced with one, two, or three eggs—*nature*—swallowed like oysters. Advantageously, the eggs should be quite fresh, i.e., newly-laid. The eggs should not be switched or mixed with milk, or other ingredients, apart from a sprinkling of pepper or salt. In cold weather the chill is better taken from all raw preparations by *gentle* exposure to warmth just before use.

Short of exclusive zomotherapy, it is frequently well to limit the patient to a dietary of raw and underdone meat, butter, toasted bread, and milk, with perhaps a little stimulant, avoiding much vegetable or farinaceous food. Thus, breakfast may consist of raw meat rissoles, toast and butter, and a glass of warm milk slightly diluted, to which, in some cases, a tablespoonful of rum has been added ; lunch and dinner of raw meat juice, and lightly grilled minced beef or tender steak, butter, toast, stewed fruit, and a glass of milk as above, or a little light wine. Such a dietary sometimes starts healthy nutrition as nothing else will. It may be necessary to maintain such a dietary for weeks. As the condition improves, a more varied menu may be again sanctioned.

The use of milk to some extent is commonly advantageous. The amount to be ordered is not the same in all cases. The determination of the *optimum* quantity requires considerable discrimination.

If the patient can take full ordinary dietary, there is no need to push milk further than already indicated. Excess is apt to disturb stomach and bowels. Where, however, the patient cannot manage a varied dietary, the amount of milk may be increased. When taken solely, or chiefly, 3 to 4 pints may be allowed in twenty-four hours.

Where there is definite irritability or disease of the gastro-intestinal tract, a more rigid milk dietary is sometimes indicated. Thus, a milk dietary may be made to alternate, at varying intervals, with raw meat feeding. The milk may be given in different forms according to the needs of the patient. In most cases it is advantageously diluted with barley-water, soda- or lime-water, or sound butter-milk, according to circumstances. It may be combined with eggs, or tea, coffee, cocoa, or alcohol in some form. Or again, it may be fermented, as in koumiss or kefir ; or be peptonized. In critical cases, where assimilation is feeble, there is need for patience and skill in the selection and apportionment of these from day to day.

3. *Rest.*—Discrimination is required in the determination of the amount of rest. In dealing with most patients for the first time, it is well to maintain rest until the condition is fully known.

The best index from day to day as to the amount of rest is to be found in the pulse and temperature. In proportion as the temperature continues to swing and the pulse remains rapid and soft, the patient should rest chiefly or entirely. It is a handy enough rule to insist on complete rest when the temperature tends to rise above 100·5° F., or when the pulse beats constantly more than 90 per minute.

As the temperature and pulse improve, the rest should be made less absolute. The amount of movement should, however, be carefully detailed to the patient. Thus, he may be allowed ten or fifteen minutes' slow walking every hour or two, resting for the remainder. With a continuance of improvement, the periods of activity may be lengthened, and perhaps combined, so that the patient may walk for three-quarters of an hour to two hours in the forenoon, and perhaps for a similar period in the afternoon, resting between times. In most cases, rest for half to three-quarters of an hour should be insisted on before and after meals. The effect of movement will be carefully gauged by the pulse and temperature. If these are disturbed to any marked extent, the amount of activity should be

readjusted accordingly. By way of variety, when his strength permits, the patient may be allowed carriage or gentle motor riding, care being taken to avoid dusty roads and undue effort.

4. *Activity.*—If the pulse and temperature are not disturbed—and they are often conspicuously benefited—by regulated movement, the periods of activity may be advantageously increased.

As to the kind of exercise, walking is most suitable in the majority of instances. It should at first be slow, say at the rate of 2 to 3 miles an hour. The patient should not talk, and all hurry must be excluded. It should be practised at first on the level. With increase of strength, slight inclines may be faced, and still later, more definite hill climbing may prove advantageous. When the patient has been sufficiently tested, mild golfing exercise may be allowed. The interest of the game, and the swing of the club, if not too violent, are distinctly helpful. By this time, horseback exercise is generally permissible, and easy cycling. The patient must, of course, be warned against over-fatigue and chill. More rapid activity, such as tennis, hockey, and the like, are less desirable, and should only be sanctioned in exceptional cases.

Respiratory exercises are helpful. These should be simple, and practised in the open air, or at least at the widely opened window. The patient should be taught to respire slowly, through the nose—not the mouth. Both inspiration and expiration should be slow and full.

The patient's carriage should be as erect as possible. This may be helped, and faulty chest architecture remedied, by carrying a stick behind the back in front of the folded elbows which may be brought together behind by straps. Simple movements of the arms backwards, and upwards and backwards, and so on, are also helpful. All such movements to be effective, must be slow, in correspondence with a slow rate of respiration. If dumb-bells, Indian clubs, or other apparatus be used, the weight should be light and the movements slow.

5. *Clothing and Skin Hygiene.*—The functions of the skin in respect of heat regulation and excretion must be looked to. While the patient should be kept sufficiently warm, he should not be overclothed. Most patients err much on the side of over-clothing. I have known of twenty-three layers between the skin and the air. Excessive clothing seriously interferes with the skin as a heat regulator.

Woollen garments are, as a rule, best. A knitted undersuit, or combination with a single flannel shirt or its equivalent, is usually sufficient under the outer clothing. The texture should be as light and loose as is compatible with sufficient warmth. Chest protectors, flannel bandages, rolls of cotton wadding, and the like, should be forbidden. Corsets are better absent.

Bed-clothing should similarly be on the light side. The patient, while sufficiently warm, ought not to be overheated in bed. The bedstead should be as open as possible. Curtains and hangings should be forbidden.

Water may be used to the skin freely. In most cases this will be advantageously attained by a morning dip into tepid, cool, or cold water, according to circumstances. Other things being equal, the cooler the water and the more rapid the bath, the better from the therapeutic point of view.

Where the patient is confined to bed or couch, rapid sponging, followed by dry rubbing, will be sufficient. Even for such cases, sometimes a rapid dip into a long bath is more satisfactory. Generally it is better to arrange for a nurse or other assistant to be in attendance to rub the patient. Rapid improvement frequently follows the institution of a regular daily bath.

6. *Drug treatment.*—There should not be too much of this. For the purpose of increasing tissue resistance, and repairing loss and generally improving tone,

certain drugs and other agents are serviceable. In the first place, especially when an insufficient amount of butter and ordinary animal fat is taken at meal times, oils are helpful. Of these, perhaps the most generally available and satisfactory is cod-liver oil. It may be exhibited pure, or emulsified in a variety of ways. The form is pretty much a matter of palate. As to dosage, this varies from 1 to 4 drachms twice or thrice daily. Patients on open-air lines take cod-liver oil more readily, and tolerate it better, than do others. Butter, cream, and other animal fats, of course serve a similar purpose. The patient may tolerate and even enjoy such fats, when he rebels against cod-liver oil. In this case, certainly let him have what he prefers.

Various other oils, notably preparations of petroleum, have been proposed as substitutes for cod-liver oil. It has been shown, however, that little, if any, of such oil is absorbed from the gastro-intestinal tract. Although not absorbed, such oils are not without value as scavengers, and cleansers of the digestive tract, thereby rendering intestinal metabolism healthier.

Malt preparations are undoubtedly of service. They may be given by themselves, or conveniently in combination with cod-liver oil. There are several good preparations of the sort available. Hypophosphites of calcium, potassium, and sodium have tonic value. They may likewise be given in combination with one or both of the above. The Syrupus Hypophosphitum Compositus B.P.C. 1 to 2 dr. is a serviceable preparation. It contains hypophosphites of calcium, manganese, potassium, iron, and quinine.

Arsenic, in one or other form, is a drug of much value. To be effective, it must be continued for a considerable length of time, that is, weeks or months. During its prolonged use, an occasional interruption for a week or ten days is wise. As to form, it is conveniently exhibited as liquor arsenicalis (say 3 to 6 min. thrice daily), or arsenious acid (say $\frac{1}{30}$ to $\frac{1}{12}$ gr.) or, cacodylate of sodium $\frac{1}{2}$ to 1 gr.). Some have maintained that special advantage results from the subcutaneous or intravenous use of arsenic, more particularly in the form of cacodylate of sodium. While the writer is convinced of the value of the prolonged exhibition of arsenic, especially in early cases, he has been unable to trace any special advantage from subcutaneous injection. In more dilute form, arsenic may be given conveniently in La Bourboule water, say a half tumbler, thrice daily. This is given with advantage immediately before meals. The special efficacy of arsenic seems to lie in its influence over the blood-forming mechanism. Not only is secondary anæmia lessened, but tissue resistance is increased. Glycerin appears likewise to be of some value. It may at least be conveniently added to various tonic mixtures.

Sanatoria.—Sanatoria are now available in most countries for the special treatment of tuberculosis. It is of course unnecessary to send all patients to such institutions. Most of the measures which have been already indicated can be carried out in reasonably well-equipped private dwellings, provided the doctor realizes what is necessary and can get the assistance of a suitably trained nurse, or can persuade the friends to carry out the system rigidly.

It is usually easier to attain what is wanted in a sanatorium. For a good many cases it is helpful if the patient live for a time at least in a sanatorium, so that he may become acquainted with the system which he will have to follow for a long time. He is there taken thoroughly in hand. Strict regularity is introduced into his life, and slight aberrations from the path of recovery are quickly noticed. Happily, with the growing education of nurses and persons generally regarding the physiological principles of treatment, sanatoria will become less and less necessary.

In the selection of a sanatorium, it is efficiency and thoroughness of régime which should be sought, rather than climatic or other of the much advertised

advantages. There are not a few risks in connection with the commercial side of sanatoria which unfortunately are likely to grow rather than to diminish. What is especially desirable is the close personal supervision of a physician who has a wide experience of tuberculosis in its extremely varying manifestations. Other things being equal, a smaller sanatorium, where each patient is directly under the care of the physician in chief, is better than very large institutions.

Climate.—Till recently, climate played the chief part in treatment. This was largely owing to the belief that pulmonary tuberculosis resulted from a neglected cold, and that such colds were more likely to occur and continue in certain countries. More recent observations have proved that the disease is not materially influenced, either in origin or course, by climate as such. It has been conclusively shown that the disease occurs in all climates, at all latitudes, and at most elevations. Certain climates are better than others by reason of their comparative sunniness, dryness, equableness, and other qualities. After all, the best climate is undoubtedly that which brings patients most into the open air, and frees them from the prejudicial system of protection. The cure of tuberculosis may be successfully carried out in all ordinary climates, provided the air be pure, the physiological régime realizable, and a sufficiently early diagnosis has been made.

While this is true, it is none the less certain that change of climate, if it can be effected with sufficient comfort, does exercise a helpful influence in many instances. This influence is frequently wanting, or rather is entirely neutralized, by the absence of other hygienic requirements. Many hotels and so-called sanatoria at climatic resorts are anything but satisfactory.

It must also be kept in view that in sending a patient to another climate there is necessarily a large expenditure, both of physical energy and of means. This expenditure may be in excess of the patient's resources in one or other direction. In either instance, his condition is apt to be injured rather than benefited by the strain. It is wrong to send him far afield, if he is not in a fit state to stand fatigue, the possible discomforts of hotel life, and the absence of home attention. It is no less a mistake to allow him to go far from home if he has to economize at every turn.

In deciding the question of sending a patient away, it is a good rule to keep in view, that the more advanced the disease the less likely is the patient to benefit from the transference. It is patients in the early stage of the disease who may be expected to do well. It is not advisable to let pyrexic patients undertake long journeys. If complications are present, it is generally best to be content with treatment nearer home. All patients in the more advanced stages, and all dying persons, should be kept at home. It is an egregious sin to sanction risk and inconvenience at such a time.

Selection of Climate.—The selection of a climatic resort depends a good deal on the patient's taste and disposition, no less than on his actual condition. There is probably less virtue in the actual climate than was at one time supposed. The most important point to be determined is that, in the selected climate, really suitable conditions of residence and life can be obtained.

For working purposes, climates may be roughly grouped as follows :—

1. *Sea-coast Climates, including Sea Voyages.*—The advantages are pure air frequently in movement, ozone, maximum of sunlight, relatively equable temperature, and comparative warmth in relation to latitude. Disadvantages are wind—often boisterous—which disturbs many patients, upsetting their nervous system, clouds of sand, and moisture. Such climates are probably rather protective than curative. Patients sleep well usually, and there is a whetting of appetite. On the other hand, some patients suffer much from the

irritation referred to, and constipation and other gastro-intestinal discomforts are common. This group may be recommended in chronic cases, more especially when complicated by catarrhal tendency or albuminuria. They are particularly serviceable in children with glandular, osseous, or articular disturbances. Examples are found along the south and south-west coasts of England, Forres and Nairn in Scotland, the south-west coast of France (Arcachon, Biarritz), south-east coasts of Spain, the French and Italian Riviera, the Sicilian coast, north coast of Africa, Canary Islands, Madeira, West Indies, and Florida. In tropical countries, as a rule, coast towns are undesirable, and indeed the sea border generally.

A sea voyage has the same kind of advantages, with the absence of sand storms. The great drawback is the insufficient ventilation commonly found in both public and private cabins. In proportion as much time has to be spent in these, for one reason or another, the advantages of the voyage are neutralized.

2. *Desert Climates.*—Desert climates enjoy a maximum of sunshine and heat, and the further advantage of purity and dryness of air. Sand and dust storms are, however, frequent. Desert climates offer the same kind of advantages as do coast climates. They are well adapted for chronic cases, and exert a curative influence on slowly progressive cases. Examples of this type of climate are found in Egypt (Helouan, Luxor, Assouan) and Algeria (Biskra).

3. *Forest and Woodland Climates at Relatively Slight Elevation* (*say* 150 *to* 1500 *feet*). These may be found in almost any country and are correspondingly convenient. The character of these, in respect of dryness, warmth, and suitability generally, necessarily varies with the latitude, distance from seaboard, and nature of country. They have more or less the advantage of purity of air, absence of dust and, where trees are present, shelter from wind, and sweetness, even fragrance, of atmosphere (pine woods). Such resorts are favourable for most cases, even acute, progressive conditions. Provided the stay be long enough, and other physiological indications are fulfilled, patients commonly do well. Numerous examples might be cited from the Highlands of Britain and Ireland, Switzerland, the Black Forest, France (Pau), Austria (Tyrol, Dolomites), Italian lakes.

4. *Mountain Climates* (*say* 1500 *to* 10,000 *feet or more*).—The advantages are great purity, rarity, dryness and coolness of atmosphere, brilliance and warmth of the sun's rays, and, in many cases, extreme stillness. These properties differ considerably according to elevation. In varying degree, they stimulate respiration, circulation, and blood formation, improve appetite and digestion, and promote healthy activity of skin. The higher elevations have the disadvantage sometimes of over-stimulation, with resultant sleeplessness and other irritation. Such resorts are generally suitable for most cases, even those far advanced. It is, of course, unwise to transfer patients during acuter manifestations to such altered conditions. Probably, cases with albuminuria or tuberculous enteritis are better elsewhere. In selecting a mountain climate, regard must be had to the fact that often food supplies are less abundant and less satisfactory than is desirable. This is specially true of some in South Africa, where neither food nor accommodation is very good, and where the dust storms during dry weather are trying. Such resorts are not available in the United Kingdom. Examples may be found in Switzerland—Leysin (4757 feet), Davos Platz (5115), Arosa (6035), St. Moritz (6090); in South Africa—Beaufort West (2,800), Cradock (3,000), Middleburg (4,200), Aliwal N. (4,350), Bloemfontein (4,500), Pretoria (4,500) and Harrismith (5,280); in New South Wales—the Blue Mountains; in North America—the Rocky Mountains, Denver (5,196), Colorado Springs (5,992); and in South America, the Andes.

II.—TO OPPOSE THE TUBERCLE BACILLUS MORE DIRECTLY, OR COUNTERACT ITS EFFECTS.

This is the sphere of specific treatment. From the experimental point of view, many attempts have been made in this direction with varying success. On the clinical side, the results have been less consistently fortunate than might be desired. This has been chiefly due to over sanguine expectation, and the hasty, sometimes reckless, employment of powerful agents without proper selection of cases. The effect on the minds of many has been to exclude from consideration therapeutic agents of great value. But although their mode of exhibition may require further elaboration, there is no doubt as to their curative properties in suitable cases.

First in time and in practical importance is **Tuberculin.** Since Koch's earliest announcement in 1890, various modifications and refinements have been proposed by himself and other workers. The several recognized tuberculins possess specific properties. They are certainly of diagnostic value. Their therapeutic value is, in the writer's opinion, also considerable. The statement is based on the continued use of tuberculin in one or other form in a large variety of cases during the past fifteen years. It may be convenient to mention the leading preparations which have been found of service.

Koch's Original Tuberculin is a glycerin extract obtained from recent (6 to 8 weeks old) bouillon cultures of tubercle bacillus, concentrated by evaporation. The injections are made intramuscularly, conveniently behind the shoulder, by means of a sterilized syringe. The initial dose, as first recommended, was 0·001 gram. The writer's experience is in favour of much smaller doses, say 0·0001 gram diluted with normal saline solution, or ½ per cent carbolic acid. This dose produces a very slight, perhaps hardly traceable, reaction. Within the first 12 to 24 hours the patient may experience some degree of malaise. The temperature may be elevated a degree or two. The symptoms may become very pronounced (cough, expectoration, etc.) and the physical signs more definite. As to the date of repetition of dose, there is room for doubt. In most cases, sufficient guidance is forthcoming from the aspect of the patient, his temperature and pulse, and the local symptoms and signs. More recently, an endeavour has been made to determine this point by certain blood tests, and, more especially, by estimation of the so-called opsonic index of the blood as register of the opsonic content of the patient's blood, i.e., the amount of opsonin protective substances in circulation. Apart from theoretical objections as to the validity of the test, the method has meantime the practical difficulty of being rather lengthy for repeated clinical requirements, and too dependent on the personal element in the equation. Prolonged experience justifies the statement that, apart from estimation of the index, the other clinical evidence is usually sufficient for the regulation both of amount and frequency of dosage. It will be commonly found right to repeat the dose in from 7 to 14 days. With repetition of the same dose, there is manifested greater tolerance on the part of the patient, so that after several injections the dose may be increased. Corresponding increases may be made later, from time to time, at varying intervals, until the dose amounts to 0·01 gram or more.

Every case does not lend itself to such treatment. It is especially serviceable in less advanced cases, in which the local lesion is in excess of constitutional involvement. It is preferable to commence treatment in the absence of pyrexia. In such cases the results certainly justify the procedure. In many cases these are brilliant. On the other hand, carelessness in dosage, and too frequent repetition, may prove unfortunate. Too violent a reaction may occur. A pyrexic disturbance difficult to restrain may be induced, and a large extension of disease

become traceable. In highly pyrexic cases, it is wiser not to attempt the special treatment.

TR Tuberculin (*Koch*) is an extract obtained from recently dried cultures, after they are pounded in a mortar. Certain of the more toxic substances present in the earlier tuberculin are excluded. The method of injection is similar. The initial dose is $\frac{1}{50}$ of a mgrm. This is gradually increased on the general principles just described, until a dose of, say, 20 mgrms. has been reached. Most satisfactory results have been obtained under its careful use. Like the former, it is of special service in early cases, and particularly in non-febrile subjects.

Béraneck's Tuberculin, introduced some years ago, and fully described at the Paris Congress on Tuberculosis, 1905, differs from Koch's preparations in several respects and merits special consideration. The fluid contains: (1) Extracellular toxins, TB (toxines-bouillons), which are obtained from a culture of tubercle bacillus on a special medium, free of peptones; (2) Intracellular toxins, AT (acido-toxins), abstracted from the bodies of tubercle bacilli by means of orthophosphoric acid (1 per cent).

Each of the two constituent elements possesses a certain immunizing power. The maximum of immunization is obtained by a combination of TB and AT. The combined product constitutes Béraneck's tuberculin, which, although only slightly toxic, has marked bactericidal properties. The tuberculin is employed, both subcutaneously and by direct injection into the tuberculous focus—for example, joints, glands, etc. Treatment is begun with injection of ·1 cc. of a 1 per mille solution of Béraneck's original $\frac{1}{20}$ strength, dilution being effected in normal saline solution, say 0·75 per cent. The dose is very gradually increased. Already considerable clinical evidence has been adduced in favour of the remedy. The writer's opinion, based on an experience of two years, and the treatment of more than fifty cases, is that in this new tuberculin we have an agent of great therapeutic value, without, so far as he has seen, any serious risk.

Other preparations, variously termed oxytuberculin (Hirschfelder), Denys' tuberculin, tuberculocidin, antiphthisin, have been obtained either from tuberculin or directly from cultures of the bacillus. More or less encouraging results have been described in relation to these, but none of them seem superior, if equal, to those just described.

Various attempts have been made to obtain a *serum* possessed of immunizing properties, from the blood of animals, themselves rendered immune by means of bacilli or their products. Of these the serum of Maragliano and that of Marmorek are best known. But, while the results justify the continuance of observation and research on this and similar lines, such sera have not yet obtained a therapeutic position of first-class importance. (See also BACTERIOTHERAPEUTICS.)

Apart from tuberculin and sera, which derive their specific properties from their relationship with the tubercle bacillus, certain *drugs* have been credited with a more or less germicidal influence on the tubercle bacillus. The number of these is great. The limits and purpose of the present article admit citation of the chief of these only.

As to *mode of administration* practice varies considerably. Rather an over-estimate is sometimes made of the value of certain modes of exhibition. The most natural method is administration by the mouth, whether in solution, emulsion, pill, or other form. Where, for any reason, continuous oral administration is undesirable, e.g., in presence of gastro-intestinal irritation, use may be made of subcutaneous or rectal medication. The disadvantage of either of these is that it is generally desirable to have it carried out by a skilled attendant, which for obvious reasons may not always be possible. Intratracheal injection

is a ready means of continuous medication. It is doubtful if any real advantage is obtained by the use of the respiratory passages for the purpose of *direct* combat, although absorption proceeds readily, as from other mucous surfaces. The intratracheal method is easy in trained hands, but has the disadvantage that, to be effective, it must be carried out either by a doctor or by a thoroughly trained nurse. Intravenous injection of various drugs has been frequently proposed. This mode of employment is, however, open to the objection that, at the best, intravenous injection is not quite free from risk, and that, while in emergency such risks may be properly run, there is no sufficient need to justify the procedure in a more or less chronic condition like the present. It seems likely that all the benefit to be obtained from intravenous medication can be achieved by subcutaneous injection, and this without risk. The exhibition of drugs by inhalation is probably of little lasting benefit.

Of such germicidal agents, *Creosote*, or one of its congeners, is the most important. Almost all observers are agreed that, if not possessed of specific properties, it exerts a most wholesome influence. It is sometimes objected, regarding such drugs, that it is impossible to introduce into the system an amount sufficient to kill the organisms, without at the same time gravely damaging the living tissues. In answer to this, it has to be borne in mind that it is not a question of killing the bacillus, but rather of so modifying the conditions of environment as to make them unsuitable, or at least less suitable, for its development. It is further possible that creosote acts by neutralizing some of the products of the bacillus. It may be that its chief activity is in the gastro-intestinal tract, which it puts into better order, thereby improving intestinal metabolism.

In exhibiting creosote, care must be taken that it is a pure preparation of beechwood creosote. Cruder preparations tend to cause gastric irritation, with resultant dyspeptic phenomena. As to dosage, 2 to 5 min. may be given, gradually increasing to 15 or 20, three times daily. When the larger doses are reached, the kidneys should be carefully watched. The urine tends to become dark as the result of over-dosage. It is conveniently exhibited in capsule form, preferably along with or after food. Although less pleasant, it may be given in liquid form, e.g., in wine, or emulsion of cod-liver oil. Carbonate of creosote (creosotal) is said to contain 90 per cent creosote and to be less irritating. It may be given in doses of 5 to 30 mins., thrice daily.

Creosote may also be administered hypodermically, dissolved in sterilized oil (5 to 10 per cent), or per rectum as in the following formula :—

℞	Creosot.	℥ xv–lx	Ovi Vitelli		j
	Ol. Oliv.	ʒv	Aq.		ʒvj

It may be used by cutaneous inunction, as in the Unguentum Creosoti, or the following :—

℞	Creosot.	℥ lxx	Adipis		
	Lanolin.		Ol. Oliv.	āā	ʒvj

Or it may be exhibited by intratracheal injection, dissolved in oil (10 to 50 per cent). It is doubtful in this, as in all intratracheal injections, how far the agent reaches. There can be no question that by means of intratracheal injection the patient is frequently benefited. Conspicuous symptoms yield, cough and expectoration are lessened, and in many ways he improves. Local tuberculosis of larynx and upper air-passages is certainly helped. It is probable that, so far as the lung lesion is concerned, the drug does not act by immediate contact. But the respiratory passages afford an absorbent surface whence the drug is doubtless carried to different parts, as after absorption from the alimentary tract.

Inhalations of creosote, formerly so much in vogue, are probably of little service. The respirators which used to be worn are positively harmful, as impeding respiration.

Of its congeners, *Guaiacol*, which has the same active principle, is the most important. Its action is essentially the same. It may be prescribed in doses of 2 to 15 minims, either in capsule, pill, or in solution.

℞ Guaiacol 1 part | Water 180 parts
Alcohol (90 per cent) 20 parts |
One to three teaspoonfuls twice or thrice daily.

Or the Mistura Guaiacol of Guy's Hospital :—

℞ Guaiacol ℥iv | Ol. Cinnam. ℥j
Alcohol (90 per cent) ℥xl | Aq. ad ℥j
Glycerin. ℥xxx |

Or it may be given with sherry wine. It is combined pleasantly enough with cod-liver oil.

Or it may be given hypodermically, as in the following :—

℞ Guaiacol 5 parts | Parolein 100 parts
Iodoform 1 part |
Fifteen to thirty minims once or twice daily.

Where the stomach threatens to be troublesome, or where there is difficulty as to the smell, or taste, the same influence may be obtained by the use of carbonate of guaiacol (duotal), a white crystalline powder, without taste or smell, which may be given in pill or cachet to the extent of 5 to 25 gr. thrice daily. A good prescription is as follows :—

℞ Guaiacol Carbonat. gr iv | Acid. Arsenios. gr. $\frac{1}{20}$
Ft. pil. One to three pills to be taken thrice daily.

Other derivatives are numerous, but of less importance, e.g., benzoate of guaiacol (Benzosol), phosphate of guaiacol, and orthosulphoguaiacolate of potassium (Thiocol). The last named has a considerable reputation. It is a white powder without smell, and not disagreeable to taste, free from noxious influence. It may be exhibited in doses of 15 to 30 grains three times daily.

Tannin has been considerably used, and is much vaunted by some authorities, both on experimental and clinical grounds. It may be given in doses of 15 gr. three times a day. My experience has been rather unfavourable to its use, owing to the gastric disturbance which sometimes follows.

Menthol has been employed much, both in pulmonary and laryngeal tuberculosis, especially by intratracheal injection. A 20 per cent solution in olive oil is sufficient. Of this, one or more drachms may be injected once or twice daily. The remarks which have been made regarding intratracheal injections of creosote and guaiacol equally apply here. There is no question that symptomatically the patient is commonly benefited.

Eucalyptus Oil or *Eucalyptol* is certainly of value. Under its use the patient often improves remarkably. Notably, expectoration is lessened. The oil may be taken by the mouth, either in capsule, 5 to 20 minims thrice daily, or in emulsion along with cod-liver oil. Or it may be given subcutaneously dissolved in liquid vaselin, or intratracheally in olive- or castor-oil. Eucalyptol should not be used if there be kidney complication.

Iodoform. — Considerable difference of opinion exists as to the value of iodoform. There can be no doubt as to its significance in local (surgical) tuberculosis. On the whole, the evidence points to its value in pulmonary disease. Under its influence, cough and expectoration lessen. There is less tendency to hæmorrhage. In pyrexic cases the temperature is sometimes

favourably affected. It may be variously exhibited, e.g., in pill, ½ to 3 grains three times daily, or it may be given subcutaneously, dissolved in liquid vaselin (1 to 2 per cent). This has sometimes been combined with guaiacol and eucalyptol. Good results have been reported from its continued subcutaneous use. It has also been used intravenously. Iodoform is contra-indicated in presence of kidney disease. During its exhibition the urine should be examined frequently.

Cinnamic Acid or *Sodium Cinnamate* (*Hetol*) deserves mention. If the strong claims which have been advanced for its specific properties cannot be entirely admitted, its continued use is certainly beneficial. Sodium cinnamate may be dissolved in distilled water or normal saline solution, sterilized, and injected subcutaneously or intravenously. It has also been dissolved in oil or glycerin for the same purpose. It may be given internally in doses of 3 to 5 grains, or in the form of oil of cinnamon or oil of cassia (5 to 10 minims), e.g., added to an emulsion of cod-liver oil. Balsam of Peru, which has been used in various ways with benefit, probably owes its influence to the cinnamic acid it contains.

Camphor is similarly of service symptomatically in the form of camphoric acid, 10 to 20 grains. It has a special influence over night sweating. Camphor has been introduced subcutaneously and intralaryngeally, and even directly into the lung, with benefit. For such purpose it is dissolved in oil.

Formalin.—For cases of lung tuberculosis in which the larynx is involved, inhalation of formalin (½ to 2 per cent) is to be recommended. It is best exhibited on a light oro-nasal mask made of fine, open-meshed muslin, which does not interfere with respiration, the patient keeping the muslin constantly moist.

There is no end to the list of remedies which have been announced at one or other time as specifics. It would serve no useful purpose to present a long list of these. The following are perhaps worthy of mention at least, viz.: sulphur (including the natural sulphurous waters), mercury, iodine (including iodide of potassium), tar, carbolic acid, and other tar products (izal, cyllin, etc.).

Surgical interference has been utilized as a means of effecting a direct attack on the disease. More superficially-lying vomicæ have been opened and drained. The results have been, however, less encouraging than might be wished. They hardly justify recommendation of the procedure, as at present realizable.

III.—TO MEET SYMPTOMS AND COMPLICATIONS.

The symptomatic treatment of pulmonary tuberculosis is often made the chief, and sometimes the only, treatment. This is a great mistake. In proportion as the larger indications have been followed, there is little scope for symptomatic measures. Still, from time to time, symptoms must be met.

Cough.—The cause of the cough should be determined. This varies in different cases. We must see that it is not produced artificially, as by the condition of bedroom or residence. It is remarkable how an obstinate cough yields under conditions of hyperaeration, day and night. Cough is sometimes maintained by certain agents used for inhalation, e.g., terebene, eucalyptus, or by the use of unphysiological respirators. It is frequently the expression of such a simple cause as smoking, especially cigarette smoking. Sometimes the patient keeps it up voluntarily. He thinks he should cough. He certainly coughs more than is needful for purposes of expectoration. In such cases it is well to explain to the patient that every cough tends to injury, by putting undue strain on the delicate lung tissue, and by forcibly spreading disease. Much can be done by training the patient to hold his breath, and by means of simple demulcent and sedative pastilles.

The routine use of expectorants in presence of cough is to be deprecated. They are seldom necessary, and tend to spoil the appetite, disturb the stomach,

and generally derange the patient. Where the cough is irritating and resultless, sedatives, e.g., dilute hydrocyanic acid in glycerin, are useful, as in the following:—

℞	Acid. Nitr. dil.	℥j–iij	Glycerin.	℥j
	Acid. Hydrocyan. dil.	♏xlviii	Inf. Quass.	ad ℥vj

One tablespoonful to be taken thrice daily, immediately before meals.

Or small doses of morphine ($\frac{1}{12}$ to $\frac{1}{8}$ grain); or better, as causing less disturbance of gastro-intestinal functions, codeine $\frac{1}{2}$ to 1 grain, dionin $\frac{1}{4}$ to $\frac{1}{2}$ grain, or heroin $\frac{1}{16}$ to $\frac{1}{8}$ grain. One or other of these may be conveniently given at bedtime and the first thing in the morning, in effervescent citrate of potash or soda water. Of milder sedatives, hyoscyamus and belladonna may be mentioned.

When cough is due to irritation about the pharynx, it may be relieved by a menthol and cocaine pastille or by a spray of menthol in paroleine (10 to 20 per cent). A similar spray is of value in irritation about the larynx or trachea. Or counter-irritation may be used, e.g., a blister over the manubrium sterni.

Expectoration.—Morning expectoration, which supervenes after the rest of the night, may be rendered easier by the use of warm drinks, especially warm alkaline drinks. Boiling milk, to which an equal amount of one of the natural alkaline waters has been added, is often serviceable; or a tumblerful of warm milk with 2 to 4 teaspoonfuls of rum.

When expectoration is attended with difficulty, it may be eased by small quantities of ipecacuanha ($\frac{1}{4}$ to 1 gr.). With this may be advantageously combined 5 to 10 gr. of chloride of ammonium. When expectoration tends to be excessive, benefit is derived from terpene hydrate (2 to 5 gr.), or from 5 to 10 min. of terebene or eucalyptol. These may be combined suitably in conditions of irritation, with codeine, heroin, or other sedatives.

Hæmoptysis. (See Special Article.)—For slighter degrees of hæmorrhage, there is no need for special treatment. The infrequency of hæmoptysis is one of the more remarkable results of the open-air treatment of tuberculosis.

Dyspnœa.—This affords urgent call for complete hyperaeration. Some patients, dyspnœic when indoors even with windows freely open, are marvellously relieved when carried outside. In emergencies of the sort, aromatic spirit of ammonia is helpful. It may be given conveniently in 1-drachm doses in lemon water. Where dyspnœa is associated with lodgment of discharge in the tubes, which is not easily expelled, relief may be had by the use of stimulant expectorants, e.g., carbonate of ammonium, senega.

Pain.—The cause of the pain varies, and should be determined where possible. If comparatively slight, and due to recent pleurisy, relief may be had by fixing the affected side by means of broad strips of sticking-plaster. If the pain is greater, counter-irritation by fly blister is most helpful. This is commonly more effective, and in the end less troublesome, than mustard or iodine. When the distress, as often happens, results from strain of the muscles in coughing, sedatives should be used for the cough, and a rubefacient liniment of oil, e.g., aconite, belladonna, and chloroform liniment, applied locally on spongiopiline or lint under oilcloth. Or a more sedative application may be made by means of poppy-head stupe. When pain is due to more widespread congestion, whether of tubes or lungs, a large poultice, to which mustard may be added, is often serviceable.

Pyrexia.—The effect of hyperaeration on pyrexia is striking. It is extraordinary how quickly temperatures which have swung more or less violently for months under the older treatment in more or less confined rooms, become normal in the course of days or weeks or months. It may take months of persistent hyperaeration to attain the effect. Yet patience through long periods

is amply rewarded. In such cases, the supply of air cannot be too great and direct.

Apart from drug treatment, the cause of pyrexic disturbance should be carefully sought, with a view to its exclusion. The tuberculous patient is more highly sensitive to disturbing influences than the normal subject. Thus, fatigue, excitement, gastro-intestinal irritation, and the like, readily affect his temperature. Consequently, the temperature should be carefully taken at least twice daily, and, in more anxious cases, every three hours. Where pyrexia is present, the temperature curve should be carefully analyzed to determine if there be any uniformity in the recurrence of pyrexia, and if there be any relationship with times of exercise, meals, etc.

If pyrexia seem to follow fatigue, the indication is rest. If it be associated with gastro-intestinal disturbance, the dietary should be revised, and in most cases simplified. Thus the patient may be placed on a milk dietary or, again, on a raw meat dietary (raw meat-juice, raw eggs). Or the bowels may require attention. A dose of castor oil may have remarkable effect. Daily repeated 1-dr. doses of castor-oil, with a minute quantity of opium, are sometimes serviceable. When there is no evident and removable cause, hydrotherapeutic measures may prove helpful, for example, sponging with cool or cold water, to which may be added Eau de Cologne or toilet vinegar. Or the wet pack may be tried, or a cool or cold bath, with care.

For the same purpose, inunction with guaiacol, 1-dr. doses, over the skin of the thorax, may be serviceable. It must be practised with caution, as sometimes grave depression has followed the application. It may be used pure, or in combination with soft soap and olive oil, as in the accompanying prescription :—

R	Guaiacol	℥j	Ol. Oliv.	ad	℥iij
	Sapon. Mollis. Peroleat.	℥j			

A tablespoonful to be applied by inunction.

Antipyretic drugs should be used with some caution. It is easy enough to lower temperature by such means : it is more difficult to say to what extent the patient has benefited. Quinine is largely used, but there exists doubt as to the degree of efficacy. In lesser pyrexia, small doses of, say 2 gr., dissolved in dilute acid, are sometimes helpful. In more persistent pyrexia, quinine is of less service. The old-fashioned combination of quinine (1 gr.), digitalis (½ gr.), along with a small quantity of opium, may assist. Some stubborn cases yield to the regular exhibition of strychnine (e.g., Liquoris Strychnin. Hydrochlor. 3 min. every four hours). Or quinine, digitalis, and strychnine may be combined. In obstinate cases, where the cause of the pyrexia cannot always be determined, the recently introduced cryogenine has proved of signal service. It may be given in doses of 5 to 10 gr., twice or thrice daily, conveniently an hour or so before the expected rise of temperature. In the same way, antipyrine in 5- to 10-gr. doses twice or thrice daily, may be tried. This is especially helpful when there is attendant discomfort, headache, and other irritability. Phenacetin in similar doses may prove helpful, or pyramidon (5 gr.). It is not advisable to prolong the use of such antipyretics for many days. They should be stopped in any case when gastro-intestinal disability ensues.

The administration of alcohol offers distinct advantages in the pyrexia of advanced disease. If exhibited an hour or so before the temperature tends to rise, it frequently prevents this, while at the same time it lessens tissue waste in patients unable to take sufficient nourishment. As to form, pure spirit (whisky, brandy) is commonly wisest, diluted with milk, or mixed with eggs and milk as egg flip, or in alkaline water.

Gastro-Intestinal Disturbance.—As already indicated, digestive troubles are

remarkably lessened under the open-air régime. This is so striking, that it is almost useless to speak of treating them under other conditions. If they fail to yield to this, the diet sheet and prescriptions should be revised. We must make sure that the disturbance is not maintained from without. Simpler diet and the exclusion of drugs may make a vast difference. Thus, limitation to raw meat, or to a milk diet, for a few days, may prove sufficient.

Loss of appetite is sometimes removed by the use of ordinary bitters taken half an hour before food, while the patient is resting, or by a little dilute acid. Some patients do better with a corresponding dose of alkali before food.

A feeling of fullness and discomfort about the stomach, with tendency to sickness, is often best relieved by a mild alkaline drink, e.g., bicarbonate of sodium, 5 gr. in hot water, shortly before meals ; or by a glass of boiling water taken sip by sip, half an hour before meals or, it may be, two or three hours after food. The occasional use—perhaps every second or third day—of minute doses of grey powder (½ to 1 gr.) is sometimes effective. A drop or two of creosote or of iodine, diluted and taken after food, is similarly helpful. Or, 10 to 15 gr. of bismuth may be given with meals.

Where vomiting occurs as the result of cough (*toux émétisante*) it may be prevented by small doses of a sedative, e.g., morphine, codeine, heroin, just before meals. Creosote taken with meals seems likewise helpful. A mustard poultice over the epigastric region has similar value. It is sometimes serviceable to anticipate this variety of vomiting by making the patient sick the first thing in the morning, by tickling the throat or other simple means. This commonly saves his being sick after meals.

Diarrhœa.—This may be due to a variety of causes. Some judgment is required in determining the point. Thus, it may depend on a dietetic error or drug, on simple or tuberculous enteritis, or on waxy disease of intestine.

A dose of castor oil (and it is the safest purgative) may be needed to remove existing irritation. Thereafter a simple milk dietary for some days, or the adoption of more or less strict zomotherapy may prove of utmost service. In most cases, one or other form of bismuth is helpful. In simpler cases, 10 to 20 gr. of subnitrate of bismuth with each meal may be sufficient, while in more pronounced cases, with offensive stools, salicylate of bismuth (5 to 15 gr.) is more serviceable. Where pain accompanies the diarrhœa, or where the latter is excessive, the addition of a small quantity of morphine is indicated. Of other drugs, liquor calcis saccharatus (1 dr.) or other chalk preparation may be tried. Of vegetable astringents, logwood (e.g., of decoctum ½ oz.) is perhaps the best.

Where the condition is more certainly due to tuberculous involvement of the bowel, the diarrhœa calls for the strictest attention dietetically, on the lines already indicated, and salicylate of bismuth with morphine will generally prove of much assistance. It is often necessary, however, to alternate among a variety of antiseptic and astringent drugs, of which may be cited, in addition to those already mentioned, salol, tannin, tannoform, sulphate of copper, acetate of lead, and oxide of zinc. The continued use of creosote sometimes proves more helpful than anything else. In milder cases, petroleum emulsion does good service.

Night Sweating.—This classic symptom, as it used to be considered, hardly ever occurs where hyperaeration is sufficiently achieved. The rapidity with which persons who have been persistent night sweaters, and suffered in consequence from broken sleep and corresponding depression, have lost the symptom under physiological treatment, is one of the most striking facts in clinical medicine. If, for any reason, open-air methods cannot be efficiently carried out, or the tendency persists notwithstanding such measures, the clothing,

night-dresses, and bedclothes should be looked to. They must be as light as is compatible with comfort. At bedtime, the patients should be freely sponged with acidulated, or sometimes with alkaline, wash, and this may be followed by dry-rubbing. Thereafter the surfaces may be freely dusted with tannoform powder. Irritating external applications should be avoided at bedtime. Internal drugs will be seldom necessary. Of these may be mentioned, atropine ($\frac{1}{100}$ gr.), or extract of belladonna ($\frac{1}{8}$ gr.), camphoric acid (10 to 20 gr.), picrotoxin ($\frac{1}{100}$ to $\frac{1}{50}$ gr.), and agaricin ($\frac{1}{8}$ to $\frac{1}{4}$ gr.). The writer's experience is that, with proper attention to the physiological requirements, the need for special drug treatment for night sweating is quite exceptional.

Insomnia.—Bad sleepers, even without tuberculosis, usually sleep better in the open air. This is emphatically true of the tuberculous subject. If the open-air prove insufficient, sleeplessness is often averted by some such simple means as a warm drink at bedtime, e.g., of dilute milk, malted milk, thin soup, or dilute toddy. The lessening of the evening meal proves beneficial for some persons. Constipation and flatulence, and other gastro-intestinal disturbances, should be looked to. Painful conditions must of course be excluded. Irritating applications should be avoided at bedtime. If iodine is used it had better be applied in the morning rather than at night, and at bedtime the surface be dusted over with a soothing powder. If irritating cough be present, a slight sedative may be added to the warm drink, e.g., codeine, dionin, or morphine. Of hypnotics proper, perhaps the most valuable are paraldehyde (1 to 1½ dr.), sulphonal (15 to 20 gr.) dissolved in hot fluid, or trional (10 to 15 gr.).

Anæmia.—Arsenic is of greatest service in the treatment of the anæmia of tuberculosis. It is to be preferred to iron, which in most cases is of doubtful value. Arsenic should be used, as already indicated, for prolonged periods. Sometimes there is considerable glandular enlargement. A good many glands increase in size without a tendency to suppuration. In such cases the continued use of arsenic is especially indicated. Raw-meat feeding is here of remarkable and rapid efficacy.

The treatment of other complications—laryngeal, peritoneal, and genito-urinary—is considered under several appropriate headings. *R. W. Philip.*

PILES.—(See HÆMORRHOIDS.)

PITYRIASIS ROSEA.—This disease usually disappears spontaneously in from six to eight weeks, but its departure can be greatly hastened by the treatment first recommended by Allan Jamieson. Every night the patient should take a bath to which sufficient permanganate of potash is added to make the water claret-coloured. After drying, a 5 per cent salicylic ointment should be well rubbed in. In favourable cases, the eruption is removed in less than a week; others may persist for a fortnight. *Norman Walker.*

PITYRIASIS VERSICOLOR.—The treatment of this disease is really only difficult because the disease is so easily destroyed that the patient is usually satisfied with a large measure of apparent improvement, and leaves off treatment prematurely. If even the smallest portion of fungus is left, it is quite obvious that the disease may spread to any extent. The principle of treatment then is perseverance for a considerable time after all traceable evidence has disappeared. Almost any antiseptic will destroy the fungus, but it is better to use those which at the same time produce an exfoliation of the cuticle, such as tar, resorcin, and salicylic acid. While not denying altogether to hyposulphite of soda some antiseptic powers, the writer is of opinion that it owes its reputation in this disease largely to its bleaching properties. *Norman Walker*

PLAGUE.—*Symptomatic treatment* is that usually adopted. As early as possible in the disease, calomel, (3–5 gr.) should be given, and be followed by a saline purgative. Diarrhœa, if it occurs, is best treated by antiseptics such as salol, or bromide and morphia may be given. Stimulants must be used early, on any sign of cardiac failure. If collapse occurs, strychnine hypodermically gives the best results. In apparent convalescence, the possibility of sudden cardiac failure must be remembered.

Hypodermic injections of morphia may be required to produce sleep and relieve pain. The buboes may be fomented or treated with glycerin and belladonna. When pus forms, they should be incised, but there is no advantage in incisions in the early stages. All dressings and discharges may be carriers of infection, and must be thoroughly sterilized or destroyed.

Serum Therapy.—Numerous attempts at treatment by the injections of sera have been made, but none can be said to be of proved value. Yersin's and Lustig's sera in large doses are still advocated by some observers. Injections into the buboes of various antiseptic solutions have not led to any beneficial result.

In the pneumonic form, stimulating expectorants, inhalations of oxygen, and antiseptic sprays have been used, but are of doubtful value. (See also BACTERIOTHERAPEUTICS.)

C. W. Daniels.

PLEURISY.—(See also RHEUMATISM, ACUTE.) Putting aside questions of etiology, and looking at this affection mainly from the point of view of treatment, pleurisies become naturally divided into acute and chronic, dry or with effusion. The acute stage is much the same for the cases which remain dry and for those in which fluid eventually forms. We will, therefore, consider the treatment of: (1) *Acute Pleurisy;* (2) *Chronic Dry Pleurisy;* (3) *Pleurisy with Effusion.*

1. **Acute Pleurisy.**—Here we have no effusion, and our indications are to relieve pain, reduce fever, and prevent, as far as possible, extension and implication of lung. At the same time we must carefully watch for indications which would point to the presence of trouble in the lung, pericardium, or any other organ of which the pleura is only a part, and also for the supervention of effusion. with which we may subsequently have to deal.

The patient should be kept warm and at rest in bed. Leeching, wet or dry cupping, blistering or repeated hot stupes or poultices are the best local measures. The two first (leeches and cupping) are the most efficacious for the relief of pain and checking extension, and should be used in all severely acute cases. Bleeding may be encouraged by subsequent poulticing. The patient is easier the more the respiratory movements can be restrained; firm bandaging or strapping of the chest often helps in this way, while, for a similar reason, it is well to check a troublesome cough with some simple linctus. There is generally some fever, and it is well to open the bowels with a pill or calomel and saline, followed by a diaphoretic mixture. If the attack occurs as part of acute or subacute rheumatism, salicine, salicylate of soda, aspirin, or some other antirheumatic treatment, is often rapidly effectual in giving relief. The presence of Bright's disease must not be overlooked, as influencing the use of opium and blisters, and as also affecting the gravity with which we regard the case. Further, it is obvious that the treatment must be, to a certain extent, influenced by whether the attack is simple, or only part of some grave malady in the course of which it occurs.

2. **Chronic Dry Pleurisy.**—This is generally rheumatic, frequently recurrent, and the danger of its prolongation is great thickening of the pleura, with possible fibrotic extension into the lung itself, which may eventually culminate in a

more or less contracted fibroid condition (cirrhosis). It may arise as an acute pleurisy, when the treatment already discussed for that condition will be necessary; but more generally it runs a chronic course, with slight subacute exacerbations. The chief indication is to keep the patient at rest, especially to limit the respiratory movements of the affected side, for by these movements recovery is delayed, involving increased thickness of pleura and more permanent damage to the lung. The patients are frequently not at all ill, and it is, therefore, difficult to persuade them of this necessity, but it is a point which must be emphasized. They should be kept at rest, the chest bandaged or strapped, and, until the attack has passed off, any exertion or further exposure, which may cause a relapse, must be forbidden. The salicylates are not so effective in this form, but iodide of potash and belladonna are often useful. After or between attacks it is important to see to the proper expansion of the lung by appropriate gymnastics and deep-breathing exercises.

3. **Pleurisy with Effusion.**—Pleural effusions have been divided pathologically into: (1) Septic; (2) Idiopathic; and (3) Mechanical. For purposes of treatment they are perhaps better divided into: (1) The small or stationary; (2) The large or increasing. (Only serous effusions will be dealt with here; for purulent effusions see EMPYEMA.)

Small or large effusions may arise acutely, and the appropriate treatment for acute pleurisy may have been employed. Many, however, arise without any acute stage, the only complaint often being increasing dyspnœa. Beyond the treatment already discussed for pleurisy, all we have to consider is the question of tapping. Many authorities advise early and repeated tappings, whatever the cause of the pleurisy or the amount of the fluid. We believe, however, that many small effusions, accompanying febrile disorders, or following simple lung affections (such as bronchitis and pneumonia), become rapidly reabsorbed, without causing any inconvenience, or leaving any more mischief behind than if they had been tapped. Let us consider the possible results of leaving fluid untapped, or of taking it away, and then try to deduce guiding rules in this matter.

DANGERS ATTENDING THORACOCENTESIS.

(i). Syncope, from too rapid emptying and consequent sudden shifting of important organs (heart, etc.).
(ii). Rupture of lung, which may be softened by inflammatory changes or partly tied down, so that only part of it can dilate.
(iii). Conversion of a serous into a purulent effusion.
(iv). Repugnance of patient and friends to the operation, which may have to be frequently repeated.
(v). "Albuminous Expectoration" (rare), from the sudden release of previously compressed vessels, allowing copious exudation into tubes and alveoli.

DANGERS ATTENDING AN UNTAPPED PLEURAL EFFUSION.

(i). Permanent damage to lung, which, if long collapsed, will undergo fibroid changes; also thickening of pleura, which prevents complete expansion subsequently.
(ii). Sudden attacks of syncope, which are frequently fatal. (These occur chiefly with large effusions. N.B.—It is very difficult to tell whether an effusion is large or small.)
(iii). Protraction of the case to the detriment of the general health.

We would suggest the following rules for guidance:—

(*a*). When an effusion is obviously small in amount; is causing no inconvenience to circulation or respiration; when it has followed some definite simple affection of the lung, such as bronchitis or pneumonia; then, perhaps, especially in children (who so frequently rapidly reabsorb pleural fluid), there is no harm in allowing a week or two to pass, to give time for reabsorption.

(*b*). When, in the course of pneumonia, an effusion forms on the affected side, unless our hands are forced by urgent symptoms, we should give the lung time

to resolve before tapping, and in any case only a small amount of fluid should be withdrawn. We have seen pneumothorax result from neglect of this precaution, where the lung, softened by the pneumonia, ruptured in trying to dilate as the fluid was withdrawn.

(*c*). On the other hand, when the effusion is large, or increasing ; when it is of long standing or recurrent ; whenever it is attended by urgent symptoms ; when it has come on insidiously (that is, from some cause not likely to be shortly removed) ; and when, as in the above-mentioned exceptions, time has been given, and no progress made, then undoubtedly the best and quickest results are given by tapping, and, if necessary, doing so repeatedly.

Thoracocentesis.—The operation, small as it may seem to the surgeon, is not considered so by the patient or his friends, and it is well to remember that it can be ill or well done. The chief points to be remembered are these :—

(i). The patient should be in the lying or half-lying position.

(ii). The operation must be carried out with the strictest antiseptic precautions ; the diagnosis having been verified by hypodermic needle.

(iii). The trocar and cannula used should be of medium size ; if too large, there is danger of withdrawing the fluid too rapidly ; if too small, it is very apt to become choked by lymph. Further, the larger the instrument, the greater the force needed to puncture and the greater the pain inflicted. Whether the ordinary aspirator (Potain), or the large, exhausting syringe (Dieulafoy) be used, or the fluid allowed to trickle out under its own pressure, care should be taken that the withdrawal is *slow*. It can easily be checked, if coming too fast, by pinching the rubber tube.

(iv). The point at which the puncture should be made must vary according as the fluid is free, or located in some particular part of the pleural cavity. When the fluid is in the general cavity, a point should be chosen a little in front of, or behind, the posterior axillary border, at the level of the angle of the scapula.

(v). In introducing the needle, care must be taken to keep close to the upper border of a rib (lower border of the space), so as to avoid injuring the intercostal vessels.

(vi). A general anæsthetic is strongly contra-indicated ; a local one may, occasionally, be needed. For this purpose a few minims of 5 per cent solution of eucaine may be used.

(vii). Have brandy and ether handy in case of necessity.

(viii). It is not well to take away all the fluid that will come ; 20–50 oz. is generally quite sufficient at one time. Frequently the remaining fluid will be rapidly absorbed when only a small quantity has been removed.

(ix). The necessary amount having been withdrawn, remove the instrument and seal the puncture with a piece of lint soaked in collodion.

The dangers of tapping. (*a*). If sudden faintness come on, withdraw the instrument or check the flow of fluid by pressure on the tube, and apply restoratives. (*b*). If troublesome cough occur, the withdrawal of fluid should be discontinued. (*c*). If " albuminous expectoration " result, it is stated to be increased by the attendant cough, and this should be checked by morphia.* (*d*). If a serous effusion should become *purulent*, treat the case as an empyema (free drainage) without delay.

After the removal of fluid, our object is to get the lung to expand. We should, therefore, not bandage or strap the chest, as is sometimes recommended, but, on the other hand, after a day, get the patient to use Wolff's bottles (blowing water from one to the other), so as to help in expanding collapsed air vesicles.

* NOTE.—(*a*), (*b*), (*c*) are all liable to be caused by too rapid removal of fluid ; and again one must emphasize the importance of guarding against rapid evacuation.

It is well not to delay this, and in our experience reaccumulation is less frequent in cases where this method is employed early.

The after-treatment of cases of pleural effusion is perhaps more important than their immediate management. If the effusion occurs in the course of morbus cordis or Bright's disease, the proper treatment of these conditions must be undertaken. If the effusion be primary, the origin is nearly always tubercle. Attempts should be made to arrive at a definite diagnosis in such cases by carefully examining the lungs for any evidences of phthisis, and by submitting some of the fluid to expert examination for tubercle bacilli. If this cannot be done, we should not be far from the mark if we regarded all cases of primary, idiopathic, sero-fibrinous, pleural effusion as tuberculous. It is only necessary to point out that, for all such, the proper treatment is that which is now well known as "sanatorium" or "open-air" treatment. Cases of phthisis, starting with pleural effusion, are, as a rule, very hopeful ones, and no pains should be spared to persuade them to undergo a course of after-treatment as suggested above.

W. J. Hadley.

PLEURODYNIA.—(See RHEUMATISM.)

PLUMBISM.

1. CURATIVE TREATMENT.—This may be summed up in the employment of means to relieve symptoms, promote elimination of the metal, and to restore function.

In the milder forms, with recurring attacks of colic and constipation, it is desirable that the bowels should be moved as early as possible by means of olive oil and warm water enemata, and by the internal administration of magnesium sulphate along with belladonna and carminatives :—

℞ Magnes. Sulphat. ℥vj | Tinct. Zingib. ℥iv
Tinct. Bellad. ℥jss | Aq. ad ℥viij
Tinct. Cardam. Co. ℥iv

A tablespoonful in water every three hours until the bowels have been moved.

There is the opinion that sulphate of magnesia acts in these cases by precipitating lead in the bowel in the form of a rather insoluble sulphate ; but while this is true, and lead sulphate is less soluble in the alimentary canal than the carbonate, the medicine can only precipitate such lead as is present in the alimentary canal, and *all* lead compounds are more or less poisonous. Workers in lead sulphate may suffer from well-marked saturnine cachexia, but in them the symptoms are developed slowly.

When colic is extremely severe, and the patient is being worn out from want of food and sleep, a hypodermic injection of morphia may be required. Should there be vomiting, an effervescing mixture of soda and bismuth may be tried, e.g. :—

(1) ℞ Sod. Bicarb. ℥ij | Tinct. Zingib. ℥ij
Liq. Bismuth. et Ammon. Cit. ℥j | Sp. Chlorof. ℿxl
Sp. Ammon. Arom. ℥ij | Aq. ad ℥viij

(2) ℞ Acid. Tartar. ℥jss | Aq. ℥iv

One tablespoonful of No. 2 to be added to two tablespoonfuls of No. 1, and drunk during effervescence four times a day.

Warmth applied to the abdomen and, in severe cases, a hot bath, will often give relief. If the colic persists after the bowels have been opened, nothing acts so well as monosulphide of soda, in doses of ¼ or ½ gr. every three hours :—

℞ Sod. Monosulphid. gr. ¼ | Aq. ad ℥j
Tinct. Cardam. Co. ℿxv |

Every three hours.

Potassium iodide favours the elimination of lead from the system, but if given too early or in too large doses, a patient may be re-poisoned by lead which has been dissolved out of his own tissues. This drug should therefore be avoided in the severe and acute forms of plumbism, but in the milder cases of colic and constipation, after the bowels have been freely moved by sulphate of magnesia, a few grains of potassium iodide may be safely added to the aperient.

In **Lead Palsy** the object of treatment is to eliminate lead from the system and restore function. Iodide of potash will accomplish the former ; but to restore function, hypodermic injections of strychnine may be resorted to, with massage and electricity. Opinions differ as to whether the hands, when affected by wrist-drop, should be allowed to hang by the sides, or be supported on splints. The latter plan has much to commend it, inasmuch as it takes the weight off the affected muscles, and reduces the synergic action of those which are still healthy.

In the use of electricity in these cases, it must be remembered that the therapeutic effect is *not* to be measured by the amount of contraction produced in the muscles ; there are invisible nutritive and vasomotor effects which are of great service. Indeed, over-stimulation of the muscles may induce fatigue, and do harm. Induction coil or sinusoidal currents may be used, with or without a water bath, to produce functional stimulation of the paralysed muscles. Electric baths aid in the elimination of lead and are therefore to be recommended. (See also NEURITIS, and ELECTROTHERAPEUTICS.)

2. PROPHYLACTIC TREATMENT.—For lead workers, personal cleanliness is of the first importance. The hands should always be washed before eating ; baths should be provided at all workshops where lead or its compounds are manipulated, and the workpeople urged to take a warm bath at least once a week. Aperients should be taken regularly. The acid lemonade on draught in lead works has only a questionable value ; sulphur lozenges taken twice a week do more good. The day's work should not be begun without a meal ; milk is of special value as a preventive. Finally, it should be remembered that once a patient has had lead colic he becomes more susceptible to the metal, and ought therefore to exercise greater care at the factory, and change his occupation if the attacks are recurrent. In obscure cases of plumbism the drinking water should be analyzed for lead.

Thomas Oliver.

PNEUMONIA.—(See also BRONCHOPNEUMONIA.) There is no disease which has given rise to so much difference of opinion as regards treatment, nor for which so many so-called specific remedies have been vaunted, as this. One might divide the various schools of treatment thus :—

1. Those who leave everything to nature, believing all interference useless or even harmful.

2. Those who treat every case on the same plan, or with the same remedies (specific treatment), many of whom push their hobby to an almost dangerous extent.

3. Those who wait till the patient shows some definite symptom, which they then endeavour to relieve (the symptomatic or expectant treatment).

4. Those who advocate very active treatment, believing that early measures are most important, and that it is bad policy to wait until the patient is so ill that something *must* be done, by which time the possibility of giving relief, or of averting a calamity, may have passed.

In criticism we would say that we deplore the hopelessness of doing nothing. Although ready to admit that some cases get well without treatment, whilst others die in spite of everything, there is yet another class of cases which would not recover without help, and in which appropriate treatment saves life.

" Specific treatment " comprises many measures which are often most

beneficial ; but no two cases of pneumonia are the same, and even the same case will vary greatly at different times, so that quite different methods may be necessary. It is in blindly following the same line of treatment in every case, and in every stage, that these methods fail.

With regard to pure " expectancy," we feel that valuable time and opportunities are lost, especially in the early stages, when there are usually no urgent symptoms to treat, and that by this method we lose sight of the case as a whole, regarding it rather as a collection of symptoms. Therefore :

1. It is bad policy to do nothing in every case ;

2. It is often dangerous to wait for symptoms which necessitate active interference ;

3. It can hardly be expected that specific plans and remedies can meet the requirements of every case alike.

When death occurs in pneumonia, it is due to toxæmia, heart failure, or to the supervention of some complication. A rational treatment should, therefore, be framed on these lines :—(1) *To Lessen Toxæmia* by every means in our power ; (2) *To Limit Extension of Pulmonary Lesion* (because it causes heart failure) ; (3) *To Prevent or Treat Cardiac Failure ;* (4) *To Prevent or Treat Complications.*

1. **To Lessen Toxæmia.**—Most authorities agree that toxæmia is, directly or indirectly, the cause of the majority of deaths occuring in cases of pneumonia. The means we have at our disposal are :—

(*a*). *Bleeding.*—By withdrawing a certain amount of blood, we not only relieve the right heart, but also lessen the total amount of poison circulating.

(*b*). *Diaphoresis.*—By hot baths, hot packs, and best, by the hot foot-bath given in bed, and kept up by adding more hot water, and a little mustard, for half to three quarters-of-an-hour, till there is profuse sweating, which can be increased by giving copious drinks of water in the meantime.

(*c*). *Catharsis.*—Calomel and saline are unequalled for this purpose. It must be remembered that free evacuation must be kept up (two or three times daily) for two or three days, in order to get the best effects.

(*d*). *Diuresis.*—The citrates are most useful in this respect, as also large quantities of bland drinks. We do not want to employ powerful remedies, because the kidneys are already congested from the fever and toxæmia (witness the almost constant albuminuria).

(*e*). *The Cleansing of the Mouth.*—This is most important, so as to prevent auto-infection by the constant swallowing of bacteria, with which the mouth swarms.

Other methods of lessening toxæmia may be mentioned, as saline infusion, and the free use of oxygen for inhalation (which has a powerful effect in destroying the circulating toxins) ; but these methods are more useful in relieving the over-taxed heart, and should be included under treatment for cardiac failure. This is also true of bleeding.

All these measures are of a depletory nature : it must be remembered that bleeding is certainly not recommended as a routine treatment, but only in exceptionally acute, sthenic cases, when seen very early. So, too, diaphoresis, catharsis, and diuresis are only applicable in the early stages of the disease, while the powers of the patient are as yet unimpaired, and when, by promptly and effectively promoting the increased excretion of toxins, the exhaustion, heart failure, etc., which the toxæmia so frequently causes, may possibly be prevented.

Emphatically it is in the earliest stages that these measures are called for. The " expectant " treatment waits, and these golden opportunities (which never recur in cases of pneumonia) of lessening toxæmia, at a time when the measures recommended involve no risk to the individual, are lost. They should be

regarded as most important preventive treatment, which may frequently prevent subsequent evils.

2. **To Limit Extension of Pulmonary Lesion.**—The importance of this lies in the fact that the wider the area affected the greater the work thrown on the right ventricle, from the consequent blocking of the pulmonary capillaries. As means, we have (locally) leeching, wet and dry cupping, and blisters, whilst certain drugs are sometimes useful in lessening the amount of fibrin in the blood (which is increased in pneumonia). By active treatment on these lines we may succeed in limiting extension if we get our cases early enough. Although we may not get them before there is a patch of consolidation, yet we should always be on the look-out for signs of extension to another part, or to the opposite lung, and apply vigorous measures at the earliest moment, while yet there may be only a few crepitations (congestion). The drugs useful for the same purpose are iodide of potash, the alkaline carbonates, and citric acid. Citric acid, by taking up calcium, tends to prevent coagulation, whilst the alkalies and iodide of potash promote fluidity of blood. The same result is aimed at by lowering the diet and giving fluids copiously. It may be said of these measures, one does not believe in starving patients, nor in drenching them with enormous doses of iodide of potash (3000 gr. daily have been given), but in sthenic cases, running an acute course, low diet and iodide of potash are certainly useful; citric acid, although theoretically active, seems practically of little use. Local methods should be applied wherever fresh signs of disease can be found. Of these one prefers leeching to any other, and it must be remembered that they are all absolutely efficacious in removing pain (a great gain where rest is so important), whether we succeed in limiting the spread of consolidation or not.

3. **To Prevent or Treat Cardiac Failure.**—To prevent cardiac failure it is necessary to understand clearly what may cause it.

(*a*). *Toxæmia and Fever.*—In this connection toxæmia is the most important. The means of lessening it have already been discussed. Fever generally goes hand in hand with toxæmia, and it is doubtful if it is well to use measures solely against the fever, such as powerful antipyretics, ice-packs, etc., because of their depressing influence on the patient.

(*b*). *Increased Resistance to the Pulmonary Circulation due to the Consolidation.*—This has also been dealt with.

(*c*). *Abdominal Distension*, so common in pneumonia, is less so where the bowels have been kept freely open in the early stage, as recommended. Care must be taken with the diet, as excess of milk and carbonates seems to increase this tendency. Distension is most distressing to cardiac action, and if, in spite of all preventive care, it should occur, appropriate treatment must be applied. Calomel and salines should be used, and a simple enema given. If still troublesome, the long tube should be passed for its relief (for it is frequently colonic), and an enema of turpentine or asafœtida given.

(*d*). *Constant Pain*, best relieved by local measures, such as leeching, cupping, and blisters, as already mentioned.

(*e*). *Restlessness, Sleeplessness and Delirium* form the most difficult problems in the treatment of pneumonia. Again, prevention is better than cure. Early in the case avoid all unnecessary moving and disturbance, and during the first few days, provided there is no distress of breathing, no cyanosis, and the kidneys are healthy, it is well to make sure that the patient shall sleep. This can generally be secured by an evening Dover's powder. Afterwards it is a much more serious matter. Each case must be carefully weighed on its merits. There are patients in whom continued restlessness and sleeplessness wear the heart out, sedatives being withheld; while in others the sedative has caused the patient to sink into a choked and cyanotic condition. On the one hand we fear to deaden the

activity of the respiratory centre, tie up secretion, and check cough ; on the other we know the almost inevitable result of continued sleeplessness and exhaustion. If we feel that cardiac failure and exhaustion are threatening, and that nothing but sleep is likely to prevent them, having eliminated faulty kidneys, in the absence of cyanosis, and with no very copious bronchitis, sedatives should be used. We see much harm from the reckless use of sedatives, but it is wrong to say that they should *never* be given. When their use has been decided upon, paraldehyde is, perhaps, the best, because the safest ; it can be given per rectum in 1- to 3-dr. doses, to avoid its objectionable taste. Chloral and bromide, and chloralamide are more frequently used, whilst others prefer opium or morphia. Delirium must be treated on similar lines and with the same precautions. It must be remembered that delirium is, not infrequently, entirely due to want of sleep, or exhaustion, and that it will often completely pass away if sleep be obtained, or food or stimulants given.

If in spite of our care the heart begins to fail, as will be evidenced by increasing difficulty of breathing, distant or absent heart sounds, increased rapidity of pulse, which is easily compressible, or dicrotic, and perhaps irregular, what means have we for stimulation ? In this connection we must consider the relative merits and uses of strychnine, digitalis, alcohol, oxygen, and hypodermoclysis.

Strychnine should be given early, before the heart shows any sign of failure, because :—

(i). It keeps the respiratory centre awake.
(ii). It is a tonic to the general nervous system (as well as to the heart).
(iii). It is potent to prevent abdominal distension.
(iv). It is a profound and prolonged cardiac stimulant.
(v). It does not tend to poison the patient.

Digitalis has been used as a specific, given early, with the idea of preventing cardiac failure and of driving the blood through the lungs, so as to overcome the inflammatory stasis. We do not advocate its use for such a purpose, but as a powerful cardiac stimulant it is almost unequalled. Unfortunately it is prone to upset the stomach, and not infrequently does harm in this way. It must be remembered that, with regard to this drug, as well as strychnine, it is frequently useless when given by the mouth. One has often seen cases, past absorbing these remedies by the stomach, immediately respond to them when given hypodermically, and in all cases where the patients are very ill, and the tongue, perhaps, dry and brown, hypodermic medication is indicated.

Alcohol.—Whilst much harm is done by the reckless use of alcohol, and also whilst acknowledging the fatality of the disease amongst chronic alcoholics, one still feels, occasionally, the necessity for its employment. The pernicious habit of putting every pneumonic patient on anything up to a bottle of brandy a day is responsible for a good many cases of delayed resolution, or even permanent damage to the lungs ; whilst it seems, in many cases, to increase the toxæmia, to develop uræmic symptoms, or to cause great restlessness, excitement, or even delirium, at the same time doing away with the desire for more useful nourishment, and causing stomach distension. Therefore, one deprecates its abuse, or even its routine employment, especially early in the case. Further, it may be urged that alcohol throws more work on the kidneys, which, as we know, are frequently already allowing albumin to pass. These are the dangers and difficulties surrounding the use of alcohol ; personally, we prefer strychnine and digitalis for cardiac stimulation before resorting to it.

Oxygen, one believes, is frequently left till too late. Its beneficial action against toxæmia has already been mentioned, whilst its great stimulating effect on the heart through the blood is undoubted. It should be used freely. It is best given without a mask, just through a plain tube, and

should always be washed and warmed by being passed through a bottle of warm water.

Many other drugs have been used for stimulating the failing heart in cases of pneumonia, such as strophanthus, musk, nitroglycerin, camphor, etc., etc., but it would not seem that they have any claim to superiority over those already discussed. Finally, the question of injection of saline solution may suggest itself. This measure is undoubtedly very powerful in stimulating the heart. Normal saline solution (1 dr. to a pint) may thus be injected into the rectum, or beneath the skin (hypodermoclysis), or directly into a vein, being most powerful when used intravenously. From one to four pints, carefully sterilized, and at a temperature of 100° F., may be used in this way.

4. **To Prevent and Treat Complications.**—It is not within the scope of this article to discuss these, as it would involve the consideration of pericarditis, pleural effusion, empyema, abscess and gangrene of lung, meningitis, arthritis, phlebitis, and other affections, which may be referred to. But one wishes to emphasize the point that, because a serious complication of the pneumonia may occur, therefore hope and further treatment need not be abandoned. We see cases complicated with pericarditis, meningitis, empyema, or even abscess of the lung, not infrequently get well. Each complication will call for its particular treatment, but do not in the meantime lose sight of the fact that the case is one of pneumonia.

Serum Therapy.—It is too early to speak definitely with regard to this method. We know: (1) That a certain amount of immunity can be conferred in the case of animals, and from the use of serum in the South African war it would seem that a slight immunity can also be conferred on man; but that it is short in duration (that is, prevention). (2) That its use in patients suffering from the disease is rendered difficult by the fact that each individual breeds his own particular strain of pneumococcus. Bearing in mind this fact, viz., that A's pneumococcus does not protect B, and that it, therefore, becomes necessary to cultivate an individual's own organism for his own cure (a process which takes about fourteen days), it is obvious that this form of treatment will become more useful in lingering cases, or for some of the more chronic complications, such as empyema, delayed resolution, or arthritis; and that there would be no time to call on its aid in the ordinary case, swiftly culminating in death or resolution. Thus we have seen cases of pneumococcal empyema and arthritis treated most successfully by this method. (See also BACTERIOTHERAPEUTICS.)

Preventive Treatment.—It is only necessary to mention this to remind practitioners of its importance. We recognize that, at any rate under certain circumstances, pneumonia is an infective disease. It is therefore obvious that care should be taken, in every case, to destroy all emanations from the patient—especially the sputa, which should be burned. Elaborate precautions as to isolation may not be necessary, but undoubtedly the spread from case to case does occur, sometimes assuming epidemic proportions.

DIGITALIS AND STRYCHNINE FOR CARDIAC FAILURE IN PNEUMONIA.

℞	Tinct. Digitalis		Sp. Ether Sulph.	āā ℥xv
	Tinct. Nucis Vom.	āā ℥v	Inf. Cinchon.	ad ℥j
	Sp. Ammon. Arom.			

M. Ft. mist. ℥j sextis horis.

FOR CATARRHAL PNEUMONIA.

℞	Vin. Antimon.	℥xv	Syr. Aurant.	℥j
	Ammon. Chlor.	gr x	Aq. Camph.	ad ℥j
	Sp. Chlorof.	℥x		

M. Ft. mist. ℥j ter die.

(*Vict. Park Hosp. Pharm.*

For Respiratory Failure.

R	Quin. Sulph.	gr xxiv	Glycerin	ʒiij
	Strych.	gr ¼	Liq. Pepsin.	ad ʒiv
	Acid. Hydrochl. dil.	♏xv		

M. Ft. mist. ʒj in water every three or four hours for a child of five years. (*Pepper.*)

W. J. Hadley.

PNEUMOTHORAX.—The immediate results of the formation of a pneumothorax may be either profound shock or a disturbance so slight and evanescent as not to be noticeable, with many intermediate degrees. Pneumothorax is often not recognized during life, even by experts, when it is superadded to advanced pulmonary disease. If it occurs in a patient whose lungs are not widely damaged, the shock is marked. Three points in treatment deserve attention :—

1. *Stimulants.*—These should be freely given, both alcohol and ammonia and ether. They help the heart to tide over the extra strain suddenly thrown on the right ventricle, and the dilatation consequent on the one lung being put out of action. The heart is further hampered by its displacement, which sometimes is great. According to the condition of the pulse, digitalis and strychnine may both be given, but it is not wise to contract the arteries over much.

2. *Morphia.*—This is the best form in which to give opium. It may be used either hypodermically or by the mouth. It helps to relieve the patient's anxiety, and there is not, to any considerable extent, the danger of its interference with the respiratory centre, which is usually in good condition in those cases where pneumothorax produces its most alarming symptoms, i.e., in relatively early lung disease.

3. If there is considerable cardiac displacement and cyanosis, and the signs point to great air-pressure in the damaged pleural cavity, it is well to try to *draw off some of the air* in the pleura, which may be done with any of the usual forms of aspirator. There are three objections to this proceeding, none of which is really important :—

(*a*). The air will collect again most probably ; which is no reason for not giving the patient temporary relief.

(*b*). The opening in the visceral pleura, which may be on the point of closing, is likely to be reopened. There is no chance whatever of any firm closing of the pneumothorax orifice within the first few days after its rupture. It is at this time that the air-pressure is great, and that puncture may be advisable.

(*c*). Subcutaneous emphysema may be produced. It may : but it very rarely occurs, and the risk is worth taking.

Besides these three methods of procedure, it is sometimes advisable to have recourse to *bleeding*. This is not often to be recommended. If there be extreme cyanosis, a bounding heart, and thready pulse, all pointing to an overburdened right heart, and blocking of blood on the venous side, the letting of fifteen to twenty ounces of blood produces great relief.

Dry cupping, or the application of a few leeches, are helpful both in relieving pain, and to some extent in aiding the right ventricle.

Strapping of the side, which has been widely recommended and used, is not, in my experience, of any value. It has the obvious disadvantages of making the patient uncomfortable and examination difficult. If, however, it is found that pressure applied to the damaged side of the chest does relieve the patient, it should be tried.

After the first shock is over, the character of the case changes considerably. Fluid, practically invariably, collects, and partially or entirely fills the pleura. The fluid may be clear or purulent, generally becoming purulent ultimately. The pus may be sweet or fœtid.

Cases where the Pleura becomes entirely filled with Fluid.

1. If the fluid be clear, or very thin pus, the temperature normal, and no marked distress of respiration, it is well to let it remain untouched for three or four weeks, by which time the opening in the visceral pleura may be firmly closed. Sometimes the fluid then becomes absorbed. If it does not, the case should be treated as an empyema, and drained in the usual way.

2. If the fluid be purulent, temperature raised, and the patient shows all the signs of pus absorption, there is no use in delay, and he should be operated on at once. This is obviously all the more necessary if the pus be fœtid.

Cases where the Pleura does not become filled with Fluid, purulent or otherwise.

These form the bulk of the chronic cases which give the classical signs of pneumothorax. Many patients remain some time in this condition, without much suffering. Their temperature is normal, or nearly so ; there is no pressure of pus in the pleura. If, then, the opposite lung works well, there is no need to interfere.

If the condition change, temperature rise, and pus absorption begin, then operation should be advised, and carried out as described in the surgical section. Many of the patients do badly after operation ; but that is the result of normal progress of the disease : there is, in my opinion, no evidence to support the rather widely held doctrine that operation hastens the end in these cases.

Gustave Schorstein.

POISONING.—The most convenient emetics to use in cases of poisoning are :—

Mustard, a tablespoonful in ½ pint of warm water.
Sulphate of Zinc, 30 gr. dissolved in water.
Powdered Ipecacuanha, 30 gr. in water.
Apomorphia, $\frac{1}{10}$ to ¼ gr., hypodermically.
Sulphate of Copper, 5 to 10 gr. in water.

The following are brief directions for the treatment of different forms of poisoning :—

Acetanilide or Antifebrin.—Emetic or stomach tube. Subcutaneous injection of strychnine $\frac{1}{25}$ gr. ; warmth. If cyanosis—oxygen, alcohol.

Acid, Arsenious.—(See ARSENIC.)

Acid, Carbolic.—Stomach tube, or apomorphine hypodermically ; sodium sulphate, 1 oz., or magnesium sulphate, ½ oz. in 3 oz. of water ; saccharated lime water, 1 oz. in 3 oz. of water.

Later : demulcent drinks ; olive oil ; brandy subcutaneously or by enema ; warmth.

Acid, Chromic.—

Immediate treatment : stomach tube with extreme care ; chalk mixture 5 oz., or chalk, ½ oz. in half a pint of milk.

Later : olive oil ; or milk, or gruel, or white of egg and water.

Acid, Hydrochloric (Spirits of Salts).—

Immediate treatment : introduce water, and use stomach tube with care ; sodium bicarbonate, 2 dr. in 5 oz. of water ; or soap and water ; or chalk or calcined magnesia ½ oz., in ½ pint of water or milk ; or liquor ammoniæ or sal volatile, freely diluted ; or white of egg and water ; milk ; gruel ; arrowroot ; or linseed tea.

Later : morphine for pain, and ice for thirst.

Acid, Hydrocyanic.—

Immediate treatment : dash cold water over head and chest ; emetic ; inhalation of ammonia ; brandy, by mouth or rectum ; artificial respiration ; faradic current ; hypodermic injection of liquor atropinæ sulphatis, 2 min.

Acid, Nitric.—

Immediate treatment : soap and water, calcined magnesia, chalk, whiting, or carbonate of soda with water.

Later : demulcents—olive oil, white of egg, morphine hypodermically.

Acid, Oxalic.—Stomach tube with care ; chalk, ½ oz. in 5 oz. of water ; or saccharated lime water, 4 dr. in 2 oz. of water, repeated every half hour for eight doses ; stimulants hypodermically ; gruel or linseed tea.

Acid, Sulphuric.—

Immediate treatment : soap and water, calcined magnesia, chalk, whiting, or carbonate of soda with water.

Later : demulcents—olive oil, white of egg ; morphine hypodermically.

Aconite.—
Immediate treatment : emetic, or stomach tube ; subcutaenous injection of tincture digitalis 20 mins., or digitalin $\frac{1}{100}$ gr.
Later : brandy, warmth, friction, artificial respiration.

Alcohol.—
Immediate treatment : stomach tube, cold effusions to head.
Later : hot strong coffee ; warmth.

Almonds, Bitter, Essential Oil of.—(See Acid, Hydrocyanic.)

Ammonia.—(See Caustic Potash and Soda.)

Aniline.—Stimulants ; artificial respiration ; bleeding and intravenous injection of warm saline solution (1 dr. of common salt to 1 pint of warm water).

Antimony.—Stomach tube or emetic, if required ; glycerin of tannic acid, 2 fluid dr. in 5 oz. of water ; or tannic acid, 30 gr. in 5 oz. of water, to be repeated if vomited ; strong tea or coffee, ½ pint ; milk ; stimulants ; hot bottles and blankets ; friction.
Later : morphine.

Antipyrin.—Stomach pump ; brandy ; subcutaneous injection of strychnine $\frac{1}{20}$ gr. ; warmth. If cyanosis—oxygen.

Aqua Fortis.—(See Acid, Nitric.)

Arsenic.—
Immediate treatment : emetic or stomach tube ; ferric hydrate (prepared by mixing liq. ferri perchlor. ½ oz. in ½ tumblerful of water with equal quantity of saturated solution of washing soda ; collect precipitate on a handkerchief and mix with ½ tumblerful of hot water), repeat frequently. (Liquor ammoniæ may be used instead of washing soda.)

Atropine.—Stomach tube or emetic ; brandy ; 1 pint of strong, hot coffee ; morphine hypodermically, ⅓ gr. to be repeated in two hours ; or hypodermic injection of pilocarpine (½ gr. of pilocarpine nitrate), to be repeated in fifteen minutes, if pulse improves ; flicking ; pinching ; warm and cold douche ; faradism ; hot bottles and blankets ; artificial respiration ; friction.

Barium, Salts of.—Stomach tube or emetic ; sodium sulphate 1 oz., or magnesium sulphate ½ oz., in 5 oz. of water ; or alum 1 dr. in 5 oz. of water ; stimulants ; hot bottles and blankets.
Later : morphine.

Battle's Vermin Killer.—(See Strychnine.)

Belladonna.—(See Atropine.)

Benzol.—
Immediate treatment : emetic, stomach tube.
Later : brandy ; inhalation of ammonia ; subcutaneous injection of liquor atropinæ sulphatis 2 min.

Bichromate of Potash.—Stomach tube or emetic ; chalk mixture 8 oz. ; or ½ oz. of chalk in ½ pint of milk ; warm bottles and blankets.

Burnett's Disinfecting Fluid.—(See Zinc, Salts of, and Acid, Hydrochloric.)

Calabar Bean.—(See Physostigmine.)

Camphor.—
Immediate treatment : emetic and stomach tube.
Later : inhalation of ammonia ; subcutaneous injection of brandy ; hot fomentations.

Cannabis Indica.—Emetic and stomach tube ; apomorphine hypodermically ; stimulants.

Cantharides.—
Immediate treatment : stomach tube or emetic.
Later : demulcents ; opium ; morphine.

Carbolic Acid.—(See Acid, Carbolic.)

Carbonic Acid.—Fresh air ; artificial respiration ; inhalation of vapour of liquor ammoniæ ; stimulants ; hot bottles and blankets ; inhalations of oxygen ; bleeding ; faradism ; cold douche.

Carbonic Oxide.—Fresh air ; artificial respiration ; bleeding and intravenous injection of warm saline solution (1 dr. of common salt to 1 pint of warm water) ; inhalation of oxygen ; stimulants ; hot bottles and blankets ; friction ; faradism.

Caustic Potash and Soda.—Stomach tube, with care ; vinegar or diluted acetic acid, or lemon juice ; olive oil.

Cesspool Gas.—(See Sewer Gas.)

Chloral Hydrate.—
Immediate treatment : prevent sleep by wet towel to face, head, and neck ; emetic and stomach tube ; hot blankets ; hot bottle to feet.
Later : hot strong coffee ; artificial respiration ; faradic current ; subcutaneous injection of liquor strychninæ hydrochloratis 4 min. ; nitrite of amyl ; oxygen.

Chlorine, Inhaled.—Inhalations of ammonia or sulphuretted hydrogen.

Chlorine, Swallowed.—Albumin and mucilaginous drinks.

Chloroform, Inhaled.—Insert finger into mouth and pharynx to make sure that there is no obstruction, e.g., by artificial teeth ; extend the head, and push the jaw forward; pull tongue out by forceps ; loosen clothes ; fresh air ; artificial respiration ; raise foot of table that the head may be lower than the rest of the body ; flapping with wet towels ; inhalation of capsule of amyl nitrite ; faradism (poles at pit of stomach and over larynx) ; strychnine ; ether ; alcohol, hypodermically ; brandy, enema.

Chloroform, Swallowed.—Stomach tube or emetic ; olive oil ; stimulants hypodermically or per rectum ; flapping with wet towels ; faradism ; 1 pint of strong, hot coffee, capsule of amyl nitrite for inhalation.

Chlorodyne.—(See OPIUM.)

Coal Gas.—Fresh air ; artificial respiration ; stimulants ; hot, strong coffee ; oxygen inhalation ; ammonia inhalation ; transfusion.

Cocaine.—Emetic, if swallowed ; stimulants ; inhalations of amyl nitrite.

Colchicum.—Emetic ; olive oil or any demulcent ; stimulants.

Conium (Hemlock).—Emetics ; stimulants ; strychnine hypodermically ; artificial respiration.

Copper, Salts of.—

Immediate treatment : white of egg and warm water ; milk ; emetic ; and stomach tube if vomiting has not occurred.

Later : demulcents ; morphine or laudanum, and hot fomentations if much pain.

Corrosive Sublimate.—Stomach tube, with great care ; flour and water ; or arrowroot and water ; or white of egg and water (1 egg = 4 gr. of corrosive sublimate) ; stimulants ; hot bottles and blankets.

Later : morphine.

Creosote.—(See ACID, CARBOLIC.)

Croton Oil.—Stomach tube or emetic ; stimulants ; ½ gr. of morphine hypodermically ; or tincture of opium, 30 min. by mouth, by rectum, or by suppository ; morphia ; hot bottles and blankets ; friction ; poultices or hot fomentations to abdomen.

Cyanide of Potassium.—Stomach tube or emetic ; ferrous sulphate, 5 gr. in 5 oz. of water ; stimulants hypodermically ; faradism ; inhalation of vapour of liquid ammonia ; artificial respiration ; fresh air ; solution of atropine sulphate, 2 min., hypodermically (= $\frac{1}{100}$ gr. of atropine sulphate) ; or tincture of belladonna, 15 min. by mouth or rectum ; alternate warm and cold douches ; friction.

Dalby's Carminative.—(See OPIUM.)

Deadly Nightshade. (See ATROPINE.)

Digitalis (Foxglove).—Emetics ; tannin, 30 gr. in water ; stimulants ; recumbent position ; tincture of aconite internally.

Elaterium.—Emetics ; stomach tube ; demulcent drinks ; opium.

Emerald Green.—(See ARSENIC.)

Eserine.—(See PHYSOSTIGMINE.)

Ether.—(See CHLOROFORM.)

Fly Papers.—(See ARSENIC.)

Formalin.—Small doses of ammonia largely diluted with water ; or large quantities of liq. ammon. acetatis every half hour.

Foxglove.—(See DIGITALIS.)

Fungi.—Emetics ; hypodermic injection of liquor atropinæ sulphatis, 2 min. ; stimulants.

Gelsemium.—Stomach tube ; emetics ; potassium bicarbonate and tannin ; warmth; stimulants ; artificial respiration ; solution of atropine, 3 min. hypodermically.

Gibson's Vermin Killer.—(See STRYCHNINE.)

Godfrey's Cordial.—(See OPIUM.)

Henbane.—(See ATROPINE.)

Iodine.—

Immediate treatment : emetic and stomach tube.

Later : starch and water ; demulcents ; nitrite of amyl ; morphine and fomentations for pain.

Iodoform.—Emetics ; stomach tube ; bicarbonate of soda in large diluted doses ; stimulants ; hot pack ; subcutaneous injection of saline solution.

Laburnum.—Stomach tube ; stimulants ; hypodermic injection of ammonia ; counter irritation ; friction ; cold douche.

Lead, and its Compounds.—

Immediate treatment : stomach tube or emetic ; magnesium sulphate, ½ oz., or sodium sulphate, 1 oz. in 5 oz. of water ; or diluted sulphuric acid, 30 min. in half pint of water ; milk ; or white of egg and water ; poultices to abdomen ; morphine.

Later : potassium iodide.

Lime.—Carbonic acid ; any aerated water ; weak acetic acid or vinegar ; oil or demulcent drinks.

Lobelia.—Stomach tube or emetic, if required; recumbent position; glycerin or tannic acid, 2 dr. in 5 oz. of water; or tannic acid, 30 gr. in 5 oz. of water; or 1 pint of strong tea; stimulants; hot bottles and blankets; friction; tincture of nux vomica, 15 min. by mouth or rectum; or solution of strychnine hydrochloride, 5 min. hypodermically (= $\frac{1}{20}$ gr. strychnine hydrochloride).

Mercury, Salts of.—(See CORROSIVE SUBLIMATE.)

Morphine.—(See OPIUM.)

Mother's Friend.—(See OPIUM.)

Muriatic Acid.—(See ACID, HYDROCHLORIC.)

Muscarin.—(See FUNGI.)

Mushrooms.—(See FUNGI.)

Mussel Poisoning.—Emetic; stimulants; solution of atropine, 2 min. hypodermically; castor oil, 2 oz. with 10 min. tincture of opium.

Nepenthe.—(See OPIUM.)

Nicotine.—

Immediate treatment: stomach tube or emetic; stimulants; warmth; artificial respiration; strychnine hypodermically.

Later: stimulants.

Nitric Acid.—(See ACID, NITRIC.)

Nitro-Benzine (or **Nitro-Benzol**).—Stomach tube or emetic; stimulants; solution of atropine sulphate 2 min. hypodermically (= $\frac{1}{80}$ gr. of atropine sulphate); artificial respiration; faradism.

Nitro-Glycerin.—

Immediate treatment: recumbent posture; cold effusion.

Later: hypodermic injection of ergot 3 min., or solution of atropine sulphate 2 min. hypodermically.

Nitrous Oxide Gas.—Insert finger into mouth and pharynx to make sure that it is free from obstruction, e.g., by artificial teeth, gag, etc.; extend the head, and push the jaw forward; pull tongue out by forceps; fresh air; loosen clothes; if patient is upright, place in recumbent position; artificial respiration; flapping with wet towels; inhalation of oxygen.

Nux Vomica.—(See STRYCHNINE.)

Opium (or **Morphine**).—Stomach tube or emetic; wash out stomach at half-hour intervals with solution of potassium permanganate, diluted with 5 times the quantity of warm water, leaving about 5 oz. of the diluted solution in the stomach; strong hot coffee, 1 pint by rectum; mixture of ammonia and ether 1 oz. (aromatic spirit of ammonia 30 min., spirit of ether 30 min., chloroform water to $\frac{1}{2}$ oz.); or ether, 60 min. hypodermically; pinching; flapping; liquor ammoniæ or smelling salts to nostrils; faradism; make patient walk about; solution of atropine sulphate 3 min. hypodermically (= $\frac{3}{150}$ gr. of atropine sulphate) to be repeated in half an hour; or tincture of belladonna, 15 min. by mouth or rectum; capsule of amyl nitrite for inhalation; artificial respiration.

Oxalic Acid.—(See ACID, OXALIC.)

Paraffin Oil.—Emetics; stimulants; hot bottles and blankets; friction.

Paraldehyde.—(See CHLORAL.)

Petroleum.—Emetics; stimulants; friction; hot bottles and blankets.

Phenol.—(See ACID, CARBOLIC.)

Physostigmine.—Emetics; 30 gr. tannin in water; 2 min. solution atropine sulphate hypodermically; or tincture of belladonna, 15 min. by mouth every fifteen minutes until pupils dilate; chloral hydrate; stimulants; artificial respiration; solution of strychnine, hypodermically, 5 min.

Phosphorus.—Stomach tube or emetic; oil of turpentine, 20 min. repeated every half hour for six doses; or solution of hydrogen peroxide 30 min. repeated; purgative of $\frac{1}{2}$ oz. of magnesium sulphate; linseed tea. Avoid oils and fats.

Pilocarpine.—Stomach tube or emetic; tannin; hypodermic injection of atropine $\frac{1}{40}$ to $\frac{1}{20}$ gr. doses.

Potash, Caustic.—(See CAUSTIC POTASH.)

Potassium Chlorate.—Stomach tube or emetics; demulcent drinks; purgatives; warmth; hot pack.

Rat Pastes.—(See ARSENIC, and PHOSPHORUS.)

Salts of Lemon.—(See ACID, OXALIC.)

Salts of Sorrel.—(See ACID, OXALIC.)

Santonin.—

Immediate treatment: stomach tube or emetic; stimulants. If convulsions, chloral and bromide of potassium.

Later: stimulants.

Savin.—

Immediate treatment: emetic.

Later: demulcents; castor oil; opium or morphine.

Sewer Gas.—Fresh air; artificial respiration; stimulants; strong, hot coffee, 1 pint by mouth or rectum; hot bottles and blankets; faradism.

Silver, Salts of.—Common salt, ½ oz. in a pint of water; stomach tube; white of egg and water; milk.

Simpson's Rat Paste.—Contains 40 per cent of arsenious acid. For treatment see ARSENIC.

Snake Bites.—Proximal ligature; remove ligature at intervals for a second or two, and re-apply, so as to allow only very small quantities of the poison to get into the circulation, and yet to avoid gangrene; incision; cauterization; inject into the puncture made by the fangs 40 min. of solution of permanganate of potash; or 20 min. Condy's red fluid; or 20 min. of a solution consisting of 1 part of liquor potassæ and 6 parts of water; or 10 min. of liquor ammoniæ; or 40 min. of a 2 per cent solution of calcium hypochlorite; stimulants very freely; bleeding and intravenous injection of warm saline solution (1 dr. of common salt to 1 pint of warm water); artificial respiration; hypodermic injection of solution of strychnine, B.P., 5 min., to be repeated until symptoms of strychnine spasm appear. For the bite of a rattlesnake, olive oil freely by the mouth, and also to be rubbed into the skin. (See also BACTERIOTHERAPEUTICS.)

Soap Lees.—(See CAUSTIC POTASH.)

Soda, Caustic.—(See CAUSTIC POTASH AND SODA.)

Soothing Syrup.—(See OPIUM.)

Spirit of Hartshorn.—(See CAUSTIC POTASH.)

Stramonium.—Emetics; tannin; stimulation; morphine hypodermically.

Strychnine.—

Immediate treatment: wash out stomach at half-hour intervals with solution of permanganate of potash diluted three times with warm water; emetic and stomach tube; injection of apomorphine 5 min. hypodermically; bromide of potassium 1 dr. in water every half hour; chloral hydrate hypodermically 5 gr. repeated, or by rectum; chloroform inhalations.

Later: inhalation of chloroform, if convulsions are very severe; artificial respiration.

Sugar of Lead.—(See LEAD.)

Sulphuretted Hydrogen.—(See SEWER GAS.)

Sulphuric Acid.—(See ACID, SULPHURIC.)

Tartar, Emetic.—Stomach tube; tannin, 30 gr. in water; vegetable astringents; tea; coffee.

Later: stimulants.

Tobacco.—Emetic; tannin; hypodermic injection of strychnine $\frac{1}{25}$ gr.; stimulants; recumbent position.

Turpentine.—Stomach tube or emetic; magnesium sulphate, ½ oz. in 2 oz. water; demulcents.

Later: morphine.

Vegetable Irritants.—(Where symptoms of gastro-intestinal irritation follow the ingestion of some vegetable product).—Stomach tube or emetic; glycerin of tannic acid, 2 dr. in 5 oz. of water; or tannic acid, 30 gr. in 5 oz. of water; white of egg; or gruel; linseed tea; arrowroot; stimulants; hot bottles and blankets; friction.

Later: morphine.

Veratrine.—Stomach tube or emetic; glycerin of tannic acid, 2 dr. in 5 oz. of water; or tannic acid 30 gr. in 5 oz. of water; stimulants; enema of warm coffee, ½ pint; hot bottles and blankets; recumbent position.

Verdigris.—(See COPPER, SALTS OF.)

Vermin Killers.—Battle's contains 10 per cent of strychnine; Butter's contains 5 per cent of strychnine; Roth and Ringeinsen's contains phosphorus and arsenic; Simpson's contains 40 per cent of arsenious acid. Many contain arsenic, and, exceptionally, barium carbonate.

Vitriol, Blue.—(See COPPER, SALTS OF.)

Vitriol, White.—(See ZINC, SALTS OF.)

White Precipitate.—Treatment as for CORROSIVE SUBLIMATE.

Yew.—(See VEGETABLE IRRITANTS.)

Zinc, Salts of.—White of egg; washing soda in dilute solution; demulcents; strong tea; hot fomentations; morphine.

Robert Hutchison.

POLIOMYELITIS, ACUTE ANTERIOR.—This disease may, for the sake of convenience, be divided into three stages: (1) The acute stage; (2) The stage of recovery; (3) The late stage.

1. **The Acute Stage.** The child should be kept in bed, and allowed to lie in whatever position is most restful. It is a mistake to insist on the prone

position, however advisable it may seem to be from theoretical considerations. The bowels should be evacuated by calomel or by a glycerin suppository or soap enema. If fever be present, the diet should be fluid, and a mixture containing 5 to 10 gr. of citrate of potash and 10 min. of spiritus ætheris nitrosi, or 2 to 3 gr. of salicin should be given every four hours. If pain be severe, great relief can be afforded by careful support of the limbs, a water bed, and freedom from all movement. Hot applications to the spine, and in some cases leeches, will often relieve the pain. In other cases, however, morphia is needed.

When the disease is of wide extent and has affected the muscles of the thorax, the upper extremity and neck, great care should be exercised in feeding the child. Should there be any evidence of failure of the closure of the glottis on deglutition, it is advisable to feed with a nasal tube. As a rule, the extensive paralysis passes off in a few days, leaving a residual and more or less permanent paralysis.

2. **The Stage of Recovery.**—During this period the treatment consists in the application of massage, passive and resistance movements, electricity, warmth to the limbs, and the administration of strychnine.

(*a*). *Massage.*—Although no specified time can be given, yet in those cases in which there is no pain on movement, and no elevation of temperature, gentle rubbing may be started in about 10 to 14 days after the onset of the disease.

(*b*). *Passive and Resistance Movements.*—These movements are of the greatest importance, and can in most cases be commenced simultaneously with the massage. Passive movements should be followed by active movements. In many cases the child is at first unable to perform any movements with the paralyzed leg, and then he should be encouraged to move the healthy limb against a resistance, and in this manner movements can sometimes be excited in the paralyzed limb, which cannot be brought out by other means.

(*c*). *Electricity.*—If the paralyzed muscles react to faradic stimulation, it is advisable to use this form of current for treatment; if on the other hand the muscles react to galvanism alone, then that form of current should be used, and the pole, negative or positive, which causes the most active contraction, should be applied over the muscle, and the current interrupted by a make-and-break key. If a contraction cannot otherwise be obtained, the current may be alternately reversed. The application of faradism is best carried out by two electrodes applied to the paralyzed muscle. The galvanic current may be applied in a similar manner, or the positive pole may be placed on the back and the negative pole over the paralyzed muscle and moved slowly up and down. The application of the galvanic current can also be conveniently made in a bath.

Although it is generally advisable to apply faradism to muscles which react to such a current, yet there are some exceptions. In a case, e.g., in which there is considerable affection of the muscles below the knee, it may be found that the gastrocnemius and soleus muscles respond to faradic stimulation, whereas the anterior tibial group respond only to galvanism. In such a case galvanism should only be used to the anterior tibial group of muscles, and no form of stimulation employed for the posterior group.

(*d*). *Warmth.*—The attention of the parent and nurse should be especially directed to this point. Warm baths and douches are useful, but it is of still greater importance to maintain the temperature of the limbs during the day and night by loose woollen garments, and by frequent rubbing of the limbs. A warm, equable climate will also be beneficial, but home comfort and convenience should not be sacrificed for the sake of climate.

(*e*). *Drugs.*—Apart from general tonics, such as iron, cod-liver oil, and maltine, the only drug which seems to be beneficial is strychnine. This should be given at first in doses of $\frac{1}{100}$ gr. and gradually increased.

3. **The Late Stage.**—During this period the treatment consists in (*a*) Mechanical support; (*b*) Division of tendons; (*c*) Nerve resection and reunion; (*d*) Resection of a joint; (*e*) Transplantation of tendons.

(*a*). *Mechanical Support.*—It is difficult to state positively when resort should be had to mechanical support, but, since with careful treatment some improvement may be hoped for two years after the onset of the disease, it is well, if possible, to delay the application of this method for that period. On the other hand, mechanical support will, in some measure, prevent the occurrence of deformity.

(*b*). *Division of Tendons.*—In many cases, before any mechanical support can be applied, division of one or more tendons is required. The simple shortening or lengthening of a tendon will in some cases greatly increase the usefulness of a limb, apart from any other measure.

(*c*). *Nerve Resection and Reunion.*—The principle of this operation depends upon the observation that when the proximal end of a degenerated nerve is connected with the distal end of a nerve in connection with a healthy nerve-centre, the peripheral portion of the nerve regenerates, and hence impulses are able to pass from the centre to the muscles. The successful application of such an operation depends on several factors. First, on the possibility of obtaining a healthy nerve in proximity to the degenerate nerve; secondly, on the paralyzed muscle retaining muscle fibres capable of regeneration, when normally innervated; and thirdly, that the interference with the healthy nerve will give rise to no loss of power of serious importance. As may be readily understood, the number of cases in which such treatment is applicable is small, and are most likely to be found among those in whom the disease has affected the muscles of the upper extremity. The operation should be performed between the third and sixth month after the onset of the disease.

(*d*). *Resection of a Joint.*—The object of this operation is to give a fixed instead of a flail-like joint, and thus dispense with the necessity of mechanical support. The knee and ankle are the joints to which this form of treatment is generally applicable.

(*e*). *Transplantation of Tendon.*—This method of treatment is—in selected cases—one of the most successful for correcting and preventing deformities. The method adopted is to insert a slip from the tendon of a healthy muscle into the tendon, or insertion of the paralyzed muscle. For details of this mode of treatment, a surgical work should be consulted.

It must be urged that, whatever method of treatment be adopted, it is essential to keep the limb warm; this is in part accomplished by loose woollen garments, stockings and overalls, but superficial rubbing and passive movements of the limbs, twice or thrice a day, are of the greatest importance. *F. E. Batten.*

POLYPUS, RECTAL.—(See RECTUM, SURGICAL DISEASES OF).

POST-NASAL GROWTHS.—(See ADENOIDS.)

POTT'S DISEASE.—(See SPINE, CARIES OF.)

PREGNANCY, DISORDERS OF.

Vomiting.—If the vomiting be only slight and confined to the beginning of the day, breakfast in bed may be all that is required. If more severe, it should be treated on general principles, i.e., rest in bed, attention to the bowels, careful feeding—if necessary only peptonized milk and soda-water at first—and an effervescing mixture containing bismuth and dilute hydrocyanic acid. If the vomiting persists in spite of this treatment, twenty-four hours' rest to the stomach may be successful. During this time nothing is given by the mouth except albumen-water and the effervescing mixture, nutrient enemata being administered if necessary. Suggestion often plays an important part in

the treatment. Seclusion and trained nursing are all-important in severe cases. A careful search for the cause should always be made, as severe vomiting during pregnancy is not necessarily due to the pregnancy. "Pernicious vomiting" due to toxæmia is very rare in this country, and the induction of abortion is seldom necessary. (See also VOMITING, and SEA-SICKNESS.)

Salivation.—The treatment of this very unpleasant complication of pregnancy is most unsatisfactory. Belladonna has very little good effect, at least in many cases. Large doses of alkalies sometimes relieve it, but the doctor often has to be content with pointing out to the patient that her health is not suffering, and assuring her that the trouble will cease soon after labour.

Heartburn.—This is best treated by such a mixture as the following :—

℞	Sod. Bicarb.	gr. xx	Glycerin.		℥xxx
	Sp. Ammon. Aromat.	℥xx	Aq. Anethi	ad	℥j

Pruritus Vulvæ.—This may be very resistant to treatment. If any vaginal discharge is present, lukewarm douches of lead lotion (liq. plumbi subacetatis 1 dr. to the pint) should be given. Rest with the pelvis raised, to diminish the congestion, bathing with lead or other suitable lotion, dusting with dermatol, and avoidance of constipation are the best measures to adopt. (See also PRURITUS.)

Toothache.—The aching may be relieved temporarily by bicarbonate of soda taken into the mouth dry. A dentist should always be consulted, as caries may make very rapid progress during pregnancy. *H. Russell Andrews.*

PRIAPISM may occur (1) As the result of injury to the spinal cord ; (2) In association with prostatic enlargement ; (3) In the course of leukæmia (probably from thrombosis in the cavernous sinuses) ; (4) As a local manifestation of gout.

In addition to treatment of the primary condition, the following may be useful :—

℞	Pulv. Camph.	gr. xvj	Tinct. Lupulin.		℥ij
	Tinct. Bellad.	℥1			

Mix and add—

℞	Mucilag. Tragacanth.	℥iv	Aq. Camph.	ad	℥iv

℥ss an hour after breakfast and at bedtime for three or four days.

Locally, cold applications are helpful, or the patient may be instructed to place some cotton-wool beneath the foreskin at bedtime, and on waking inject into this a few drops of a 10 per cent solution of cocaine by means of a pen-filler. This will sometimes effectually control the condition. *Robert Hutchison.*

PROCTITIS.

Acute Catarrhal Proctitis.—Rest in bed is essential until all symptoms have disappeared. The bowel should be thoroughly washed out with a saline laxative, and afterwards irrigation of the bowel with hot or cold water is often most comforting. Suppositories of iodoform and opium or an ounce of flax tea containing ½ gr. of opium and 30 min. fl. extr. of krameria will allay the tenesmus and spasm at once. The diet must be regulated so as to leave as little residue as possible, but it is better to avoid the use of milk. After the acute stage is passed, irrigation of the bowel with 1 per cent of argyrol or argonin will hasten convalescence, especially if combined with strychnine and iron by the mouth.

Gonorrhœal Proctitis.—The best treatment in acute cases is to stretch the sphincters under an anæsthetic and then introduce a tube so as to drain the bowel. Frequent irrigation with saline or weak antiseptics is indicated.

Chronic Proctitis.—A very good plan is to start the treatment with large rectal injections of warm olive oil, which should be retained as long as possible. After this, irrigation of the bowel twice daily with 1–2000 potassium permanganate or 1 per cent argonin is useful if it can be properly carried out. Careful

regulation of the diet to prevent intestinal fermentation, combined with a daily dose of sulphate of magnesia or Carlsbad salts, is also indicated. Full doses of arsenic are beneficial, and in many cases an intestinal antiseptic is useful.

J. Lockhart Mummery.

PROLAPSUS ANI and RECTI.—(See RECTUM, SURGICAL DISEASES OF.)

PROSTATE, ENLARGEMENT OF.—Setting aside chronic inflammatory enlargements of the prostate which are met with at any age, obstruction to micturition and the secondary changes caused by it in the urinary system are seldom encountered before the sixth decade of life. Enlargement of the prostate is commonly called hypertrophy of that organ, but in examination of a large number of specimens the writer has not come across a single instance of true hypertrophy—i.e., a general enlargement of the organ in which each several element—glandular, connective tissue, and vascular—was enlarged in its right proportion to the whole. On the contrary, the enlargement is due either to an abnormal increase of the epithelial or the connective tissue portions of the gland in the one case or the other, and it must be remembered that this increase may be either of an innocent or a malignant character.

As the character of the treatment to be adopted depends entirely upon the nature of the enlargement, it is essential that the practitioner should clearly recognize the different types which may be met with : —

1. *Innocent:* (*a*) Adenoma (the epithelial type) ; (*b*) Fibroma (the connective tissue type).
2. *Malignant :* (*a*) Carcinoma (epithelial type) ; (*b*) Sarcoma (connective tissue).

Increase of the epithelial elements is more common than of the connective tissue, and in the order of their frequency occur adenomata, carcinomata, fibrous enlargement, sarcomata.

At present surgery has found no adequate means of dealing curatively with malignant disease of the prostate. Therefore the first essential for successful treatment is a most careful diagnosis of the condition to be dealt with, to determine, first, the character of the prostate, whether innocent or malignant ; next, if the growth is innocent, the method to be chosen to treat it.

The examination of a case of this nature should proceed in a methodical way : (1) The history ; (2) The symptoms ; (3) Examination of the abdomen ; (4) Examination *per rectum* and bimanual ; (5) Instrumental examination, including testing of residual urine, and where possible a careful cystoscopy ; (6) Careful analysis of a twenty-four-hours' specimen of urine ; (7) A general examination of the patient, with special reference to the cardio-vascular and respiratory systems.

1. *The History of the Case.*—It is important to ascertain the nature of the onset of the difficulty or cessation of normal micturition, whether it was acute or chronic, not forgetting that an apparently acute attack of retention is often only the culmination of a long-standing trouble. The importance of being quite clear upon this point is great, for a long history of difficulty of micturition usually means that damage has been done to the bladder, ureters, or kidneys.

2. *The Symptoms.*—Frequency of micturition is usually the earliest symptom noticed, and commonly the patient's attention is first called to it by the necessity of micturating at night, i.e., nocturnal frequency. Pain may be present, and its character should be ascertained as well as its situation. Sacral pain, radiating to the perineum and down the thighs, is not infrequent in carcinoma of the prostate ; less so, or more commonly entirely absent, in innocent enlargements. The presence of vesical calculus, cystitis, and inflammation of the enlarged prostate give rise to characteristic penile pain before, during, and after micturition.

A very important group of symptoms should be looked for whenever the prostatic difficulty has been long established. They are not confined to cases of prostatic obstruction, but are met with whatever the cause of long-standing difficulty may have been. They are : Thirst, a dry mouth and tongue, a dry harsh skin, polyuria, and constant dull, lumbar aching. These symptoms indicate grave damage to the kidneys inflicted by long-standing back-pressure. The effects of back-pressure upon the bladder vary considerably. In some cases it dilates and becomes very capacious, with much-thinned walls ; or the bladder wall may first hypertrophy to withstand the pressure, and after a while give way, but not as a whole, sacculation taking place and the mucous membrane being protruded between bars of muscle, the final result being the sacculated bladder. In some cases, again, the bladder remains small, with immensely thickened walls and a very small cavity. But whatever the effect upon the bladder, if this backward pressure is long-continued it presently exerts its force upon the ureters, and then upon the kidneys. The ureters dilate, the pelvis of the kidney dilates, and finally the cortical substance of the latter is spread out as the thin walls of a large hydro-

nephrosis. On examining such kidneys they are found to be very pale and anæmic. The blood has not been able to enter the glomerular arteries freely, and for this no doubt the high intra-pelvic tension of urine is to some degree responsible. The interstitial fibrosis which is usually present also bears its part in adding to the difficulty.

If the urine is suddenly drawn off from these patients the bladder is emptied, but so too are the ureters and kidneys, for the sphincters of the ureters have given way to the back-pressure, and no longer keep the upper urinary passages separate from the lower. The intra-pelvic renal pressure is suddenly relieved, and the kidneys become choked and gorged with blood, and having for long worked at a disadvantage, can now do no more, and cease work. Complete suppression may occur, and these patients sometimes die anuric within three or four days. On post-mortem examination the kidney cortices—what is left of them—are found congested and even hæmorrhagic. In some cases death is even more rapid, occurring within a few hours, an element of shock largely entering into the case no doubt. Lastly, it is well to remember that in this condition septic infection is most easily induced, and runs like wildfire the whole length of the urinary tract.

The point to which this description leads is a practical one in treatment, viz., never to empty suddenly a chronically over-distended bladder. No doubt this is constantly done without these grave results, but they may occur, and no risks should be taken.

Sometimes incontinence is complained of, and is of the nature of retention with overflow or false incontinence. On examination, the bladder is found to be distended to the umbilicus or higher, and a constant, slight dribbling of urine is taking place.

Hæmaturia is a fairly frequent symptom in prostatic enlargement, more common in the adenomata than in malignant disease of the prostate, except in the latest stages of the latter, where there is no difficulty about the diagnosis.

3, 4. *Abdominal and Rectal Examination.*—The abdomen as a whole should first be carefully examined, especially the hypogastrium, for evidence of a distended bladder, and next the loins, for back-pressure kidneys are often tender and can be felt.

Rectal examination should be made in two positions, with the bladder empty: first in the knee-elbow position, with the buttocks protruding; and next supine, with one hand above the pubes and the other in the rectum. By this latter method a much enlarged prostate can often be felt between the two hands, especially when the abdominal wall is lax and thin. This rectal examination should be made purposively and systematically to ascertain shape, outline, consistency, size, persistence or absence of the interlobar sulcus, and last, but not least, mobility or fixity of the gland as a whole.

5. *Instrumental Examination* consists in testing for residual urine, ascertaining the length of the urethra (for in enlargement of the prostate the urethra is always lengthened), and whenever possible a careful cystoscopic examination of the bladder.

6. *Examination of the Urine.*—A twenty-four-hours specimen should always be used for this purpose, and particular attention paid to total quantity and total solid excretion, particularly urea.

7. Lastly, a careful examination of the *general condition of the patient* should be made before deciding upon the course of treatment to be adopted.

The chief diagnostic features of carcinomatous, adenomatous, and fibrous enlargements of the prostate are best set forth in tabular form :—

Signs.	Carcinoma.	Adenoma.	Fibrous Enlargement.
Shape.	Usually irregular, bossy, sometimes flat, and spreading	Rounded and smooth, with some lobulation usually to be felt.	Small and collar-like.
Outline.	Commonly very irregular.	Usually smooth.	Quite regular and rounded.
Consistency.	Stony hard, except in earliest stages.	Always elastic, sometimes very soft.	Always firm, but somewhat elastic. Never stony hard.
Size.	Moderate at first, may be very large later, slow in enlarging.	Varies from quite small to enormous.	Always moderate in size.
Interlobar Sulcus.	Disappears early.	Persists.	Present.
Mobility.	Absolutely fixed.	Quite mobile.	Mobile, but often this point is difficult to determine.
Infection of Lymph Glands.	Very common.	Absent.	Absent.

It will be seen that it is not as a rule difficult to distinguish between the adenomatous and carcinomatous prostates. The difficulty arises in the case of moderately enlarged fibrous prostate. The practitioner who is not frequently engaged in the examination of these cases should be careful in committing himself to a diagnosis, for the number of cases diagnosed as suitable for operation when in reality they are carcinomatous is considerable.

TREATMENT.—The treatment of enlargements of the prostate must be considered separately for each variety. Carcinoma in the great majority of cases can only be treated palliatively. Careful aseptic catheterism should be instituted and persevered with until the pain or hæmorrhage caused by it become severe, or the difficulty of catheterism becomes too great. At this point a carefully performed suprapubic drainage should be done. If great attention is paid to the fitting of the suprapubic tube very little leakage occurs, and the patient is able to get about in fair comfort. Perineal drainage should never be undertaken for carcinoma of the prostate.

It is only quite recently that a serious and sustained attempt has been made to remove the growth. No mere enucleation will serve, but the prostate, and the whole lower portion of the bladder up to the inter-ureteric bar, together with the seminal vesicles, must be excised. The bladder is then sewn up and anastomosed to the cut urethra. The patients are, of course, completely incontinent after this operation. Sufficient time has not yet elapsed to speak with certainty as to the radical nature of this operation, but results are fairly encouraging.

Fortunately, in a large number of cases the growth does not tend to encroach very much upon the urethra or cavity of the bladder, and catheterism remains fairly easy up to the end.

Fibrous Enlargement.—Palliative treatment consists in careful catheterism, but these prostates are particularly well suited to complete cure by operation, and without much danger. The operation of enucleation, so successful in adenoma of the prostate, is neither easy nor very satisfactory in these cases. Piecemeal excision, or prostatotomy by the perineal route, are the two operations which give the best results. In the former the posterior aspect of the prostate is freely exposed by careful dissection, and the gland removed from its sheath by scissors and forceps and a blunt dissector. Prostatotomy should be done through a median perineal incision, the urethra being opened well in front of the compressor urethræ muscle and the prostate incised from within in any desired direction. The writer has performed this operation frequently, and has found the results immediately and lastingly satisfactory. Great care must be taken to leave the compressor urethræ intact, or the patient will be incontinent. The operation may be performed through a suprapubic incision, the cuts in the prostatic urethra being made from within the bladder, but the writer has found the former operation much more satisfactory.

Adenoma.—The most common enlargement of the prostate is the adenomatous type, which formerly went by the name of " senile hypertrophy of the prostate." It may be said at the outset that in the case of patients who are unfitted by some intercurrent disease of the cardio-vascular or respiratory systems, or in those of generally very feeble health, and whose condition of life permits them to take the stringent precautions necessary, catheterism will ensure a comfortable existence without much risk. But in the majority of these cases complete removal of the prostate is the method of choice for their treatment, and the risk is very different in degree in those cases where the operation is one of expediency on the one hand or of urgency on the other. By expediency is meant that the operation is performed whilst the patient is in good general health and has not had his powers undermined by long-continued suffering. An urgent prostatectomy, upon the other hand, is done when the patient is in serious straits ; where, after long-continued over-distension, with consequently damaged kidneys, catheterism

has been tried and is failing; where sepsis has been introduced, hæmorrhage has been often repeated, and possibly calculi have formed several times in consequence of decomposition of urine in the bladder.

It is often wise in these cases to do the operation in two stages, first draining and cleaning the bladder by a suprapubic cystotomy, and removing the prostate after a week or two when the conditions are much better. The writer has met with great success by following this plan, and has saved cases which in his opinion would have been lost had the operation been performed immediately. There are some aged men, whose expectation of life is not very long in any case, who, with capacious bladders, need the catheter only twice or three times in twenty-four hours, and to whom the use seems merely a part of their ordinary toilet operations. These patients appear to have an extraordinary tolerance of catheterism, and though they treat the operation with scant ceremony as regards asepsis, suffer only the most transient attacks of epididymitis, and slight and passing exacerbations of the slight grade of cystitis which is invariably present. All practitioners are familiar with such cases, and it is not a duty to urge prostatectomy upon them, though it may very well be left to them to accept it if they will.

On the Continent and in the United States perineal prostatectomy is more favoured for adenoma of the prostate than by British surgeons. The writer has tried both, and finds the suprapubic method quicker, easier, and more thorough than the perineal operation.

Conclusions.—1. Except in very early cases it is not permissible to operate for malignant disease of the prostate, except for the purpose of permanent suprapubic drainage.

2. In the case of fibrous enlargement interfering with micturition, piecemeal enucleation or a prostatotomy should be done. The mortality of the latter operation is practically nil, and the results are satisfactory, both immediately and permanently.

3. Some few aged men suffering from adenomatous enlargement of the prostate show a very marked tolerance of catheterism, and live comfortable "catheter lives." In these cases surgical interference is unnecessary.

4. Unfortunately catheter life in the great majority of sufferers has serious dangers and discomforts, and for these prostatectomy is by far the best treatment. It should be done at the period of election, namely, when the symptoms of obstruction are becoming marked, but before cystitis, infection of the kidneys, and their results have placed the patient in a position of danger; in the writer's opinion the best method is complete suprapubic enucleation.

5. The surgeon should not refuse operation to cases seriously infected and very ill. Their lives are sure to be painful and seldom prolonged if operation is refused; and although the mortality is higher than in selected cases, it is not unduly high, and much may be done to ensure success by preliminary cystotomy for thorough drainage and clearing up of septic conditions.

The writer has in this article recommended those procedures which are serving him well, and has omitted mention of methods of treatment which are widely advocated in some quarters; for instance, Bottini's galvano-caustic incisions, combined perineal and suprapubic prostatectomies, and so forth. But the simplest operations are usually the most successful, and those recommended here have been found amply sufficient to meet all cases. *John George Pardoe.*

PROSTATITIS.—(See Gonorrhœa).

PRURITUS.—Itching is an accompaniment of many skin diseases. The term pruritus should be strictly reserved for those cases where there is no obvious explanation of the itching forthcoming on inspection. This excludes those numerous cases which suffer for years from the unfortunate term of pruritus ani

or vulvæ, where some local condition, generally easily detected on inspection, is responsible for the irritation.

General itching, without local lesions, is an expression of some general condition. It is found in the aged where the skin has lost most of its natural fat and is preternaturally dry. This is best relieved by the application of grease; it is sometimes due to cold, to which some are more sensitive than others, and such should abandon cold baths and wear warm clothing; and it is often a symptom of some visceral disease, especially hepatic or renal. The real treatment is that of the cause, but the symptoms can be temporarily mitigated by the application of such lotions as, e.g. :—

R	Ac. Carbol.	ʒj	Aq.	ad ℥viij
	Glycerin.	℥ss		
R	Liq. Carbon. Deterg.	ʒij	Aq.	ad ℥vj
	Zinci Oxidi	℥ss		

Norman Walker.

PRURITUS ANI.—The treatment of pruritus ani is both difficult and tedious, and the results are unfortunately often far from satisfactory. One of the most important factors is to make a very careful examination of the anus and rectum. If there is a local cause for the itching—and there usually is—and it is not discovered, the treatment is more than likely to completely fail.

If polypi, piles, or a fissure exist, they must be treated by operation. External skin tags—often called external piles—may cause itching, owing to dirt and secretion being retained in the folds between them; little sores are thus formed which keep up the irritation. These skin tags should be cut off.

When the pruritus is due to proctitis, this must be first treated by daily irrigations, etc. (see PROCTITIS). If the external skin is red and eczematous, applications should be applied to restore its normal condition. For this purpose lead lotion, liq. carbonis detergens, or resorcin ointment 10 gr. to the ounce, are useful. Patients suffering from pruritus should keep the anal region scrupulously clean. The parts should be washed twice a day, and after an action of the bowels, with Castile soap and warm water applied with a soft sponge. The parts should then be dabbed dry and powdered with boracic powder. A little orthoform powder blown on to the parts with an insufflator is effectual in some cases.

When there is much thickening of the skin round the anus, fomentations of carbolic lotion 1–60 applied every night for a week will often rapidly bring the skin back to its normal condition, or the skin can be painted over with pure carbolic acid.

The following ointment will be found to give relief in many cases :—

R	Hydrarg. Subchlor.	ʒij	Glycerin.	ʒij
	Bismuth. Subnitrat.	ʒiss	Ung. Sambuc.	ʒj
	Tinct. Aconit.	♏viij		
R	Balsam. Peru.		Vaselin.	℥j
	Acid. Boric.	āā ʒj		

In some patients lotions are more effectual.

R	Liq. Plumb. Subacet.	ʒj	Lact. (nov.)	℥j
R	Campho-phenique	ʒj	Aq. dest.	℥j

This should be applied after washing the parts with hot water.

In bad cases of pruritus an anæsthetic should be given and the sphincter stretched. The anal canal and rectum should then be thoroughly explored, and any local condition, such as an ulcer or submucous fistula, be treated. It cannot be too strongly insisted upon that there is almost always a local cause

for the itching: in some persons, however, diet has much to do with it, and in such cases must be regulated, alcohol, tea, coffee, and tobacco being interdicted.

Lastly, in those cases of old intractable pruritus, where all forms of treatment have failed and the patient's life is rendered miserable by the constant irritation, Ball's operation is the best treatment. This is similar in principle to the operations for "tic douloureux," and consists in dissecting up flaps on each side of the anus, and dividing all the cutaneous nerves to the affected area. This operation stops the itching at once, and the results appear to be permanent in most cases. It should certainly be done in bad cases. *J. Lockhart Mummery.*

PRURITUS VULVÆ.—The first thing to do is to search for and, if possible, to remove the cause of the pruritus. The urine should be tested, and if it is found to contain sugar, antidiabetic treatment should be given. Any vaginal discharge should be treated. Imperfect local cleanliness may be the cause, sebaceous matter being retained in the folds of the vulva. Threadworms coming out from the anus are occasionally the cause of intolerable itching. Pediculi pubis *may* be the cause of pruritus, but probably only when their presence is accidental rather than habitual. External piles and constipation must be treated. Pruritus vulvæ may occur during pregnancy (see PREGNANCY, DISORDERS OF).

If no cause can be found, the treatment consists in cleanliness, bathing with lotio plumbi (liq. plumbi subacetatis 1 dr. to the pint), liq. carbonis detergens (2 dr. to the pint), or a lotion of carbolic acid (1–60 or 1–80), and powdering with dermatol. Menthol used locally is sometimes effective. Cocaine as a rule is unsatisfactory. If these measures fail, cauterization or even excision of the itching skin and mucous membrane may have to be considered.

In cases where the scratching has caused a raw eczematous surface, an ointment of zinc oxide or subacetate of lead should be used. *H. Russell Andrews.*

PSILOSIS.—(See SPRUE.)

PSOAS ABSCESS.—(See SPINE, CARIES OF.)

PSORIASIS.—The treatment of psoriasis may be divided into *internal* and *external.*

Internal Treatment.—Of the many internal remedies which have been at one time or another recommended, only a few have stood the test of time. Of these the most popular is arsenic, which in suitable cases is of undoubted value. If the disease is recent, and if the spots are increasing in number, and are deep red in colour, it should not be given, as it will almost inevitably aggravate the disease; if, on the other hand, the disease has begun to retrograde, if the spots are pale pink in colour, and, most important, if the patient's digestive functions are in good order, small doses of arsenic will hasten its disappearance. The disadvantages attendant on its use must not be forgotten; the least of these is the deep pigmentation of each spot; more serious is the development of peripheral neuritis; and most serious of all is the occasional development of malignant growths. The cacodylates and other organic preparations have been recommended in its place, but experience seems to show that their action is essentially that of arsenic, and that they are no more efficient. Various salicyl compounds may be administered. In some cases, particularly the inflamed ones, the effects are often favourable. The dose must be a generous one, and it is usually several days before any benefit is shown. Thyroid is, or rather was, a very favourite remedy, and it undoubtedly causes the disappearance of the eruption in many cases; but the dose required is often a dangerous one, and it should only be used in such cases as respond to moderate amounts. It is perhaps best prescribed combined with a small dose of arsenic, as recommended by Ewald. Large doses

of iodide of potassium may sometimes be administered with benefit, but there are many disadvantages attending this treatment, including the expense of the drug, and it is not often resorted to.

External Treatment.—Perhaps the most important point to realize in connection with external treatment of psoriasis is the almost invariable presence of the disease in the scalp, and the importance of treating it in this situation. If the body surface alone is dealt with, no matter how successfully, the eruption will inevitably extend from the untreated scalp. Systematic washing of the scalp with soap spirit, and the application of some suitable drug, are essential to success. The most commonly prescribed drug is salicylic acid; but sulphur, pyrogallol, resorcin, white precipitate, and tar are all valuable. For the eruption on the body and limbs one has a rich choice, which must be determined in each individual case, both by the form and extent of the disease, and by the circumstances of the patient.

Chrysarobin, which is certainly the most efficient application, has so many disadvantages that, unless full advantage is taken of its virtues, the disadvantages outweigh these. The ordinary plan of rubbing the ointment in twice a day, and allowing the patient to go about, involves a treatment extending over weeks, and is generally unsatisfactory even then. The writer never uses chrysarobin except as follows, and then only after explaining to the patient the object of the treatment:—

An ointment of 5 per cent chrysarobin is applied to the skin after a bath. This is well rubbed in, and pieces of lint freely spread with the ointment are applied to the affected surfaces, and bandaged on. This application is renewed twice daily, and a bath is taken daily. In five or six days there is marked improvement, and in eight or ten the discomfort is considerable, the skin being reddened, and the diseased spots standing out white against it. If possible, the treatment should be continued until the redness is universal. Some soothing application, such as zinc paste, is then made, and in a few days desquamation takes place.

It is important to keep a strict look-out for any patches which are lagging behind, for the treatment is so disagreeable that it is not easy to keep it up on isolated patches after the greater part of the eruption is gone. These may be dressed, in addition to their share in the general treatment, with a strong compound chrysarobin ointment, made as follows: chrysarobin, 10 parts; acid. salicyl., oleum rusci, of each 20 parts; saponis viridis, vaselin, of each 25 parts. This almost dissolves the spots away, and must be used with caution. If the patient is unable to submit to this treatment, which involves confinement to the house, the use of chrysarobin should be eschewed; and of the various other remedies, the most generally useful is tar, which may be used in the form of ointment, or as a varnish, such as: Picis carbonis, 1 dr.; benzol, 2 dr.; acetone, 1 oz. This has the great advantage over ointments that it dries almost immediately, and though not quite so efficient, is in the majority of cases more likely to be persevered with than the more unpleasant ointment. Another application commonly made is salicylic acid, regarding which it is only necessary to say that though perhaps the most cleanly of all preparations, its effects must be watched, for the drug is readily absorbed if spread over a large area.

To the chronic sufferer from this disease baths should be suggested. There is no doubt, though the effects of these are not all that is claimed for them by the physicians practising among them, that baths, particularly sulphur baths, have a distinctly beneficial influence, and intelligent patients are often convinced that they suffer less during the year following a course of baths, than in other years.

Recently, electricity has been used in this as in so many other diseases, and it has been demonstrated beyond doubt that under high-frequency currents and X rays psoriasis does sometimes disappear. To the former probably no objection can be urged, but it seems doubtful how far one should, at least systematically, use, in the treatment of a benign disease, a remedy so potent for evil as the X rays.

After the psoriasis has been temporarily got rid of by any method, the patient should have impressed upon him the necessity of keeping the scalp free from dandruff, and should be urged, even if no sign of the disease appears, to keep up the systematic washing of the scalp, and the application of salicylic acid—the least unpleasant of the applications mentioned—for at least several months, and the longer the better. *Norman Walker.*

PTOSIS.—(See EYELIDS, DISEASES OF.)

PTYALISM.—(See SALIVARY GLANDS, AFFECTIONS OF.)

PULMONARY ABSCESS.—This condition is unfortunuately but seldom amenable to direct surgical treatment, owing to the great difficulty in satisfactorily localizing the abscess. In a few cases, however, where an abscess happens to be near the surface of the lung, and its site has been successfully determined by means of the exploring needle, the cavity may be drained through an opening made in the chest wall, by resection of portions of one or more ribs, as in the operation for empyema (q.v.). *F. J. Steward.*

PULMONARY CONGESTION.—(See CONGESTION, PULMONARY.)

PULMONARY TUBERCULOSIS.—(See PHTHISIS.)

PURPURA.—The widespread effects of sepsis are well shown in connection with the various forms of purpura. So commonly does it underlie conditions of severe purpura, that the latter may be regarded as merely an important symptom of so-called "latent"—"cryptogenetic" sepsis—the latent and cryptic character of which is a measure of the oversight of the various sources of septic infection described in the article on SEPTIC ANÆMIA.

The condition termed "purpura" is not a disease, but a symptom. The conditions with which it is associated, and of which it is a manifestation, are nearly always of an infective, and most usually of a septic nature, with or without arthritic manifestations of the same infective processes, e.g. :—

1. Obscure septicæmia, pyæmia, malignant endocarditis, scarlet fever, smallpox (obviously septic).

2. So-called "cachectic" purpura, met with in cancer, tuberculosis, Hodgkin's disease, Bright's disease, scurvy, debility of old age (probably due to superadded sepsis).

3. So-called "arthritic"—often termed "rheumatic" purpura (although the evidence on which this view is based is not conclusive).—A rheumatic history can only be got in less than one-third of cases :

(*a*). One variety—"purpura simplex"— is a mild form seen most commonly in children, not infrequently associated with diarrhœa, loss of appetite, and slight anæmia, the arthritis present being less than in the ordinary rheumatism of children (probably the result of intestinal sepsis).

(*b*). Another variety—so-called "purpura rheumatica"—(peliosis, "Schönlein's disease") is characterized by multiple arthritis, and an eruption, sometimes purpuric, sometimes urticarial, which not infrequently sets in with sore throat (tonsillitis), slight fever (101°–103°F), and articular pains, and is liable to relapse (probably septic tonsillitic infection).

(*c*). A third variety is the purpura, erythema, and urticaria, associated with gastro-intestinal conditions—a variety seen chiefly in children, characterized by relapses or recurrences extending over several years; cutaneous purpura, or erythema, associated with gastro-intestinal disturbances (pain, vomiting, diarrhœa); joint-pains or swellings, often trifling; hæmorrhages from the mucous membranes, enlargement of the spleen; and nephritis—the most common cause of death. The cases with colic and purpura are often termed "Henoch's purpura."

(*d*). The fourth variety — "purpura hæmorrhagica" (morbus maculosus Werlhofii), cases of very severe purpura with hæmorrhages from mucous membranes, very common in young and delicate girls—is probably the result of the severest and most cryptogenetic infection.

The chief indication in all such cases is the removal by appropriate measures (see above) of the infective conditions which underlie them. In the last three cases seen by the writer, the source of the sepsis in two was extreme oral sepsis, and in the third an unrecognized chronic antral suppuration.

Apart from that, the chief indication is the use of tonics, good food, fresh air, with arsenic in full doses in simple purpura, and salicylate of soda in so-called rheumatic purpura; in all cases correction of the possible sepsis of the alimentary tract by intestinal antiseptics—best of all some form of mercury—(hydrarg. c. creta, liq. hydrarg. perchlor.), or oil of turpentine, 10–15 min. three or four times per day.

For the blood condition the best remedies are chloride of calcium in 20-gr. doses four times daily for three or four days, to correct the diminished coagulability, and liq. arsenicalis and tinct. ferri perchloridi as tonics. Polyvalent anti-streptococcic serum has been used successfully in some severe cases of purpura. It may be given by the rectum, 10–20 cc. being injected the first day, and half that quantity the next three or four days. *William Hunter.*

PYÆMIA.—(See SEPTICÆMIA.)

PYELITIS and PYONEPHROSIS.—Suppurative inflammation of the pelvis of the kidney is very seldom of primary origin in the pelvis, but is usually due to the spread of infection from below. It is, however, occasionally seen as a complication of certain infective disorders, the most common of which is enteric fever, and in this connection should be mentioned the condition known as the pyelitis of pregnancy. In this type of pyelitis the kidney substance proper usually escapes. The inflammation of the renal pelvis commences in the later months of gestation, and is almost invariably due to infection by the *Bacillus coli communis*, which can be recovered from the urine in pure cultures. The termination of the pregnancy is usually followed by a rapid disappearance of the pyelitis, but in some instances the symptoms are so severe that labour must be artificially induced to save the life both of mother and child.

Pyelitis may be either acute or chronic, severe or very mild, in character.

TREATMENT.—This is *palliative* and *operative*.

Palliative Treatment.—In acute cases the patient must be kept absolutely at rest in bed, upon a fluid diet of milk, eggs, chicken, veal, and fish broth, jellies, and the like. The bowels should be fully moved daily, and a free diuresis induced by means of Vichy, Contrexéville, or Wildungen waters. Urinary antiseptics combined with diuretics should be given; of the former, urotropin, cystamin, helmitol, and cystopurin are probably the most valuable, in doses of 5–15 gr. three times a day, whilst bicarbonate and citrate of potassium, acetate of ammonium, and nitrous spirit of ether may be employed for their diuretic effect.

Large hot poultices to the affected loin should be frequently applied, and dry cupping is sometimes of considerable value.

If the condition is mild and more chronic in character, the patient may be allowed up, but avoidance of undue exertion and fatigue should be insisted upon, and when possible, winter residence in a dry, warm climate is advisable.

As a rule these cases tend to improve slowly, and eventually a complete cure may be anticipated.

Operative Treatment.—In some instances, however, the condition does not clear up beyond a certain point. The urine still remains somewhat cloudy, and on standing deposits a small sediment of pus, broken epithelium, and occasionally a few blood cells. In such cases the writer has on several occasions hastened a cure by the instillation of small quantities of silver nitrate solution into the infected pelvis by means of the ureteric catheter.

But when the free exit of the pus-laden urine from the pelvis is impeded, the condition becomes very much more serious, and to it is applied the name of pyonephrosis. The most common cause of this condition is blockage of the ureter by a calculus, with infection of the resulting hydronephrosis. Removal of the stone or other obstruction should be undertaken without delay, and the pelvis of the kidney should be freely drained through the usual oblique incision in the loin. If operation is deferred too long the substance of the kidney itself will be infected, and total removal of the organ will become necessary. (See also HYDRONEPHROSIS.)

J. G. Pardoe.

PYELONEPHRITIS.—By this is implied a suppurative inflammation of the whole kidney, both the pelvis and the secreting substance of the kidney being implicated. To this condition the term "surgical kidney" is sometimes applied, and inasmuch as the condition undoubtedly follows infection of the bladder by unpurified instruments, the term is not in some cases a misnomer. Pyelonephritis is most common in cases where long-standing obstruction has caused dilatation of the ureters and pelves of the kidneys, and is particularly liable to occur in chronic retentions and difficult micturition due to enlargement of the prostate and old-standing stricture of the urethra. It is also very easily induced in cases of atony of the bladder dependent upon diseases and injuries of the central nervous system, such as locomotor ataxia, spastic paraplegia, disseminated sclerosis, and in complete transverse myelitis due to injury of the spinal cord. Indeed, in the latter class of case, however careful the medical attendant may be, and however strictly the catheter may be sterilized, cystitis and rapid extension of septic infection to the ureters and kidneys not infrequently terminates the patient's life. It is therefore essential to take the very strictest precautions in employing the necessary catheterism in these cases. But in laying stress upon the supreme need for asepsis in the catheterism of patients suffering from nervous diseases, the writer must insist that there is no excuse for the passage of unsterilized instruments into the bladder of any patient whatsoever.

Pyelonephritis may be acute or very insidious in its onset.

In the acute type the disease is marked by acute rise of temperature with rigors, a scanty secretion of urine sometimes terminating in suppression, lumbar aching, a dry tongue and skin, and indeed all the phenomena of an acute septic infection combined with the particular renal symptoms. If unilateral, an immediate nephrectomy is the only chance of life for the patient, but only too often the infection is bilateral, and these cases are of necessity quite hopeless.

The chronic cases are most usually seen in those patients who have for some time lived a catheter life without paying due regard to the necessary aseptic

precautions. The phenomena witnessed are those of chronic sepsis, and unfortunately surgery is powerless to aid these cases when the disease is well advanced. Progressive emaciation, combined with an irregular pyrexia, constant dull lumbar aching, a dry skin, marked thirst, and a cachectic appearance, combined with the local signs of urinary trouble, form a picture which is not difficult to recognize. *J. G. Pardoe.*

PYLORIC STENOSIS OR SPASM (Congenital).—(See VOMITING IN CHILDHOOD.)

PYORRHŒA ALVEOLARIS.

This is a form of marginal caries of the alveolar bone of the jaws. There is progressive bone destruction, resulting in pus discharge and in the formation of pockets between the gum and the tooth. The edge of the gum may be inflamed and swollen, or it may shrink and expose the neck of the tooth. Gradually the teeth become tender on pressure, and loosened, and abscesses along the side of a denuded root, in the pocket between it and the gum, are common.

As regards effects on general health, the discharge of pus is the important point. To ascertain its presence, dry the necks of the teeth gently, and then press the gum over the root of a tooth, beginning at the apex and continuing to the neck, thus driving pus before the finger. Do this over several teeth, before determining absence of pus. Not only the swallowing of pus, but also the local absorption from the pockets is an important factor in the general results of pyorrhœa alveolaris.

Pyorrhœa alveolaris, like dental caries, owes its existence to the difficulty of cleansing the teeth, or when confined, in some localized cases, to one tooth, to infection after trauma. Bacteria and food débris find undisturbed lodgment under the gum edge in the circumdental (periodontal) sulcus, and eventually determine a tissue infection. The process is accelerated or retarded by variations in general resistance, but the disease is local in origin, and must be treated locally. Gout is not a *causa causans*, and the expression "gouty gums" is entirely misleading.

TREATMENT.—Careful and frequent cleansing and application of germicides, combined with destruction of pockets and removal of tartar, will better the condition and in a few cases cure it. But where pockets are extensive and, as in the case of multi-rooted teeth, impossible of free access or drainage, extraction is to be recommended. When the general health is affected this should be insisted on.

If the teeth are to be retained, the patient must be taught to rub the gums and teeth, especially at their necks, with a piece of cloth wrapped round the end of the index finger and dipped in an antiseptic lotion, before each meal and the last thing at night. As a lotion :—

R	Sod. Bicarb.	gr. x	Glycerin.		℥j
	Acid. Carbol.	gr. viii	Aq.	ad	℥j

When the gums recede, the exposed roots are often extremely sensitive. Cleanliness, by use of the prescription given above, or of a 10-gr. sod. bicarb. solution, will reduce the sensitiveness; should pain persist, $AgNO_3$ must be applied to the sensitive parts, when possible in the solid form. Dry the parts, protect the cheek or lip with a napkin and pick up some powdered $AgNO_3$ on a minute cotton wool pledget held in the conveying forceps and *rub* on the tooth. This generally gives pain when the sensitive part is touched. Before removing the napkin apply a solution of NaCl to neutralize any excess of $AgNO_3$.

Joseph Geo. Turner.

QUINSY.—(See ABSCESS, and TONSILLITIS.)

RANULA.—A cyst in the floor of the mouth due to blocking of the duct of a mucous or salivary gland. The commonest form is that arising in the sublingual gland, producing a painless, tense, fluctuating swelling, with a bluish translucent appearance bulging up between the tongue and the jaw. When the cyst is small it may be completely removed with scissors under cocaine anæsthesia. The complete removal of a large ranula is very difficult. The best plan is to

remove as much as possible of the cyst wall with scissors, and scrape the remainder with a sharp curette, followed by the application of pure carbolic acid. The cavity is packed daily with antiseptic ribbon gauze until it granulates up, care being taken to prevent the edges closing before the deeper parts have healed.

Edmund W. Roughton.

RAYNAUD'S DISEASE.—(See also CHILBLAINS, ELECTROTHERAPEUTICS, AND BLACKWATER FEVER.)

1. **Preventive Treatment.**—The patient should avoid undue exposure to cold. In severe cases it may be necessary for him to winter abroad, or at any rate to remain indoors during cold weather; he should be warmly clothed in flannel, and wear wide, stout boots, and loose, warm gloves; he should wash only in water at blood heat. The dietary should be abundant and contain plenty of fat. From time to time a course of tonics, especially cod-liver oil and iron, is beneficial.

2. **Medicinal Treatment.**—Quinine should be given, if there be a history of malaria, in doses of 10 to 20 gr. per day. Opium is to be specially recommended in middle-aged or elderly persons who suffer from daily painful paroxysms with a tendency to gangrene. It may be given in doses of $\frac{1}{8}$ or $\frac{1}{4}$ gr. in pill thrice daily, or $\frac{1}{4}$ gr. of the extract may be given with 2 gr. of extract of hyoscyamus. If there be any suspicion of a syphilitic taint, iodides should be given a fair trial.

3. **Electrical Treatment.**—Galvanic treatment, preferably by means of a local bath, is of great value as a local vascular tonic. For the details of its application see ELECTROTHERAPEUTICS.

4. **Local Measures.**—During a paroxysm the affected parts should be covered with cotton-wool; friction or gentle massage with the aid of a stimulating liniment (e.g., lint. camphoræ) is very useful when it can be tolerated. The application of a tourniquet to the affected limb for one or two minutes twice daily has recently been strongly recommended. It seems to act by inducing a temporary loss of vasomotor control (see MED. ANN., 1905, p. 429).

Robert Hutchison.

RECTUM, SURGICAL DISEASES OF.—

Cancer of the Rectum.—The only treatment which will materially prolong life is excision of the rectum at the earliest possible opportunity. This operation has been greatly improved within recent years, and most satisfactory results can now be obtained, providing the cases are seen early enough. The position of the growth in the rectum does not now affect the question of removal, as any growth can be removed providing it is not too densely adherent to surrounding structures. Growths that cannot even be felt per rectum can be quite successfully removed.

The contra-indications to excision are: (1) The presence of secondary deposits in the liver or abdominal glands; (2) Dense adhesions to important structures, such as the bladder; (3) Fixation of the growth to the pelvic fascia, if high up; (4) Bad general condition of the patient, great obesity, bronchitis, etc.

The best results are obtained from the modern methods of excision of the entire rectum by the perineal or abdomino-perineal routes. In these operations, after excision, some part of the sigmoid flexure is brought down and stitched to the skin of the anus after repairing the anal sphincter.

The rectum, growth, and glands in the hollow of the sacrum are removed together. It is possible by modern methods of excision to obtain aseptic healing of the wound, and to almost entirely restore the normal function of the bowel. The operation, however, is one of the most formidable procedures of modern surgery.

The Results of Excision of the Rectum.—After a successful operation, in which the bowel has been restored, complete functional control is obtained in the normal way, and except for some slight difficulty at first in emptying the bowel, the patient suffers but little inconvenience from the removal of the rectum. Stricture will not result, providing there is not free suppuration of the wound or sloughing of the bowel after operation. If the sphincters have to be removed, functional control cannot be expected, and the patient is more comfortable with a colotomy opening and no opening in the perineum. The percentage of recurrences of the growth after rectal excision is still high as compared, for instance, with the results of operation for cancer of the breast, but better results are to be expected from the present improved methods of operating.

Colotomy.—(See COLOTOMY).—This is indicated when there is commencing obstruction, or for the relief of diarrhœa and tenesmus. It does little, however, to prolong the patient's life apart from obstruction.

Curetting.—When the growth cannot be removed and is low down in the rectum, great temporary benefit follows curetting or cauterizing the ulcerated portion of the growth.

Palliative Treatment in Inoperable Cases.—With proper care the patient may be made much more comfortable and saved much pain. Opium should be avoided, if possible, in the early stages, and the pain relieved with aspirin in 10-gr. doses, or by phenacetin, antipyrin, etc. Later, opium and belladonna suppositories should be given sufficiently frequently to allay all severe pain, and the dose increased if necessary, or hypodermic injections of morphia may be used. Iron, in the form of tinct. ferri perchlor., by the mouth, is often beneficial in relieving pain and discomfort, and great relief is afforded by irrigation of the rectum with weak antiseptics or astringents. An occasional dose of castor oil, 1 oz., to which 10 min. of tinct. opii have been added, will also be found beneficial in getting rid of fæcal accumulations and preventing congestion of the parts. No form of electrical or X-ray treatment is of any value. Such treatment more often seriously aggravates the condition and increases the pain. Much better results can be obtained by care in keeping the growth clean and preventing secondary septic infection and ulceration. Orthoform ointment introduced through a rectal pipe will often relieve the pain and tenesmus most effectually.

A guarded prognosis should always be given as regards the prolongation of life in cases of inoperable cancer of the rectum. The author has known two patients with inoperable cancer of the rectum who lived in fair health for over five years.

Polypi of the Rectum.—The two common forms of rectal polypi are the myxomatous and the fibromatous. The former is the most common, and is often seen in children. They often cause bleeding or prolapse, and should be removed. The sphincter should be stretched under anæsthesia, and the polypi either twisted off, or cut off after ligaturing its base with silk.

Prolapse of the Rectum (Procidentia).—It is important to distinguish between prolapsus recti and prolapsus ani. The latter is a condition commonly associated with piles, and the mucous membrane only is involved, while in the former the whole of the rectal wall comes down, and in the severe degrees of procidentia the peritoneum may form part of the prolapsing mass. Prolapse of the rectum in children is also a very different thing from the same condition in adults. In children prolapse is common and very amenable to treatment, while in adults it is not so common, and treatment is often unsatisfactory.

Prolapsus ani requires no special treatment apart from that necessary for hæmorrhoids (which see).

Prolapse of the Rectum in Children.—Treatment should be directed to improving the child's general health, correcting the dietary, regulating the bowels, correcting

nasal obstruction, if present, and administering iron and strychnine in small doses to improve the muscular tone. The child must not be allowed to sit on a chamber for the purpose of evacuating the bowel, but should perform this act lying in bed or in a squatting position over a shallow receptacle or newspaper. This is all that is required in most cases, but if not effectual the buttocks should be strapped together with a broad piece of strapping, the front edge of which passes just behind the anus. In a few cases operation is necessary. This usually consists of linear cauterization of the prolapsing bowel, the object being to obtain adhesions between the mucous membrane and the muscular coats of the bowel. From three to five shallow grooves, two to three inches long, are made in the rectal wall with a Pacquelin's cautery blade. The child is kept in bed for a week, and made to pass all stools lying down for at least a month.

Treatment in Adults.—Nothing but operative treatment is of the slightest use. The simplest operations are linear cauterization of the prolapse, as already advised for children, and ligature of the slack mucous membrane in two or three places. A slack fold of the rectal mucosa is seized with forceps, and a silk ligature tied tightly round its base. This is done in two or three places at different levels. It is practically the same operation as that for piles (see HÆMORRHOIDS). These operations are not likely to be more than temporarily successful except in slight cases.

Other operations are: (1) Rectopexy, which is done by making an incision behind the anus and anchoring the bowel into the hollow of the sacrum; (2) Restoring the pelvic floor by a plastic operation somewhat similar to that for ruptured perineum; (3) Excision of the prolapse; (4) Sigmoidopexy. This consists in dragging up the bowel through an abdominal incision, and fixing it to the anterior abdominal wall.

It is often advisable to combine two of these operations in the same case. There are numerous other methods, but those only have been mentioned which the author knows from personal experience give satisfactory results. With the exception of the ligature and cautery methods, they should not be attempted by anyone who is not thoroughly accustomed to the performance of difficult surgical operations, as they often involve unexpected difficulties, and the peritoneal cavity may be opened in dealing with the prolapse.

Prolonged rest in the recumbent position is essential after any operation for prolapse.

Stricture of the Rectum (for malignant stricture see CANCER OF RECTUM, *supra*).—In treating any stricture of the rectum of old standing it must never be forgotten that there is more than likely to be ulceration of the bowel above the stricture. The treatment of fibrous stricture of the rectum will depend very much upon its situation and density, and also upon the degree and extent of ulceration above it. It is therefore very important to make a thorough examination with the sigmoidoscope before proceeding to treat the case. In slight or recent stricture where there is not any very dense induration, gradual dilatation with bougies will sometimes effect a cure. The dilatation must be very carefully and gradually performed, and after the stricture has been fully dilated the patient should pass the largest bougie which can be inserted, for himself, and should continue to do so daily for some months. Unfortunately, in most cases the stricture recurs rapidly in spite of the continuous use of bougies.

Good results have been obtained by posterior proctotomy, by which the stricture and all the tissues are divided straight backwards to the coccyx, the anus being also laid open in the same cut. Division of the stricture alone is not satisfactory, and is often dangerous from septic periproctitis. At the present day by far the best method of treating a bad stricture is to excise the affected portion of bowel, including the whole of the stricture. The healthy

bowel above is then brought down and stitched to the anus; the operation is similar to that of excision of the rectum for cancer.

The results of excision are most satisfactory, and it is the only way in which a complete and permanent cure of the condition can be obtained. In cases of stricture at the anal orifice or within two inches of it, such as are sometimes seen after a badly performed operation for piles, the proper treatment is to dissect out all the fibrous tissue and free the rectal mucous membrane. Most excellent results can be thus obtained, but it is essential to success that the wound should heal by primary union and not by granulation. Often the easiest way of removing the fibrous tissue is to excise the last two inches of the mucous membrane and bring down the stump.

In bad cases of stricture, accompanied by severe and intractable ulceration, the proper treatment is a left inguinal colotomy, and this should be most strongly urged. Such patients are far more comfortable with a good colotomy, and it is the only way to get the ulceration to heal. It may be possible later to excise the stricture and close the colotomy, and on the other hand chronic ulceration above a rectal stricture is apt in time to become malignant.

Ulceration of Rectum (see also ANUS).—Rest in bed, combined with frequent irrigation of the rectum with some mild astringent lotion, is the best treatment at first. Later, local applications of pure ichthyol, or nitrate of silver 10 gr. to the ounce, may be made by means of a speculum. The diet should be as bland as possible, and the bowels should be kept acting loosely. In severe cases, stretching the sphincters so as to obtain free drainage is often necessary; and in very bad cases a colotomy may be needed in order to deflect the fæcal current.

J. Lockhart Mummery.

RELAPSING FEVER.—In this form of fever the treatment must be mainly directed to the relief of symptoms and complications, of which pneumonia and hyperpyrexia are the most important. These must be treated on ordinary lines.

The disease is most debilitating, and stimulants are usually required towards the end of each pyrexial period and during the crisis.

C. W. Daniels.

RENAL CALCULUS.—(See CALCULUS.)

REST CURE.—(See NEURASTHENIA.)

RETENTION OF URINE.—(See URINE, RETENTION OF.)

RETROPHARYNGEAL ABSCESS.—(See PHARYNGITIS.)

RHEUMATISM, ACUTE.

I.—ARTICULAR RHEUMATISM.

A sharp attack of articular rheumatism with cardiac dilatation occurring in an adult is the most generally recognized of all forms of rheumatism, and most of the chief methods and problems that concern the treatment of acute rheumatism centre round it.

The illness commences with general malaise, fever, and pains in the limbs and trunk. The temperature rises to 102° or 103° F., the tongue is thickly coated, the pulse full and bounding. The patient is profoundly depressed, and the skin sweats profusely. After a time, the pains locate themselves in the joints, and particularly the larger joints, which become hot, swollen, and painful. Over one or more there may be a red flush. The inflammation moves from one joint to another, and thus the patient soon becomes completely helpless. There are thirst and constipation, and the urine is high-coloured and scanty, deficient in chlorides, and loaded with phosphates. The dilatation of the heart is evidenced by an increased pulse-rate, a diffuse cardiac impulse, an enlarged area of præcordial dullness, and an alteration in the sounds of the heart. Thus, the first

sound at the impulse becomes shorter, and the pulmonary second sound at the base is accentuated. In addition, a soft systolic murmur may appear, the maximum intensity of which is internal to the left nipple line.

The indications for treatment are to :—

1. Alleviate the pain and distress.
2. Control so far as possible the rheumatic processes.
3. Encourage the great natural resistance to the disease.
4. Conduct the patient safely through the stage of convalescence.

The first step towards alleviating the pain and distress is *rest in bed.* This rest must be absolute. The bedstead should be a convenient one in height and breadth for nursing purposes, and should, if possible, consist of a good hair mattress on a modern woven wire foundation. It is a great boon to the patient to avoid all unnecessary movement, and for this reason it is advisable to have powerful nurses who can manage the heavy lifting. Much importance is generally attached to the necessity of lying between blankets, but in my opinion there is less need for this since the introduction of skilled nursing, and it is most uncomfortable for those with sensitive skins. There are exceedingly soft, light blankets to be obtained which are a great comfort, but failing these, if there is a good nurse, the patient may lie upon a blanket and be covered by a cotton sheet and more blankets. The night-dress should be loose and made of the best soft flannel. It should be opened down the front its whole length, and also along the sleeves. A light woollen shawl for the shoulders can be used in addition. By these arrangements it is easy for a nurse to dry the patient gently and rapidly from time to time, and thus prevent his lying in a steamy, sour bath of his own perspiration.

Diet.—During the acute stage this should be fluid and consist chiefly of milk. There is good reason to believe that during the acute illness the function of the kidneys is impaired, and therefore strong meat essences are not advisable. Milk diluted with water or Salutaris water should be given, and 10 gr. of citrate of soda may be added to every ½ pint of milk. In addition, as recommended by Dr. Burney Yeo, a home-made lemonade, to which bicarbonate of potash has been added in the proportion of 20 gr. to the pint, may be placed beside the patient. He should take about three or four pints of the milk and water in the twenty-four hours, and the lemonade between. The citrate of soda renders the milk more digestible, and the thirst is relieved by the lemonade. At the present time the condition of "acidity of the blood" that was supposed to exist in acute rheumatism is not literally accepted, for there is no evidence in its support. Nevertheless, it is a most interesting and remarkable fact that the diplococcus of rheumatism possesses powerful acid-producing properties. The alkaline treatment of acute rheumatism is thus quite as clearly indicated now as in the days of Dr. Fuller. Stimulants are seldom needed for acute articular rheumatism : the indications for their use in rheumatic fever will be given under the section on cardiac rheumatism. While on the question of diet, I would add that in my opinion there is no justification for a rigid rule prohibiting meat. In countries where, of necessity, meat is taken in excess, the disease occurs and is recovered from. In countries where the diet is practically meat free, it also occurs, and may be fatal. Each case must be judged on its merits. If the type of the attack is sthenic, or the kidneys are affected, meat must not be given except with great caution. On the other hand, the asthenic cardiac type of childhood is often much benefited by a liberal diet.

The Condition of the Bowels.—It may be looked upon as a rule of practice that the bowels should be well opened before a severe course of treatment by the salicylates is commenced. Two grains of calomel in cachet, followed by a saline aperient, will usually answer the purpose. When once the bowels have acted

thoroughly, mild aperients, such as liquorice, cascara, confection of senna, or a saline, can be used.

Local Applications.—Numerous local applications to the inflamed joints have been advocated, but in the majority of cases hot wool, skilfully applied, is sufficient. The limbs should be kept at rest, and if necessary all weight taken off them by means of a cradle. There are exceptional cases in which the arthritis is exquisitely painful and unusually obstinate. The limb should then be placed upon a splint, and thus absolute immobility of all the muscles that may act upon the articulation be secured. Fuller's alkaline and opium lotion can also be applied on lint. The formula of this lotion is :—

R	Potass. Bicarb.	℥ss	Glycerin.	℥ij
	Tinct. Opii	℥j	Aq. Rosæ	ad ℥xij

Ft. lotio. To be applied warm.

Blisters are, in my experience, more effectual in the chronic types of painful arthritis. There is another form of application which is believed to produce anodyne effects by withdrawing fluid from the tissues, thus reducing the heat and swelling. Examples of this group are "Antiphlogistine" and "Thermogen." Other forms, more applicable I think to the subacute phases of painful arthritis, are the Oil of Wintergreen preparations. Thus methylsalicylate, a colourless liquid with strong odour, is spread on the skin and covered by some impermeable tissue. Mesotan, a methoxyl-methylester of salicylic acid which has not so strong an odour, is used in solution in olive oil in the proportions of one part of the mesotan to two of olive oil. This mixture is gently rubbed into the affected part; but it should be used cautiously, for troublesome and irritable cutaneous eruptions (erythematous and papular in character) have followed its use. An elegant preparation is a compound gaultheria liniment containing methyl salicylate, gaultheria, and terebene: two or three drachms to be lightly rubbed into the affected parts.

Medicinal Treatment.—The salicyl compounds are at the present time very extensively used, and yet authorities of mature judgment and wide experience are still at variance as to the best way in which to employ them.

Salicylic acid and its salts are obtained from three sources, from the oils of certain plants, from salicin, a glucoside obtained from the willow bark, and thirdly, by the chemical interaction of phenol and carbonic anhydride. The artificial salts made by chemical combination, being less expensive, have necessarily a far wider field of use than the natural salts, but have the disadvantage of containing irritant creosotic acids. The natural salts are for this reason the safest preparations, although recent improvements by the production of a physiologically pure artificial salt have diminished the differences between them.

Salicin, which was so extensively used by the late Dr. MacLagan, is less powerful in its action.

Many physicians believe that these drugs are directly antidotal to acute rheumatism, and some have gone even further, and have looked upon them as tests of the presence of the disease. We must, however, remember that the proof of specificity rests entirely upon clinical observation, and that observations upon the results of treatment are notoriously difficult, and are rendered more so from the tendency of our profession to run in a circle upon an insecure platform of fact. Thus it is stated: "Salicylates are antidotes to rheumatism"; following this we are told: "What does not yield to salicylates is not rheumatic." It only remains for someone in an authoritative position to emphasize these two dicta, and any real advance in our knowledge is at once checked. The fatal weakness of such a position lies in the fact that we are in complete ignorance of the nature of the poison or poisons that are formed in acute rheumatism. I think the whole question of the specific action of these drugs is still an open one. Certain important facts, however, have been ascertained. In the first place, no drugs ease the pain and lower the temperature in acute articular rheumatism with such constancy as these do. Secondly, none of the other rheumatic manifestations react to these drugs in a manner comparable to the articular lesions. On the other hand, certain points are still in dispute :—

1. Is the lack of success with salicylates in other than the articular lesions the result of insufficient dosage?

2. Can large doses be given without producing ill effects ?
3. If large doses are given, are the results superior to those obtained by other methods of treatment ?

Dr. D. B. Lees has shown conclusively that children and adults can take very large doses of the best preparations of sodium salicylate. His conclusions favour the view that large doses, if they are given *early* in the disease, are antidotes to all rheumatic manifestations. If, however, we consider the possible danger from large doses, we find again there is general agreement that some individuals show an intolerance to these drugs, and in some cases, if large doses are pushed, very grave and even fatal results may ensue. In such cases the vision becomes dim, there are buzzing in the ears, deafness, and giddiness. Sometimes there is headache and more often vomiting, which is sometimes difficult to control. Of greater importance are the cardiac symptoms: the pulse becomes slow, irregular, and small in volume, and the cardiac sounds are enfeebled. The extremities become cold and clammy, and the aspect of the patient is one of intense depression. In rare cases, a very remarkable series of symptoms arises, in which slow and deep breathing develops, much urine is passed, coma supervenes, and the patient dies in a condition strikingly suggestive of diabetic coma.

Granting this idiosyncrasy, there is dispute as to whether or not in other cases the drugs are depressant. This would seem easy to settle considering the great number of observations that are made; but the rheumatic poisons are in themselves intensely depressant, especially to the heart. Thus, one observer will attribute the symptoms to the disease, and another to the drugs. The last question to be answered is, whether better results are obtained by large doses of salicylates than by other forms of treatment ? Here again, opinions entirely differ; but in rheumatic cardiac lesions I cannot myself believe that large doses of salicylate of soda produce such good results as do other methods of treatment.

As there is this diversity of opinion, I shall first consider the medicinal treatment with salicylate of soda used only as an aid in subduing rheumatic arthritis and rheumatic pains—the method to which I personally incline—and then the treatment as carried out by those who believe the drug to be a specific antidote.

For a strong adult the following prescription may be given :—

℞ Sod. Salicyl. gr. xx | Syr. Zingiber. ℥ss
Sod. Bicarb. gr. xv | Aq. Chlorof. ℥j

Ft. mist. Two tablespoonfuls every two hours for six doses, every three hours for four doses, and then every four hours.

The result, if favourable, will be a fall in the temperature and marked relief to the articular pains, together with a striking improvement in the general comfort of the patient. In some cases, when the pain is exceptionally severe, it is advisable to add to the evening dose 10 min. of nepenthe, or to give a cachet containing 10 gr. of Dover's powder. If there is much nervousness and anxiety, bromide of potassium is indicated. Here it may be repeated, that the bowels should be well opened at the commencement of the illness. If the patient is easily depressed, sal volatile should be added.

A child of ten years, of robust constitution, can be given 10 gr. of salicylate of soda at a dose; but frequently, when the drug is being used to control the arthritic pains, 6 gr. will be sufficient. For a delicate child, following Dr. Cheadle's recommendation, salicin may be prescribed. This can be given in warm milk, thus :—

℞ Salicin. gr. x | Sod. Bicarb. gr. v
Ft. pulv. Mitte tales xii. Take one in milk as directed.

When the temperature has fallen, and improvement is clearly indicated, the dose of salicylate of soda or salicin is gradually diminished, but these drugs are not entirely discontinued until at least a fortnight has elapsed from the day that the temperature reached normal. In many cases, at the end of this time a change can be made to salicylate of quinine, and a week later to a simple quinine tonic, which for adults can be prescribed in an effervescing alkaline draught.

℞ Saloquin. Salicyl. (Rheumatin.) gr. x
Ft. cachet. Mitte xii. Take one three times a day.

Children will take this drug well if it is given in 5-gr. doses suspended in syrup and water.

EFFERVESCING QUININE MIXTURE.

℞	Sod. Bicarb.	gr. xx	Aq. Chlorof.	ad	℥j
		Ft. mist. alkalina.			
℞	Acid. Cit.	gr. xvij	Aq.	ad	℥ss
	Quin. Sulphat.	gr. ij			

Ft. mist. acida. To two tablespoonfuls of the alkaline add one of the acid mixture, and take as a draught three times a day.

For children at this stage of the illness, the following prescription is useful :—

℞	Quin. Sulphat.		Mucil. Tragacanth.	℥j
	Ammon. Carb.	āā gr. ss	Syr. Aurant.	℥ss
	Potass. Bicarb.	gr. v	Aq. Chlorof.	℥ij

Ft. mist. Mitte ℥iv. Two teaspoonfuls three times a day after meals.

The *convalescence* from articular rheumatism, in spite of every care, is frequently retarded by relapses. Many attribute these to an over-hasty return to solid food. I would, however, point out that the diplococcus has prolonged vitality, and we have no evidence that any drugs can destroy it in the tissues, neither can we gauge how completely the resistance of the tissues has done its work. What then is more likely than that there should be these relapses ? There seems little doubt that premature exertion is detrimental, and on this account it is advisable that the tender joints and stiffened ligaments should be skilfully massaged for a week before the patient attempts to bear his weight upon them or make voluntary movements. The massage should include passive movements of the limbs. If the effusion has been more than usually copious, and the softened capsule thereby stretched, it is advisable to strap the joint firmly as soon as the effusion has disappeared. Hydropathy in those cases in which there are left much pain and stiffness, coupled with considerable muscular wasting, is of great service. In this stage there can be no doubt of the value of this treatment ; but when we bear in mind that some of the most successful hydros are situated near districts which are hotbeds of acute rheumatism, one cannot but doubt a specific action of the waters. The combination of radiant heat baths and massage is also very useful. Stimulating liniments, such as the compound mustard or camphor liniment, are also helpful, and a prescription on the following lines will sometimes give relief :—

℞	Liq. Arsenic.	℥iij	Syr. Zingiber.	℥ss
	Potass. Iodid.	gr. v	Aq. Chlorof.	℥ss
	Sod. Salicyl.	gr. x		

Ft. mist. Mitte ℥vj. One tablespoonful, in an equal quantity of water, three times a day after meals.

Should there be, in addition to pain, swelling of the joints after movement, blisters should be applied above them. Occasionally cases are met with, resembling those of acute articular rheumatism, *which do not respond at all to treatment with salicylate of sodium.* These, some authorities consider to be examples of a special disease they term acute rheumatoid arthritis. I am not convinced of the truth of this opinion. In such cases it may be advisable to push the drug for a few days, but if there is no improvement, then to abandon this method and turn to the alkaline quinine mixture ; or, if the pain is severe, to the acid solution of quinine, to which liquor morphinæ hydrochloratis can be added. Another difficulty which sometimes confronts us is, finding that most of the joints react to treatment with salicylate of sodium, but that one remains obstinate, very painful, and drifts into a condition of arthritis deformans. We

must be on our guard for such an occurrence when there is great œdema and peri-articular swelling. The limb should be placed on a splint, and, if (though this is exceptional) there is much intra-articular fluid, it is advisable to aspirate the joint very slowly and with strict antiseptic precautions. A film of the exudation should be examined, and if the diplococcus is present in numbers, the joint cavity should be washed out with a 1 per cent carbolic solution. In any case, after aspiration the joint should be carefully strapped with Scott's dressing. I do not think that the free opening and drainage of the joints in acute rheumatic arthritis is indicated in the present state of our knowledge. I have made no allusion to the treatment of acute dilatation of the heart, for the necessary rest in bed and proper care during convalescence will generally put this right. After an attack of rheumatic fever, the winter and spring are better spent out of England. Thus, a winter in Egypt may complete the recovery. As regards our own climate, we badly need a careful investigation and report upon the incidence of acute rheumatism in all its ordinary types in various localities. In general terms, a dry gravel soil and liberal amount of sun are advisable, and inland is preferable to seaside.

II.—CARDIAC RHEUMATISM.

The second clinical type is a severe attack of acute cardiac rheumatism. This is most frequent in childhood, and on this account the outlines of treatment are mapped out for the child, but can be modified for the adult.

This form is common among the poor in London, and will illustrate some of the most troublesome points in treatment.

The onset is often gradual, with malaise and loss of strength and a complaint of pain and stiffness in the tendons behind the knees. The child becomes anæmic, and on account of the pain, and perhaps also articular swellings, is put to bed. The temperature is found to be about 101° F. During the next few days there is complaint of pain in the chest and shortness of breath, and examination shows acute dilatation of the heart and early mitral disease. Again, the pain and distress increase, and a pericardial and, very probably, a pleural friction rub are audible. The physician is now confronted by one of the most serious manifestations of rheumatism, viz., rheumatic carditis. Nodules may appear, and also erythematous eruptions, but these, though of great importance as evidences of the severity of the infection, do not influence the treatment. The cardiac lesions in order of frequency are :—

1. Acute dilatation.
2. Endocarditis.
3. Carditis.
4. Malignant endocarditis.

There will be no need here to detail the signs of valvular disease, but it is useful to remember that the valves are attacked in this order of frequency :—

1. The mitral.
2. The mitral and aortic together.
3. The aortic alone.
4. The mitral, aortic, and tricuspid together.
5. The pulmonary.

In childhood, more than one valve is often damaged.

Pericarditis is a sure index of a severe rheumatic infection, and though rarely fatal when it occurs in a first attack of acute rheumatism, it is the most frequent cause of death in this disease, because it tends to make its appearance at the end of a series of attacks, and gives the last fatal blow. From the standpoint of treatment it is important to remember that a large pericardial effusion is rare. I have never yet seen a fatal case in which paracentesis would have been of the least service, and it is now generally accepted that the chief cause of the great præcordial enlargement is the dilatation of the heart that invariably occurs.

The chief therapeutic indications are :—

1. To relieve pain and distress by immediate and complete rest, coupled with suitable remedies.

2. To feed the patient skilfully.

3. To spare the heart all avoidable strain, and to endeavour to strengthen it.

4. To guide the patient through the convalescence. The child should be kept in bed, and trained nurses are advisable, for much depends upon the nursing in difficult cases. For easing the pain and distress there is no better remedy than the *ice-bag*, which has been so warmly advocated by Dr. D. B. Lees. The details of this treatment are as follows :—

The præcordial area is marked out with an aniline pencil as a guide to the nurse. If possible, two ice-bags should be in use, so that one can be substituted at once when the other is exhausted, and hot-water bottles should be placed in the bed to keep the lower extremities warm. The bag must not press heavily upon the chest, and if there is much præcordial pain, it should be suspended from a cradle. For fixation in position on the chest—a point of much importance—a domett vest should be made with armholes, and in addition, with a third hole over the cardiac region through which the neck of the ice-bag is slipped. The vest is fixed above by a tape passing round the neck, below by a safety pin. The ice should be carefully pounded, and the top of the bag must be screwed down on the washer. Nothing should intervene between the bag and the skin, although cotton-wool should be packed round the bag to absorb the moisture which tends to condense upon its surface. The most convenient arrangement is to refill the bag every two hours, at which time the temperature and the rate of the pulse should be taken. The continuous application is the most satisfactory, although in the early morning hours it may be advisable to intermit the treatment.

If skilled nursing cannot be obtained, the ice-bag may still be used during the day. Some delicate children find the cold too depressing, and in spite of stimulants may show signs of collapse. In such cases, the application of belladonna liniment or warmed pine wool is preferable. When there is considerable distress consequent upon dilatation of the right side of the heart, four leeches applied to the præcordial region give relief, but I do not personally favour the use of leeches as a routine method. It is for the dilatation of the heart rather than for the pain that they are indicated. In these cases, if there is arthritis or much muscular pain, let 5 gr. of salicylate of sodium be given to a *child of seven* with the object of controlling these pains. For the præcordial distress and sleeplessness, opium may be given, the bowels having been previously opened by aperients.

For Insomnia and Restlessness.

℞	Nepenthe	♏iv	Glycerin.	♏xx	
	Potass. Brom.	gr. v	Aq. Chlorof.	℥ss	
	Misce. Mitte ℥vj.	Two teaspoonfuls to be given at night or every six hours for a child of seven.			

I do not advocate the free use of salicylate of sodium, although the details of this method will be given later for the guidance of those who favour the theory of its specific action.

In many cases there is no special necessity for relieving pain, and then a prescription containing small doses of quinine is serviceable; children prefer it in simple rather than effervescing solution. Regarding stimulants, alcohol, in the form of sound brandy, is useful when the temperature is low, the pulse feeble, appetite poor, and the rest disturbed. It is not advisable for routine use in rheumatic heart disease, and quite wrong to persist with it longer than is absolutely necessary. The same discretion is needed in the employment of direct cardiac stimulants. There is nothing to be gained by plying an excited heart with strychnine during the early stage of acute pericarditis, for the rapidity of the heart is thereby increased, and its force may be exhausted prematurely. Should the cardiac excitement be the prominent feature, and there be no unusual effusion, digitalis is more useful.

℞	Tinct. Digit.	♏v	Glycerin.	♏xv	
	Potass. Brom.	gr. v	Aq. Chlorof.	℥ss	
	Ft. mist. Mitte ℥iv.	Two teaspoonfuls every six hours for a child of seven.			

It is when the strength of the heart is failing that strychnine is of great use. It can at first be given by the mouth in combination with digitalis, and later hypodermically, in doses of 2 min. every six hours to a child of seven. When the heart, after the outbreak of pericarditis has died down, is left feeble and dilated, I have observed good effects from the use of formate of soda.

℞ Sod. Format. gr. v | Aq. Chlorof. ℥ss
Syr. Aurant. ℥ss |
Ft. mist. Mitte ℥viij. A tablespoonful every six hours for a child of nine.

It is a very grave event when, in an attack of acute pericarditis, vomiting, restlessness, and livid pallor supervene. It is all important to cope with the sickness at once. Such drugs as digitalis and strophanthus should be discarded, and recourse had to hypodermic injections of strychnine. The drugs given by the mouth should be those which assist in arresting the vomiting. The milk should be peptonized, or citrate of sodium added in the proportion of 2 gr. to the ounce of milk, or ass's milk obtained. Patent meat juice is sometimes of great value, and well-made beef, chicken, or veal tea may be used in place of milk. A stomachic mixture containing bismuth and soda with 3 min. of dilute hydrocyanic acid will help to arrest the sickness. If in spite of these measures the vomiting is persistent and urgent, all food by the mouth should be stopped and recourse had to rectal injections. For the lividity, oxygen is of some value, and for the restlessness, the bromide and opium mixture already mentioned. Brandy and dry champagne are the most useful stimulants. Allusion has been made to the early application of leeches in pericarditis. It is, however, in the later stages, especially in cases when there has been old valvular disease, that their use will be most frequently required. When the right heart is beating forcibly in the epigastrium, when the pulse at the wrist is small and feeble, the colour ashen, and the child in great distress, five leeches applied over the liver may give great relief, and even if this be only temporary it is some gain. The leeching should be followed up by free stimulation of the heart. Should the rare event occur, of embarrassment of the heart from a large pericardial effusion, it will be found that the impulse becomes diffuse and wavy, the cardiac sounds more and more muffled, and the præcordial dullness wooden in character. If then, after most careful deliberation, it is thought advisable, paracentesis should be done by introducing the needle of the syringe at the extreme limit of the cardiac dullness in the left axilla over the region of the apex. The operator must be prepared to find that flakes of lymph may block the syringe.

The convalescence after an acute carditis is prolonged. Six months of the greatest care is not a day too much. This time should not, however, be spent in passive rest, but be employed in cautiously preparing the heart for the return to everyday life. The methods at our disposal are :—

1. Rest, fresh air, and sun.
2. Massage of the limbs.
3. Passive and resisted movements.

There can be little doubt that it is a mistake to keep children at rest for long periods and then allow them to plunge suddenly into ordinary life. When once the temperature and pulse are steady, and have remained for an interval of three weeks, massage of the limbs should be commenced.

III.—ACUTE RHEUMATIC CHOREA.

In considering treatment, it is necessary to take a broad view of the various factors in the causation of chorea.

Rheumatic children are often highly nervous, very sensitive, and lacking in

reserve force. They frequently suffer from night terrors and headaches, and are easily upset by shocks and frights. A knowledge of this will sometimes enable us to anticipate an attack of chorea. Such warning symptoms as headache, dreaming of school work, fidgety movements, irritability, slight fever, and loss of mental and physical powers, call for active measures. All school work should be stopped, and the child be kept in bed, or at most allowed upon a couch in the afternoon, and later rest in the fresh air. The bowels should be well opened, and only light food allowed. It is in this stage that some believe that full doses of salicylate of sodium or aspirin will cut short the illness, even if they are given when definite choreic symptoms have appeared. At the present time we have not sufficient evidence by which to gauge the value of this method. Unfortunately we are usually called upon to treat chorea when the active stage has fully developed, and then treatment by salicylate of sodium seems to me ineffectual. Severe cases, the tests of which are, the inability of the child to feed itself, to control its emotions, and above all to sleep, require most careful and skilful nursing. In order to prevent injury from the violence of the movements, the bed must be thoroughly padded, and although it is not permissible to use active restraint, a good nurse will certainly help the child by firmly tucking the clothes round it whenever it shows an inclination to sleep. Slight injuries and bed sores are difficult to prevent, for the skin becomes dry and unhealthy from the exhaustion of the child, and the incessant movements strongly dispose to their occurrence. If bed sores do arise, there is a peculiar liability to the supervention of septicæmia. The most absolute quiet must be insisted upon. The food should be fluid, nourishing, and abundant. Milk, eggs and milk, strong soups and jellies, are all indicated in these severe cases, and, if large doses of hypnotics are being given, stimulants are of great service. For the worst cases, the most valuable drugs, in my opinion, are chloral hydrate and bromide of potassium, and it is seldom that any decided signs of cardiac failure occur in children when treated with these. The chief difficulty lies in leaving off the chloral, for experience shows that, when it is omitted, there may be considerable nervous disturbance. This is most likely to arise when the physician has been alarmed by signs of collapse, and on this account has abruptly stopped the chloral. In most cases the difficulty can be overcome by cautiously diminishing the dose, and substituting occasionally a small dose of another hypnotic, such as veronal.

Another admirable plan advocated by Sir Thomas Barlow, is the use of a hot pack given morning and evening. This is often followed by a refreshing sleep.

A considerable amount of judgment is required in the management of chloral and bromide. These drugs should be pushed sufficiently to produce drowsiness, but, whenever it is possible, the interval between any two doses should be increased, although on no account should the child be allowed to become very restless. For a child of seven years the following prescription can be given at the commencement :—

R	Chloral. Hydr.	gr. vij	Aq. Chlorof.		℥ss
	Potass. Brom.	gr. x			

Ft. mist. Mitte ℥vj. One tablespoonful every four hours.

The dose can be raised to 10 gr. of chloral hydrate, and such stimulant as is given should follow the medicine. Instructions should be given to the nurses to be on the watch for coldness of the extremities. Throughout the illness, the bowels, which are often obstinate, should be kept well opened. When the urgency is over and the child left exhausted by the illness, quiet is still imperative, and any inclination to sleep should be encouraged. A

liberal diet should be allowed, and arsenic can now be given in an alkaline solution, thus :—

R	Liq. Arsen.	℥iij	Sp. Chlorof.	℥vj
	Sod. Bicarb.	gr. vj	Aq.	℥ss

Ft. mist. Mitte ℥vj. One tablespoonful three times a day after meals.

Later, massage should be commenced, and if the weather is suitable the child can soon be wheeled into the fresh air. Should it be noticed that, although the health appears to be restored, the movements remain choreiform, then passive exercises combined with suggestion are useful, as Dr. Guthrie has advised, and such toys and games as favour co-ordinate movements should be chosen. Lastly, when walking is permitted, Swedish exercises are indicated.

In many cases of moderate severity, Dr. Goodhart advises rest, feeding, and careful massage. The bowels are regulated by aperients, and no further medicinal treatment, in his opinion, is needed.

A favourite drug in the treatment of chorea is arsenic. Some use it in ordinary doses, others commence with moderate doses, and rapidly push it to the limit of tolerance. Others again, commence at once with large doses, e.g., 10 to 15 min. of liquor arsenicalis. I never myself use arsenic in rheumatic chorea when the temperature is raised, and in severe cases it seems to me valuable time is lost by its routine employment. When there is no fever, and the nervous rather than the infective element predominates, arsenic sometimes produces marked improvement. If it be decided to push the drug, its toxic symptoms must be remembered, such as vomiting, irritation of the eyelids, silvery tongue, looseness of the bowels, abdominal pain, and dermatitis. Three severe cases of neuritis have come under my observation, the results of the undue prolongation of this method of treatment. The dose at first is 5 min. of liquor arsenicalis three times a day, and is raised drop by drop until 10 or even 15 are given. When the maximum is reached, it is maintained for a week, and then the treatment abandoned. As the dose of arsenic is increased, so must be the bulk of fluid in which it is prescribed, for it is the concentrated arsenical solutions that are especially liable to damage the digestion. A useful device is to give the drug in barley-water flavoured with lemon.

A very great number of drugs have been used in the treatment of chorea, as antipyrin, ergot, conium, belladonna, strychnine, and quinine, but their success is very doubtful, and I am convinced that in a case of ordinary severity it is wiser to trust to the healing power of nature than to give a child large doses of powerful drugs. Throughout the illness a close watch must be kept for the onset of carditis.

IV.—ACUTE RHEUMATISM, WITH HYPERPYREXIA OR CEREBRAL RHEUMATISM.

This most dangerous condition is probably the result of an acute rheumatic toxæmia, for local lesions are the exception, and recent observers have found great and general degeneration of the nerve cells in the brain. It is fortunately rare, although it may supervene in what is apparently a mild attack of rheumatism, and not only in the severe forms. The onset is as a rule in the third and fourth week of the active disease. Warning symptoms are, headache, delirium, and vomiting. Importance has been attached to the sudden disappearance of the arthritic pains without any corresponding improvement in the general condition of the patient. In other cases, cutaneous hyperæsthesia has been noted. Graver signs are spasmodic twitchings, irregular breathing, and a lapse into semi-consciousness. The temperature may rise with great rapidity to the height of 107°, 108°, or even 110° F. It must, however, be

remembered that grave nervous symptoms may arise with a temperature of about 105° F., and that such symptoms must be looked upon as pointing to cerebral rheumatism, unless there should be evidence of severe pericarditis.

The most successful method of treatment is the use of the cold bath. Some advise that the bath be at first warm (about 90° F.), then rapidly cooled down by ice; others, that it be only tepid (75° F), and the ice added. I think that those who advocate the latter and more drastic treatment are more likely to be successful, for, as they point out, the element of nervous shock is in itself of some value. There is undoubted danger of collapse; but by the slower method the patient must remain longer in the bath. In either case no time should be lost. Collapse can only be anticipated by watchfulness and the use of stimulants. The temperature is taken repeatedly while the patient is in the bath, and it is important to remember that the fall in the temperature will continue after the patient has been removed. Thus, if the initial temperature is 106° F., the patient should be taken out when it has fallen to 102°. Twenty minutes is the average time required.

It must sometimes happen that there is no convenience for giving a bath. In such cases a sheet can be wrung out in cold water and wrapped round the patient, who is then rubbed over with smooth blocks of ice.

Should the temperature rise again, the bath must be repeated. No drugs appear to control the fever. Salicylate of sodium is powerless, although when once the temperature has been lowered, both salicylates and quinine may aid in keeping it down. Drugs of the nature of antipyrin, or phenacetin are ineffectual alone, and too depressant if combined with the cold bath treatment.

V.—OTHER RHEUMATIC MANIFESTATIONS.

The greater number of rheumatic symptoms not dealt with already in this article are treated upon general principles. There are, however, a few points in connection with them that are worthy of mention.

Rheumatic Pleurisy is essentially plastic in type, and seldom gives rise to much effusion. Should it, however, complicate cardiac dilatation and tricuspid regurgitation, then fluid may accumulate rapidly, and increase the dyspnœa. In such cases the fluid should be drawn off before there is any great accumulation, particularly should it occur on the right side, embarrassing the right chambers of the heart.

Unusually high pyrexia in acute rheumatism, apart from the cerebral type, should suggest a patch of **Pneumonia.** This usually subsides rapidly, with no special treatment. The type of rheumatic pneumonia is the broncho-pneumonic.

Acute Pulmonary Œdema—a rare occurrence—commences, as in renal disease, with the appearance of numerous fine râles in the upper lobes of the lungs. There is also a rapidly-increasing dyspnœa. All depressing remedies should at once be stopped, and such cardiac stimulants as strychnine and strophanthus employed.

Erythema Nodosum is looked upon by many as a special disease. Rest in bed, and soothing lotions are indicated for the painful swellings. These are most commonly met with over the shins, but may also occur on the upper extremities and trunk. Salicylate of sodium relieves the articular pains, but does not appear to control the course of the disease. Gargles should be freely used for the sore throat which is not infrequently present.

Rheumatic Tonsillitis shows no very special clinical features. In most instances there is a general and diffuse redness, spreading over the tonsils and uvula. On the other hand, it may be more severe, and I think that some cases of rheumatic tonsillitis are mistaken for diphtheria. The sore throat is frequently

very transitory, but hardly sufficient attention has been directed to this manifestation. Children who are rheumatic or inherit the tendency, should be taught to gargle early in life, and much attention should be paid to their throats. They can safely use a gargle of oxymel, borax, and water. Adults can use a gargle containing salicylate of sodium, or formalin, or chlorate of potassium.

VI.—TREATMENT OF ACUTE RHEUMATISM BY SODIUM SALICYLATE USED AS A SPECIFIC.

In the description of this method, I cannot do better than follow the rules laid down by Dr. D. B. Lees in his monograph upon "The Treatment of some Acute Visceral Inflammations," for there can be no doubt that if the drug is specific, the logical procedure must be to push it in the more severe types of the disease. For an adult, 20 gr. of salicylate of sodium are given, combined with 40 gr. of sodium bicarbonate, every two hours during the day and every four during the night. Dr. Lees emphasizes the necessity for the addition of a quantity of bicarbonate of sodium double that of the salicylate, for this combination tends to prevent the supervention of that dangerous form of dyspnœa already described. In proportion, children require large doses. Thus, a child from six to ten years will commence with 10 gr. of the salicylate and 20 gr. of the bicarbonate, every two hours in the day and every four hours at night. In two days time the doses are raised to 15 and 30 gr. respectively, and later, even to 20 and 40 gr. This treatment is persisted with until the symptoms of the acute disease are overcome, and then the doses are cautiously diminished. For rheumatic chorea the same line is adopted. The objections to the method by those who do not agree with it have already been enumerated.

Surgical Treatment of Rheumatic Arthritis. — O'Connor and others have advocated the free opening of the joints in severe cases of acute articular rheumatism, on the principle that the process is an infective one, and that the heart may be infected from the local lesions. Vernon Shaw, has in fact, experimentally proved that the *Diplococcus rheumaticus*, when injected into the knee joint of a rabbit, will cause not only arthritis but endocarditis. Granted that these reasons, so far as they go, be sound, I cannot believe that in the majority of cases there is any necessity for such drastic measures. Moreover, as the diplococci are located especially in the synovial membranes and not in the articular fluid,this treatment, though drastic, is not radical; further it cannot prevent a primary infection of the heart, which clinical experience leads one to believe is a frequent event.

Serum Treatment of Acute Rheumatism. — It is in some such direction as this that we look for help in the future, though we do so with feelings chastened by a remembrance of repeated failures in serum therapy. The difficulties are numerous. The diplococcus, though tenacious of life, soon loses its virulence, and the virulence is not as a rule very high. An antibacterial serum is notoriously uncertain in its action, and such sera cannot as yet be standardized. At the present time no specific serum has established itself, and, should one appear, let us hope that it will fall into the hands of those who realize how great a natural tendency there is to recovery in acute rheumatism. Those who do not believe the micro-organism is specific, have employed sera made from several varieties of the streptococcus. This method I have myself used without success, but the polyvalent sera are apparently improving in efficacy, and their value is still *sub judice*.

The serum which has attracted most attention is Menzer's. The cultures from which this serum is made are taken from the upper air passages of patients suffering from rheumatic angina faucium, and I need hardly point out that such

a method assumes that rheumatism is not a specific disease, for such cultures could hardly be pure. This serum produces certain very decided effects. In four to six hours from an inoculation, heat and swelling occur in the joints which have been affected by the rheumatism. For a while the cardiac symptoms may be increased. Fever and pains in the neck and head, swelling of the lymphatic glands, and sore throat, are all occasional events. Later there is a fall of temperature by lysis, and then should follow a natural course towards cure. The serum has not been standardized. The test dose used by Menzer was 5 to 10 cc., but as much as 200 cc. has been used for a single case. He is of opinion that it prevents relapses and the development of endocarditis. The dangers and weaknesses of this method should be thoroughly realized. The dangers are the local reactions described by Menzer; for since we cannot standardize the serum we have no complete control over these reactions. The weaknesses are the assumption that rheumatism is not specific, and that in the present state of our knowledge cultures from the throat are to be relied upon as a basis of treatment. *F. J. Poynton.*

RHEUMATISM, CHRONIC.—The essential pathological change in chronic rheumatism is found in the white fibrous tissue of muscle-sheaths, tendons, aponeuroses, ligaments, periosteum, fascia, and nerve-sheaths. The lesion consists in inflammatory overgrowth of the connective tissue, this being the result of a local reaction against microbes, or possibly toxins, conveyed by way of the blood-vessels. The irritant gives rise to proliferation of fibrous tissue locally, with serous exudation, and the whole may resolve without treatment, or may become fibrous and permanent. When once formed, these fibrous indurations are usually more or less defined and circumscribed, and they vary in size from a split pea to an almond, or they may be in comparatively large masses, or spread out as an inelastic layer under the skin. They may occur after acute rheumatism, rheumatic colds, influenza, gonorrhœa, rheumatoid arthritis, and local injuries such as a sprain. They are therefore sequelæ of many morbid conditions. Many of them have nerves passing through them, or are attached to nerves. In an individual with these lesions, exposure to cold and wet, muscular exertion, a chill, indigestion, and other exciting causes, produce swelling of the fibrous tissue, with consequent pressure on nerves, and this gives rise to the series of symptoms which are characteristic of "chronic rheumatism," namely, stiffness, aching, pain, a feeling of fatigue, and often neuralgia. These fibrous indurations may occur in any part, but they are most frequently found in the back, thighs, legs, neck, shoulders, and joints. According to the part specially affected, we use the terms lumbago, stiff neck, pleurodynia, sciatica, etc. The swellings can be most readily made out by smearing the skin with oil or vaselin, and then passing the thumb or tips of the fingers over the part with firm, gentle pressure. They are usually tender on pressure, and can be felt as ill-defined, doughy swellings. The larger ones, and those in large superficial masses, can be readily grasped by the fingers.

TREATMENT.—When the indurations are quite recent, they can be comparatively quickly resolved by massage; hence, after an attack of acute rheumatism or influenza any painful local spots should be efficiently massaged for ten days or a fortnight. A course of treatment at a spa, with hot baths and rubbing, is a great aid to complete recovery. During an acute exacerbation occurring in a chronic case, when the fibrous indurations swell, and cause pain or severe aching, general treatment may be necessary. The treatment is that of a slight feverish attack, and improvement takes place in a few days. Sodium salicylate or salicin, alone or with phenacetin, greatly relieves the pain, or a hot bath followed by a copious perspiration, or a Turkish bath, may cut short the attack.

If the pains are widely spread, rest in bed, light diet, saline purgation, and mild diaphoretics and diuretics hasten recovery, and give ease to the patient.

Very often the chief site of the pain is localized in the lumbar region, or the shoulders, neck, or chest wall. If so, a few thorough applications of massage may give complete relief. The parts are usually very tender, and the manipulations must be begun very gently by stroking, so as to get rid of the exudation and relieve tension, but gradually more severe pressure can be borne, until finally the fist or knuckles may be forcibly applied. Dry cupping, hot applications, mustard, methyl salicylate, menthol, A B C liniment, etc., are all of great value in relieving the local pain, and may be used in addition to the massage.

To obtain permanent cure and complete relief from recurrent attacks, the fibrous indurations must be got rid of, and this is always a tedious and troublesome affair.

Massage.—The most important agent at our command is massage, aided by appropriate exercises. General massage as ordinarily applied is of no use, as treatment must be specially directed to the nodules and indurations which can be felt, and to those parts which are painful on pressure or movement. In carrying out the massage, the muscles of the part should be relaxed, and the skin (shaved if necessary) be well smeared with vaselin, oil, lard, or liquid paraffin. To begin with, the rubbing should not be too severe, as it is apt to unduly irritate the indurations and so cause sharp pain, followed by aching and stiffness. It requires a good deal of tact and experience to determine how much pain must necessarily be caused, and how much the patient may reasonably be expected to put up with. Different individuals vary very much in these respects, and also in the feeling of fatigue following the massage. If the manipulations are properly carried out, the pain is severe only during the actual rubbing. After a few days of treatment the fibrous thickenings become harder and more defined, and only then are many of them detected. After treatment for ten to fourteen days they begin to shrink in size and become much more callous, and then more and more pressure may be applied to them, until even the knuckles may be used. The massage must be carried out daily for an hour, about fifteen minutes being devoted to each part treated. If expense is no object, two masseurs may be employed. If the indurations are numerous and widespread over the body, the best plan is to select three or four regions for treatment (e.g., the back and thighs), and to continue with them until a cure is effected, before proceeding to deal with other parts. At the beginning of each treatment gentle effleurage should be given for two or three minutes to remove serous engorgement and to make the subsequent manipulations less painful. For a thoroughly satisfactory result the indurations must be completely dispersed, otherwise the pain and aching recur. The length of time required for this varies very much. Recent soft thickenings can be removed in two or three weeks, or less. In old-standing cases, three to six or twelve months are required. The rapidity of dispersion depends greatly upon their anatomical situation. If the nodules can be effectively compressed against a bony part, such as the sacrum or humerus, the massage is much more effective than if they lie in the fleshy mass of the thigh or alongside the spinal column, where they are difficult to get at. Deeply placed nodules in the heel and elsewhere can seldom be removed.

Exercises.—Appropriate exercises which stretch the joints, aponeuroses, and muscles involved, are a great aid to the treatment just described. They can be readily devised, and can be carried out without any apparatus, or with the aid of dumb-bells, Indian clubs, a stick, and an india-rubber exerciser. Two periods of ten minutes daily are sufficient for the purpose.

Faradism.—The faradic current is of some assistance also, especially if neuritis is present.

Drugs.—No remedies are known which cause absorption of the fibrous indurations. Locally, blisters and iodine sometimes do good, but very often they have no effect, probably because many of the indurations are beyond the reach of their action. Where the joints or periosteum are affected superficially (close to the skin), the results are better than in other cases.

Where intestinal indigestion is present, a small dose of rhubarb and grey powder at night, with a saline purgative in the morning, often lessens the aching. The salicylates of sodium, of methyl, and of quinine, and other salicyl compounds, such as aspirin, salicin, salol, etc., often give relief to pain, but their value is merely that of a temporary palliative. The same is true of phenacetin, phenazone, quinine, and similar substances. In very recent cases potassium iodide has a limited value, but it is quite incapable of dispersing old indurations.

Diet.—Dietetic treatment is, *per se*, of no specific value. The broad rule is to avoid gastro-intestinal fermentation, and this is best done by a sufficient but simple ordinary diet. It is very important that digestion should be perfect.

Spa Treatment.—In recent cases, where the fibrous thickenings are newly formed and still plastic, cure is often rapidly brought about by a course of bathing, or hot-air treatment, combined with massage. Even in chronic cases a good deal of relief is obtained from the stiffness and aching. The indurations remain, however, and, after a longer or shorter time, again give rise to symptoms.

Climate.—During sojourn in a dry stimulating climate, rheumatic people find that their sufferings are much lessened or even entirely abolished. In some cases the indurations appear to be absorbed.

Surgical Treatment.—Single nodules, if they are well-defined, may be excised. The operation is not always an easy one, as the small mass of fibrous tissue may lie deep, and is then very difficult to find.

Chromic Acid.—If the nodule is sharply defined and can be accurately penetrated by a hypodermic needle, the injection of 5 to 8 min. of a 1 per cent solution of chromic acid often causes it to shrink, and greatly relieves muscle and nerve pain. The small piece of fibrous tissue is, however, very easily missed.

Prophylaxis.—Rheumatic patients should avoid damp, draughts, and over-exertion; but on the other hand they should lead active out-of-door lives as far as is possible, and take plenty of muscular exercise. Sore throats, muscular colds, and indigestion should always be carefully and immediately treated.

Prognosis.—Under such methods of treatment as have been indicated the prognosis is good in most cases of ordinary severity, but time and perseverance are necessary. In very severe cases, where there are large and numerous indurations, and the patient is very stiff and crippled, recovery is hopeless, but by stretching, massage, and manipulations, more freedom of movement may be obtained. When the subcutaneous tissue is brawny and much thickened over a large area, such as the lumbar region, any very substantial improvement is rare except after very prolonged and continuous treatment. *Ralph Stockman.*

RHEUMATOID ARTHRITIS.—Within the last few years the views of physicians as to the value of treatment in checking the progress of rheumatoid disease have undergone considerable modification. Formerly it was believed that treatment was of little or no avail, but now it is held that our efforts may be not only rewarded with great alleviation, but possibly, in some cases, by cure, if the condition be treated in its earliest stage. It is therefore essential to recognize the disease early, and to persist in a carefully thought out plan of

treatment, possibly for many weary months. Consequently, the patient's co-operation and help are of prime importance.

Rheumatoid arthritis is essentially dependent on agencies which lower the general health, and any line of treatment not based upon this fact is foredoomed to failure. Recently, too, it has been thought that the actual cause of the disease is, in all probability, a bacterial or toxic poison affecting the entire system as well as the joint structures. It is therefore essential to make a most careful scrutiny of the patient's past history, to discover the offending organ or function through which the poison has obtained entrance, and, by correcting any local disturbance, prevent further developments of the mischief. For instance, it is important to remember that in many cases the disease follows some chronic lesion of the mucous membranes, some local discharge, some ovarian or uterine disorder, or it may be subsequent to some general infection, such as influenza, etc. Local lesions must, in the first instance, be remedied as far as possible. In the second place, as we are not able at present directly to destroy the poison once it has invaded the system, we must be content to increase the resisting power of the patient by overcoming general debility; and in the third place we must assist the organism by drugs, baths, etc., to eliminate the poison. With these objects in view the principal elements of treatment may be subdivided into three sections: (1) Diet, clothing, exercise, climate, etc.; (2) Drugs; and (3) Thermal, electric, and surgical treatment.

I.—DIET, CLOTHING, EXERCISE, AND CLIMATE.

1. *Diet.*—Following what has already been said, the diet must be of a nourishing and sustaining character, but it must not be too rich. It is fatal to place a patient on a low diet on the supposition that it is a gouty condition; any restricted dietary is almost certain to do harm. It should be varied, and contain plenty of nitrogenous food. Fats are important, and cod-liver oil must form a staple article of diet. Vegetables and fruit are necessary; abundance of milk, butter, and cream are indicated. Should there be fever, the food must be given in a liquid form. Stimulants are often of service, especially good sound wine; but each case must be considered separately, and should the stimulant increase the pains, it must be discontinued. Food should be taken regularly, and its quantity determined by the patient's condition, and increase or loss of weight. Although no hard and fast rules can be laid down, the following is a good diet list:—

Soups.—Mutton, chicken, oyster, turtle, barley, rice, pea, bean.
Fish.—All that agree—boiled, baked, stewed, or broiled—not salt fish.
Meats.—Beef, broiled or roast; lamb, roast or broiled; mutton, roast or broiled; poultry, roast or broiled; game; sweetbreads; predigested meats (beef peptonoids, sarco-peptonoids, peptonized beef tea, beef jelly, etc.).
Eggs.—Raw, poached, or boiled.
Vegetables.—Greens, lettuce, celery, spinach, asparagus, cresses, cauliflowers, onions, tomatoes, green peas, beans, lentils, and other leguminous vegetables; rice, well cooked, sparingly; potatoes more sparingly.
Bread.—Wheat and gluten bread, toast, milk toast. Bread should be at least one day old, and only a small quantity should be taken.
Fruits, etc.—Oranges, lemons, pears, apricots, peaches, grapes, green figs and dates, apples baked, but avoid them raw; walnuts, and other nuts, sparingly.
Drinks.—Fresh water, but Apollinaris and other carbonated waters sparingly; hot milk, cream, egg-nog, lemonade, sherbet, alcoholic drinks as prescribed (whisky, wines, and malt liquors); malt preparations, coffee tea, cocoa, chocolate more sparingly.

2. *Clothing.*—Too much clothing does harm, yet it is essential that the body should be encased in woollen garments worn next the skin. Some patients find it desirable to wear a piece of wash-leather next the skin and over the affected joints, but often this plan leads to abuse, and in the majority of cases is

unnecessary. Many rheumatoid cases feel cold and damp to a much greater extent than ordinary rheumatics, and this has to be taken into account. They are also particularly sensitive to changes in the wind, cold easterly and north-easterly winds being particularly felt.

3. *Exercise.*—In acute cases, where there is fever and great pain, the patient must be confined to bed, but on no account should this be continued a day longer than necessary, and everything must be done to encourage the patient to move and use the joints as much as possible. To my mind, half the battle is to induce the patient not to give up doing things, for once a joint is allowed to stiffen and become useless, many months of treatment will be required before it becomes usable again. If the pain be very severe, a light splint may sometimes be used for short periods, but as soon as possible gentle passive movements and massage must be begun. In the more chronic cases, rest in bed is a mistake, and the patient should be ordered a moderate amount of exercise. If unable to walk out-of-doors, fresh air should be obtained by carriage driving or in a Bath chair, and, as the case becomes less acute, graduated gymnastics, special movements, passive exercises, and the use of pulleys and weights are all of great use. Under no circumstances is force or violence to be used or recommended, everything must be done gently and progressively, and with as little pain as possible.

4. *Climate.*—As far as possible no rheumatoid patient should be allowed to live in a damp, cold climate, on heavy clay, or at the bottom of a valley. The ideal climate is bright, sunny, and dry, and the soil should be sand or gravel, with no subsoil water. In this country this is hard to find. The seaside is not suitable, but these cases often do well on a high moorland, where the moisture runs off quickly—especially in summer. Wherever possible, the patient should winter in a dry, warm atmosphere, as for example in Egypt (Assouan for preference) or at Biskra, in Algeria. As a rule the northern Mediterranean seaboard is not advisable. Latterly, some cases have done very well at Seville, in Spain, a place where the disease is practically unknown amongst natives. But it must be borne in mind that rheumatoid patients require comfort and good food, and therefore it is better to live at home than go where these cannot be obtained. Many have found benefit from a visit to the dry Karoo of South Africa, or to some of the dry places in Western America, but these are not available to the ordinary patient. As a rule a sea voyage is not desirable, but the mere rest and absence of worry may do good.

II.—DRUGS.

We know no specific for this disease. Looking upon it as an infective condition, the question of a general antitoxin naturally arises. So far such has not been found, but a few acute cases, corresponding apparently with typically acute rheumatoid arthritis, have been benefited, and the disease apparently arrested, by the injection of the polyvalent antistreptococcic serum. At present our experience is too limited to do more than record the fact.

Treatment by drugs may be classified under three headings: (1) Those substances which, when administered internally, are antagonistic or antitoxic to the rheumatoid poison, or which enter into conjunction with it and thereby assist in its elimination; (2) Those substances which act by improving the general tone of the body, and those whose action is more or less indefinite, and which have been given empirically and to relieve symptoms; and (3) Those substances which are of use when applied externally.

1. In the first group we know of no substance having any certain antagonistic action, except it be the antistreptococcic serum already mentioned. We are

therefore forced to turn our attention to those drugs which have been found useful owing to their power of entering into conjunction with the rheumatoid poison and thus assisting in its elimination. To this group belong guaiacol carbonate, benzosol, salol, and quinine salicylate. Their action in the first instance seems primarily to be in the intestinal canal, where they decompose with varying rapidity. After being split up into their component parts, they are absorbed, and, in the blood, enter into combination with the toxic albumins, and thus render their elimination easier. The longer the substance takes to decompose, the greater its local action; and in inverse ratio, the greater the rapidity of decomposition, the greater the rapidity of absorption and eliminative power. Apparently, the various substances do not act with certainty or regularity, or are governed by factors of which at present we are ignorant. Thus, one case will do well on guaiacol carbonate, whereas another will do better with the quinine salt. I have seen cases which did not respond to the one, when put on one of the others to be followed at once by an increase in the amount of urine excreted, and which has often given off a volatile matter with an unpleasant odour. This has always been followed by an immediate improvement in the joint condition. It is therefore obvious that, while one salt had not produced an easily excretable combination, the other salt had. The large majority of my cases respond best to guaiacol, and it is my routine treatment. It may be administered in doses of 5–10 gr. three times a day in powder, pill, or cachet. It is usually readily taken, with little or no symptom of intolerance. After ingestion it is decomposed throughout the entire length of the small intestine, giving off guaiacol, which is absorbed into the blood, and carbonic acid. The total process of decomposition is slow, but within an hour or so the guaiacol can be traced in the urine, and as only a small quantity exists in the blood at one time, it can never become dangerous.

Benzosol is slightly soluble in the stomach, and more so in the intestines. It splits up into guaiacol and benzoic acid. It is given in doses of 5–10 gr. three times a day, and acts much as does guaiacol carbonate. Salol may be given alone in 10-gr. doses, but it acts better when combined with quinine salicylate, and it may then be given in 5-gr. doses. It splits up in the intestines into phenol and salicylic acid, both of which are rapidly absorbed and form compounds with the toxic products, and so assist their elimination. Quinine salicylate may be given in 4–10-gr. doses, with or without salol. Its action is similar. When these drugs act beneficially, they begin by improving the appetite, relieving pain, lowering the temperature, and diminishing the joint swellings. The patient sleeps better, gains flesh, pigmentation and other vaso-motor anomalies disappear, and in fact looks and feels better.

2. In the second class are those drugs which have been found useful by improving the general tone of the body—the most important being iron and arsenic. They are best given in conjunction, either in a pill or mixture, probably the best preparation of iron being the syrup of the iodide. Many prefer to combine the iron with quinine. Arsenic may be given as the B.P. liquor, or as the liquor sodii arsenatis. Iodine and the iodides are commonly supposed to be beneficial, iodide of iron being said to have a special action. As a tonic it is excellent, but beyond that it has no influence. Amongst many other remedies are the alkalies, actæa racemosa, fraxinus excelsior, colchicum, etc., which all have their advocates, but are of little lasting avail. Quinine has already been spoken of. The salicylates may occasionally give relief, but their action does not seem to be curative. Guaiacum has been largely used, and abroad ichthyol is a favourite remedy. For the relief of painful cramps, Dr. Garrod recommends hyoscyamus. Morphia is occasionally necessary for the relief of pain. An extract of thyroid and glycerin has been recommended by Dr. Solis-Cohen, and

the late Dr. Hyde tried an extract of joint-tissue. Neither remedy has been successful to any great extent.

3. For external use the best drugs are—guaiacol, which should be applied in equal parts with olive oil, or in the proportion of one to six of tincture of iodine; methyl salicylate, either pure or with olive oil, lanolin, or vaselin; mesotan (deodorized methyl salicylate) one in three, with olive oil or lanolin. After the preparation has been applied to the skin it should be covered over with lint, guttapercha tissue, and a bandage, or else with a glove. The principal objection to guaiacol, and to a less extent to methyl salicylate, is its smell; in private practice, therefore, mesotan answers best. Oil of cloves, to a certain extent, masks the smell, but not entirely. When applied externally, they all produce a slight numbness, a sense of coolness, and a feeling of relief. They are absorbed rapidly and can be traced in the urine. They may produce a reddening, and occasionally, if applied too strong, a blistering of the skin; so care must be taken with the first few applications.

Carbolic acid is used, in the strength of 1 in 30 or 40, as a warm fomentation, renewed every two or three hours, and acts as a local anæsthetic and analgesic. In acutely painful joints it may give great relief.

Menthol may be combined with any of the foregoing, and is often useful. Apart from these, practically every liniment has been tried; all are more or less unsuccessful in the majority of cases in accomplishing more than the temporary relief of pain. Iodine frequently relieves pain, and may diminish the size of a joint: I prefer to combine it with guaiacol or methyl salicylate. A small cantharides blister often markedly relieves pain and lessens a swollen joint. Chaulmugra oil, cod-liver oil, oleate of mercury and morphia, unguentum hydrarg. co., are often useful to rub into a joint, or for strapping. Ordinary strapping is of use in many cases in lessening the size of a joint, and it certainly relieves pain. It is most usefully applied to a knee or wrist.

III.—ELECTRICAL, THERMAL, AND OTHER SPECIAL TREATMENT.

Electrical treatment often gives much relief, probably most good being gained from the use of a weak continuous current used twice a day. It should be applied directly to the affected joint. The interrupted current does not give such good results. In no case should electricity be used in acute cases. It is particularly of service where there is much wasting, and the application must be to the individual muscles. The electric bath has also been used, but it does not seem to act other than as a general nerve tonic. Latterly, high-frequency currents, static electricity, and sinusoidal currents have all been used, and occasionally some good may be obtained, but their use is not required as a routine treatment.

Thermal treatment.—The use of hot mineral waters and other accessories is of the utmost use; but while one can safely say this, it must be remembered that different waters are most advantageously employed in different cases. Many things must be taken into account, besides idiosyncrasy, in ordering a patient to a certain spa, and for a certain course of treatment; but broadly speaking, a spa that is at all lowering is useless in this disease. Unfortunately no fixed rules can be laid down, but undoubtedly hot alkaline or indifferent mineral waters with douches and massage act best; and perhaps next to these, the warm peat baths. In this country Bath and Buxton are probably the most successful. Owing to its situation, Bath is much warmer than Buxton in winter; and hence, in the majority of cases, is the more suitable. Should it be desirable to try the sulphurous waters of this country, Strathpeffer and Harrogate are of use in summer. At the former spa an excellent form of peat bath is employed.

Amongst the other spas in this country are Woodhall (iodine) in Lincolnshire, and Llangammarch (bromine) in Wales, both of service in certain cases. Abroad we have the thermal waters of Aix-les-Bains, Bourboule, Mont d'Or, Aachen, Wildbad, Wiesbaden, Töplitz, Homburg, Kissingen, Assouan (Egypt), Hammam R'Irka and Hammam-Meskutin (Algiers), Arkansas, Virginia, and Banff (America). When anæmia and debility are prominent symptoms, the chalybeate waters of Langenschwalbach, Rippoldsau, Spa, and Franzenbad are of use.

Mineral waters are administered both internally and externally, but it is to their external influence that most good can be traced. Moreover, the balneological treatment is only part of the cure, as by going away from home many of the daily worries are left behind, and the patient has the advantage of change of air and scene, and superintendence of diet and mode of life.

Why mineral waters should relieve rheumatoid patients is not quite obvious, but that it does so we know from experience, and also that it cannot altogether be replaced by other modes of treatment. To explain it scientifically is more difficult, but they doubtless act partly by causing increased perspiration and expiration of watery fluid from the lungs, with consequent increased imbibition of fluid and flushing of the body channels ; also by their sedative action on the nervous system, and by their stimulating effect on the circulation as a whole.

In rheumatoid arthritis, douche massage is the best form in which to administer baths. The massage combined with douching is much more effectual than either remedy alone, although great benefit is derived from additional dry massage, on days on which the patient is not bathed. Massage is specially indicated in chronic cases, and where there is much stiffening, fixation of the joints, and muscular wasting. It may be combined with electricity, or passive or active movements. At first it should be applied very lightly, and principally to the muscles, and then, as it is found the patient can stand it, to the joints, getting more forcible and deeper as the case goes on. Massage à friction is the most suitable form to use, but in addition, gentle kneading and squeezing of the tendons and fibrous parts may be practised.

Should douche massage baths not be advisable, ordinary immersion, with or without douches, vapour baths, peat baths, radiant heat or electric baths, are all of use in special circumstances.

If there be much rubbing of ulcerated cartilages one upon another, with great pain, relief may sometimes be got by extension by weights. This method is particularly useful in the case of the knee-joint. Heavy weights are unnecessary. Again, if there be much tension of a joint from fluid, good may be done by tapping the joint, great care being taken to see that the syringe is aseptic.

The prevention of deformities is of great importance, and this can usually be secured by massage, etc., and the use of light springs, which are applied to exert their strength in the opposite direction to that in which the deformity is occurring. In the case of the fingers and hand, the springs are best applied attached to a glove, which may readily be drawn on and off. Should ankylosis occur, it may be desirable to give an anæsthetic and move the joint, or possibly the question of a more drastic operation may arise.

Surgical treatment.—Recently surgical treatment of rheumatoid arthritis has received a good deal of attention both on the Continent and in America, and good results have been recorded both for the relief of ankylosis or locking of a joint, and with the view of arresting the spread of the disease. In one class of case the operation can only be intended as a local measure, whereas in the other it is done with a view to eradicate the disease. Data at present do not allow us to speak authoritatively on either question, but it seems to the writer that excision or removal of bony nodules must be a comparatively rare necessity. For one thing, bony ankylosis is very rare in true rheumatoid

disease, and although bony excrescences and fibrous adhesions are common in the chronic forms, yet the stiffened joints usually yield to milder forms of treatment, and even if ankylosis has occurred, it is but in few cases one would recommend excision, and only if the ankylosis were the cause of such serious crippling as to affect the general health or wage-earning capacity of the patient. It would only be of service, too, when the disease had assumed a quiescent stage, and where one or, at the most two, joints were involved. In these cases there is no question of cure, but it is quite otherwise in the acute cases, where excision, incision and scraping of the joint tissues, or incision only, have been practised, with the idea of arresting the spread of the disease. The operations so far have been confined to one, or at most two joints, and many of the cases have given most encouraging results, as it has been found that by the removal of the diseased cartilages and synovial membranes of one joint, not only is that joint improved, if not cured, but the other affected joints are also improved. As our knowledge at present stands, surgical interference should only be recommended in the chronic cases where real bony ankylosis has occurred, or where there is such rigid fibrous union and locking of the joints as to resist all gentler methods, and where the joint thus fixed seriously interferes with the patient's health (as in the case of the jaws) or his wage-earning capacity ; and in the acute cases, only where the disease is so severe and painful as to resist all other methods of treatment, and where the patient is fully informed of the dangers and probabilities of the operation. As a rule, once a stiffened joint has been made to move by massage, passive movements, and baths, the atrophied muscles quickly respond to treatment. Electric and other stimuli soon cause the tissues to regain their tone and usefulness.

To Summarize.—In the acute stages the patient should be kept quiet and on a light, nutritive diet, if possible being encouraged to use the joints gently, and for short periods, but, if too painful, the limb may be allowed to rest for a short time in a splint. The joints should be painted with guaiacol and olive oil or iodine, or with methyl salicylate or mesotan, or fomented with carbolic acid fomentations. Internally, guaiacol carbonate, or salol with quinine should be given, and, as an occasional tonic, iron and arsenic. If sleep be not readily obtained, this must be attended to, as must also be the various functions and organs of the body. If the patient can stand it, light massage and baths, for short periods, may be ordered. As the case becomes more chronic, the thermal treatment must be pushed, increased exercises, electricity, and gymnastics now also being indicated. Internally, the treatment must be as in the acuter stages, with possibly the free use of cod-liver oil and maltine. Above all, there must be persistence and patience.

Gilbert A. Bannatyne.

RHINITIS.

Acute Rhinitis.—The ordinary cold in the head is so familiar that it may be briefly dealt with.

In the *earliest stage*, when the patient has a burning or pricking sensation in the nose or throat, and is feeling feverish and ill, but before any definite symptoms of catarrh have commenced, various remedies have been recommended to cut short the disease. None of these is absolutely reliable, but all are apparently successful at times, and act better in some patients than in others. One of the best is a full dose (10 gr.) of Dover's powder at bedtime. The diaphoretic action of this drug may be increased by taking a hot bath and by some of the other remedies about to be described. Another procedure, successful in some patients, is the administration of a single large dose of quinine ; 5 to 10 gr. should be given in solution, or the ammoniated tincture of quinine may be prescribed in drachm doses every two hours for three doses. Others recommend

ten drops of spirit of camphor to be taken as a single dose. Whenever possible the patient should remain in bed one day and stay in the house another day if the weather is inclement.

In the *second stage*, when the cold has really commenced, the ordinary household remedies should be employed. The patient should have a hot bath, go straight to bed, and sleep in flannel. In cold weather he should have a fire in the bedroom. He should take plenty of hot drinks, such as hot lemon, or hot whisky and water. The following mixture is very beneficial :—

R	Liq. Morphin.	℥ x	Aq. Chlorof.	ad	℥ss
	Liq. Ammon. Acetat.	℥ij			

One tablespoonful to be taken every two hours for four doses.
or until sleep or profuse perspiration is produced.

An alternative mixture having almost identical effects is the following :—

R	Tinct. Opii	℥v	Aq.	ad	℥j
	Sod. Bicarb.	gr. x			

Two tablespoonfuls every two hours for four doses, or until sleep
or profuse perspiration is produced.

A hot steam inhalation, made by adding 1 dr. of tincture of benzoin, or 1 dr. of a 10 per cent solution of menthol in spirit, to a pint of water at a temperature of about 130° F., will often alleviate the local discomfort. The patient should inhale the steam through the nose for five to six minutes, and the inhalation may be repeated three or four times a day provided the patient remains in a warm room. If confinement to one room is impossible, the best local application is a soothing ointment, such as plain lanolin or weak boracic ointment, containing 5 to 8 gr. of menthol to the ounce. A piece about the size of a pea is inserted up each side of the nose and well smeared over both nostrils. In addition to this treatment the patient's general health should be attended to. The diet should be light and nutritious, and a brisk purge should be given. If these directions can be followed out for two or three days, a cold can generally be cured. This is of importance in the very young, in the aged, and in weakly persons, and it is especially important in singers and other professional voice users. Solution of cocaine as sprays, or ointments containing cocaine, are frequently recommended as local applications in this stage, but their use should be absolutely forbidden. The constant use of cocaine is exceedingly pernicious, and it is at all times a dangerous drug to place in a patient's hands. Moreover, although the immediate local effects are increased comfort, the ultimate results on the nose are harmful. The use of adrenalin or other of the suprarenal extracts is equally pernicious.

In the *third stage*, when the sneezing and irritation have subsided, when the profuse watery discharge is lessening and becoming more sticky and muco-purulent, a simple alkaline nasal lotion such as the following should be prescribed, to be sniffed up the nose two or three times a day :—

R	Sod. Bicarb.		Sacch. alb.		gr. v
	Borac.		Aq.	ad	℥j
	Sod. Chlor.	āā gr. ij			

The use of the boracic ointment as above described may be continued. As the patient becomes convalescent, the best remedy is a change of air to the country or seaside, together with a suitable tonic. Cod-liver oil may be given to children, perchloride of iron and strychnine to adults.

PROPHYLAXIS.—Much may be done to prevent colds. Children who are particularly prone to nasal catarrh should be carefully examined with a view to the detection and removal of adenoids. In adults any chronic nasal affection

should be remedied, especially any cause of nasal obstruction, such as hypertrophy of the inferior turbinates, polypus, and thickening or deviation of the septum. General measures should also be adopted. The clothing should be warm and light, and wool should be worn next the skin. The healthy action of the skin should be promoted by a cold or tepid daily bath, followed by thorough drying and rubbing, or by an occasional Turkish bath. The patient should sleep with open window, should avoid cold draughts when overheated or tired, and should especially avoid hot, stuffy rooms. Ill-nourished children should be put on a fattening diet and cod-liver oil prescribed, and any departure from the normal general health must be corrected.

Fibrinous Rhinitis (Croupous or Membranous Rhinitis).—Whenever fibrinous rhinitis is suspected, the nasal secretion should be examined for the Klebs-Löffler bacillus, both by staining films of the discharge and by taking cultures. If the organisms be found, the patient should be isolated, and must not be allowed to associate with other children until by subsequent examinations it has been ascertained that the bacilli have disappeared. The child must be kept quiet, but is usually not sufficiently ill to be confined to bed. Plenty of good food, and a tonic such as Easton's syrup, should be prescribed. The nose should be frequently washed out with a weak solution of boric acid (10 gr. to the ounce), or with salt and water (1 dr. to the pint), to which Sanitas, an ounce to the pint, has been added. Weak boracic ointment or, better still, dilute nitrate of mercury ointment prepared according to the following formula, should be applied to the anterior parts of the nose with a brush:—

R	Ung. Hydrarg. Nitrat.	gr. xl	Parolein.	ad ℥j
	Ol. Amygd.	℥ss		

Under this treatment the child usually makes a complete recovery in three to six weeks. The disease is never followed by serious sequelæ such as paralysis, and never gives rise to diphtheria in others.

Attempts to remove the membrane should be avoided, as they cause bleeding and discomfort, and the membrane quickly re-forms. The use of antidiphtheritic serum has so far proved useless.

Chronic Rhinitis.—Both local and general treatment are necessary. The general treatment consists chiefly in the correction of any constitutional condition, such as anæmia, dyspepsia, or constipation.

The plethoric, gouty, or alcoholic patient must be carefully treated by regulation of the diet, restriction of alcohol, and regular exercise in the open air. Many men who lead a sedentary life without regular exercise, and eat and drink too much, are greatly benefited by undergoing an annual "cure" at a health resort, such as Carlsbad, Contrexéville, or Marienbad. If a visit of this kind is impossible, a morning dose of mistura alba or of some natural aperient water will be beneficial. An occasional Turkish bath is often useful. Late hours, overheated, ill-ventilated, crowded rooms, and other insanitary surroundings, should be avoided.

In the anæmic thin type of patient the diet should be nourishing and include plenty of fats. Cod-liver oil may be given if the patient can digest it; an iron and strychnine mixture often does good. The patient should live in well-ventilated rooms, take a fair amount of outdoor exercise, and wear suitable clothing. A cold morning bath is useful, provided it is followed by a healthy reaction. In all cases a change of air, especially to a dry, bracing place, is of the greatest benefit.

In old or delicate persons the question of change of climate must be considered. Although the affection is not serious in itself, it may be impossible to cure it if the patient remains in the ordinary English climate during the winter. It may

be necessary to send such patients to a health resort in the South of England, or to a warmer climate, such as Madeira.

The *Local Treatment* depends upon the local condition. If there is no gross abnormality in the nose, such as hypertrophy of the inferior turbinates, the affection will usually yield to simple local measures combined with suitable general treatment. The best is the regular use of an alkaline lotion to cleanse the nose. The lotion should be sniffed up the nose or introduced with a nasal irrigator. It should be used regularly at least twice a day. The following are examples of useful formulæ :—

R	Sod. Bicarb. Borac. Acid. Carbol.	gr. āā iij gr. j	Sacch. alb. Aq.	gr. v ad ℥j
R	Sod. Bicarb. Borac. Sod. Chlorid.	āā gr. ij	Sacch. alb. Aq.	gr. v ad ℥j
R	Glycerin. Borac. Sp. Rect.	āā ♏x	Aq.	ad ℥j
R	Sod. Bicarb. Borac. Sod. Benzoat.	āā gr. iv gr. $\frac{1}{6}$	Eucalyptol Menthol Aq.	♏$\frac{1}{12}$ gr. $\frac{1}{24}$ ad ℥j

It is convenient to prescribe these lotions four times the above strength and to direct the patient to add ½ oz. to 1½ oz. of warm water for use. The second and fourth prescriptions may be given in the form of compressed tablets, a great convenience to patients who travel. When one lotion fails another should be tried.

If this treatment fails, or succeeds only up to a certain point, an oily spray may be used. The following are two of the most useful formulæ :—

R	Menthol Ol. Eucalypt.	gr. v ♏xx	Ol. Amygd.	ad ℥j
R	Ung. Hydrarg. Nitrat. Ol. Amygd.	gr. xl ℥ss	Parolein.	ad ℥j

To be applied with a small camel's-hair brush or by means of an atomizer, twice daily after using the nasal lotion.

If these methods fail, more active measures must be adopted. In the first place, any cause of nasal obstruction, such as hypertrophy of the inferior turbinates, or deflection or thickening of the nasal septum, must be dealt with (*vide infra*). If the nasal passages are unduly narrow it may be necessary to remove portions of the inferior turbinates, even if these bodies are not hypertrophied, in order to make a free air-way through the nose. If the nasal obstruction depends mainly upon congestion of the inferior turbinates, the best treatment is the application of the galvano-cautery. Two or three applications may be necessary, as it is well to do very little each time. Local anæsthesia should be produced by packing pledgets of wool soaked in a 10 per cent solution of cocaine round the anterior half of one inferior turbinate. After ten or fifteen minutes the part will be found completely anæsthetic. The cautery point is then introduced into the nose, heated to a dull red-heat, and two or three horizontal lines drawn along the inferior turbinate from before backwards. Care must be taken to avoid burning the septum, and also to prevent the heated wire coming in contact with the skin of the vestibule. Injury to the septum is liable to lead to subsequent adhesions, whilst if the vestibule be burnt the pain is severe. Three or four days later the anterior half of the other inferior turbinate should be cauterized, and if it is necessary, after fourteen days, when these wounds have healed, the posterior ends of the turbinates should

be similarly dealt with. These little operations are followed by very slight reaction. The nostril should be lightly plugged with wool, and the patient should return home as quietly as possible and lie down for a few hours until the effects of the cocaine have completely passed off. For the next few days he may insert a small piece of the following ointment into the nose two or three times a day:—

℞ Menthol gr. vj | Lanolin. ℥j
Acid. Boric. gr. xx |

A piece the size of a pea may be inserted into each nostril with the finger, or the ointment may be warmed and sprayed into the nose with a De Vilbiss spray. As a rule this ointment alone is sufficient, but if there is much nasal secretion an alkaline lotion such as above described (*vide supra*) should also be used.

Linear superficial cauterization as above described is better than puncture with the cautery, inasmuch as it is followed by less reaction and by more shrinking. The latter method consists in plunging the red-hot cautery point deeply into the tissues of the inferior turbinate, without destroying more of the surface epithelium than is absolutely necessary. This is done to avoid the danger of adhesions, but if proper care be taken there is no risk with the ordinary method.

When the electric cautery is not at hand, the application of a chemical caustic may be tried. Caustics act very well, but it is a little more difficult to limit their action. The inferior turbinate is anæsthetized with cocaine as above described, and then chromic acid fused on a probe, or fuming nitric acid on a wooden or glass rod, is applied to it. Any excess of acid is immediately wiped away with wool mops. These applications produce very little pain and are followed by little reaction.

When the nasal passages are excessively narrow, it may be impossible to clear them sufficiently by these methods, and it is often impossible to cure a chronic catarrh without restoring free nasal respiration. Thus it may be necessary to remove portions of the inferior turbinates, and anterior turbinectomy, alone or combined with posterior turbinectomy, may be required. Enough tissue should be removed to restore free nasal breathing, but no more of the turbinate should be sacrificed than is absolutely necessary to attain this end; therefore complete turbinectomy should never be attempted. For the methods of performing these operations see HYPERTROPHIC RHINITIS, *infra*.

To sum up, the treatment of chronic catarrhal rhinitis consists in the use of simple lotions and oily sprays, and when these are unsuccessful in the application of the galvano-cautery. Free nasal respiration must be restored by the removal of any deflection or thickening of the nasal septum, of hypertrophy of the inferior turbinate, of adenoids, or of any other cause of nasal obstruction, and even, in cases of undue narrowness of the nasal passages, by the removal of portions of normal turbinates. At the same time appropriate general treatment must be carried out, and in some few cases, especially in old and delicate patients, or in those suffering from some dyscrasia, climatic treatment is absolutely necessary to obtain a cure.

Hypertrophic Rhinitis.—Hyperplasia of the inferior turbinates is usually associated with, and is merely an advanced stage of, chronic catarrhal rhinitis. If there is not too much hyperplasia, the treatment should be carried out on exactly the same lines as for chronic rhinitis. Simple cleansing lotions should be prescribed, and it will usually be necessary to reduce the enlarged turbinates with the galvano-cautery (see CHRONIC RHINITIS, *supra*). If this treatment fail, if the hyperplasia be excessive, or if the nose be unduly narrow, more active surgical measures must be adopted. If the anterior ends of the inferior turbinates are in contact with the septum, and if this enlargement does not disappear under

the application of cocaine, anterior turbinectomy should be performed. If the posterior ends of the turbinates are hypertrophied, they should be removed with the snare. If the whole of the inferior turbinate be markedly hypertrophied, complete turbinectomy may very rarely be necessary, but as a rule combined posterior and anterior turbinectomy is sufficient. Small portions of the middle parts of the turbinates may be removed with the snare when necessary. The fact must be again emphasized that no more of the turbinate should be removed than is necessary to restore free nasal respiration. These operations may be briefly described.

Anterior Turbinectomy may be carried out under local anæsthesia, or under nitrous oxide gas alone or followed by ether. In some cases it may suffice to remove portions of the anterior end of the turbinate with punch forceps or scissors, or it may be possible to snare off a large portion with a strong wire snare. When it is wished to remove a considerable piece of bone, as is necessary when the nose is unduly narrow, the following method will be found the most convenient.

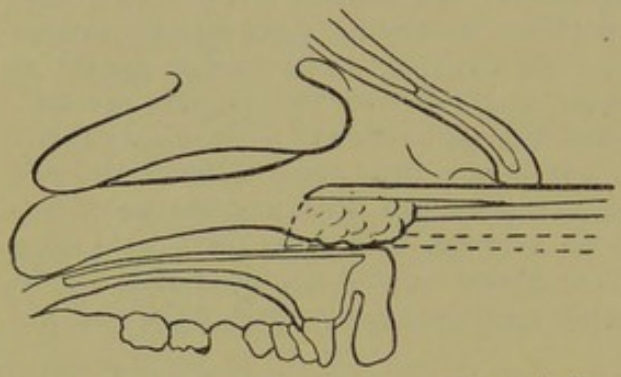


Fig. 39.—Anterior Turbinectomy. The plain lines show the blades of the scissors, the dotted lines the barrel of the snare and the wire loop.

With nasal scissors or shears, or with strong cutting forceps such as Mahu's, the attachment of the inferior turbinate is divided from the outer wall of the nose. The wire of a stout snare is quickly slipped into the notch thus made, and the anterior end of the turbinate cut through (see *Fig.* 39). As a rule this operation is followed by little bleeding, which soon ceases. The after-treatment consists in keeping the nose clean with a simple alkaline, or with weak boric acid lotion, and in applying an ointment such as the menthol and boracic ointment (*vide* CHRONIC RHINITIS).

Posterior Turbinectomy.—In removing the posterior ends of the inferior turbinates it is best to use the cold wire snare. The snare is introduced through the anterior nares, and the wire loop is guided by sight over the posterior end of the turbinate, or held in position with the tip of the left forefinger introduced through the mouth. With the former method local anæsthesia is sufficient. The inferior meatus is packed with pledgets of wool soaked in a 10 per cent solution of cocaine and suprarenal extract. These are left in position for about half an hour, so as to obtain the maximum shrinkage of the mucous membrane. It is now usually possible to see the posterior end of the turbinate by anterior rhinoscopy. The wire loop of the snare is passed down the inferior meatus and adjusted over the posterior end of the turbinate, partly by sight and partly by feel. A strong snare with a fairly thick wire is necessary, as the tissues are often tough. It is convenient to give the loop a double twist, so that as the wire is tightened up it curves over towards the part to be removed, and thus prevents the tendency to slip off. This double twist is effected by protruding a small loop of wire from the snare and bending it sharply over in the direction in which it is desired that it should subsequently curl. Another quarter of an

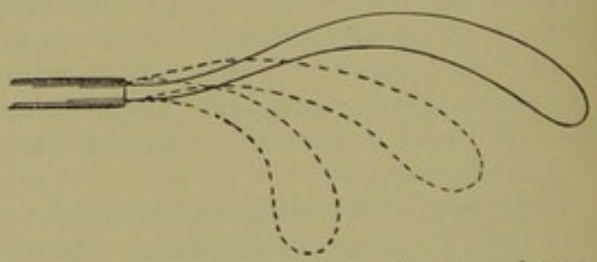


Fig. 40.—Method of shaping wire loop of snare. The plain line shows the wire loop as introduced into the nose, the dotted lines the positions it successively assumes as it is tightened.

inch of the loop is then protruded from the snare, and the loop bent sharply back so as to lie in a line with the barrel (see *Fig.* 40). When in position the wire loop should be quickly tightened so as to obtain a firm hold of the part, and then slowly pulled home so that the cutting may be done slowly and the vessels obliterated as they are divided. In this way there will be very little bleeding. The after-treatment consists in cleansing the nose two or three times daily with a weak antiseptic lotion, such as boracic acid solution. For the first twenty-four hours all food should be given cold, and the patient should remain quiet, and especially abstain from violent efforts to blow the nose, for fear of re-starting the bleeding.

If it is impossible to perform the operation in this way, or if for any other reason, e.g., for the removal of adenoids, a general anæsthetic is given, the operation may be carried out in a similar way with the snare ; but the wire loop is guided over the posterior end of the turbinate and held in position by the tip of the left index finger, which is introduced through the post-nasal space (see *Fig.* 41). This method cannot be carried out under local anæsthesia owing to the great discomfort caused by the finger.

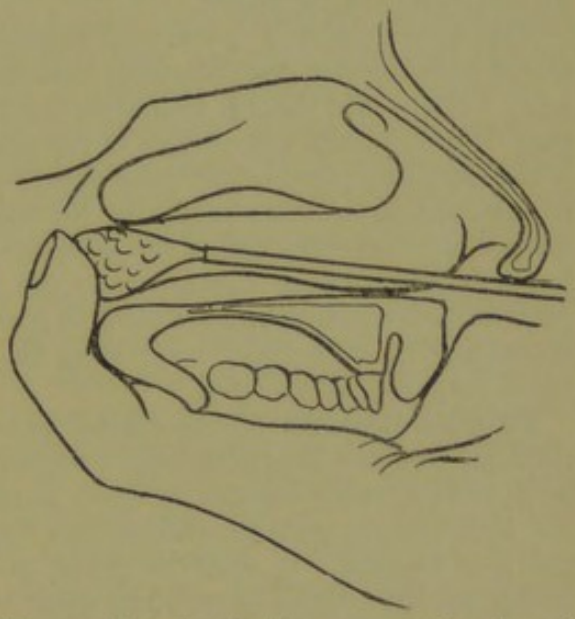


Fig. 41.—Posterior Turbinectomy. Wire loop of snare held in position by left forefinger.

Total Turbinectomy.—This operation is very rarely required. The inferior meatus is much more roomy in the centre than at either extremity, and therefore it is usually possible to restore free nasal respiration by removing only the anterior and posterior ends of the turbinates. In rare cases of extreme turbinal hypertrophy or of unduly narrow noses, and in a few other rare conditions, it may be necessary to remove a slice from the whole length of the turbinate. This may sometimes be accomplished by removing successive pieces with the snare, or the free inferior border of the turbinate may be clipped away with a pair of nasal scissors. If these methods fail or seem impracticable, the spokeshave may be used. The operation is not altogether free from danger. The bleeding at the time is profuse, but usually soon ceases ; secondary hæmorrhage may occur, and has even proved fatal. Further, it is impossible to gauge accurately the amount of tissue that will be removed ; one is very apt to remove too much, and the patient may subsequently suffer from a dry condition of the nose and throat. The operation should be performed under general anæsthesia, but nitrous oxide gas is usually sufficient if only one turbinate is to be removed. The spokeshave is passed back through the anterior nares with the convex part of the blade outwards. It is guided over the end of the turbinate either by sight or by the finger passed through the post-nasal space, and then sharply hooked forward, when the turbinate is easily brought away. The after-treatment is the same as for posterior turbinectomy.

Rhinitis Sicca.—Rhinitis sicca occurs in two distinct conditions : (1) It may depend upon anæmia (local and general), which in turn is usually associated with indigestion and constipation. In this case the nasal mucous membrane is pale, shrunken, and dry. (2) It occurs in plethoric, gouty, or alcoholic individuals, in whom the mucous membranes will usually be found red, congested, and dry,

In the first type the general treatment consists in regulating the bowels, in correcting any dyspepsia, and in the administration of a plentiful nutritious diet, with plenty of fresh air and gentle exercise. Later, tonics, such as iron, are useful. In the second type the patient's diet should be regulated, alcohol strictly limited, and outdoor exercises encouraged. Such patients will be all the better for a daily morning dose of Epsom salts or of some natural aperient water. A regular course of aperient waters at a health resort, such as Carlsbad, is usually beneficial.

The local treatment must also be attended to. The chief indications are to cleanse the nose and to prevent the formation of crusts. The nose should be washed out with a lotion two or three times daily. A good lotion is the alkaline lotion (see CHRONIC RHINITIS) which after a time may be modified by substituting chloride of sodium or chloride of ammonium (5 gr. of either to the ounce) for the carbolic acid. To prevent the formation of crusts the washing should be followed by spraying the nose with oil. The two most useful prescriptions are given under CHRONIC RHINITIS, *supra*.

Sometimes it will be found more efficacious to use plain lanolin ; a piece about the size of a pea should be inserted into each nostril twice or three times a day. There is a special tendency for the crusts to collect on the most anterior part of the mucous membrane of the septum. They often cause much irritation, which leads to picking the nose or to violent efforts to detach them. This leads to excoriation and ulceration of the mucous membrane, repeated epistaxis, and ultimately to perforation of the septum. This condition must be met by energetic application of oil or ointment to the anterior part of the septum, and if the patient's occupation entails work in a very dusty atmosphere it may be necessary to change it, or he may wear wool in the affected nostril and breathe through his mouth whilst at work.

Atrophic Rhinitis.—This disease generally begins in childhood as a purulent rhinitis, but the characteristic symptoms—the crusty discharge and the fœtid breath—are more usually delayed until adolescence. As the atrophic changes are progressive, prompt recognition and early treatment are essential to obtain the best results. It must be borne in mind that the crusts and the stench are *secondary* symptoms, depending upon the fact that the discharge is retained in the nose for a long period.

The muco-purulent nasal discharge, sometimes in part derived from one or more of the accessory sinuses, tends to collect in the nose because :—(1) It is unduly tenacious owing to atrophy of the secreting glands and diminished watery secretion ; (2) The abnormal width of the nasal passages impairs the power of blowing the nose ; and (3) The ciliated epithelium is replaced by squamous cells. The discharge retained in the nose, exposed to the passage of the respiratory air, loses water by evaporation and dries into crusts, and the germs in the air are deposited in the crusts, develop, and cause decomposition of the discharge, with the resultant fœtid odour of the breath. Further, the products of decomposition are irritants and set up fresh discharge. These pathological conditions explain the *rationale* of successful treatment and the intractable nature of the affection.

The aim of the treatment is to cleanse the nose and to prevent the formation of crusts. The first object is accomplished by syringing, and the second by packing the nose. If air be excluded, the discharge cannot dry into the tenacious crusts which are so difficult to remove, but remains fluid and is easily washed away. Also, the discharge as it first forms is without odour, and if its retention in the nose be prevented, the fœtor of the breath is at once removed.

The nose must be syringed regularly with a mild antiseptic lotion. A solution of ordinary salt, a teaspoonful to the pint, to which a little sanitas or perman-

ganate of potash is added, a weak boric acid lotion, or any of the mild alkaline lotions (see CHRONIC RHINITIS) may be used. Strong lotions should never be employed. The nose should be syringed; sniffing up is useless, and the nasal douche is not really so effective as the syringing, whilst it is more dangerous. Higginson's syringe is the most convenient for the patient's own use. About a pint of fluid should be used each time, and injected in various directions until the nose is absolutely clean. It is advisable for the doctor himself to do the first syringing, and he should always supervise it until he has properly instructed the patient. After syringing, the interior of the nose should be inspected, and any remaining crusts should be detached by directing a stream of water directly on to them, or, better still, by gently detaching them with a mop of cotton wool dipped in a solution of peroxide of hydrogen. When the nose has been thoroughly cleansed, it should be lightly packed with a strip of cyanide gauze about one inch broad and nine to twelve inches long. This prevents the patient breathing through the nose, and also, by setting up a certain amount of irritation, renders the nasal discharge more watery. The packing should be worn day and night, and changed only when the nose is syringed. The patient soon becomes tolerant, but at first the packing may cause considerable discomfort or headache, and may interfere with sleep. At first, also, when the discharge is profuse, it may be necessary to renew the packing two or three times a day. If the packing causes much pain, or if it sticks and causes bleeding on removal, plain sterilized gauze should be used, and should be soaked in oil or ointment, such as the dilute nitrate of mercury or weak boric acid ointment.

The nose should be syringed and packed at least twice daily until the discharge has apparently ceased. After three or six months, as the case may be, the packing should be omitted, at first for a few hours a day, and gradually increasing the time until it is omitted all day and worn only at night. Many patients, however, prefer to continue the packing owing to the great relief it gives them, and such patients may be instructed to pack the inferior meatus only and to leave the middle meatus clear for breathing purposes. When it has been found that the packing may be safely omitted without the return of the worst symptoms, it may be left off altogether, but the daily syringing must be continued. As already pointed out, the nasal passages are unduly wide and are lined by squamous epithelium which possesses no cilia. The nose, therefore, is no longer a self-cleansing apparatus, and any dust or dirt in the air, mixed with dry nasal secretion, collects in the nose and forms small dry mucous crusts all over the mucous membrane. If the patient takes a severe cold, there is apt to be a partial return of the symptoms. It will therefore probably be necessary for the patient to syringe his nose regularly every morning for the rest of his life. At this stage of the disease the patient may also find benefit by spraying the nose with liquefied vaselin or lanolin, or with one of the oils prescribed for the treatment of RHINITIS SICCA *supra*. It is only in the very early cases, when but slight atrophy has occurred, that the patient can recover sufficiently to be able to abandon all treatment.

In addition to local treatment, the general health must be carefully attended to and the patient's nutrition maintained. The majority of patients are, under the circumstances, in surprisingly good health, but any tendency to anæmia should be corrected. In a proportion of cases, variably estimated at from 10 to 20 per cent, complications, such as suppuration in one of the nasal accessory sinuses, are present. The sinuses most frequently affected are the antrum and the sphenoidal sinus. These complications must be carefully sought for and appropriately treated (see NOSE, ACCESSORY SINUSES OF). The method of packing the nose as above described greatly facilitates the diagnosis of these complications.

Numerous other methods of treatment have been from time to time recommended and abandoned, but some may still serve a useful purpose. Massage of the mucous membrane by rubbing it lightly with small pledgets of wool wrapped on a probe has been recommended as a restorative of the nasal mucous membrane. It undoubtedly causes increased vascularity and discharge at the time, and although it cannot restore the atrophied mucous membrane, it is a useful help in thoroughly cleansing the nose, especially if the wool is soaked in peroxide of hydrogen.

Attempts have been made to restore the atrophied turbinates by submucous injections of melted paraffin wax. The posterior part of the turbinate should be first injected, then the anterior part, and finally a little paraffin may also be inserted into the septum. The technique is the same as for the subcutaneous injections of paraffin, but the paraffin should have a melting point of 105° F. Local anæsthesia suffices. When a fair-sized turbinate is present, the injections are easy, but when the turbinate is represented by a thin ridge along the outer wall of the nose, they may be almost impossible. In the former case, the inferior turbinates may be filled out to resume their proper proportions in the nose, and although it is impossible for the important functions of these bodies to be restored, it is certain that some patients experience much benefit, probably owing to the diminished width of the nasal passages. In cases of extreme atrophy it is impossible to inject sufficient paraffin to produce any beneficial results.

Other methods of treatment may be briefly dismissed as useless and often harmful. Cupric electrolysis and the application of the constant or interrupted electric current are quite useless. The application of the electric cautery, of caustics, or of blisters, or the curettement of various spots to which crusts appear to adhere, can only be productive of harm. Gottstein's method of introducing a large plug of wool into the nose, and Macdonald's method of partially obstructing the nasal passages and insisting upon nasal breathing so as to produce a diminished air tension behind the seat of the obstruction, and thus to produce flushing of the nasal mucous membrane, are both useless, as it is impossible to get patients to carry them out.

Rhinitis Caseosa.—In this affection a large mass of semi-solid material looking like putty is found in one nostril, usually surrounded by swollen mucous membrane and œdematous granulations. The treatment consists in clearing the nose. Cocaine and suprarenal extract should be applied to anæsthetize, and to reduce the swelling of, the mucous membrane, and then the putty-like mass should be broken up and removed, partly by blunt hooks and scoops, and partly by syringing the fragments away with mild antiseptic lotions, such as a solution of boracic acid or of sanitas and salt. When the nose has been cleared, which may require two or more sittings, the granulations will usually subside without further treatment. Sometimes the disease involves the accessory sinuses, especially the antrum. Extensive operations are generally required in these cases, as the sinus is usually filled with material similar to that found in the nose, and its walls are often carious. Sometimes extensive necrosis may be present in the nose, and a general anæsthetic will be required to deal with it thoroughly; or a foreign body will be found and must be removed.

H. Lambert Lack

RHINOLITHS.—(See Nose, Foreign Bodies in.)

RICKETS.—The prevention of rickets depends on the maintenance of the mother's health during pregnancy, and on the provision of proper hygienic conditions, and of suitable diet, for the child.

The therapeutic indications to be observed in the case of a child who has rickets may be summed up as follows: (1) He must have more fresh air and

sunshine; (2) His digestion must be attended to; (3) His diet regulated; (4) Certain tonic measures must be used; (5) Severe symptoms or complications present are to be treated; and (6) Means are to be taken to prevent or relieve bony and other deformities.

1. **Fresh Air and Sunshine.**—The child should be taken out of doors twice daily at least, and for as long as possible. In the case of the poor it is often a good plan to have the baby left in the open air in his perambulator for the greater part of the day, provided the weather be at all suitable. He must, of course, be very warmly clad, because a rickety infant, owing to his excessive sweating and general debility, is particularly liable to chills. If he cannot be taken out, the window should be kept widely open, night and day, and he should be kept in the sunniest room available. When the parents' circumstances permit of it, a stay at the seaside may be very beneficial.

2. **The Digestion.**—Before making any great change in the diet, or giving tonics, it is advisable to consider the state of the digestion, and, if this is defective, to take means to improve it. A short course of soda, with rhubarb or with nux vomica and gentian—

℞	Pulv. Rhei	gr. j	Syr. Zingiber.	℥iij
	Sod. Bicarb.	gr. ij	Aq. Menth. Pip.	ad ʒj
	Ammon. Carb.	gr. ½		

M. Thrice daily half-an-hour before food.

℞	Sod. Bicarb.	gr. iii	Inf. Gent. Co.	ʒj
	Tinct. Nucis Vom.	℥j		

M. Thrice daily half-an-hour before food.

will often so strengthen the digestive powers as greatly to enhance the efficiency of the dietetic treatment. A few doses of grey powder will sometimes be found to facilitate considerably the digestion of the increased fat in the food. Should diarrhœa and vomiting be present, it is of course important to stop them before beginning to give cod-liver oil or otherwise to increase the fat.

3. **The Diet.**—In all cases, the feeding of the child must be carefully regulated. It is important to see that his meals are reasonable in amount and digestibility, and are given at suitable intervals. The main thing, however, is to ensure that they contain an adequate proportion of fat and proteid in such forms as to be easily assimilated.

Should the patient be a young baby on the bottle, a wet-nurse's milk is the ideal treatment for him. Short of this, however, careful modification of cow's milk, so as to make it resemble human milk as nearly as possible, is often very successful. When the child is unable to digest the casein of cow's milk sufficiently for the necessities of his nutrition, the addition of raw meat-juice to the bottle is often serviceable.

In the case of children during the second year of life, the first point generally is to see that sufficient milk is being given. Mothers, who are otherwise sensible, will often be found giving their infants less than half a pint of milk in twenty-four hours, instead of 1½ or 2 pints, as they should. It is also important to see that the child is not having a large excess of bread, potatoes, and other starchy foods, and that his digestion is not being upset by frequent mouthfuls of "whatever is going." Oatflour or well-boiled oatmeal porridge, or some such preparation as Chapman's wheat flour, should be given in preference to arrowroot and cornflour, and a little cream should be given with them. Yolk of egg—providing as it does both proteid, fat, and organic combination of phosphorus, is almost always good for the child. The regular administration of cod-liver oil in moderate doses is advisable in most cases.

4. **Tonic Measures.**—Cod-liver oil often seems to act as a tonic as well as a

food. The value of alkaline tonics in improving the digestion has already been referred to. Iron is occasionally very useful if anæmia be present.

℞	Magnes. Sulph.	gr. v	Syr. Zingiber.	℥ij
	Acid. Sulph. dil.	℥j	Aq. Menth. Pip.	ad ʒj
	Ferri Sulph.	gr. ¼		

M. Thrice daily after food.

℞	Ferri et Ammon. Cit.		Aq. Menth. Pip.	ʒj
	Pot. Citrat.	āā gr. ij		

M. Thrice daily after food.

℞	Ferri Redacti	gr. j	Sacch. Alb.	q. s.

Ft. pulv. Thrice daily after food.

Often, however, this only upsets the digestion, and generally it is unnecessary, because the condition of the blood rapidly improves as the rickets passes off.

Uncombined phosphorus has been strongly recommended as a sort of specific for rickets by Jacobi and Kassowitz. Although others have found it less useful, it is certainly sometimes of considerable advantage, if given with care not to disturb the digestion. It is usually administered dissolved in cod-liver oil, and it may be given in doses of $\frac{1}{200}$ gr. thrice daily after food.

℞	Phosphor.	gr. ½	Ol. Morrhuæ	ʒiij

A teaspoonful thrice daily after food.

℞	Phosphor.	gr. $\frac{1}{12}$	Sacch. Alb.	ʒiv
	Ol. Amygd.	ʒj	Aq. Destill.	ʒiss
	Gumm. Acac.	ʒiv		

A teaspoonful thrice daily after food.

Phosphorus combined in the form of mineral phosphates has long been known to be of no value—these salts being passed unchanged in the motions.

Cold douching does a great deal of good in most cases of rickets. Salt water is to be preferred to fresh; and the douche may have a temperature of 70°–75° F. to begin with. The child should be seated in warm water at the time of its administration, and it should be very rapidly and carefully given. Cold douching is specially indicated in cases where there is great muscular feebleness, and where there are any nervous symptoms (facial irritability, laryngismus, tetany, convulsions). It has a strongly tonic effect on the circulatory and nervous systems. The frequent use of cold water in this way has the great advantage that it renders the child much less susceptible to cold, and thus enables him to be more freely exposed to the open air without taking chills.

5. **Symptoms and Complications.**—It is always to be remembered with regard to the symptoms and complications of rickets, that their main treatment is that of the diathetic condition, and that the local treatment is only of secondary importance. Thus, we find that profuse sweating, laryngismus and convulsions, sleeplessness and restlessness, digestive disturbances, loss of appetite, constipation, and bronchial catarrh are generally all rapidly and permanently improved when thorough antirachitic treatment is carried out, even if no special measures are taken.

It is often, however, desirable to make use of local treatment also. If the sweating is severe, it may sometimes be benefited by oxide of zinc (1–2 gr.). When laryngismus and convulsions recur, antipyrine (1–2 gr. according to age) or bromide of potash may be very useful; and in these cases it is generally well to use cold douching twice a day, as its effect is very markedly beneficial. The ordinary treatment of digestive and respiratory disorders should, of course, not be neglected.

6. **Prevention and Relief of Deformities.**—We have to remember that, while

rickets softens the bones and the ligaments, it does not bend and stretch them. That is done by mechanical forces acting in various directions on the softened parts. While, therefore, we are trying to arrest the rickety processes which are softening the bones, we must not forget to prevent, as far as possible, all postures and actions on the child's part which tend to produce deformities.

The child must not be allowed to sit up for long, for fear of the development of kyphosis. If he is very rickety, he had better, at first, be kept lying on a pillow, and not allowed to sit up at all. His nurse must not carry him always on one arm, lest he develop scoliosis ; and any tendency to assume undesirable attitudes habitually must be checked.

It is, of course, very important to prevent the patient's attempting to stand or walk while the bones are still soft. Returning health is apt to bring with it a desire for more active exercise than can be safely allowed ; and, if care be not taken, bow-legs, knock-knee, and flat-foot result. The application of lateral wooden splints, reaching from the thigh to four inches below the sole, is very useful, because these entirely prevent the child's standing. No form of steel or other apparatus, which permits the child to walk about, is of any value in preventing the bending of the limbs.

Rickety deformities of the thorax have a striking tendency to lessen as the child grows older and stronger ; and this improvement can be very much increased by the persevering use of dumb-bells, and by various other exercises of the arms and trunk. (See also INFANT FEEDING.) *John Thomson.*

RINGWORM.—Ringworm may be treated from various standpoints. One may aim at the direct destruction of the fungus by the application of antiseptics, which, indeed, is the method commonly used ; and the usual prolonged duration of the disease testifies to its inefficiency. But although it does not cure the disease, or at all events does not do so rapidly, it at least has the merit of preventing its spread, and one may describe first how this treatment should be carried out, when once it is determined on.

The hair should be cut quite short, so that the patches may be identified. It is probably not necessary to shave the head, but if the patches are few in number it is a good plan to clear a little ring round each with epilating forceps. The head should be washed daily, and an antiseptic ointment applied twice a day. It does not matter much what the antiseptic is : it is the method of application which counts. Sulphur, various mercurial or copper salts, resorcin, and other preparations, all have their advocates. But the important matter with all is that they should be thoroughly rubbed in. The mother or nurse should be instructed to spend twenty minutes over each spot, working the ointment thoroughly into the scalp with the thumb.

The next method of treatment is that which is often unintentionally carried out, and which may be called the indirect method, as it consists in applying to the affected part something which will produce a reaction, and thus bring about destruction or elimination of the fungus from within. The popular iodine, and the (with the patients) unpopular blistering fluid, are the more characteristic examples of this method ; but many so-called antiseptic ointments really act as counter-irritants. If the disease be recent, this method is often successful, but it has the disadvantage that one is unable to follow, under the resulting scab, the progress of the affection.

The third method is that of *epilation*. Dermatologists have long recognized that this was the ideal, but the erosion of the hairs by the fungus made it impossible, even for the most skilful, to remove by the roots more than a small percentage of the diseased hairs. In the depilatory action of the X rays, many hoped to have found a solution of the difficulty, and numerous efforts were made,

which mainly resulted in the removal of the healthy surrounding hair, the diseased ones remaining in the follicles. It was left for the ingenuity of Sabouraud to point out that all that was required was a little longer exposure to the rays, and now, in skilled hands, the X-ray treatment is likely to take precedence over all others, since it has reduced the average duration of treatment to about one-eighth of its former length.

This is not the place to give the details of the operation. It is one which should never be undertaken by unskilled persons; indeed, of the many diseases in which X rays are used, it is probably the one in which experience is most essential. The disappointment when the hair does not come out, and the regrets when the reaction produced is too severe, are serious troubles to the beginner, and it is impossible to lay down hard and fast rules applicable to all the varying mechanisms by which X rays are produced, and even then, the factor of the tube remains probably the most important of all. As a general rule it may be said that an exposure of twenty minutes, at a given distance, which varies with different tubes, should be followed, in from two to three weeks, by a complete loss of hair. If the application has not been quite long enough, the healthy hairs will fall out, and the diseased stumps remain, ready to infect the new growth when it appears some six weeks later. These stumps are loose, and much may be done by the application of a comedo extractor, or even by vigorous scrubbing, to remove them, but if they are left alone, the whole labour has been in vain, and the patient is no better off.

In successful cases, when the hair has fallen, antiseptics should be vigorously applied to the bald scalp. The rays have no effect on the fungus, and it is almost certain that some spores remain in the follicles. These, however, are not only empty but open, and ointments well rubbed in have every chance of reaching and destroying the remaining spores.

When one considers the serious interference with education, and with family life, caused by the occurrence of a case of ringworm in a large family, perhaps the advice will be appreciated that it is more important to treat those children who are unaffected than the one who is. In such cases, all the boys in the family should have their hair cut weekly with clippers, and washed daily with an antiseptic soap. Such advice would probably not be favourably received in the case of the girls, but at least daily washing should be insisted upon, and the utmost rigour of separation from the infected member. *Norman Walker.*

RODENT ULCER.—The treatment varies with the stage of development and extent of the disease, and also with its position. It will be convenient to consider three groups of cases.

1. In its earliest stage the rodent ulcer is a small, solid, pinkish tumour. It sometimes starts in a mole, and its commonest sites are the outer and inner canthi, the side of the nose and the alæ, and the cheek and ear. It is important that the nature of the tumour be recognized early, for it is often regarded as a wart, and allowed to develop, or, perhaps, is perfunctorily touched with caustic. If any doubt exist as to the exact nature of any wart-like tumour, especially in an elderly person, it should be treated as if it were malignant.

Complete removal with the knife gives excellent results. Care must be taken that the whole growth is excised, or recurrence is inevitable. The incisions should, therefore, include a margin of healthy skin. After excision, a series of short exposures to the X rays is useful to prevent recurrence. Even in this, the earliest stage, it may be impossible to remove the growth completely, because of its position. This is especially the case when the canthi and eyelids are affected. The removal of a small rodent growth from an eyelid is attended with great deformity; such deformity should be avoided, if possible, not only

for cosmetic reasons, but also on account of the secondary eye troubles which result from ectropion, etc. In such cases I have found the application of radium very useful. Small glass tubes or a specially constructed apparatus may be used. I place small tubes containing 5 mgrams of radium bromide in contact with the tumour for half an hour, care being taken to protect the conjunctiva and adjacent healthy skin by small pieces of sheet lead. An inflammatory reaction is set up, and this may be sufficient to destroy the tumour. A second and third application may be necessary. It is important to remember that the reaction set up by the radium may not appear for from fourteen to eighteen days after the sitting, so that there should be an interval of at least three weeks between two applications.

Small rodent tumours which cannot be excised, can also be successfully treated by paring down the growth with the knife or curette (under anæsthesia) and then applying the X rays in the manner described in the following paragraph. If this preliminary curetting be impracticable, the X rays must be used alone, but a larger dose is required.

2. The commonest stage in which advice is sought is that in which there is an ulcer with a raised beaded margin. If small, and in a suitable position, such an ulcer should be excised together with the margin and some healthy skin, and the X rays applied to prevent recurrence. But if there be the slightest doubt as to the possibility of complete removal, I strongly advise that surgical interference be limited to paring away the margin by the knife or curette, and that all further treatment be by the X rays. This preliminary curetting removes the mass of the growth and the intact epidermis over it; in fact, converts the whole into an ulcer and thereby considerably shortens the ray treatment. Some cases require only two or three sittings, provided sufficient doses are given. Each worker must estimate the output of X rays from his own apparatus. This is conveniently done by the Sabouraud pastille, originally introduced for the treatment of ringworm. Placed midway between the area under treatment and the anode of the focus tube, the pastille, which is coated with platinocyanide of barium, changes from a yellow to a particular orange colour (Tint B) when a dose of X rays has been given sufficient to remove the hair from the scalp without producing an erythema. The pastille must be examined without exposure to light, or it will return to its original colour. With a 15-inch coil, worked with a current of 60 volts and 4 to 5 ampères in the primary, and 0·7 milliampère in the secondary circuit, a spark gap of about 15 cms., a tube with a penetration corresponding to No. 7 on the Benoist scale, and the area under treatment 15 cms. from the anode, I can get this result with great regularity in 14 minutes, with a dipper interrupter making 600 interruptions per minute. I find that this is a full dose for a rodent ulcer, and under ordinary circumstances, an exposure of ten minutes is sufficient. Where the parts are thin and delicate, a still smaller dose is given. At the end of a fortnight there is usually a slight reaction, and when this has subsided a second dose may be required, and at the end of another fortnight a third. With smaller coils proportionally longer exposures are necessary, but with a little experience it is easy to regulate the conditions to get the required result. I find it more satisfactory to give the larger doses at longer intervals, than the frequent small doses which were formerly the rule. During the application, the parts free from disease are protected with sheet lead, or the whole focus tube is enclosed in a special shield of lead glass. The shield has an aperture opposite the anode, and to the margin of this aperture are attached short lead glass tubes of various calibres adapted to ulcers of different sizes. The advantage of this apparatus is that the part under treatment is kept at a constant distance from the anode, and also that the rest of the patient's body, and the operator, are completely

protected from the rays. After each treatment, the part is covered with lint or butter muslin spread with a simple ointment, hazeline ointment being very convenient. When the healing is complete, a beautiful, soft, supple scar is left. From time to time resistant cases are met with, and the application of the rays may have to be repeated again and again, but with the conditions above mentioned, it is rarely necessary to give sittings at shorter intervals than a fortnight.

If the edge be not removed by the curette, larger doses of X rays will be necessary; and when there is a massive edge with much infiltration, I have had to give sittings of double the duration mentioned. In these cases we must set up a definite inflammatory reaction. With deep infiltration a more penetrative tube, No. 8, 9, or even 10, on Benoist's scale, may be required.

3. Lastly, we meet with rodent ulcers of long duration, in which bone and cartilage have been exposed and cavities opened. Here a complete cure is usually impossible, but the X rays are particularly valuable. Pain is relieved, ulcerated areas clean remarkably, and large cavities often fill up. Some of the most unpromising cases do remarkably well. Bare bone, of course, cannot be covered, and here surgical interference may be required.

Some of the worst cases are those in which the orbit is involved. In these, an early clearing out of the cavity is advisable. It should be followed by X-ray treatment, special attention being paid to indurated edges. When the cavity is foul, antiseptic lotions must be used, and I have found lysol (1 drachm to a pint of water) and a 10 volume solution of peroxide of hydrogen valuable.

Recurrence after X-ray treatment is not uncommon, but in many cases it is due to insufficient dosage, and to leaving small portions of the infiltrated margin untreated. The edge is always the most resistant part, and, unless dealt with in the manner described, usually gives trouble. Up to the present I have found recurrence in 35 per cent of my cases, but many of these were of very long standing. Small recurrences are usually dealt with easily by fresh X-ray treatment. Some patients have been quite well for five years. *James H. Sequeira.*

ROSACEA.—A very large number of the cases of this disease are consequent on seborrhœa of the scalp, and the treatment for that disease is followed, in such cases, by rapid improvement.

Local applications hasten the disappearance of the eruption; of these, sulphur and calamine lotion is often useful. The glycerin, which is so commonly added to such applications, is often irritating, and may with advantage be omitted.

Although one is convinced that the relationship of indigestion to this condition is greatly exaggerated, still there is no doubt that digestive disturbances do aggravate it; therefore, if these are present they should be appropriately treated.

Quite recently Sabouraud has recommended the practice of vegetarianism, and one's comparatively brief experience of this is certainly encouraging.

In cases where there is much thickening, more active measures must be resorted to. The resorcin peeling method, which consists in the application of a 50 per cent resorcin paste, may be tried, while in those cases where hypertrophic changes lead to the disfiguring condition known as rhinophyma, or "potato nose," surgical measures are necessary. These are, however, exceedingly simple, all that is required being the peeling down of the nose to any required shape. The raw surface left skins over in a remarkably short time. *Norman Walker.*

ROUND WORMS.—(See INTESTINAL PARASITES.)

SALIVARY CALCULI are not uncommon in Wharton's duct, and are usually found near the orifice. They cause enlargement of the submaxillary gland, most pronounced on mastication. The stone can be readily detected by the finger in the floor of the mouth, and may be easily removed by cutting down on it under cocaine anæsthesia.

If the stone has remained in the duct for a long time, the surrounding parts may become so much thickened as to simulate a tumour. Sometimes suppuration occurs, leaving a sinus or ulcer in the floor of the mouth which may be mistaken for an epithelioma. The stone may be situated far back in the duct, and can then only be detected by getting it between a finger introduced into the mouth and a couple of fingers beneath the jaw. If a fine probe can be introduced into the duct it may grate against the stone. In these difficult cases it is best to give a general anæsthetic and explore the parts thoroughly by finger and probe. The tongue is pulled forcibly to the opposite side, and the stone fixed by finger against the jaw whilst it is cut down upon and squeezed out.

Calculi may occur in the substance of the submaxillary gland. They are then not usually diagnosed until the gland is cut down upon. The best treatment is to remove the salivary gland by an external operation. *Edmund W. Roughton.*

SALIVARY GLANDS, AFFECTIONS OF.

Salivation, or Ptyalism, most frequently results from excessive mercurialism, mercury in even minute doses, owing to an idiosyncrasy, sometimes producing this effect in certain cases. It is also known to be produced by drugs, such as iodine, potassium iodide, antimony, jaborandi and its alkaloid pilocarpine, tobacco, physostigmine, ipecacuanha, etc.

The free salivation associated with certain gastro-intestinal disorders, e.g., in pyrosis or water-brash, and in atonic dyspepsia occurring in those of nervous temperament, should also be remembered. Salivation has been observed in pregnancy, during menstrual disturbances, and in certain abnormal conditions of the nose.

TREATMENT.—Removal of the exciting condition, drug, etc., when possible, and in the case of mercury, the use of a chlorate of potash mouth-wash for the spongy gums, with good nourishment, will generally effect a cure. Prophylaxis may be attempted, where a course of mercury is about to be ordered, by careful attention to the state of the mouth and teeth.

Xerostomia, or Dry-mouth.

This affection, a sudden and acute form of which is exemplified in fright, is of nervous origin in many cases, and occurs as a primary trouble chiefly in elderly women, in whom there may be also similar dryness of the conjunctiva (xerosis) and of the nasal mucous membrane, due to the xerosis bacillus, which may possibly prove to be the origin of primary xerostomia. Secondarily, it is a marked symptom, accompanying and usually preceding "symptomatic parotitis," a fact which serves to distinguish secondary parotitis from ordinary mumps.

Thirst and dryness of the mouth are always more marked after operations on the abdomen (especially on the stomach) than elsewhere. This is most noticeable where peritonitis is also present.

In non-operative gastro-intestinal disturbances, e.g., cholelithiasis, suppression of salivary secretion may precede for a considerable time the symptomatic parotitis which not infrequently supervenes.

In chronic and recurrent parotitis due to gout, in saturnine parotitis due to plumbism, at the menopause, and during menstrual disturbance, xerostomia has been observed, and a toxic origin is suggested by Tebbs.

TREATMENT.—The mouth should be carefully examined for carious teeth, and other sources of irritation, such as have been indicated above, should be dealt with, and tonics administered. Mouth-washes, and sialagogues, such as injections of pilocarpine, have been suggested as prophylactic measures when operation is followed by xerostomia, but according to Walsham and Spencer

they are not to be recommended. On the other hand, Fraser (*Edin. Hosp. Reps.*, vol. i.), recommends that the patient should hold in the mouth from time to time, for a few minutes, 5 minims of a 2 per cent solution of pilocarpine.

Primary Parotitis.—*Epidemic Parotitis* (see MUMPS).

Simple Parotitis is due to exposure to cold, resulting in catarrh ascending Stenson's duct; to the presence of a calculus obstructing the duct, more frequently seen in the case of the sublingual; or to injury, in which case suppuration may occur. A very obstinate form of parotitis has recently been found to be due to infection of the duct by the *Pneumococcus*, a vaccine of which organism has, in Wright's hands, yielded excellent results.

TREATMENT.—The painful swelling is relieved by belladonna fomentations. If suppuration supervenes, the pus should be evacuated through a small skin incision, horizontally placed, so as to avoid fibres of the facial nerve. While some prefer Hilton's method, others advocate a freer opening of the abscess.

Suppuration follows more commonly in secondary than in primary inflammation, and its occurrence is indicated by the increasing size of the gland, with redness and œdema of the skin. Owing to the density of the capsule, and the direction of the deep processes of the gland, pus tends to track towards the base of the skull, towards the mouth, and over the upper border of the superior constriction of the pharynx.

In parotitis due to obstruction of the duct by a calculus, or to stenosis after operation for cancer, etc., there is interference with salivation, with painful swelling of the gland at meal-times, which slowly passes off with the gradual escape of the saliva. The gland becomes fibrotic, and permanently enlarged, and when a stone forms in the centre, the mass is so hard as to be sometimes mistaken for neoplasm.

TREATMENT.—A calculus should be cut down on and removed. Removal of the submaxillary is sometimes necessary, especially where exploration has involved damage to the gland substance, with risk of subsequent salivary fistula. A stenosed duct should be slit up.

Secondary Parotitis.

Secondary, or acute symptomatic, or metastatic parotitis occurs in the course of the exanthemata and general pyæmia, during the puerperium, lesions of the alimentary canal, non-operative and post-operative; and by extension of inflammation to the parotid from adjacent tissues, lymphatic glands, face, and jaw. To this group Tebbs applies the term *septic*, considering as *toxic* such cases as occur in connection with metabolism, gout, and plumbism, and genital auto-intoxication due to menstrual disturbances.

Another group, mostly recurrent, is believed to be of vasomotor origin. Post-operative parotitis is commonest after abdominal operations (especially upon the stomach) and profound gastro-intestinal disturbance, such as acute intestinal obstruction, and is a well-marked complication of gastric ulcer, especially where there is peritonitis. It is not particularly common after operations on the pelvic organs (Tebbs).

Dryness of the mouth and great thirst are well known to follow abdominal operations, and results from a reflex inhibition of salivary secretion, which disposes the gland to infection. The commonest organism found is the *Staphylococcus pyogenes aureus*. The majority of cases subside without suppuration.

Symptomatic parotitis is uncommon in children, is unaccompanied by genital metastases, is preceded by and associated with suppression of the saliva, and is not infectious. Mumps, on the other hand, occurs in young children, genital metastases are not uncommon, the secretion of saliva is unaffected, and infectivity is very great.

ETIOLOGY.—According to one view, symptomatic parotitis results from infection ascending up the duct from a mouth which has become septic, e.g., during rectal feeding, etc. According to another view, the infection is generally by the blood, and is almost always the result of intra-abdominal sepsis.

TREATMENT.—On the first hypothesis, Bucknall emphasizes the necessity of preventing duct infection by a thorough and constant use of mouth-washes, etc., and it can certainly do no harm. The value of this toilet of the mouth as a prophylactic measure has been absolutely denied by Tebbs, who believes that in

the vast majority of cases infection is by the blood, so that only by the strictest sepsis during the operation, and damaging the peritoneum as little as possible, is there any hope of preventing this complication.

That the recurrent form of parotitis may be dependent on vasomotor disturbance seems borne out by the present writer's experience of one case, in which the symptoms were relieved by the administration of zinc valerianate.

Attention should be directed to special causes at work: gout, plumbism, etc. The fact that tubercle and syphilis may occur in the salivary glands must be borne in mind.

Salivary Fistula.

This is seen almost exclusively in the case of the parotid gland, resulting from a wound of Stenson's duct, or of the gland, by stab through the cheek, or from operation, or from the ulcerating through of a salivary calculus. There is a most troublesome flow of saliva over the cheek, worse during meal-times. Stenson's duct opens into the mouth through a papilla, situated in the mucous membrane, opposite the crown of the second upper molar tooth. A bristle can just be passed through the orifice, the duct itself being an eighth of an inch wide, acting as a reservoir of saliva in health, and so predisposing to infection of the duct in disease (metastatic parotitis).

A probe inserted into the orifice would pass for three-sixteenths to three-eighths of an inch between the buccal mucous membrane and the buccinator muscle; then, piercing the muscle, the duct emerges at the anterior border of the masseter, and turns sharply out, at a right angle to its former course, and proceeds backwards over the outer side of the muscle. The course of the duct is indicated by taking the middle third of a line from the lower margin of the concha to a point midway between the ala nasi and the margin of the upper lip. (Cunningham.) Lying on the duct, between its upper border and the zygoma, is the socia parotidis.

TREATMENT consists in re-establishing a channel from fistula to mouth, so that it becomes easier for the saliva to escape by the mouth than by the fistula. The methods generally recommended are two:—

1. A fine drainage tube, threaded with silk at both ends, is attached to the eye of a probe, the fine point of which is insinuated into the mouth of the duct, and brought out on the cheek, leaving the tube in the duct. The silk threads are tied over the cheek at the angle of the mouth. After four days, the outer third or less of the tube is removed, and a silk thread allowed to remain in the outer part of the fistula, which then gradually contracts and closes; or a plastic operation can be done on the cheek at this stage. The inner two-thirds of the tube is gradually shortened, and finally removed.

2. In the event of the duct being occluded or destroyed, Rose and Careless recommend a trocar and cannula being pushed through the cheek. The trocar is removed to allow of the introduction into the mouth, through the cannula, of a fine silk thread. The cannula being withdrawn, the silk is left behind and used to pull through a fine drainage tube.

The end of a loop of silver wire has also been introduced from the fistula into the mouth, and its outer portion twisted up so as to remain in the cheek until it ulcerates its way into the mouth.

Parotid (Tumours of).—These are either *innocent* or *malignant*, and this prime distinction is often the only one possible, as it is certainly the only one of importance prior to operation.

Simple Tumours are variously described in accordance with the tissue most prevalent in them, as fibroma, adenoma, myxoma, chondroma, angioma, lipoma, etc., and combinations of these, adeno-chondroma, angio-fibroma, etc.

What is usually spoken of as the "common tumour of the parotid" (submaxillary, etc.) is now believed to be an *endothelioma*, the proliferated epithelium lining the capillaries and lymphatics distending these channels, which in section present a hyaline appearance, mimicking cartilage; or the proliferating endothelium develops into fibrous or myxomatous material.

This view would explain the appearance of imperfect glandlike and angiomatous structures generally present in such tumours, which, though more frequent in the

parotid, are not unknown in the submaxillary, and in the *Transactions of the Pathological Society of London* for 1898, some twenty-two cases of this kind are mentioned as occurring in this gland.

Malignant Tumours.—These are sarcomatous or epitheliomatous. It should be borne in mind, also, that the lymphatic glands, some lying on the surface and others within the capsule of the parotid, may be the seat of malignant trouble, generally secondary to disease in the area they drain: scalp, eyebrow and eyelid, ear, cheek, nose, and soft palate.

Diagnosis.—In the case of *benign tumours*, growth is slow, and the swelling is well defined, smooth or faintly lobulated, firm or slightly elastic at first, later on exhibiting fluctuation where myxomatous degeneration has occurred. Neither skin nor lymphatic glands are involved, and free mobility remains for years. There is no facial paralysis. *Malignant tumours* involve the skin and glands, the skin being hard, and becoming brawny and dusky purple in tint, and at the later stages giving way. The swelling is diffuse and ill-defined, decidedly nodulated, but cystic or semi-fluctuating at a very much earlier stage than is generally seen in innocent tumours. It infiltrates the tissues beneath and around, the onset of facial paralysis being frequently a sign of value when a benign growth develops malignancy.

Treatment.—A benign growth, freely movable beneath the skin, and over the deep structures, should be excised, lest malignancy supervene, apart from which, delay only increases the difficulty of operation, especially in the case of the parotid, which, besides the detached portion lying upon the masseter above Stenson's duct, called the socia parotidis, has several deep-lying processes passing inwards towards the pharynx and tonsil, or downwards towards the neck.

In operations on this gland, the important point is the preservation of the facial nerve, which enters at the posterior limit of the parotid, and breaks up into its two main branches. These radiate forwards, upwards, and downwards, in a more or less horizontal direction, both within and superficial to the dense capsule of the gland derived from the deep cervical fascia. Branches of the facial nerve, though generally lying deep to a benign tumour, may pass superficially, and to avoid them, by bringing them clearly into view, an extensive horizontal skin incision over the swelling has been recommended. This is carefully deepened, retracting such nerve fibres as are seen, until the capsule has been reached and incised, when the tumour can usually be shelled out without difficulty.

A vertical skin incision is less unsightly than the horizontal, and minimizes injury to the temporal vessels and nerves ascending in front of the tragus of the ear. The edges of the wound are then held aside, and the tumour is exposed by a horizontal incision through the fat, etc.

Cheyne and Burghard recommend a curved incision along the anterior border of the sternomastoid, from the mastoid process downwards, and then forwards, and finally curving up across the ascending ramus of the jaw.

In the case of the submaxillary gland, the growth is exposed through a curved incision below the body of the lower jaw.

In the case of malignant tumours—if operable—the entire gland must be excised. For details, surgical text-books must be consulted. *Henry Curtis.*

SALPINGO-OÖPHORITIS.—In the majority of cases of salpingo-oöphoritis, or inflamed appendages, no operation is necessary. During the acute stage the treatment consists in absolute rest in bed, administration of laxatives, fomentations or turpentine stupes to the abdomen, and hot douching if it gives relief to pain. When the condition has reached a chronic stage, counter-irritation to one or both sides of the lower abdomen is useful, e.g., painting with equal parts of tinct. iodi or liniment. iodi, or application of a blister.

If there is strong evidence that one of the Fallopian tubes contains pus, an operation should be performed, if possible after the acute stage is over, as the pus becomes less virulent after a lapse of time. Apart from evidence of the presence of a pyosalpinx, removal of an inflamed tube or ovary and tube

may have to be advised on account of pain, impairment of general health, and recurrence of attacks of pelvic peritonitis. No minor uterine operation should be carried out during an attack of salpingo-oöphoritis : curetting in such circumstances may be followed by a severe pelvic peritonitis.

It must be noted that the ovaries are blameless in many cases of so-called "chronic ovarian pain." Neurasthenia, anæmia, constipation, and dyspepsia are common causes of this complaint. Attention to the general health, especially to the state of the bowels, with entire avoidance of local treatment, will often effect a cure. Nothing can be worse treatment in such a case than to tell the patient that her ovaries are responsible for her pain, and to direct her attention to the condition of her genital organs. If there is any local condition that really requires treatment, it should be treated, and the patient should be told that its bad effects begin and end in leucorrhœa, backache, etc., and that it is not responsible for her general condition ; but unnecessary "tinkering," such as repeated cauterization of the cervix, insertion of tampons, etc., in a neurotic patient, and giving her detailed information as to the size, shape, and position of her uterus and ovaries, may do her an incalculable amount of harm.

H. Russell Andrews.

SCABIES.—By far the best treatment for this disease is the old-fashioned one of sulphur ointment. But it is not enough to apply it in a perfunctory manner, twice daily. In the severe cases, such as one meets in hospital practice, it is generally necessary to keep the patient freely anointed with the ointment day and night for three days. The more rapid, if somewhat cruel, method in use in some foreign hospitals, of soaking the patient in a hot sulphur bath, then scrubbing him vigorously with soft soap and a nail brush, and allowing him to soak for a further hour in the bath, and then rubbing sulphur ointment freely in, is perhaps worthy the attention of municipal authorities ; for scabies takes a heavy toll annually from the efficiency of the navvy class.

In the more cleanly classes, while the same treatment may be resorted to, milder methods are often sufficient. The writer cannot speak so highly as some do of Peru balsam, and prefers to recommend in such cases the use of sulphur soaps, the lather of which may be diligently rubbed in night and morning to the axillæ, and other parts where the disease is found in the cleanly.

It may also be worth while to adopt the plan suggested by Sherwell, of dusting the bed with flowers of sulphur, which he says is the most efficient of all methods.

In children, the pustular lesions are often so tender looking as to dissuade the young practitioner from so irritating a remedy as sulphur, and in such cases β-naphthol, from 5 to 10 per cent in ointment, may be used instead.

Norman Walker.

SCALDS.—(See BURNS AND SCALDS.)

SCALP, CONTUSIONS OF.—These injuries differ in some respects from similar injuries in other parts of the body, and so need special mention. The receipt of a blow on the head is frequently followed by considerable extravasation of blood. This extravasation may be in one of three positions :—

1. *Subcutaneous*, in which case the tough subcutaneous tissue of the part prevents the effusion from becoming of great extent.

2. *Subaponeurotic* : the extravasation is in this case only limited in extent by the attachment of the epicranial aponeurosis, in front to the supraciliary ridges, laterally to the zygoma and mastoid process, and behind to the superior curved line of the occipital bone.

3. *Subpericranial* : the effusion of blood being limited by the attachment of

the pericranium to the suture lines, the resulting hæmatoma assumes the form of one of the cranial bones.

A swelling occurring in any one of these three situations has characteristics which must be carefully noted. The central part of the swelling is soft and compressible, whilst the edge is hard and raised. The greatest care is called for to avoid mistaking this hard ridge for bone, and the central soft part for a depression of the vault. If firm pressure be made upon the hard ridge for a short time it is felt to disappear, and the smooth bone beneath is felt at its normal level; moreover, similar pressure upon the soft centre will reveal the surface of the vault smooth and regular, not irregular and guttered as it would be in the case of a depressed fracture.

TREATMENT.—It is here well to quote at the outset the saying of Hippocrates, "Nullum capitis vulnus contemnendum." If there have been signs of concussion, or if there be any suspicion of intracranial lesion, it is the duty of the surgeon to insist upon the precautionary measures in the way of rest, etc., which are detailed under the head of BRAIN, CONCUSSION OF. The careful cleansing of any abrasion, and the application of evaporating lotions, are all that is necessary in direct treatment for the hæmatoma. Should suppuration ensue, the swelling should be incised immediately, the breaking-down clot turned out, and a drainage tube inserted.

S. Maynard Smith.

SCALP WOUNDS.—The subcutaneous tissue of the scalp is closely bound to the pericranial aponeurosis; the aponeurosis, on the other hand, is but slightly connected with the pericranium over the bone beneath. It therefore follows that a superficial scalp wound will gape but little, whilst one which involves the aponeurosis will lie widely open. Again, the blood-vessels enter at the margins of the aponeurotic attachment. No vessels of appreciable size cross the sub-aponeurotic space to enter the scalp. Consequently, all the bleeding from a torn-up flap of scalp comes from the torn edge; there is none from the under aspect of the flap. For the same reason there is no danger of a flap sloughing so long as it has a marginal attachment, since the source of its blood supply is uninjured.

TREATMENT.—The arrest of hæmorrhage sometimes gives rise to trouble. The vessels at the margin of the flap may be caught with artery or Spencer Wells's forceps, and tied with fine silk or catgut. If the deep temporal arteries be divided, it may be necessary to enlarge the wound to secure them. The chief essential in the treatment is to carry out thorough and careful purification of the wound and its neighbourhood. The wound is protected by a piece of gauze wrung out of antiseptic lotion (carbolic 1–40 or perchloride 1–2000). The surrounding skin is then shaved; this may, in the case of extensive wounds, involve the shaving of the whole or nearly the whole scalp. The skin is next scrubbed with soap and water, and finally cleansed with the antiseptic lotion. The gauze is now removed from the wound, and the cavity and edges of this are carefully treated with the same lotion, great care being taken to remove all hair and foreign substances. The wound is closed with silkworm-gut sutures, but if it be at all extensive, a small rubber drainage tube, which has been boiled, should be inserted in the lower angle of the wound. A dressing is applied, and if all goes well the drainage tube is removed after forty-eight hours, and the stitches at the end of a week. If suppuration ensue, several of the sutures are removed, and drainage tubes inserted at two or three points along the wound; and if difficulty be experienced in securing free exit for discharge, a counter-opening is made through the most dependent part of the attached margin of the flap, and a drainage tube inserted there. Boracic fomentations are then applied, and changed every four hours.

S. Maynard Smith.

SCARLET FEVER.

The Malignant or Toxic Form.—The patient must be kept strictly in the recumbent position; hypodermic injections of strychnine should be given every two to four hours, and brandy or champagne by the mouth; if the temperature be high, the patient should be wet-packed, or sponged with cold or tepid water. There is usually too much prostration to permit baths. If there is vomiting, the milk should be peptonized, or nourishment given by enemata.

The Anginous or Septic Form.—The pyrexia, sleeplessness, and delirium are best treated with sponging, packs, or baths.

The local faucial lesion (inflammation followed by sloughing and ulceration) requires antiseptic treatment. In mild cases, gargling or spraying will be sufficient, but in severe cases the fauces and nasal passages should be flushed out with a Higginson's or a ball syringe, or with a douching apparatus. A sheet or large towel should be fastened round the child so as to restrain the arms. The patient's head should be held under the nurse's left arm over a basin; with the right hand the nurse uses the syringe. Two persons may be required for strong children, if they resist, as they are very likely to do when delirious. The following solutions may be used: chlorine water; (to make this, 4 dr. chlorate of potash are put into a large dry bottle and 1½ dr. of pure hydrochloric acid are added; chlorine gas is given off; when the gas ceases to evolve, add 30 oz. of water, a few ounces at a time, shaking the bottle each time water is added: the gas is dissolved in the water: 1 oz. of syrup should be added to every 5 oz. of the solution, just before use); permanganate of potash, 15 gr. to the ounce; a saturated solution of boracic acid; chinosol, 1-600 to 1000; the alkaline lotion mentioned in the article on DIPHTHERIA. In very foul cases the following solution may be used as a spray:—

R	Liniment. Iod.	℥xl	Glycerin.		℥iv
	Acid. Carb. Liq. Pur.	℥ij	Aq.	ad	℥viij
	Sp. Rect.	℥ss			

Later, when the swelling has subsided and the exudation or secretion is less abundant, the ulcerated surface should be swabbed with carbolic lotion 1–40, or 1–1000 perchloride of mercury. Gargling, flushing, spraying, and swabbing should be done as often as the case requires, from three times a day to every three or four hours. The pain in the throat may be allayed by the application of hot fomentations, and letting the patient suck ice. A 5 per cent solution of cocaine may also be occasionally applied.

For **Cervical Cellulitis** the writer does not recommend early incision. The treatment he adopts is fomentation with warm boracic lotion till the skin is beginning to give way; then the skin is slit up, the underlying slough removed, and the wound treated aseptically.

If the ulcerative process spreads from the fauces to the *larynx*, the patient should be put in a steam tent; and, if severe dyspnœa supervenes, submitted to tracheotomy. Intubation is harmful in this condition.

Otitis Media.—Often earache is the first sign; this may be relieved by the instillation of a drop or two of warm laudanum or cocaine solution, and the application of hot fomentations over the whole ear. If these measures do not relieve, a leech over the upper part of the mastoid process will often succeed. If the tympanic membrane is found to be bulging, it should be punctured. There is nothing special about the treatment of the ear discharge that usually follows upon the earache (see EAR, AFFECTIONS OF).

Rhinorrhœa should be treated by syringing the nasal passages with one of the solutions already mentioned. It is also important to prevent the child from picking his nostrils, and so setting up a very intractable and infectious ulceration. Cardboard splints on the arms are the best means.

Nephritis.—It is quite unnecessary to keep the convalescent scarlet fever patient in bed in the hope of averting nephritis. Whether the patient be getting up or not, the urine should be examined at least every other day, and also upon the occurrence of any other complication, such as adenitis, otitis, or secondary tonsillitis; if albumin is found, the patient should be ordered back to bed at once, and put upon a milk diet. Three or four days will usually show whether the albuminuria is a symptom of nephritis or not. Usually, nephritis begins suddenly with hæmaturia. The patient should be kept on milk, not only till blood has ceased to appear in the urine, but also until the albumin has much diminished. He may then be allowed, in due course, fish, chicken, and, finally, meat diet. It is a mistake to keep nephritis cases, in which the acute symptoms have subsided, too long on a milk diet and in bed. When the diet is increased, they may be allowed to sit up in blankets or a dressing gown, and later, even before the albumin has quite disappeared, to get up in clothes, and, in warm weather, walk out of doors.

During the acute stage of the kidney inflammation the patient should be encouraged to drink freely of water, or, better still, "imperial drink": two drachms of acid tartrate of potash are put in a large jug with the juice of one lemon and some syrup; two pints of boiling water are added, and the whole well stirred.

Linseed-meal poultices should be applied to the loins every thee or four hours. Perspiration may be encouraged by hot packs or baths once or twice a day. The bath should be brought to the bed-side. The bowels should be kept freely open by castor oil or salts.

Convulsions may usually be cut short by the inhalation of chloroform.

Coma (fortunately not common apart from convulsions, when it passes off soon after the convulsions cease) should be treated by dry-cupping the loins and giving hot packs. If these remedies fail, a few ounces of blood may be abstracted by venesection or the application of leeches to the loins.

Nephritis cases usually become anæmic, and during convalescence will require iron. Perhaps the best form is the alginate, in 5- to 15-gr. doses.

Rheumatism.—Salicylate of soda will, as a rule, relieve the articular pain and swelling very quickly. The affected joints should be wrapped in wool, and the patient be put on a milk diet.

There is no special treatment required for the remaining complications of this disease.

With regard to the *general treatment*, the reader is referred to FEVERS, ACUTE INFECTIOUS. The patient may be allowed to sit up in a dressing-gown as soon as the temperature has been normal for six or seven days, provided there is no severe complication. In another five or six days he may be allowed to walk about in clothes. A very large number of the patients in the Metropolitan Asylums Board's Hospitals are transferred to the convalescent hospital in the country at the end of two to three weeks' stay in the town hospital, and they derive much benefit from the early change.

With respect to the period when the patient is to be considered free from infection, for some time past the writer has been discharging patients from the hospital at the end of four weeks' stay therein, quite irrespective of the desquamation; some of the patients have finished peeling by that time, others are still peeling vigorously. These patients, however, do not appear to be infectious. But if there is any discharge from the nose or ear, the patient should not be dismissed so early. It is also desirable that patients who have recovered from scarlet fever should be kept away from other susceptible children for at least a fortnight after their return home.

Quarantine period: one week. *E. W. Goodall.*

SCHOTT-NAUHEIM TREATMENT. — The physical treatment of chronic affections of the circulatory organs, generally referred to as the Schott Method, consists in the application of mineral baths and of therapeutic exercises as first systematized and carried out at Bad-Nauheim, in the Grand Duchy of Hesse-Darmstadt, of which the saline springs are by their nature pre-eminently suited to the balneological treatment of the circulatory organs.

THE BATHS.—The springs used at Nauheim for bathing purposes are those known as Nos. 12, 14, 7, 11. They are given in the order of their richness in sodium chloride, with the varying proportions of calcium chloride and carbonic acid gas.

	No. 12 Friedrich Wilhelm's Spring*	No. 14 Neuer Sprudel (1900)*	No. 7 Grosser Sprudel*	No. 11 Gas Quelle*
NaCl ..	29·2940	24·0692	21·8245	17·1388
CaCl$_2$ ..	3·3249	1·6327	1·7000	1·2598
CO$_2$ ..	1·0074	1·1905	3·1756	1·4136

* The ingredients are given in grams as contained in 1000 grams of water.

It will be observed that No. 7 spring is by far the richest in carbonic acid gas. A course of baths, however, commences with waters which have thrown off, in tanks or reservoirs, practically the whole of their gas, and in so doing have acquired a yellow opacity due to the presence of undissolved iron peroxide and calcium carbonate (Thermal-Bad), generally those of No. 7. To these, as the case may require, are added in increasing portions from one to three or more litres of the uncrystallizable mother-liquor (Mutterlauge) of the neighbouring salt works, which is rich in calcium chloride and bromine. Next in order come the waters of Nos. 7, 12, or 14, which have been stored in underground tanks under conditions which retain sufficient gas to hold in solution their iron and calcium salts (Thermal-Sprudelbad). Later comes the "Sprudel," drawn from No. 7 or No. 12, according to the temperature desired, containing a still larger residue of natural gas, and sufficient to induce in most subjects a well-marked rubefacience as well as a glow of warmth. Finally, but not for all patients, comes the flowing sprudel bath (Sprudel-Strombad), in which the waters of either No. 7, No. 12, or No. 14 forcibly enter, and, through exit pipes, leave the receptacle, during the entire period of immersion, and are capable of effecting rubefacience in a still higher degree. It will thus be seen that the waters employed increase, in regulated order, in mineral and gaseous ingredients, and represent stages of increasing balneological strength.

THE EXERCISES.—The exercises should be so administered and regulated as to involve *little exertion and no fatigue*, and should be resisted on the part of the operator with an amount of force sufficient to oppose without arresting the movement. They may be conveniently tabulated as follows :—

No. 1.—The arms raised in the horizontal plane, with the palms of the hands in contact, are carried back in the same plane until in line with each other, and with an imaginary line drawn through the thorax from shoulder to shoulder. Reverse the movement.

No. 2.—The fore-arm of one side at a time, extended in the depending position, with the palm directed forwards, is flexed from the elbow until the hand rests on the corresponding shoulder joint. Reverse.

No. 3.—Both arms placed in the same initial position are raised outwards from the shoulder until the thumbs meet over the head. Reverse.

No. 4.—The hands, with fingers flexed so that the second phalanges or corresponding fingers of the two hands are in contact, are pressed together in front of the hypogastrium, and raised until they are on a level with the vertex of the head. Reverse.

No. 5.—The arms extended in the depending position, with the palms touching the corresponding thigh, are raised in parallel planes until they are extended directly upwards. Reverse. The above movements are resisted at the wrist.

No. 6.—The trunk is flexed forwards, without the knees being bent, until it is at right angles with the lower extremities. Reverse. Resistance (*a*) the hand over the manubrium sterni ; (*b*) over the scapulæ.

No. 7.—The trunk is rotated without movement of the feet to the extreme right and the extreme left. Resistance by both hands, one in front of one shoulder, the other behind its fellow, the positions being reversed for the reverse movement.

No. 8.—The trunk is flexed laterally, first to one side then completely over to the other, and finally brought back to the erect position. Resistance by hands placed one on the thigh, the other on the axilla, and the reverse for the recovering movement.

No. 9.—Is identical with No. 2, except that the fists are kept firmly clenched.

No. 10.—Is similar, except that the hand is turned outwards, the fist being clenched.

No. 11.—The arm is extended in the depending position, the palm in contact with the thigh, and made to execute a complete revolution from the shoulder joint, forwards, upwards (when vertical the palm must be turned outwards), then backwards to the initial position. One arm at a time. The resistance is offered by first one hand, then the other, being placed against the side of the wrist.

No. 12.—Both arms are placed in the same initial position as in No. 11, and are then moved backwards and upwards in parallel planes to the extreme limit. Reverse. Resist by the hand placed on the wrist.

No. 13.—The thigh is flexed to the extreme limit, and then extended until the feet are side by side. The body is steadied by the hand of the opposite side (alternately) resting on a table or the back of a chair. Resist the upward movement by the hand placed upon the patella, the reverse movement by the hand placed under the sole of the foot.

No. 14.—The body being supported as in the last movement, the lower extremities in succession are flexed from the hip joint, first forwards, then backwards, to the extreme limit. Resist on the anterior and posterior aspects of the ankle joint, alternately.

No. 15.—The patient, with his hands resting on a table or a chair in front of him, stands on either foot in succession, while the leg of the other side is flexed on the thigh. Resist as in the last movement.

No. 16.—Supported as in No. 14, the patient raises the lower extremities in succession outwards from the hip joint, and reverses the movements. Resist as in the last movement.

No. 17.—The arms extended horizontally outwards are, in succession, rotated from the shoulder joint to the extreme limits forwards and backwards. Resist with the hand folded round the wrist.

No. 18.—Flexion and extension of the hands successively, on the wrist joint. Resist with one or two fingers placed alternately below and above those of the patient.

No. 19.—Flexion and extension of the feet, successively on the ankle joint. Resist in a similar manner.

It will be apparent that in general outline the movements particularized are similar to, or identical with, many of those which form part of current systems of hygienic and physical training. The cardio-vascular therapy of the movements—the essence of the system—lies in the science and technique of their administration as adapted to the condition of each individual patient. The movements may be given in any order that may be convenient, or modified according to the condition of the patient, and to any posture he may be obliged to maintain, such as the sitting and the recumbent positions ; or others may be devised, provided that the rules of application be strictly observed. Many patients are unfit to perform more than three or four movements at the commencement of treatment, consistently with the avoidance of increased frequency of the pulse, accelerated breathing, and fatigue.

Artificially Prepared Nauheim Baths.—It will have been noticed in the account given of the baths as administered at Nauheim, that, in the earlier stages of the treatment, the waters have, as far as possible, been made to give off their carbon-dioxide. The question of effervescence does not, therefore, enter into the first stages of the treatment. It will also have been observed that the usual initial strength is 2 per cent of sodium chloride, and rather less per mille of calcium chloride. For all practical purposes, therefore, 6 lb. of the sodium salt and 8 oz. of the calcium salt dissolved in 40 gall. of water, giving a sp. gr. of 1005, constitute a useful initial bath. From time to time additions of 1 lb. of the one, and 1 oz. of the other salt, may be made, until at about the middle of a course of twenty-eight baths a strength of 10 lb. and 12 oz. have been attained. It will then devolve on the medical attendant to decide whether to proceed to effervescing baths. Half the contents of one of Dr. Sandow's boxes of effervescing ingredients added to the ingredients of the preceding bath will be approximately equivalent to the "thermal-sprudel" bath. The next step would be to add the entire contents of one box in order to produce the equivalent to the full strength sprudel bath. The production of a bath equivalent to the sprudel-strom bath is not a matter of essential importance.

Points of Resemblance and Difference.—As is the case with the natural waters, those artificially prepared are regulated so as to present increasing degrees of balneological force, first in sodium and calcium salts, next in carbonic effervescence. It is possible that, volume for volume, the gas given off from solution in the natural waters may exercise a higher degree of pungence on the skin ; but, as in the artificially produced "sprudel," the gas is incessantly renewed during immersion, the result is in effect not less, as may be observed, in the degree of resulting rubefacience. In the artificial

effervescing bath of full strength the water is kept in a continuous boil by the unbroken relays of nascent gas, and, therefore, approximates to the "strom-bad"; while, if it be desired to keep the water moving in a stream throughout immersion, it is not difficult to effect that purpose by mechanical means.

Physiological Action of the Baths.—The temperature of the baths is below the normal of the body, and must be regulated so as not to check, but rather to ensure, a rapid, if not immediate, reaction. The saline and gaseous ingredients of the waters effect cutaneous excitation much as would friction with a rough towel or a horse-hair glove; but the process begins with immersion and is progressive throughout. In many subjects the resulting rubefacience is obvious, more especially after the higher-grade baths.

The vasodilatation and increase in energy of the cardiac systole which ensue on, and during immersion and are maintained for varying periods after, are generally attributed to the stimulus conveyed through afferent nerves to the vasomotor and heart-controlling nerve mechanisms. It may also be suggested that the secondary effect of immersion in a medium below the normal is to promote the flow of an increasing volume of blood to the surface for the purpose of maintaining its temperature; and that, as in experiments conducted by other means by Dr. George Oliver, the weight of mineralized water pressing on the abdomen of a subject sitting at an angle of 45° to the base of the bath, effects a gentle, gradual, and sustained emptying of the splanchnic veins into the right heart, supplying from one of the natural reservoirs, and sending on for arterialization, the blood required to fill an expanding arterial area. The result might be expected to be that the heart would retain less residual blood, and that its contraction, being more complete, would occupy a longer interval, making the pulse at once slower and fuller. Such is the case. The results, in fact, may be summarized as follows:—

1. A glow of warmth.
2. Increased pulse volume, with diminution of frequency.
3. Stronger cardiac systole.
4. Diminished area of dullness.
5. Relief of præcordial discomfort.
6. A general sense of relief.

It should be added that improved metabolism, increased renal circulation, and the elimination of retrograde products combine to promote appetite, diuresis, thirst, and healthy perspiration.

Influence of the Baths on Blood-Pressure.—In respect of blood pressure the following axioms may be laid down:—

1. If the degree of arterio-dilatation be in excess of the increase of cardiac energy, the blood pressure will fall.
2. If the increase of cardiac energy be in excess of the arterio-dilatation, the blood-pressure will rise.
3. If the increase of arterial capacity and of cardiac energy be exactly co-ordinate, the blood-pressure will remain unchanged.

It will be obvious that the relative conditions thus defined will, from the clinical point of view, be influenced by, and dependent on, the integrity of:—

1. The several nerve mechanisms involved.
2. The vascular tunics.
3. The cardiac structures, more especially of the myocardial tissue, the valves, and the coronary vessels. As a matter of fact, and speaking generally, the blood-pressure falls unless the vascular tunics have undergone such changes as inhibit or have abolished contractility and expansibility.

Technique.—During immersion, the patient should incline at an angle of about 45°, with the head and neck only out of the water. He should breathe regularly, abstain

from talking, and only move as comfort may dictate. The sense of oppression, or of tightness across the chest, which often supervenes during the earliest baths, in the course of the second or third minute, may be often relieved by a few deep inspirations, which facilitate the passage through the pulmonary circuit of the blood which is being driven into the right heart from the splanchnic and other venous reservoirs. The patient should leave the bath immediately on the expiration of the prescribed time limit, be enveloped from neck to feet in a warm bath towel, and, if there be dyspnœa or marked feebleness, be dried in the sitting posture by frictions administered through the towel by an assistant. Not less than an hour's rest in the recumbent position, preferably in bed, should be enforced after each bath. It is not desirable to administer more than five baths in a week, at the rate of two or three in succession. In many cases the medical adviser may find it advisable, on account of physical weakness or of neurasthenia, to allow only one bath at a time, with intervals of one or two days spent in more or less complete repose of mind and body.

Physiological Action of the Exercises. — The effect of the exercises is identical with that of the baths, though less profound and apparently less permanent. On the other hand, they develop the musculature of the body to a degree which cannot be emulated by the baths, and so, without undue fatigue, prepare an enfeebled frame for the resumption of a more active life. Further, modified to adapt them to the recumbent or sitting posture, and carefully regulated, they can be applied as a preparatory measure to subjects as yet unfit to be raised and placed in a bath. It has been shown by experiment that after carefully regulated and gently resisted movements the output of a divided artery is, on removal of the ligature, found to be three-fold in volume, and it is easy to demonstrate, by observation of the face and ears, that arterial and capillary flushing are not limited to the parts exercised.

Technique.—The person who administers the exercises may be called the operator, and should strictly observe and enforce the following rules :—

1. Each movement is to be performed slowly and evenly ; that is, at a uniform rate.
2. No movement is to be repeated twice in succession in the same limb or group of muscles.
3. Each single or combined movement is to be followed by an interval of rest.
4. The movements are not to be allowed to accelerate the patient's breathing, and the operator must watch the face for the slightest indications of (*a*) Dilatation of the alæ nasi ; (*b*) Drawing of the corners of the mouth ; (*c*) Duskiness or pallor of the cheeks and lips ; (*d*) Yawning ; (*e*) Sweating ; and (*f*) Palpitation.
5. The appearance of either of the above signs of distress should be the signal for immediate interruption of the movement in process of execution, and for either supporting the limb which is being moved, or allowing it to subside into a state of rest.
6. The patient must be directed to breathe regularly and uninterruptedly, and should he find any difficulty in so doing, or for any reason show any tendency to hold his breath, he must be instructed to continue counting in a whisper, during the progress of each movement.
7. No limb or portion of the body of the patient is to be so constricted as to check the flow of the blood by compression of the vessels.

Therapeutic Effects :—

1. *Vascular.*—Oft-repeated, prolonged, or permanent arteriole constriction may, and in fact does, conduce, even at relatively early periods of life, to fibrotic and atheromatous changes, diminishing capacity and conductivity generally, with not infrequent special incidence on particular organs. In respect of the kidneys, an affection at one time general, may become not only locally accentuated, but develop into an autonomous and irremediable disease. But apart from localized effects of arteriosclerosis, the practitioner is confronted with such results as increased venosity of capillary and trunk channels, inducing permanent changes in both classes of vessels, congestion of pelvic and abdominal organs, as well as of respiratory passages, dilatation of arterial trunks, more especially of the aorta, with the possibility of aneurysm, not to speak of cardiac hypertrophy and dilatation, and gradual but progressive increase of residual blood in the chambers of the heart. In all conditions dependent on such changes, relief, and cure where tissue change has not passed beyond the range of repair, may

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be effected by judicious resort to baths, or exercises, or both, according to individual conditions. That the cure of early stages, and relief of even later conditions of arteriosclerosis, may be effected has been abundantly shown. Obsolescent and obsolete capillaries may be restored to function ; and conditions tending towards permanent varicosity relieved. It needs no argument to emphasize the importance of such considerations in connection with the autoxis of gout and of rheumatism, as well as with the tissue changes induced by alcohol, nicotine, and syphilis. It is, therefore, certain that in all such progressive morbid conditions, in which pharmaceutic treatment lags or fails, recourse to the methods under consideration will open up new and great possibilities of relief and repair.

2. *Cardiac.*—Once it is admitted that arterial lumen may be restored, tissues repaired, and patency restored to obsolescent capillaries, no difficulty will be encountered in realizing that a potent means of restoring cardiac structure and function has become available ; for it would be unreasonable to suppose that the coronary vessels and capillaries alone would be shut off from the general change. Moreover, while peripheral resistance diminishes and arterial area expands, and the heart is co-ordinately stimulated to increased contraction, residual blood is expelled, and the muscles are set free to move in wider range. The heart, like other muscles, grows in response to increasing energy in the exercise of its physiological office, and an increasing supply of nutritive material. Therein lies the reply to the question as to the range of the application of physical treatment to cardiac affections, namely, that such treatment is suited to all cases in which it will be for the advantage of the patient to restore healthy substance, and, therefore, additional power, to the muscular and other tissues of the heart. The limit of its beneficial action lies in the conductivity of the nutrient vessels in relation especially to orificial obstruction, and to degenerative changes in their tunics. If either or both of those conditions be irremediably established, increased work can only result in increasing exhaustion and consequent deterioration, with hastening of the inevitable end. It is scarcely necessary to point out that the structures in which the reparative process is most readily established are : those of the nutrient vessels themselves, whenever orificial patency remains or can be in any degree restored, and the myocardium ; and that in the nature of things, deforming lesions of the valves stand outside the scope of any known treatment. On the other hand, the restoration of compensation for valvular defects, and the relief of dilatation in conjunction with vascular repair, may be said to be the special office of this treatment. It is needless, therefore, to enquire whether it is applicable to cases of valvular disease, in view of the obvious consideration that the safety of the individual, in such conditions, depends on the effectiveness of compensatory action and the delay or repair of parenchymatous degeneration and of dilatation as opposed to conservative hypertrophy. As, however, a statement has been promulgated to the effect that these methods are not applicable to aortic regurgitation, it is necessary to emphasize the fact that, in that condition, the maintenance of the histological integrity of the myocardium and of effective compensation is perhaps more immediately vital than in any other valvular lesion. On that point Professor Schott and the writer desire to record their opinion unequivocally. In extreme cases, the recourse to treatment should be cautious, because, as already indicated, increased heart work can only bring increased exhaustion if permanent coronary occlusion have been established.

Briefly, these methods are of pre-eminent value to bring about the restoration of compensation in valvular affections, whether stenotic, regurgitant, or both, and for the repair of myocardial degeneration, and in the following conditions :—

Athlete's heart (right side strain).
Minor epilepsy of the cardiac variety (often mistaken for syncope).
Palpitation, associated with gastric or intestinal distension, especially the night palpitation of the enfeebled heart.
Palpitation associated with high blood-pressure.
Air hunger, which is always accompanied by some degree of dilatation, an extreme form of which is often denominated cardiac asthma.
Early stages of brain waste, as indicated by loss of power of mental concentration and of memory for recent events.
Abnormal cardiac conditions associated with auto-toxis, such as tachycardia, bradycardia, Graves' disease, asthma, and ichthyosis, in which arterial atrophy is concurrent with, or dependent on, auto-toxis.
Cheyne-Stokes breathing dependent on the concurrence of arteriosclerosis, high blood-pressure, and generally albuminuria (especially in conjunction with hypodermic injections of small doses of morphine).
Œdema.

After-Treatment.—A course of treatment should be followed by a sojourn of from a fortnight to a month's duration in a healthy situation which offers the advantages of a dry soil and walks both level and gently inclined, which lend themselves to regulated and gradually extending walking exercise. Carriage exercise is of secondary importance, except in those cases in which walking powers are exceptionally limited and seasonal conditions make it difficult to remain long out-of-doors in a quiescent condition. Generally speaking, an inland place with a moderate altitude is to be preferred. Such are Hindhead, Crowborough, West Malvern, Buxton, and the health resorts on the Yorkshire Wolds. But it has to be remembered that in advanced cases of arteriosclerosis, with irreducible high blood-pressure, even so moderate an altitude as from 600 to 800 feet may rapidly induce dyspnœa or initiate temporary accesses of Cheyne-Stokes breathing. For such cases, and especially for those complicated with chronic bronchitis, asthma, and emphysema, a South-Coast place with a mild and even somewhat moist air, and a supply of invalid chairs, is to be preferred. Breathing exercises, and gentle calisthenics practised without weights or mechanical appliances, are often useful adjuncts to a course of after-treatment.

W. Bezly Thorne.

SCIATICA.—Sciatica may be, and frequently is, only a symptom of disease situated in the spinal cord, the bodies of the vertebra, the pelvis or hips. Disease of the rectum and new growth may give rise to pain in the course of the sciatic nerve. Constipation is also a frequent cause of sciatica, and is said to explain the greater frequency of the affection in the left leg. Exposure to wet or cold, or the pressure of a hard seat, may under certain conditions induce an attack. It is especially liable to occur in gouty individuals and in those who pass uric acid in the urine. It also occurs in connection with rheumatism and gonorrhœa.

It is obvious then, that successful treatment depends to a large, extent on accurate diagnosis: but although a certain number of cases come under observation which may be due to the causes above indicated, a far larger number occur in which no very obvious cause can be demonstrated.

Treatment may be dealt with under the following heads: (1) Rest; (2) Application of heat; (3) Electricity; (4) Local applications; (5) Massage; (6) Diet; (7) Drugs; (8) Change of climate; (9) Surgical treatment.

1. **Rest.**—In most cases rest in bed is advisable, and in acute cases essential. Complete rest to the affected limb is best secured by the use of a long splint. The limb should previously be carefully bound up with a flannel bandage. When a splint is not employed, the limb should be supported by pillows, and movement limited by the use of sand bags.

2. **Application of Heat**—Is of special value in the relief of pain. During the early stages of a mild attack, a Turkish bath undoubtedly gives good results.

Hot-air baths applied locally are also most beneficial, and a temperature of 300–400° F. can be made use of when suitable precautions are taken.

Such local heat may be obtained in a closed chamber heated by gas or a spirit lamp, or still more easily by the electric current. Both methods are somewhat expensive in application, and much good may be done by hot sand-bags, which can be heated in an ordinary oven and applied along the course of the sciatic nerve. Another simple and effectual method of applying heat is by means of a hot iron, the patient being ironed along the course of the sciatic nerve. A hot-water bottle may also be used. The local hot-air bath should be applied at first every other day, and, since it gives rise to a considerable amount of sweating, the patient should be carefully protected both during and after its application. The local application of heat is also available in cases in which for general reasons it is inadvisable to sanction a Turkish bath.

A simple hot bath, to which an alkaline salt or ammonia has been added, is often beneficial.

3. **Electricity.**—Galvanism gives the most satisfactory results, although faradism and high frequency have been used in some cases.

The current may be applied by means of a bath—the direction of the current being immaterial—or direct application may be made to the skin, the positive pole being placed on the thigh and the negative pole on the back. A current of 2 milliampères is gradually increased to 5 milliampères. This is allowed to pass for 5 to 10 minutes, the current then being gradually reduced and the electrodes removed when the current has been shut off.

4. **Local Applications.**—Blisters, along the back of the thigh, are sometimes successful in the relief of pain, two or three days being allowed to elapse between the application of each blister. Counter-irritation may be made by the actual cautery. The local application of belladonna, mesotan, turpentine, and iodine is also useful. In order to avoid pressure on the nerve, it is advisable for the patient to have an air cushion when seated for any length of time.

5. **Massage.** — Massage and passive movements are of service in the late stages of the disease, but should not be allowed during the acute stage.

6. **Diet.**—A restricted diet, such as is suitable in a case of gout or rheumatism, should be ordered. Beer and stout should be strictly forbidden, but claret and whisky may be allowed.

7. **Drugs.**—Drugs in some cases have a very marked beneficial effect, but in other cases seem almost useless. Quinine, iodides, bromides, salicylates, salicin, belladonna, sodium and potassium bicarbonate, colchicum, gelsemium, aspirin, acetanilide, phenazone, and many others have been used with good effect.

Quinine and iodine may be given together in the following mixture, three or four times a day :—

℞	Quin. Sulph.	gr j	Ac. Sulph. dil.		℥ j
	Pot. Iod.	gr iij	Aq. Chlorof.		ʒ ss

The small quantity of acid is sufficient to keep the quinine in solution, and not incompatible with the iodide.

The following mixture will also be found of some service :—

℞	Sod. Salicyl.	gr x	Tinct. Cardam. Co.		ʒ ss
	Tinct. Gelsem.	℥ x	Aq. Chlorof.	ad	ʒ ss

The quantity of gelsemium is gradually increased, until the pain is relieved or poisonous symptoms produced. The local hypodermic injection of cocaine, $\frac{1}{8}$ to $\frac{1}{4}$ gr., is often beneficial. Hypodermic injections of morphia give relief to pain, but should not be given until other remedies have failed.

8. **Change of Climate.**—A warm dry climate is that which suits most patients, and appears to be generally beneficial. The routine treatment by baths, waters, and diet at various hydropathics is often more beneficial than the same treatment when carried out at home. This is in part due to climatic conditions, but also to the enforced absence from work, which makes it possible for treatment to be carried out regularly and efficiently. Harrogate and Buxton are favourite resorts. Bath suits older patients, but does not as a rule agree so well with the younger.

9. **Surgical Treatment.** — Acupuncture of the nerve, nerve stretching, and splitting the sheath of the nerve have all been successful in cases which had resisted other forms of treatment.

Shortly, it may be said that the treatment of sciatica consists of rest in bed, regulation of diet, local application of heat, counter-irritants, or some form of liniment, the administration of drugs ; and, failing a successful result from these methods, the application of electricity, acupuncture, and nerve-stretching. (See also ELECTROTHERAPEUTICS ; NERVES, PERIPHERAL ; and RHEUMATISM, CHRONIC.)

F. E. Batten.

SCOLIOSIS.—Scoliosis, also called lateral curvature and rotary lateral curvature of the spine, is a deformity of growth rather than of disease. The deformity consists of one or more lateral curves of the spinal column, associated with a rotation or tortion deformity, the rotation being mainly in the vertebral bodies and towards the side of the convexity of the lateral curvature. This condition must not be confused with a simple lateral deviation—a purely functional and easily corrected condition. In true lateral curvature flexion of the spine intensifies the deformity ; in lateral deviation, flexion of the spine obliterates it. Curvature persists in the horizontal position, while deviation disappears. A neglected lateral deviation may develop into a true scoliosis.

The most common curvature is in the dorsal region with the convexity to the right. This is usually associated with another curvature in the lumbar region with a convexity to the left. There may also be a cervical curvature with a convexity to the left. The curve which shows the greater amount of deformity and rigidity, the one which is usually first to appear if there is more than one curvature, is called the primary curve ; while the curve of lesser deformity, or the curve to appear later, is known as the secondary or compensatory curvature.

The most frequent location of the primary curve is in the dorsal region, with the convexity to the right. The next most frequent curve is in the lumbar region, with the convexity to the left. Following this, comes dorsal curvature with a convexity to the left, and lumbar curvature, or dorso-lumbar curvature, with a convexity to the right. Least frequent of all of these lateral curvatures is that found in the cervical region (Ridlon).

THE DIFFERENTIAL DIAGNOSIS of lateral curvature is generally comparatively easy, but mistakes in differentiating it from spinal caries are perhaps more frequent than is generally supposed. At any rate, greater difficulty occurs in differentiating it from spinal caries than from any other disease.

In spinal caries, the most important feature in the diagnosis is the rigidity due in the early stages to involuntary muscular spasm, and in the later stages to more or less complete ankylosis and to structural shortening of the soft parts.

Assume a case with the lateral curvature to the right in the dorsal region, or to the left in the lumbar region with a deviation from a vertical of not more than half an inch, and with only a moderate degree of rotation deformity. The diagnosis must depend upon the history of the case taken in conjunction with the degree of rigidity. If the spine is flexible and the curvature can be partially overcome by gentle passive manipulation, it is generally safe to assume that it is a case of lateral curvature ; but if the spine is rigid, and the history warrants one in assuming that the curvature has been present not more than some months, it is equally safe to assume that it is the beginning of spinal caries. On the other hand, if the spine is rigid without angular

deformity, and the history covers a period of several years, it must be assumed that it is a case of scoliosis which has perhaps undergone spontaneous arrest.

Scoliotic curves do not become rigid until they have been present for many years, while curves due to bone disease become rigid comparatively early, and the spinal caries that has existed for many years is more than likely to present a posterior angle, or at least so great a posterior deformity that the case can be readily recognized for what it really is.

A few years ago, rotation deformity, and particularly deformity of the ribs, were regarded as very positive evidence of scoliosis, but we now believe that these deformities can arise in a slowly developing lateral curvature due to spinal caries.

PROGNOSIS.—Lateral deviation of the spine and round shoulders are very amenable to treatment so long as no structural changes have occurred in the bones. In principle the treatment consists (*a*) In educating the patient to know when she stands straight, and voluntarily to correct her faulty attitude ; and (*b*) In strengthening her muscles by appropriate exercises designed to keep her spine in the normal position. It is also necessary to correct any errors of dress which favour bad posture. In curvature with organic change, both age and growth-rate influence its progress. With very rare exceptions, the untreated case grows steadily worse, and that largely in proportion to rapidity of growth ; in cases discovered early in girls who have attained full growth, the prognosis is favourable. Lateral curvatures in infants co-existent with rickets have but to be moulded straight and fixed until the bones harden, to be fully eradicated ; if not rachitic in character, however, they are all but hopeless. Lateral curvature when associated with infantile paralysis can only be controlled by mechanism. The treatment of girls is more successful than that of boys. In true lateral curvature the treatment by exercise alone often fails to arrest the deformity. Such cases under treatment of braces alone will almost invariably retrogress. Under the combined treatment of exercises and removable support continued during growth, the deformity may be easily checked, and sometimes even considerably diminished. Complete eradication of deformity must not be looked for unless in those curves with but the slightest degree of rotatory change, and even in such a case we deem treatment successful which checks increase of structural change.

TREATMENT.—This has reference to : (1) Faulty attitude with lateral deviation ; (2) Lateral curvature or scoliosis.

1. **Faulty Attitude** may give rise to antero-postero deformity (round shoulders) or to side bending (lateral deviation). Round shoulders are always associated with weakness of the posterior shoulder muscles, and most frequently affect the rapidly growing girl. An intractable variety is sometimes found in the short-necked muscular subject, and is associated with heredity. The common causes of round shoulders, are : careless habit in the home and at school ; imperfect eyesight requiring glasses ; improper arrangement of clothing ; overwork which induces muscular debility ; and sometimes the presence of adenoids. Treatment should be influenced by the cause. Girls are much more frequently affected than boys, and Goldthwaite has pointed out the important effect of clothing in producing and maintaining the deformity. The under-waists, no matter what style, are practically so made that the weight is applied to the outer or movable portion of the shoulder by bands which so act as to depress and displace forwards the shoulder girdles. From actual measurement the drag upon the shoulders when the clothing is adjusted has been proved to represent 3 or 4 lbs. on either side. Treatment must therefore, as Goldthwaite says, be directed to correct the defect of garment, and the weight must be removed from the outer part to the inner or rigid part of the shoulder at the base of the neck.

The gymnastic treatment of round shoulders should be directed to drilling the child in holding herself correctly. The following exercises prescribed by Lovett are simple and effective.

(*a*). The patient hangs from a bar by the arms.

(*b*). The patient lies on the back with a hard roll under the scapulæ, while the arms are extended and stretched by an assistant pulling them above the head upwards and backwards.

(*c*). The patient sits on a stool with the hands behind the head and the elbows squared ; the elbows are pulled backwards, while the knee of the manipulator presses forward against the spine on a level with the shoulders.

In a minority of cases where the structures on the sternal side have shortened, or the deformity is of very long duration, more forcible methods should be adopted to render the region flexible before recourse to exercises. A military attitude should be assumed at all times, the chin being depressed, the head erect, and the shoulders held well back. For the depressed chest which so often accompanies the deformity, breathing exercises with resistance should be practised.

In lateral deviation of the spine, treatment is definite and effective. The deviation is often pronounced, and may be single, or there may exist a compensatory curve with or without pelvic obliquity. The point of practical bearing in such a case is that when placed in a fully corrected position the patient can ordinarily hold herself there. During stooping the spine is straight, and in that position no skeletal irregularity can be detected. The most common type of this deformity is the left total curve, where the spine sweeps with its convexity to the left, the left shoulder being raised. Such curves, if untreated, may undergo but slight change, or they may easily develop into single or compound structural curves. In treating such cases the patient must be placed in a correct attitude; if any pelvic obliquity exists, it must be rectified by placing a thickness under the heel, and exercises, mainly of a symmetrical kind, persevered with while the pelvis remains equalized.

The exercises should consist of breathing in recumbent position, with and without resistance, the arms being uplifted with the palms uppermost; circumduction of limbs; contraction of scapular muscles and hyper-extension of spine; with massage of the spinal muscles if this be indicated.

The child should be taught correct postures during reading lessons at the desk, at the table, and at the piano, and everyone about the child should be encouraged to correct.

2. **Structural Lateral Curvature** requires energetic and long-continued supervision. Rotation of the vertebræ being added to the lateral deviation renders the problem of treatment more complex. Its tediousness is apt to depress both parent and child, and relapses are usually due to neglect.

In a general way, treatment aims at rendering the curvature more flexible; at re-educating muscular sense, so that the patient feels straight when she is in as straight a position as it is possible for her to assume, and feels crooked when she is in the old habitual position of deformity; at increasing muscular strength until she can continuously maintain the best possible position. In slight cases exercise alone may suffice. In more severe stages a retention appliance may be needed. In certain types spinal elongation and retention are called for, while in others anæsthesia may have to be administered and considerable force employed to break down adhesions. We will discuss treatment under the following headings: (*a*) Posture; (*b*) Exercises; (*c*) Stretching of spine; (*d*) Forcible correction; (*e*) Retention appliances.

(*a*). *Posture.*—Although faulty postures are associated with the origin of lateral curvatures, they must be thoroughly appreciated by the surgeon who would treat the affection. They may be associated with myopia or general debility. Scudder examined 1484 school children in Boston, and found 67 per cent in an incorrect position at the time of observation. In the large majority of the writers the left side of the hip was in front of the right and the left shoulder in front of the right; the left ear was slightly lower than the right and somewhat behind it. In all cases there was a rotation of the spinal column. For writing and reading, and meals and music, the patient should be seated on a chair deep enough to support his thighs, yet not to interfere with flexion at the knees. It should incline slightly backwards, but arch forwards in the lumbar region. The desk should be sufficiently close to the body to prevent leaning forwards, and

the height should be slightly less than the level of the elbows, and the inclination just sufficient to keep the book at a proper distance from the eye. The patient should be educated to hold herself always in her best possible position, and should sleep on a hard mattress without pillows.

(*b*). *Exercises.*—Whatever adjuncts are adopted, the treatment by exercises will always remain the essential element, and in early cases should not be complicated by the use of apparatus. To be effective they must be long-continued, and the patient should spend at least an hour and a half in their performance. Exercises must be varied, and so directed as to include all muscles, with some special attention to stretching those on the concave side of the curve and contracting those on the convex. All exercises should be performed slowly; the arms should always be moved by direct muscular effort, and not allowed to swing. The following exercises prescribed by Ridlon I have found admirable :—

(i). The patient lies upon her back upon a table of convenient height, width, and length. The Swedish table known as the plinth is perhaps the most convenient. With her arms at the sides of her body, and the palms upwards, she breathes slowly and deeply ten times. In patients who present a projection of the ribs below the breast, it is of advantage for the surgeon to make pressure downwards with his hands upon these projecting ribs as the patient takes a full breath.

(ii). The patient grasps a bar of steel shafting 3–4 ft. in length, and 10–20 lbs. in weight. With the elbows straight, she swings this from the thighs forwards and upwards above the head until the bar reaches the level of the table. From here she swings it downwards again to the thighs, and this is repeated ten times.

(iii). The arms are then stretched directly outwards from the sides of the body, and in this position, as in (i), she breathes deeply ten times while the projecting ribs are held down by the surgeon.

(iv). Again, the iron bar is swung from the thighs to the table above the head and back ten times.

(v). Then the arms are stretched upwards by the side of the head to the fullest reach, care being taken that the lower shoulder is raised as far as the other. The arms are held in this position, and the patient breathes deeply ten times, the ribs again being held down.

(vi). Then an iron bar of the same length, but double the weight of the former, is placed in the patient's hands as she lies upon her back, and she raises it directly upwards from the chest, fully straightening the arms, and repeats the exercise ten times.

(vii). Still lying on the back, with the knee held straight and rigid and the foot extended, the patient circles the limb from the hip joint, making as large a circle as possible with the foot, ten times. Then the other limb is circled in the opposite direction ten times.

(viii). Still lying on her back with the hands grasping the top of the table, both limbs are lifted, while the knees are held straight and the feet extended upwards to the fullest point, if possible to the vertical position, and repeated five times.

(ix). The patient then turns on her face, is pushed out so that the body extends beyond the end of the table by the surgeon, and she, holding the head and shoulders as high as possible, makes with her arms the motion of swimming, the forward stroke of which should be particularly vigorous. In this position ten strokes are taken.

(x). The patient is then pulled back upon the table, and lying face down with the knee straight and the foot extended, she circles first one leg and then the other, making the largest circle possible with the foot, ten times.

(xi). The patient is again pushed out with the body beyond the end of the table, and with the arms in the key-note position, she bends the body downwards and raises it upwards as far as possible. This is repeated five times.

The key-note position consists of such a position of the arms as places the back in the straightest line. For an ordinary dorsal curvature with a convexity to the right, the key-note position consists of pushing the left arm as far as possible up beside the head and holding it there close to the ear, while the right arm is stretched directly outwards with the palm turned upwards; but the key-note position must be determined for each particular case.

(xii). With the patient again pulled back and lying comfortably upon the table, she takes a 5-lb. dumb-bell in each hand, and swings them outwards and upwards, that is backwards, as far as possible, ten times.

(xiii). The patient still lying on her face on the table, places her arm in the key-note position; then as she counts aloud one, two, the legs being held down, she raises the head and shoulders upwards and backwards as far as possible; then, counting three, four, she bends the head and shoulders as far as possible towards the convexity of the

curvature; then counting five, six, she twists the head and shoulders around towards the side of the convexity, as if in an effort to look over the shoulder; then, counting seven, eight, she swings and turns back into the straight position from which she started, and this exercise is repeated five times.

(xiv). The patient then sits astride the narrow end of the table, while the surgeon sits astride the table behind her, steadying her hips with his knees. Then, with the arms in the key-note position and the spine as straight as possible, she bends forward from the hips freely, and then backwards against the resistance exerted by the hands of the surgeon. This is repeated five times.

(xv). Then, with the arms stretched out from the side, she twists the body freely towards the side of the concavity; then she twists backwards towards the side of the convexity against the resistance afforded by the hands of the surgeon, one hand resting against the ribs forming the convexity of the curvature at the back, and the other against the ribs that are prominent below the breast in front. This exercise is repeated five times.

(xvi). The patient is then bent backwards and to the side of the convexity of the curvature over the knee of the surgeon, so that her waist rests through the bulging ribs across his knee, while the shoulder on that side is twisted still further backward. In other words, the position assumed is the one, both as to flexion and rotation, which most nearly corrects or overcorrects the spinal deformity. Lying lax in this position, the patient breathes deeply ten times.

In the early months of treatment greater improvement will be gained if the patient exercises in the prone position. Patients with lateral curvature are able to lie with the spine straighter than when they sit or stand, and the success of the treatment depends greatly upon making muscular effort while the spine is at its best.

(*c*). *Stretching of Spine.*—There is a group of cases of true lateral curvature with very considerable rotatory change, where the lateral bend can be largely improved by a pull upon the spine. Sometimes as much as two or more inches can be added to its length by such a manœuvre. Such a case we fix in a plaster support, applied while the patient is recumbent. To be effective it should secure the patient's head. The pulling is to be renewed every month or two, and this treatment may have to be continued for nine months. In a number of cases which have looked hopelessly deformed the results have been excellent. The treatment merely consists in applying ordinary surgical methods to the spinal column. If we deal with knock-knee mechanically, we fix it in a splint and allow it to grow straight. The same applied to a club-foot which we have wrenched and fixed in retention. The crooked spine will react to the same principles. Drs. Andrews and Hoke have added to the efficacy of this principle by cutting large windows in the plaster where the chest has receded, so that respiration specially acts in the direction of the reduction of rotation. When the plaster has been finally removed, the patient should be kept in bed, the muscles massaged, and exercises energetically practised while in the recumbent position. A retentive brace, to be described later, should be worn by the patient while in the upright position between the periods devoted to gymnastic work. This mode of treatment is only applicable to that class of case which materially elongates when stretched, but is by no means an uncommon type.

(*d*). *Forcible Correction* consists in rendering rigid curves more flexible, so that muscular control and retentive brace may be more efficient.

Stretching the spine with a view to restoring mobility and making an improved position possible in the curved portion is generally secured by hanging by the arms and by traction on the head by means of a Sayre's sling. A pull in the length of the vertebral column is not, however, an economical use of force. Traction in the length of spine tends to stiffen it against side pressure. In other words, more displacement is possible in a slack than in a stretched spine. (Lovett).

The practical point, therefore, is that the spine is most relaxed when the patient is recumbent, and any corrective force should be applied to the spine in

this relaxed state. Lovett has figured a very simple and safe apparatus which can be used by any careful practitioner (*Fig.* 42).

The patient lies face downwards, with the knees flexed, on a board 3 ft. wide by 4 ft. long. Assuming the case to be of a right dorsal curve, a broad canvas strap is passed around the left upper thorax, over and under the patient, and fastened to a cleat on the right side of the board. This furnishes a point of

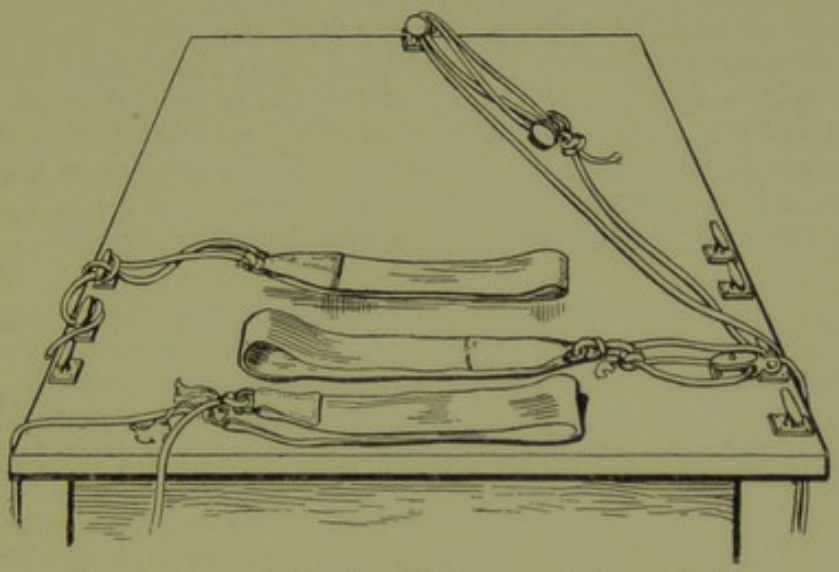

Fig. 42.—Stretching-board, with loops ready for application.

pressure to the left against the upper thorax at the level of the axilla. A broad canvas strap is then passed around the pelvis of the patient above and below, and is fastened to a cleat at the right side of the board. This furnishes a point of pressure to the left at the level of the pelvis. A broad canvas strap is then passed around the thorax at the level of the greatest point of curve ; it passes above and below the thorax, and its upper end is fastened to a cleat at the left side of the board (*Fig.* 43). Its lower end is fastened by means of a string into

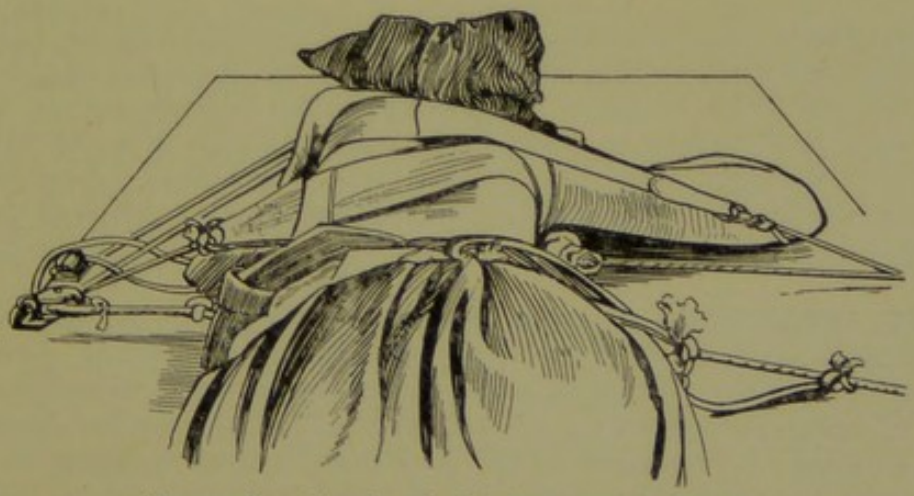

Fig. 43.—Stretching-board, with loops applied to patient.

a compound pulley attached to a cleat at the left side of the board. By means of this pulley any reasonable degree of force may be exerted against the right side of the thorax, pulling it to the left, and at the same time that it pulls it tends to reduce the rotation.

We will not discuss here the more complicated types of apparatus for forcible correction. Descriptions will be found in text-books of orthopædics.

(*e*). *Retention Appliances or Support.*—There are two schools of surgeons, one which under no plea whatever will permit of a support, and the other which thinks it imperative in all cases that a jacket should be worn. It would appear to us the height of folly to expect a jacket applied to a rigid spine to be of the slightest curative value; it is equally clear that a large proportion of cases must retrogress where a surgeon relies exclusively on exercises performed for about half-an-hour a day, no matter how marked the deformity. Where deformity can be checked without the use of a support, it is better to trust exclusively to exercises. When the deformity is so pronounced that it cannot, because of its size and its enfeebled muscles, resist the action of gravity, we must never hesitate to order a light support to be worn during the intervals between exercises. In no case, excepting when the curve is due to an unrecovered paralysis should a support be exclusively relied upon. It is only to be regarded as a means to retain the gain secured by other methods.

Robert Jones

SCURVY.—Try in the first place to get the patient away from the surroundings amidst which the disease has developed, and to place him in more hygienic conditions, chief amongst which are warmth, dryness, and fresh air. A radical alteration must be made in the diet, fresh vegetables and fruits, milk and fresh meat being abundantly supplied. Lemonade made from fresh lemons should be given as a beverage. Fresh infusion of malt is another powerful anti-scorbutic, and several pints of it may be taken in the day. Cider and the French and Italian wines are also curative drinks. If the gums are spongy they should be brushed with solid nitrate of silver every day, and antiseptic and astringent mouth-washes used freely, e.g. :—

℞	Alum	grs. v	Tincture of Myrrh		℥ x
	Dilute Sulphuric Acid	℥ x	Water		ad ℥ j

If diarrhœa be present, it should be treated with bismuth and opium. An extract of fresh Bael fruit has also been highly recommended in this complication. For subperiosteal hæmorrhages and hard swellings in the popliteal spaces and elsewhere, iodide of potash should be exhibited, and gentle massage used locally.

The Prophylaxis of scurvy demands attention to general hygiene, particularly the avoidance of overcrowding, and, most of all, the provision of a sufficiency of fresh elements in the dietary. If fresh vegetables or fruits are not available, 1 oz. of lime-juice should be given every day, although it is apt to produce "heartburn" in some subjects. Of preserved vegetables, "sauerkraut" is the best antiscorbutic. Fresh meat, even if eaten alone, is sufficient to prevent attacks of the disease.

Robert Hutchison.

SCURVY, INFANTILE.—The use of any tinned or proprietary food should at once be stopped, and the child put upon pure unboiled cow's milk. This may be supplemented by raw meat juice, made by adding to finely-minced steak one-fourth of its volume of cold water, allowing to soak for an hour, and then squeezing through muslin. One ounce of the juice may be given in twenty-four hours. Broths in which a muslin bag containing chopped potato, carrot, or other fresh vegetables, has been suspended during cooking, are also useful, or the flowery part of a baked potato may be rubbed up with some of the milk into a thin cream. A few teaspoonfuls of orange- or grape-juice should also be given every day. The use of drugs is unnecessary, but if there be rickets present, as there usually is, cod-liver oil and iron should be administered.

If the legs are affected, they should be wrapped in cotton-wool secured by a light bandage, or swathed in wet towels which are allowed to dry *in situ* after

they have adapted themselves to the contour of the limbs. A sand-bag should be placed on each side of the legs, and the weight of the bedclothes should be kept off them by a cage. If the arms are tender they should be fixed, by bandaging them gently to the chest. *Robert Hutchison.*

SEA-SICKNESS.—Prior to undertaking a voyage, a simple diet should be observed for a few days, and the bowels freely opened on one or two occasions by a dose of blue pill, followed by a saline draught. If the sea passage be of short duration (less than twelve hours), a draught of chloral and bromide of ammonium (30 gr. of each) should be taken before starting, and the patient should assume a recumbent position on going on board, preferably lying on his right side with the knees well drawn up. A tight abdominal binder is found to be a useful adjuvant in many cases. As a preparation for a longer voyage, 20 gr. of bromide of ammonium should be administered three times a day for two days before the journey is begun, and similar, or larger, doses should be continued for a few days after sailing. As soon as any discomfort is experienced, the patient should seek his cabin and lie down as described above. He should abstain from all solid food, thirst being relieved by sucking fragments of ice, and if there be much depression, iced champagne may be given freely. If the sedative action of bromides is found insufficient, other narcotics may be tried, such as chloretone (5 gr. every three or four hours) or validol (10–15 drops on sugar, repeated as required). Other useful sedatives are chlorobrom (which contains 30 gr. of chloralamide and bromide of potassium in each oz.) in doses of from 2 to 4 dr., repeated if necessary, and the proprietary preparation "Yanatas," the active ingredient of which is bromide of potassium. In very severe cases, with prolonged vomiting, leading to exhaustion and collapse, it may be necessary to have recourse to the injection of morphia.

The hypodermic injection of strychnine sulphate ($\frac{1}{60}$–$\frac{1}{30}$ gr.) along with atropine sulphate ($\frac{1}{150}$ gr.) has also been recommended. The injection should be given at the very onset of nausea or discomfort, or as a prophylactic in sensitive persons, and may be repeated in a few hours if necessary. *Robert Hutchison.*

SEBORRHŒA.—The principal treatment of this condition is washing of the scalp. This should be done with soap spirit, and it is important that the soap should be thoroughly washed out, not with the water in which the washing has taken place, but with two or three fresh waters.

The most generally useful application is an ointment of sulphur and salicylic acid, and it must be borne in mind that the scalp will tolerate more concentrated remedies than most parts of the surface. The active ingredients should be in a strength of not less than 5 per cent, and may be used much stronger in suitable cases.

On the body, the parts should be thoroughly washed, and one is guided with regard to the application by the degree of reaction in the skin. Thus, if the eruption is moist, a paste should be used, while if dry, an ointment is preferable. If the eruption is very extensive, mere economical considerations will suggest the use of a lotion.

The same drugs, sulphur and salicylic acid, are indicated, and although the application may be a little painful, the results are more rapid if they are used much stronger than usual. Much benefit, for instance, often results from a paste containing 15 or 20 per cent each of sulphur and salicylic acid, though obviously such cannot be applied to an extensive eruption. Indeed, one may say that the recognition of the seborrhœic element in a dermatitis is an indication to make the active part of one's treatment sulphur and salicylic acid.

Norman Walker.

"SEPTIC ANÆMIA."—The form of anæmia to which the writer has given the above title is, according to his observations, at once one of the commonest and one of the least recognized types. It frequently complicates other forms of anæmia, e.g., chlorosis, malignant disease, Bright's disease, pernicious Addisonian anæmia, leukæmia, the intestinal infective anæmias of children, purpura, etc., giving them an intensity out of proportion to their ostensible cause. In certain cases it is so severe that it can occasion an anæmia resembling in degree, and hitherto mistaken for, pernicious (Addisonian) anæmia, but differing from the latter in essential pathological respects, most notably in the absence of the hæmolysis and of the bone-marrow changes which characterize Addisonian anæmia. The features of severe forms of this anæmia are: (1) An oligocythæmia, in some cases comparable in degree to that found in Addison's anæmia, including the existence of poikilocytes and normoblasts, and with a low hæmoglobin ratio; (2) hæmorrhages from gums, and sometimes purpuric; (3) dirty grey, anæmic complexion, without lemon tint; (4) the existence of oral, gastric, and intestinal sepsis and symptoms; (5) fever; (6) nervous effects and symptoms in many cases; (7) in some cases chronic nephritis; (8) favourable prognosis if the cause be removed in time; and (9) absence of the hæmolytic and bone-marrow changes found in Addison's anæmia.

The indications for treatment are entirely etiological; first, the recognition of the type of anæmia we have to deal with, and then the detection of the source of the septic infection in the particular case.

In some cases the septic absorption is connected with leucorrhœal discharges, but in the great majority the septic lesions are in the alimentary tract.

In many cases the trouble is connected with chronic suppurative lesions in the nasal sinuses. The maxillary antrum is the sinus most often affected, less commonly the ethmoidal and frontal sinuses, and rarest of all the sphenoidal sinuses. It frequently happens that more than one of these cavities are discharging simultaneously, several drachms of fœtid pus being secreted and swallowed daily for many years. The patient becomes so accustomed to this discharge that in most cases he makes no mention of it—he has always had it, and does not connect it with the general loss of strength and ill-health which have gradually developed. Such cases, in the experience of rhinologists, can be multiplied a hundredfold. The effects of treatment are most striking: however severe the symptoms, the most remarkable benefit results from the removal of the septic trouble.

Still more commonly the seat of septic trouble is the mouth itself—the existence of "Oral Sepsis," manifested by deep-seated alveolar suppuration in connection with decayed roots, tartar, unclean plates and stoppings, pyorrhœa alveolaris, and lesions of gums connected with these conditions.

The important point to be noted is that the degree of anæmia is often so marked that none of the usual evidences (redness and pain) of inflammation are present, and lesions of an intensely septic character are on this account frequently overlooked.

The conditions found in the severe type of case may be illustrated by (1) Chronic empyema of antrum, not recognized before (two cases); (2) Deep-seated alveolar inflammation; (3) An alveolar abscess, and with a sinus in the hard palate discharging pus; (4) Necrosis of the upper jaw directly continuous with a decayed tooth.

The condition found in the milder type complicating other forms of anæmia may be illustrated by the following, recorded by Dr. Dalton, 1904:—A woman had had anæmia and bad teeth for four years; for two years she had had stomach symptoms, and three months before admission she had a gastric ulcer with hæmatemesis, which aggravated the anæmia. When examined, the teeth were

found to be extremely bad, and there were ulcers in the mouth with purulent discharge. The red discs numbered 48 per cent, and the hæmoglobin 26 per cent, the proportion of leucocytes was normal, and a few normoblasts were present. The case as a whole was thus not typical either of chlorosis, or of loss of blood, or of septic anæmia. Two days after admission ten teeth or stumps were extracted, and seven days later other stumps were removed. Eleven days after the first extraction the red corpuscles had risen to 64 per cent and the hæmoglobin to 40 per cent.

TREATMENT.—The prime indication is the discovery and removal of the sepsis underlying the condition. The oral antiseptic treatment to be employed includes not merely the use of mouth-washes (these exercise a very superficial effect on the oral sepsis present in such cases), but the more direct treatment of the septic lesions around each affected root. In many slighter cases this can be done most effectively by swabbing the affected roots and gums, after the removal of any tartar present, with 1-40 carbolic lotion, and in cases of oral sepsis this measure should never be omitted, even in cases which subsequently require the services of the dentist.

Wherever possible, diseased roots should be removed, particular care being taken to prevent any subsequent complications by careful antiseptic precautions both *prior* and subsequent to the operation. The best after-treatment in such cases is to pack the sockets of extracted teeth with double cyanide or sal-alembroth gauze twice a day, syringing out the cavity each time thoroughly.

In most cases the effects of the long-existing oral sepsis have extended to the stomach and intestines, and have created unhealthy conditions of the mucosa ("septic gastritis" and "septic enteritis"), which require to be dealt with by appropriate gastric and intestinal sedatives, laxatives, and tonics.

The most useful drugs are those with disinfectant properties, especially bismuth salicylate (10–15 gr. thrice daily before food), perchloride of mercury (30 min. to 1 dr. doses of the liquor), salicylic acid, or salol.

The response to such measures is immediate—*after the removal of the sepsis of the mouth.*

After removal of the sepsis, recovery from the anæmia can be promoted by the usual hæmatinic drugs—iron or arsenic, or hypophosphites—and by the other dietetic, medicinal and hygienic measures applicable to all forms of anæmia (see ANÆMIA). But it is astonishing how very little such drugs are required, and how rapid is the recovery in such cases after the sepsis is effectually removed.

William Hunter.

SEPTICÆMIA and PYÆMIA.—These two diseases are closely allied; indeed, the term pyosepticæmia has been coined to show the close relation between the two conditions. Strictly speaking, in *septicæmia* pathogenic micro-organisms are present in the blood-stream, producing severe constitutional effects by their toxic action on the tissues; in *pyæmia* a similar state of things is present, but there is a tendency to the development of multiple abscesses from localization of the process.

When once established, the treatment of *septicæmia* and *pyæmia* is almost entirely symptomatic. Wounds which have been responsible for the admission of the bacteria should certainly be treated by thorough evacuation and irrigation with antiseptics; but although this plan may prevent the further invasion of the tissues, it is clearly powerless to deal with those organisms which have already entered the circulation; besides, these diseases often arise from infections without any external wounds.

In cases of pyæmia where veins are full of infected clot, good results are said to follow the ligature of the main veins so as to prevent any further detachment

of embolic particles into the circulation. Such treatment, eminently satisfactory in lateral sinus thrombosis, has been applied to the veins of the extremity in osteomyelitis, and to the pelvic veins in pyosepticæmia of uterine origin. It is too early yet to say whether this treatment should be recommended.

Apart from the details above mentioned, the treatment must be directed to maintaining the nutrition of the patient, so as to enable him to fight his invading enemy.

Diet must consist of foods rich in nourishment and easily assimilated—strong soups, beef extracts, eggs, plasmon, etc. Alcohol is of undoubted value, and may be used freely.

Drugs.—Iron, arsenic, quinine, opium, are found to be of service. Large doses of perchloride of iron have appeared very beneficial in septic states; it is, however, not always tolerated by the stomach. Opium in one of its various forms may be given to relieve the restlessness, delirium, and pain.

Saline injections, either into the veins, the subcutaneous tissues, or the rectum, are very valuable. The saline solution dilutes the toxins and nourishes the tissues. Some authorities recommend that bleeding should be performed to remove some of the blood charged with poisonous substances. This treatment cannot be recommended, since the removal of a small quantity of blood, 8–10 oz., cannot really affect the amount of poison present in the body, while the abstraction of larger quantities will seriously weaken the patient. With regard to the injection of antiseptics into the blood-stream, we have little to say. Credé claims good results with collargol, injected into the veins of the arm. Various strengths have been used; Wassermuth has used it as strong as 2 per cent, of which 6 cc. were injected into the median basilic vein with, it is stated, an excellent result. Experiments made in the laboratory do not give any proof of the efficacy of antiseptics in conditions of septicæmia and pyæmia, but the condition is so desperate, and this remedy apparently so harmless, that it may be tried.

The application of the "vaccine treatment" in some very severe cases of pyæmia has been followed by success.

Any secondary abscesses which form in pyæmic states must be opened and drained. *W. H. Clayton-Greene.*

SEPTUM NASI, ABNORMALITIES OF.

1. **Thickenings, Deflections, and Dislocations.**—Some irregularity of the nasal septum is extremely common; in fact, a perfectly symmetrical septum is hardly ever met with. It follows then that the great majority of deviations of the septum, and such irregularities as are generally termed ridges, spurs, or crests, produce no symptoms and require no treatment. It is only when the deformity of the septum is sufficient to produce nasal obstruction or other definite symptom, that treatment becomes necessary. Even when obstruction is present, especially if not of long standing, it may be found to depend upon catarrhal swelling of the nasal mucous membrane, in which case the treatment for Rhinitis, Chronic (q.v.) should be adopted. Such treatment will often relieve the patient's symptoms, and no surgical interference may be required. When, on the other hand, there is marked deformity of the septum, causing complete unilateral or bilateral obstruction, when the patient suffers from repeated attacks of acute rhinitis, or from chronic rhinitis which does not yield to simple treatment, or from other symptoms which can be reasonably attributed to the nasal condition, surgical measures must be advised to restore a free air-way through the nose. The particular measure to be adopted depends upon the nature of the thickening or deviation of the septum, and upon the associated conditions. The important points to bear in mind are that a free air-way through the nose

should be restored with as little damage to the nasal mucous membrane and as little general inconvenience and danger to the patient as possible. These points are often overlooked in the operator's zeal to obtain a mathematically correct septum, which is not at all a necessity. Also it is advisable to avoid operation in children. Apparently operations upon the septum have occasionally arrested the natural growth of the parts and led to marked depression of the bridge of the nose.

It is not too much to say that the treatment of these conditions has been revolutionized by the introduction and perfecting of the operation of submucous resection.

In deciding upon an operation, three more or less distinct conditions may be recognized : (*a*) *Thickening or deflection limited to the cartilaginous septum ;* (*b*) *Bony spurs or ridges of the bony septum ;* (*c*) *Thickenings or deflections of the whole septum.*

(*a*). *A deflection or thickening of the cartilaginous septum* is best treated by submucous resection. Local anæsthesia with cocaine and suprarenal extract is generally sufficient, but in very nervous patients a general anæsthetic may be given. Even when general anæsthesia is employed it is always best to apply cocaine and suprarenal extract, as it diminishes the hæmorrhage and thus makes the operation easier, and also allows of less deep general anæsthesia. The instruments required are a small, sharp-pointed knife, fine and thick periosteum detachers, Killian's long nasal specula, strong short-bladed scissors, Killian's septum knife and gouge, and various small bone-cutting forceps. The chief points of the operation are as follows : A straight or slightly-curved incision is made through the mucous membrane on the convex side of the septum just in front of the deflected part, and with blunt dissectors the mucous membrane and perichondrium are separated over the whole of the convexity. The incision is then deepened through the cartilage, great care being taken not to wound the mucous membrane on the opposite—the concave—side of the septum. Blunt dissectors are introduced through this opening in the cartilage, and the mucous membrane and perichondrium detached from the concavity of the deflected portion. All the deflected part of the cartilage of the septum is thus denuded, and is then cut away with special knives or punch forceps. The operation must be continued until the whole of the deflection has been removed. The results of this operation are excellent. The incision in the mucous membrane closes naturally without stitching, usually heals in a few days, and a perfectly straight septum is left without any perforation. No raw surface being left, there is no tendency to subsequent crusting, and the only after-treatment necessary is simple cleansing of the nose for the first few days.

(*b*). *When the deformity of the septum is limited to a bony spur or ridge* situated far back in the nose, its removal is very simple. There is no great advantage in preserving the mucous membrane intact, and no harm in making a perforation of the septum ; indeed, if the nose be narrow, it may be better to remove the entire thickness of the septum. Cocaine and adrenalin should be applied so as to give a good view of the affected part. It is usually advisable to give a general anæsthetic also ; nitrous oxide should be sufficient. If the spur be small, its removal may be carried out with a spokeshave. A good light being thrown into the nose, the blade of this instrument is hooked over the posterior end of the ridge and then drawn sharply and strongly forward. If the obstruction is large and apparently consists of dense bone, it is better to use a nasal saw such as Goldsmith's. The saw is passed under the deflected part of the septum, and the ridge rapidly sawn through and removed. The after-treatment of these operations is very simple. After twenty-four hours the nose should be cleansed by gently syringing with boracic lotion, and weak boracic ointment

should be applied. The nose should never be packed unless it is absolutely necessary to prevent hæmorrhage.

(*c*). *When the bony as well as the cartilaginous septum is extensively affected*, the operation of submucous resection should generally be chosen, although it may be a little difficult and require some time and patience to complete properly. A solution of suprarenal extract with a little cocaine should be freely applied to both sides of the septum at least half an hour before commencing the operation. It is preferable to give a general anæsthetic as well, although it is not absolutely necessary, and many operators prefer to rely entirely upon cocaine. The incision is made through the cartilaginous portion of the septum, and the mucous membrane on both sides of the deflected portion is separated as above described. The cartilage and as much of the bone as necessary is then removed. Great care must be taken to remove all thickened spurs and ridges. When the operation is completed, the flaps of mucous membrane are allowed to fall back into position, and the nose should then be inspected to see that sufficient has been removed. It is generally advisable to place a small strip of gauze in each nostril, to maintain the two flaps of mucous membrane in apposition, and to keep the now flaccid septum in the middle line. The packing should be removed in twenty-four hours, and the subsequent treatment merely consists in cleansing the nose with boracic lotion for about a week, by which time healing should be complete.

When operating upon a deflected septum, it must be remembered that other causes of nasal obstruction are frequently present, and it may be necessary to remove portions of the inferior turbinates, or adenoids. Sometimes, indeed, the removal of portions of the anterior or posterior ends of the inferior turbinates may restore a free air-way through the nose without operating upon the septum at all.

2. **Adhesions between Septum and Turbinates.**—Adhesions between the turbinates and the septum require operation only if they produce nasal obstruction or prevent the removal of nasal secretion, or interfere with intra-nasal treatment. If they consist of slender bands they may be removed under local anæsthesia with punch forceps, or destroyed by the electric cautery. An extensive adhesion is usually the result of an imperfect operation upon a septal spur or upon a hypertrophied inferior turbinate in a narrow nose, when the opposing surfaces of mucous membrane have been simultaneously denuded of epithelium without the removal of a sufficiently large portion to keep the wounded surfaces apart. The best treatment is to cut through the attachment of the inferior turbinate with stout scissors as in anterior turbinectomy, and then with the spokeshave to remove the adherent portion of the turbinate, together with the whole of the septal ridge. In this way the wounded surfaces are so far apart that there is no tendency for the adhesion to re-form. The nose should be watched until healing has taken place, so that if any exuberant granulations form they may be at once removed.

3. **Abscess of Septum Nasi.**—This usually results from trauma: it is a suppurating hæmatoma. When it is certain that pus is present, free incisions should be made into the most prominent part of the swelling on each side of the septum. A general anæsthetic is usually necessary, as cocaine has little effect. The incisions should be as large as possible, and they should be kept open by inserting a probe every day for the first few days after the operation. When all discharge has ceased, the incisions should be allowed to close. As a rule this method is followed by a complete cure, but in a few cases the incisions show a great tendency to heal rapidly, and the pus re-accumulates. If this occurs, it is best to snip out a portion of the abscess wall and thus secure effective drainage. Occasionally also, if operation has been too long delayed,

necrosis of the cartilage may occur and delay the healing. When there has been delay in opening the abscess, or when the original injury was severe, considerable deformity (a sinking in of the bridge) of the nose may ultimately result. *H. Lambert Lack.*

SHOCK, SURGICAL.—Like sepsis, it is easier to prevent shock than to treat it once it has developed, and the greatest attention must be paid to preventing shock during surgical procedures.

PREVENTION.—As a general rule, it may be stated that the degree of shock produced by an operation is dependent upon the amount of traumatism to the nerve elements of the parts operated upon. The degree of shock is in direct proportion to the area of skin and muscle injured, and the relative number of nerve-endings in them. In operations upon the abdomen the degree of shock produced depends very much upon the area of peritoneum exposed, and the duration of the exposure. Any form of manipulation of the peritoneum, such as traction upon it, sponging, flushing with hot water, and even simple exposure, causes a fall in blood-pressure. Evisceration and extensive intra-abdominal manipulation, especially in the upper regions of the abdomen, very soon produce shock. For these reasons it is advisable to avoid lengthy operations and to reduce the handling of the tissues to the irreducible minimum. Much can also be done to prevent shock by keeping the patient warm and covered up as much as possible during operations. In cases where shock is likely to be a serious danger, it is important to avoid free purging just before operation, and the bowels should be emptied some two days previously; also such patients must not be starved previous to operation, except for a few hours. Small doses of strychnine administered every day for a week prior to operation are useful, and a morphia injection of $\frac{1}{4}$ gr. hypodermically just before commencing the anæsthetic is a most valuable means of combating shock.

TREATMENT.—Strychnine and other stimulants must not be given, as they tend to increase the shock, and not, as was previously supposed, to get rid of it. The foot of the patient's bed should be raised on blocks sufficiently to make the head the lowest part of the body. Bandaging the limbs is also useful in bad cases.

Large rectal injections of warm saline solution should be given. The fluid should be run in slowly with the buttocks well raised; two or three pints should be injected in this way with a douche syringe, and repeated if benefit results. This is not of much use in severe cases, however, as the fluid is not absorbed. In such cases intravenous infusion with physiological saline solution should be performed at once, and kept up, or repeated at frequent intervals. To be successful, saline intravenous infusion must be done early, and several pints of solution allowed to flow into the veins. It does the greatest amount of good in collapse due to hæmorrhage, because in such cases the nerve centres are not exhausted.

There are two drugs which are of great value in the treatment of shock if properly used: adrenalin and ernutin (a derivative of ergot). Adrenalin is of the greatest value, and will raise the patient's blood-pressure to a safe level even in the most extreme degrees of shock. It *must* be administered intravenously, and the best way is to add some adrenalin to the physiological saline solution used for intravenous infusion. The strength of the adrenalin solution should be from 1–10,000 to 1–20,000 of the saline solution. This fluid should be allowed to run into the veins rapidly until the pulse recovers, and then very slowly, just sufficiently fast to maintain the blood-pressure at a safe level. The injection of adrenalin subcutaneously is useless. It can, however, be put into the

peritoneal cavity at the end of an abdominal operation if shock has occurred. Ernutin is not so effective as adrenalin, but its effects are more lasting; it can also be used as a subcutaneous injection. No drug, however, is of any use administered subcutaneously in severe cases of shock, as there is not sufficient capillary circulation to get it into the main blood-stream.

The treatment may be summarized as follows: (1) Do not give stimulants; (2) Raise the blood-pressure in the vital parts of the circulation by raising the foot of the bed, and by bandaging the abdomen and limbs; (3) Give hypodermic injections of morphia to cut off inflowing sensory stimuli; (4) Perform intravenous saline infusion as early as possible; (5) If the shock continues for some time, give nourishment either by mouth or rectum; (6) Infuse with adrenalin, 1–20,000, or give an injection of ernutin.

Deferred Shock.—This is frequently seen in children and in old people. The shock comes on some four or five hours after operation. It is best treated by small injections of morphia, and may often be prevented by treating all such patients after operation as if shock had already developed.

P. Lockhart Mummery.

SKULL, FRACTURES OF.—From the point of view of treatment, fractures of the skull may be classified as follows: (1) *Fractures of the vault without depression;* (2) *Fractures of the vault with depression;* (3) *Fractures of the base.* Any one of these may be simple or compound.

1. **Fractures of the Vault without Depression.**—It is unlikely that this lesion will be diagnosed with certainty unless it be compound, in which case a fine red line of fracture will be seen crossing the exposed bone at the bottom of the scalp wound. The occurrence of a linear hæmatoma should, however, cause the existence of a fracture to be suspected. In all cases of fracture or suspected fracture, whether of vault or base, the importance of complete and sufficiently prolonged rest cannot be over-estimated. The patient should be put to bed in a darkened room, he should be kept free from worry, and the visits of friends and relations as far as possible controlled. A purge should be administered at the outset, and attention should subsequently be paid to the regular evacuation of the bowels. The diet should consist of "slops," and stimulants be altogether withheld. The appropriate treatment for scalp wound or hæmatoma, should such exist, is carried out, and a careful watch is kept for signs of compression or indications of intracranial hæmorrhage or suppuration. When a fracture has taken place, it is necessary that the patient should not return to work for at least six weeks.

2. **Fractures of the Vault with Depression.**—The general treatment is the same as for fractures without depression, but it is necessary in dealing with injuries of this class to realize clearly certain well-substantiated facts. In the first place the amount of depression which is apparent to the observer by external examination is no safe index to the amount of pressure on the brain beneath; a slight depression of the outer table may be, and often is, associated with extensive splintering and depression of the inner table, the fragments of which may be pressing upon and lacerating the underlying brain. Again, the absence of immediate signs of compression does not in the least indicate that no ultimate trouble is to be apprehended; fragments may be pressing upon or even lacerating the cerebral tissue, and only give note of their existence by the subsequent development of persistent headache or Jacksonian epilepsy. Further, the operation for the removal of depressed bone is, under present circumstances, devoid of risk. For these reasons it is advised that all cases of depressed fracture, whether simple or compound, whether accompanied or not by signs of compression, should be submitted to immediate operation. (A single exception may be made to this rule: in the case of extensive shallow

depressions in infants and young children, operation is not called for in the absence of signs of compression of the brain.) A flap of sufficient size is turned down, or the wound, if such exist, is enlarged, and the depressed area is thus freely exposed. If there be a small depressed area, a disc of bone may be removed with a trephine so as to include it. If more extensive depression exist, a trephine hole should be made at the edge of the depression and the fragments removed by means of elevator and sequestrum forceps. Often, when there is extensive comminution of the bone, the fragments may be removed readily without the use of a trephine. In cases where there is a large single piece of bone depressed, it may be advisable to raise it to its normal level by means of an elevator, and leave it. The flap is stitched into position, a drainage tube being left in for forty-eight hours.

3. **Fractures of the Base.**—The general treatment called for is that given under the heading of *Fractures of the Vault without Depression*. It must be remembered, however, that fractures of the base are, more often than not, compound. When the anterior fossa is affected, the cavity of the nose is opened; when it is the middle fossa which is fractured, the ear or the roof of the nasopharynx may be involved; whilst in the case of the posterior fossa, the latter cavity is again likely to suffer. It follows, therefore, that the chief object towards which treatment must be directed is the prevention or the minimization of the risk of the involvement of the brain and its meninges in septic processes originating in and spreading from the cavities above-mentioned. If the fracture involve the nasal cavity, that cavity is sprayed frequently with a lotion containing 10 gr. each of sodium bicarbonate and borax and 1 gr. of carbolic acid to each ounce, after which iodoform powder may be insufflated. When the ear is involved, it should be gently syringed with carbolic lotion (1–60), and the meatus plugged with cyanide wool, which is frequently changed. When the cavity of the mouth is opened, the nasopharynx is to be kept as clean as possible by the use of the nasal spray and antiseptic mouth-washes. *S. Maynard Smith.*

SKULL, GUNSHOT WOUNDS OF.—These injuries are often immediately fatal. With the modern military rifle the bullet may completely traverse the skull, leaving apertures of entrance and exit. Revolver bullets usually remain within the cranial cavity.

Operation is necessary. A flap of scalp is turned down, freely exposing the point at which the bullet has entered the skull. All depressed and splintered fragments are taken away, the removal of a disc of bone with a trephine being usually necessary in order to effect this. If the bullet be readily accessible it is removed, otherwise it is left; and should symptoms referable to its presence develop later, it may be localized by X-rays and extracted. *S. Maynard Smith.*

SLEEPING SICKNESS.—(See TRYPANOSOMIASIS.)

SLEEPLESSNESS.—(See INSOMNIA.)

SMALL-POX.—(See also FEVERS, ACUTE INFECTIOUS.) Mild discrete and modified cases require little special treatment; but in the severer forms, both general treatment of the febrile symptoms, and local treatment of the eruption, require attention.

The lumbar pain so frequently occurring during the *prodromal period* may be relieved by the application of linseed-meal poultices, or belladonna and glycerin, to the loins; for vomiting, morphia is the best remedy; for sleeplessness and delirium, opium.

When the *eruption* is at all copious, the hair and beard should be cut short. In the early stages of the eruption, the cutaneous swelling and irritation call for

relief; this is best afforded by the application of cold—even iced—water compresses, frequently renewed; or of lint soaked in glycerin (1 dr.) and iced water (1 oz.), covered with oiled silk. If these applications are not agreeable to the patient, an astringent powder should be dusted over the skin, such as starch and oxide of zinc, boric acid, or fullers' earth.

Another useful method of treatment is to paint the skin with undiluted tincture of iodine; this should be commenced as early as possible in the eruptive stage, and continued once or twice a day. After eight or nine days the skin begins to peel; the iodine should then be discontinued, and some antiseptic ointment be applied. In patients whose skin is very sensitive, the undiluted tincture of iodine is too strong, and a weaker solution must be used. Some patients cannot bear the iodine at all, and recourse must be had to some other method (Welch and Schamberg).

When *scabs and crusts* have formed, the object should be to hasten their separation; and this is best accomplished by the use of moist applications; dry applications must on no account be used. The best treatment is that employed by Dr. J. MacCombie; a mask is made of a single thickness of lint, holes being cut for the eyes, nostrils, and mouth; on the mask a thin layer of linseed-meal poultice is spread, and on this layer some vaselin and iodoform; the mask is applied to the face, being renewed at least every two hours. In very severe cases the same application may be used for the eruption on other parts, but usually wet boracic acid dressings will suffice.

When the crusts have separated, the ulcerated surface that is left should be treated by antiseptic dressings—boracic acid, iodoform and vaselin, or carbolic oil (1–20). Tense and deeply-seated pustules, such as are found where the skin is thick, should be opened with a lancet or stout needle, and treated aseptically.

Baths may be given at any stage of the disease, but are particularly useful during the eruptive period, especially when pustulation is taking place. The temperature of the bath will depend upon the object for which it is given. In severe, confluent cases, the continuous warm bath is of great value.

During the eruptive stage the nurse should be very careful not to give the patient any pain or discomfort when she is moving him. For instance, when raising the head and shoulders, her arm should be placed under the pillow. The bed should be soft, and the linen fine and light. A water bed should be used when the eruption is profuse.

In the nursing of delirious patients incessant watchfulness is essential. They will endeavour to escape from door or window if the slightest opportunity is afforded, and, if actively restrained, will become angry and violent, and attack the nurse or attendant in order to free themselves. Opium is the best drug for this condition; but in some cases other hypnotics or sedatives are more suitable. At times, however, even large doses of these drugs fail, and then the nurse must exercise all her tact in humouring the patient as much as possible: for instance, if he insists on getting up, she may allow him to walk about the room in dressing-gown and slippers; he will, in most instances, quickly become fatigued and be glad to return to bed.

Complications must be treated as they arise. For laryngitis the patient should be placed in a steam tent. If there is serious laryngeal obstruction, tracheotomy will be necessary. The swelling of the tongue usually yields to ice; but if it be extreme, an incision should be made in each half of the organ. When there is much eruption on the mucosa and the palate, pharynx, mouth, and nose, these passages must be frequently washed out with one of the solutions mentioned in the articles DIPHTHERIA and SCARLET FEVER.

It is most important to pay attention to the eyes, which should be examined daily. They should be frequently bathed with boracic lotion to prevent the

lids from sticking together with dried secretion. Vaselin should be smeared on the edges of the lids. Should ocular complications, such as severe conjunctivitis, keratitis, corneal ulcer, and the like, arise, they must be treated in the usual way.

Abscesses must be freely opened and drained.

In hæmorrhagic small-pox nothing can be done except to relieve symptoms and administer stimulants ; but full doses of turpentine and ergot may be tried.

In discrete and confluent small-pox the patient may be allowed to get up daily as soon as his strength permits ; but in very mild cases he needs to remain in bed only for a day or two.

No patient should be considered free from infection until all scabs have separated and ulcers have healed.

Quarantine period : fifteen days. *E. W. Goodall.*

SNAKE-BITE.—(See Poisoning, and Bacteriotherapeutics.)

SPHENOIDAL SINUS, SUPPURATION IN.—(See Nose, Accessory Sinuses.)

SPINA BIFIDA.—Posteriorly the spinal canal is completed by the fusion of the laminæ or neural arches at the root of the spinous processes. There is a separate centre of ossification for each half of a neural arch. If fusion does not take place, there occurs posteriorly a median defect of spines and laminæ seen in spina bifida. This defect most frequently appears in the sacral and lumbo-sacral regions, the neural arches in these regions being the last to ossify.

Spina bifida is a hernia of the membranes, through a congenital defect in the posterior wall of the spinal column. This forms a tumour containing cerebro-spinal fluid, and in over 50 per cent of cases the spinal cord, wholly or in part.

The principal varieties of spina bifida are : (1) *Menincocele*, where the contents are simply spinal fluid and membrane ; (2) *Meningo-myelocele*, where both cord and membranes are found ; (3) *Syringo-myelocele*, where the sac is lined by a neural layer formed by distension of the central canal of the cord.

The diagnosis is usually simple. It may be arrived at by the history, position and appearance of the tumour, and the connection of its contents with those of the spinal canal. If the communication between the cyst and spinal canal be very slight, it may be mistaken for a congenital tumour not connected with the spinal membranes.

The prognosis depends upon the character of the overlying skin, the size of the tumour, the contents of the sac, and the accompanying malformations.

Treatment.—A certain proportion of cases are best left alone, notably those where paralytic symptoms co-exist with other congenital deformities. Palliative, rather than operative, measures are indicated in very enfeebled children with extensive openings into the spinal canal, or in those cases where there is every prospect of the child growing up.

In quite a number of cases a shield may prove useful, namely, those in which the sac is ulcerated, or where it is so thin and extensive that a danger exists of puncture. The shield should be very large, to prevent the danger of the tumour being irritated by its edges, and should be well-ventilated by numerous holes.

The only operative measures which have been successful are that of (*a*) Injection and (*b*) Excision of sac.

(*a*). *Injection.*—Morton's fluid (iodi 10 gr., pot. iod. 30 gr., glycerin 1 oz.) has proved the best solution for introducing into the cavity. It is intended to produce irritation and thickening of the sac wall, followed later by its obliteration. The operation has to be performed very carefully, with strict antiseptic precautions. If the tumour is tense, some of the spinal fluid should be carefully withdrawn by means of a needle sufficiently large not to be easily occluded. It should be

introduced through the side of the tumour, and not through its thinnest part, in order to avoid the danger of subsequent leakage. About one-third of the contents should be removed. The puckered skin or depressions in the sac should be avoided, as they generally indicate nerve attachments. About 15–60 minims of Morton's fluid should be introduced into the sac, the amount depending somewhat on the size of the tumour. The needle should be carefully withdrawn, the skin dried, and collodion applied. To prevent diffusion into the spinal canal the child should be kept semi-recumbent. Later, it is well to keep the child lying on his face or side, to prevent the escape of cerebrospinal fluid.

The cases most suitable for Morton's injection are those of simple meningocele in very young children, when the tumour is rapidly increasing, and in those cases where an ulcerated surface contra-indicates excision. As death sometimes follows the injection, it is well to leave alone those cases which do not give rise to danger. It is usually necessary to repeat the injections at intervals of about fourteen days.

(*b*) *Excision of the Sac* should be practised in those cases where it is covered by normal skin and does not contain nerve elements, but where it continues to grow in size ; in those cases where the sac is membranous, or partly so, and contains neural elements ; and in those cases where the sac is in danger of rupture, with subsequent fatal infection. The operation is grave, and is fully described in text-books.

Robert Jones.

SPINE, CARIES OF.—The proper treatment for caries of the spine is *absolute and uninterrupted rest*, and this is best secured by putting the patient flat in a pillowless bed ; he must not be allowed to sit up nor roll about. As Brodie said, "From the first moment in which the nature of the case is indicated, the patient should abandon his usual habits and be confined altogether to his bed or couch." There is no treatment better than, or so good as, this. But though a child is to be lying flat for six, twelve, or more months, he is not to be shut up in a close bedroom ; the windows are to be kept open, and he is to be carried out of doors every day. He should also be given general massage.

When much of my work lay with out-patients, I had the children with spinal caries placed in the empty boxes in which oranges are imported. A box could be bought for a few pence ; and an old blanket folded on the bottom of it served as a mattress. In the process of evolution the orange-box became, for certain children, a Phelps's box-splint. By some such means a child with caries can be carried from one room to another, or taken into the open air without risk, and by slightly tilting the box or tray the child can see what is going on around him, and thus feel that he is not entirely shut out from the bustling world.

The plaster-of-Paris jacket treatment (of which, I confess, I have been a warm advocate) must be held responsible for much of the existing deformity of Pott's disease. Many a time have I seen the angular projection coming on and increasing when the child has been walking about in a plaster jacket or some other form of support. But the plaster jacket may be used in lumbar and low dorsal caries as soon as the disease is practically at an end.

Cervical and High Dorsal Caries.—The patient lying flat in bed, a shallow, firm pillow may be laid beneath the nape of the neck, and on either side of the head a sand-pillow of the size of a quartern loaf should be placed, so as to prevent all movement. If the child is restless, a coronet of webbing may be placed around the head, the ends of the webbing being sewn to the sand-pillows. Further security may be obtained by fixing a band around the child's head and attaching a cord to it which runs over a pulley at the bed-head, a weight of a few pounds being hung to the free end of the cord. This band takes its bearings from beneath the chin and the occiput. It is not suggested that the weight at the end

of the cord effects a separation of one inflamed vertebra from another: the intervertebral and the common ligaments of the spine would absolutely prevent such separation. A long bed-cradle should be placed over the feet and legs.

I have had considerable experience of the use of the *jury-mast*, as introduced by the late Professor Sayre, and have long since discarded it. It was designed to allow rotatory movements of the neck, but no movement whatever should be permitted.

When active disease has passed away, as is shown by the disappearance of local pains and of the peripheral neuralgias, the patient may be fitted with a leather cuirass (such as is made by Spratt and Brooke, of Brook Street) which, taking its bearings from the chest, shores up the occiput and the chin. Poroplastic material also answers well, but it cannot be moulded so closely as wet leather, and is, therefore, not so comfortable or efficient.

For cervical or high dorsal caries, the ordinary poroplastic or gypsum jacket which takes its bearings from the hips is, obviously, of no service.

Low Dorsal and Lumbar Caries.—When the disease is below the level of the shoulder-blades and the patient has undergone a sufficient course of complete rest in the horizontal position, a stiff jacket may be applied which fits close to the trunk and takes its bearings from the pelvis, reaching down to the top of the great trochanters. It may be made of leather stiffened with steel, of poroplastic felt, or of crinoline muslin soaked in a creamy mixture of plaster of Paris. In my opinion, the worst form of spinal appliance is the antiquated steel "support" made by the surgical mechanician; it is as heavy and cumbersome as it is expensive. The best is of "undressed" leather, which is closely moulded on when in a wet and soft condition. The cheapest and the most serviceable for general use is that of plaster of Paris.

Angular Deformity often results from spinal caries. It may make its appearance even though the patient has been kept flat on his back during the whole progress of the disease. It is due partly to the contraction of the fibrous tissue filling in the carious patch, but still more to the contraction of the recti and other abdominal muscles. A few years ago a good deal was talked about the immediate and forcible straightening of angular deformity due to caries; some of the children subjected to that treatment died from shock, or were left with paraplegia, and it was not long before the method was discredited, and was allowed to sink into deserved oblivion. The surprise is that any practical English surgeons could have ever thought of resorting to it.

"Spinal Abscess" is the term usually applied to the collection of fluid into which the tuberculous granulomatous mass breaks down; but, unless septic micro-organisms have found access to it from the colon or elsewhere, its contents are not actually *purulent*, and it must be the surgeon's care that, in his active treatment of the "abscess," it does not become septic. It may be dealt with by aspiration with a large needle, and this treatment may be repeated several times if necessary. It is useless to employ a slender needle, for it is certain to become blocked. If after several aspirations the fluid re-collects, it will be advisable to incise and empty the "abscess," to remove the lining by scraping and swabbing, and to finish the cleansing process by abundant flushings with hot water, to which a little tincture of iodine has been added, as well as a little carbolic lotion to discolour it. When the lotion comes back clear the cavity may be squeezed empty and the wound sewn up tight. No drainage tube should be inserted.

Paraplegia.—Chronic inflammation of the vertebræ is necessarily accompanied by thickening of the membranes of the cord—pachymeningitis. The motor strands of the cord are nearer the diseased bone, and they, therefore, are the filaments implicated, the sensory strands escaping. Disease of the vertebræ is

apt to set up an ascending and descending myelitis, and, if the myelitis becomes chronic, sclerosis of the cord results. With perfect rest paraplegia usually passes off.

Laminectomy, the removal of the posterior arches of the diseased vertebræ, is sometimes resorted to with the view of restoring the motor functions of the cord. But in proposing its adoption, two important facts must be borne in mind: first, that the paralysis may very probably clear up of its own accord if Nature be given a fair chance; and, secondly, that the operation not only entails a serious amount of shock, but involves the sacrifice of the only part of the vertebral support of that region which is free from disease. The conservative surgeon sees better results from the simple rest-treatment of paraplegia than he whose inclination is for operation. *Edmund Owen.*

SPINE, FRACTURES AND DISLOCATIONS OF.—The bony spinal column may suffer injury in three ways: (1) From direct violence; (2) From indirect violence due to falls on the feet or head causing compression of the vertebral bodies, and (3) The result of over-flexion or extension. These may cause fracture, dislocation, or fracture-dislocation. The 4th, 5th, 6th cervical, and the 12th dorsal and 1st lumbar vertebræ are those most often involved.

Fractures of the Spine are important on account of their complications. So far as the bony lesion is concerned, the treatment adopted for fracture elsewhere is indicated. But in the large majority of instances the spinal cord is irremediably damaged. The treatment, therefore, consists chiefly in the skilful management of a patient with a transverse lesion of the spinal cord.

Fractures may be divided into the complete and incomplete; the former into those associated with dislocation and those without, and, what is far more important from the point of view of prognosis and treatment, into the complicated, in which a lesion of the nervous system exists, and the uncomplicated, in which this is absent. Although the complete and the incomplete correspond closely to the complicated and uncomplicated, yet it must be remembered that a complete fracture by no means always leads to complications of a nervous nature. Several cases of fracture of the 5th or 6th cervical vertebræ have come under my notice in which no suspicion of the nature of the injury was aroused at the time of its infliction, but the patient came under observation later on account of persistent stiffness of the neck. The physical signs pointed to fractured cervical spine, which was confirmed by the radiograph. In the compression fractures in which the bodies of one or more vertebræ are crushed as the result of falls upon the feet, buttocks, or head, there may be no nerve symptoms. This fracture is not uncommonly unrecognized at the time of the accident, but the pain and deformity which may develop later bring the patient under observation. At this time it may be difficult to distinguish it from tuberculous disease of the spine without the aid of the radiograph. Again, certain cases of incomplete fracture may cause injury to the spinal cord, e.g., fracture of the laminæ.

Examination.—This must be conducted to discover the extent of the damage to nervous structures, the level at which this has occurred, and, finally, the nature and degree of the bony injury.

If nerve injury be absent, the greatest care must be taken to avoid its production; if existing, to guard against aggravating it. The examination should proceed in an orderly manner, the condition of the muscles being first investigated, then sensibility, and finally the condition of the bladder. The diagnosis of complete or incomplete interference with conduction is made from the condition found. The examination of all cases in which the continuity of the bony column is destroyed must be gentle; the patient must not be turned in bed to ascertain this. In most cases passing the hand beneath the patient's back at once reveals

the nature of the injury, kyphosis with irregularity of the spinous processes being present.

Incomplete Fractures.—A spinous process, or one or both laminæ, may be fractured, usually as the result of direct violence. Few of these cases are complicated, but they require careful and in many cases prolonged treatment. Considerable laceration of the soft parts is inevitable in all cases, and extra-dural hæmorrhage in fracture of the lamina; this may cause pressure on the cord, or the pressure may be due to depressed bone when both laminæ are fractured.

After deciding that no indication for operation is present, the patient should be kept at rest in bed. Pain is best relieved by hot applications, and all pressure on the seat of the injury is to be avoided. In about a week massage may be employed, but no active movements until pain has ceased. In many cases five or six weeks' rest is necessary.

For persistent pain in old cases, counter-irritation by the actual cautery or blisters often gives relief, and it may be necessary to employ passive movement to break down adhesions, after excluding other causes of rigidity, such as traumatic spondylitis and tubercle.

Operation is indicated in bilateral fracture of laminæ, or for extradural hæmorrhage. In the former case, after exposing the seat of the injury by means of a vertical incision or raising a flap, great care must be taken to avoid any pressure on the cord. The lamina must be raised with care by seizing the spinous process with forceps. Search should be made for loose spicules of bone or a laceration of the dura mater. The lamina should not be replaced.

Complete Fracture and Fracture-Dislocation.—In the examination of a case of injury to the spinal column, with signs of pressure on the spinal cord or nerves, in addition to the points already mentioned we must ascertain at once if the case is one needing operative treatment. Care must be taken that fracture of the lamina with depression is not overlooked; in these cases operation should be carried out at once. Unfortunately, in the large majority of cases the injury to the cord is inflicted at the time of the accident, and from its nature is irremediable by operation; the symptoms are not due to bony pressure.

Considerable difference of opinion exists with regard to the cases in which operation should be done. All will agree that injuries involving nerve structures below the level of the termination of the cord at the lower border of the first lumbar vertebra should be submitted to operation. But there is a difference of opinion as to the time at which this should be carried out. In lesions of the cauda equina, exploration should be undertaken as soon after the accident as possible; we should not wait for six weeks to see if the lesion will be recovered from spontaneously; if this is done the difficulties of the operation are much increased and the prognosis is less favourable. In cases first coming under observation some weeks or months after the accident, the rules governing the treatment of injuries of the peripheral nerves apply: exploration with suture if possible; if this cannot be carried out, nerve anastomosis.

Where the symptoms point to partial interruption of conduction in the spinal cord, if there is any suspicion that this is due to bone or a foreign body, or if it has appeared or increased in extent since the accident (hæmorrhage), operation should be carried out.

It is in the cases of complete interruption of conduction in the spinal cord that divergent opinions have been expressed, some surgeons considering that the patient should be given a chance by operation. For example, Scudder, in his book on the treatment of fractures, takes up the advanced position that "all fractures showing complete transverse lesion of the cord should be treated by immediate operation. Profound shock requires reasonable delay only."

The experience of most surgeons, however, coincides with that of Cushing, who writes, " It is an unjustifiable ordeal for both patient and operator."

If called to see the patient at the time of the accident, transport to the patient's home or to hospital must be so arranged as to avoid inflicting damage on the cord or increasing any existing injury. After the diagnosis has been arrived at, no attempt should be made to disturb the patient until everything is ready for his removal. A firm stretcher should be used, a shutter or hurdle answering the purpose if one cannot be obtained. Lifting must be performed with the utmost gentleness, and extension should be made by assistants while the surgeon supports the injured part.

Before the patient is moved from the stretcher, the bed must be prepared and the patient lifted under the care of the surgeon. In hospital this duty must not be left to the discretion of the porters and nurses. The bed must be prepared with fracture boards and the fracture mattress, its central portion consisting of two halves which can be removed for the attention necessary from time to time. The patient should be placed on his back with his legs flexed over a pillow. A water bed is not advisable for a few weeks.

Shock must be combated in the usual way, and care taken that the hot bottles do not come into contact with skin devoid of sensibility. The bladder must next be attended to: if it is distended, a rubber catheter should be passed. Great care should be taken to avoid infection; the catheter must be boiled, and no catheter used that cannot be disinfected in this way; the hands of the surgeon must be rendered as sterile as possible. After the bladder has been emptied the penis should be wrapped in antiseptic gauze.

In the large majority of cases the deformity reduces itself when the patient is placed flat on his back; if there is deformity it must be rectified by extension under chloroform anæsthesia. The question of immobilization next arises. In fractures in the lower dorsal region, a carefully applied plaster-of-Paris jacket should be employed, but in higher fractures it is unwise on account of the amount of the respiratory embarrassment produced. Extension by means of weights and pulleys is almost impossible to carry out if the cord lesion is present, on account of the injury caused to the anæsthetic tissues by the necessary strapping, etc., but if this is absent it is the most favourable method of securing immobilization.

If no cord lesion is present, the patient must be kept on his back for six or eight weeks, and then allowed up with his back supported by a poroplastic jacket.

With cord injury, the treatment now resolves itself into combating complications, the most formidable being bedsores, cystitis, and pyelitis.

The treatment of bedsores is preventive, and skilful nursing under the direct supervision of the surgeon is necessary. The skin exposed to pressure must be kept dry, and after washing with soap and water, at least once a day, spirit lotion applied and the parts dusted with boracic acid powder. All pressure must be as far as possible avoided, and after about three weeks a water-bed may with advantage be substituted for the fracture mattress. If a bedsore appears, dry antiseptic dressing will be found useful in most cases; in others boracic acid or eucalyptus ointment may be substituted. The ulcer should be surrounded with a water pillow or a circle of thick plaster to avoid all pressure. The greatest care must be taken with the dressing to avoid infection; when this occurs, fomentations should be substituted.

Retention of urine must be treated by regular catheterization with aseptic precautions. True incontinence is rare, and in these cases care must be taken to secure the sterility of the urine bottles. But, in spite of skilful attention, cystitis followed by pyelitis is almost inevitable. For this reason perineal or suprapubic drainage of the bladder has been advocated as a routine treatment in these cases.

Dislocations of the Spine.—Dislocation unaccompanied by fracture is limited to the cervical region, and takes place usually between the fifth and sixth vertebræ. It is commonly unilateral and caused by a fall from a horse or similar accident. It may be overlooked at the time of the accident, and occasionally the patient does not seek advice until some time has elapsed. The appearance of the sufferer is characteristic. The head is turned to the side opposite the lesion, flexed towards the side dislocated, and fixed. The muscles on the affected side are relaxed. It may be associated with injury to the roots as they pass out of the foramina and the corresponding lesions caused; hæmatomyelia may also occur as the result of the injury, but any injury to the cord is uncommon.

Reduction should be at once attempted under an anæsthetic. The head must be bent laterally and somewhat backwards towards the side opposite the lesion, in order to free the articular process which has passed in front of that of the vertebra below. The head is then rotated so that the face looks towards the side of the lesion. If the injury is bilateral, reduction should be attempted in the same way; after one side has been reduced, a similar manipulation is done on the opposite side. Failing reduction by manipulation, open operation must be resorted to. The seat of the dislocation must be exposed; in most cases it will be found necessary to excise the superior articular process of the vertebra below.

In old cases, reduction by manipulation may be cautiously tried, but no force used; if this fails, open operation must be performed if much disability or pain exists, but some cases seem to be little affected. After reduction, a poroplastic support should be worn for at least two months. *James Sherren.*

SPINE, LATERAL CURVATURE OF.—(See Scoliosis.)

SPLENIC ANÆMIA.—Under this name a great number of probably very diverse conditions have been included, and it will hardly be too much to say that every anæmia which is associated with enlargement of the spleen has at one time or other been classified under this title. The first broad distinction which must be made is between the splenic anæmia of infants and children, and that of adults.

Splenic Anæmia of Children.—It must not be forgotten that almost every anæmia in childhood is apt to be associated with enlargement of the spleen. In fœtal life the spleen is a blood-forming organ, and there is every reason to believe that under the stress of anæmia it resumes this function, while it retains its function of destroying the imperfectly formed anæmic corpuscles, and this double increase in function is associated with enlargement of size. It is extremely common to find that rickety, anæmic children—and almost all rickety children are anæmic—have large spleens. The measures advisable for the rickety state will be found to have good effect also on the anæmia and the size of the spleen. One often, however, finds children who are not rickety who are yet intensely anæmic and have large spleens. It is sometimes extremely difficult to come to an exact diagnosis of the blood condition in these cases. Some of them present a picture of pernicious anæmia with more or less accuracy, for in very early life the blood easily reverts to the fœtal condition, which is closely allied in appearance to that associated with pernicious anæmia. In others, the blood picture is not unlike that of an early lymphatic or myelogenous leukæmia, and cases of this sort have been classed as anæmia pseudo-leukæmia infantum. In others again, especially in older children, the blood picture is that of a secondary anæmia. All such cases should, of course, be treated by rest in bed, which must often be very prolonged; by fresh air and sunlight;

by nourishing food, and by due attention to excretion of all kinds. As regards more special treatment, the rule should be to give iron in all cases, and to give it in large doses ; the actual form matters little. Children take the saccharated carbonate well, and it may be given in doses of 20 gr. and upwards. If this is not well taken, reduced iron, or almost any of the pharmacopœial preparations will do. Should these not be successful, some of the organic irons which have lately been put on the market may be tried, but they are not usually so satisfactory. In cases where the colour index is high, that is to say, where the blood approaches the type of pernicious anæmia, arsenic should be given in addition.

Splenic Anæmia in Adults.—There are many conditions in which enlargement of the spleen occurs whose terminal stages are anæmic, and these are often spoken of as splenic anæmias. Pernicious anæmia in a fair proportion of cases is associated with enlargement of the spleen, sometimes to a considerable extent. Primary splenomegaly, though it may persist for years without anæmia, very often shows it in the late stages. Cirrhosis of the liver occasionally produces sufficient splenic enlargement to have been classed with this disease. Banti's disease is in similar case, while malarial cachexia, primary tumours of the spleen, terminal stages of pseudo-leukæmia, suppurating hydatid, etc., must all be differentiated before a diagnosis of splenic anæmia can be arrived at. The recently discovered condition of leukanæmia must also be borne in mind. This is a very rare disease of fairly rapid course, where the symptoms are those of a steadily advancing anæmia with enlargement of the spleen ; and the blood picture is at first that of pernicious anæmia, to which later the condition of leukæmia is superadded. When all these conditions are excluded, however, there still remains a group of cases with a progressive secondary anæmia, and with enlargement of the spleen, for which no cause can be found during life. It is extremely doubtful whether the enlargement of the spleen is more than a symptom, but the cases are not very numerous and have not been very fully worked out. The treatment must be on the general lines suitable to any secondary anæmia, and the administration of iron, rest in bed, and perhaps the use of the X rays in order to reduce the size of the spleen where that is causing pain or discomfort. Splenectomy may be tried provided the anæmia is not too great, for in Banti's disease recovery has followed the operation. In 32 cases of Banti's disease collected by Armstrong (*Brit. Med. Jour.*, Nov. 1906); the operation was fatal in 9 (28 per cent) ; in 22 there was complete recovery , in 1 only was the condition unrelieved. *G. Lovell Gulland.*

SPRUE (Psilosis).—Absolute rest of the body, and as complete rest of the intestinal tract as is possible, are the essentials in the treatment of this disease. The strength also must be maintained.

The most important part of the treatment is dietetic.

1. *Milk Treatment.*—The milk should be sipped frequently, but in small quantities at a time. It is best to begin with 5 oz. every two hours, and as the motions become less frequent, to increase the amount gradually and also lengthen the intervals. Under this treatment, though the amount of milk taken is large, there should be constant hunger. After a time, the motions, though not normal, become formed. Constipation must be carefully guarded against. If there is any tendency to it, small doses of castor oil (1 dr.) should be given. This treatment in young adults is highly successful, but the craving for food is so great that many persons will not keep strictly to the diet, and therefore it is best carried out in a hospital, or where the patient is under control. In old persons the digestion is so feeble that, though the severity of the symptoms may abate, the debility and emaciation increase. Such cases are very difficult to deal with,

as any increase in the diet brings on a recurrence of the disease. In such cases a combination of this diet with fruit or meat juice may be advantageous.

During convalescence the diet may gradually be varied. Stewed apples, fish, and later, small amounts of farinaceous food can be allowed. The return to an ordinary diet must be made very gradually, and if any symptoms of relapse occur, the milk diet must be resumed. The patient must never be allowed to become constipated ; olive oil or castor oil are the best laxatives to employ. Drastic purgatives must be avoided. Stimulants are contra-indicated.

2. Another dietetic method, which may be employed when a pure milk diet is not tolerated, is the "*fruit cure.*" Large quantities of fresh or preserved fruit without sugar, such as bananas, strawberries, pears, apples, grapes, are taken.

3. *Meat Diet* has many advocates. The meat must be either raw or very lightly cooked. In a very severe case, feeding every hour with raw beef juice may be necessary. Ordinarily, 5 oz. of pounded meat should be given three times in the day, and home-made beef jelly or calf-foot jelly every two hours between feeds. The jelly should also be taken at night if the patient is awake, and the first thing in the morning. In a few days the diet may be increased and poached eggs given. Strawberries go well with this diet. Three or four pounds of fresh strawberries can be taken between meals.

Drugs are of little value. A preliminary aperient should be given, and subsequently the patient must not be allowed to become constipated. Opium is injurious, and so is alcohol. Any of the digestive ferments—pepsin, pancreatin, papain—may be used, but the result of their administration is not marked.

The use of yellow santonin, 3 to 5 gr. in a teaspoonful of castor oil, for six successive days, has been strongly advocated, and seems to be of value in some cases.

Intestinal antiseptics such as β-naphthol, are used by some observers.

The mouth affection may cause trouble, even when the patient is improving otherwise. Weak carbolic mouth washes (1 per cent) or weak boracic lotion (5 per cent) are useful. When the condition of the mouth is very painful, the ulcers may be brushed with cocaine (5 per cent) before food is taken.

C. W. Daniels.

SQUINT.

Paralytic.—Our efforts must be directed towards treating the cause of the paralysis, potassium iodide, mercury, salicylates, or colchicum being given according to the nature of the disease.

Locally, the constant current may be useful in maintaining the nutrition of the muscle. Prisms occasionally assist the patient, but these only relieve the diplopia in one position of the eyes. The discomfort of diplopia is, as a rule, only overcome by wearing a ground glass over the affected eye. In some old-standing cases an operation may be attempted.

Concomitant Squint.

A. *Convergent Squint.*—Our object must be not only to correct the deformity, but to set up or restore binocular vision whenever this is possible. The cause of concomitant squint being a faulty fusion of the retinal impressions received from the two eyes, the principles we have to keep clearly before us are : (*a*) to train the acuity of the squinting eye ; (*b*) to train the fusion sense ; (*c*) to restore parallelism of the visual axes. If the acuity of vision in both eyes is good, and the fusion sense established, then, as soon as the eyes are straight, binocular vision will be gained.

When one eye is very amblyopic, and remains so in spite of our attempts at training it, we can never hope to get binocular vision ; again, in certain cases the fusion sense can never be acquired, as in most cases of true alternating squint, and here also binocular vision is unattainable. In these two classes all

we can hope for is to cure the deformity. In most cases of squint, however, the attempt should be made to attain binocular vision. *We cannot begin too early;* owing to neglect we often have to start too late. The best time for training the acuity of the amblyopic eye and the fusion sense is in the first seven years of life, and we should begin as soon as the squint appears.

The order of our treatment should be:—(i) *Test refraction* under atropine, and order correcting glasses for constant wear; (ii) *Train the squinting eye* by blocking the good eye with a pad or a black goggle, or paralyzing the accommodation of this eye by atropine; (iii) *Train the fusion sense* with the amblyoscope, stereoscope, or by "bar reading"; (iv) *Measuring the angle* of the squint at regular intervals; (v) *Operation*, when this is necessary.

(i) The full astigmatic correction, and not less than 0·5D below the full hypermetropic correction under atropine should be worn constantly, except at bedtime. (A baby under one year may safely wear glasses in special frames. These have short sides which end in loops, to which are attached tapes to tie behind the head. When a baby is too refractory for a retinoscopy to be done, the good eye should be blocked with a pad: *vide infra.*)

(ii) If the squinting eye is very amblyopic, the good eye should be blocked all day for at least two months, either with a pad of gamgee placed between the eye and the glass, which is fixed with strapping, or a bandage; or by a special pair of glasses which have a clear lens over the squinting eye and a black goggle over the good one. If marked improvement has not taken place in two months, training of this eye can be abandoned as hopeless. If the eye is not very amblyopic, a useful method of training is to put a little atropine ointment (4 gr. to the ounce) once a day into *the good eye only*, to paralyze its accommodation. Then, when wearing the glasses, the good eye can see in the distance but not close to, and the squinting eye, having its accommodation intact, will see near to, and will be used, and therefore trained.

(iii) Training of fusion sense. (*α*) While the squint is present, this can only be done by means of the "amblyoscope," and under the immediate supervision of the doctor himself (see Worth on "Squint"). (*β*) When the eyes are straight, fusion is trained by means of the stereoscope and Krolls pictures, and by "bar reading."

(iv, v) If glasses bring the eyes straight, training both of the acuity and fusion sense should be continued till perfect binocular vision is obtained. If the squint persists, the angle should be measured from time to time to see if it is diminishing or remains stationary.

No operation should be performed till glasses have been worn for at least a year, and not till at least six months have elapsed since any improvement in the squint has taken place.

For squints of less than 25°, either an advancement of the external rectus alone or tenotomy of the internal rectus is advisable. For more than 25° we combine the two operations. *After operation* the training must still be maintained, to acquire, if possible, binocular vision. All operations for squint are much more satisfactory and certain in the results if they are done without a general anæsthetic.

B. *Divergent Squint.*—The refraction should be tested and glasses worn regularly. If the divergence disappears, we try to train the eyes to work together as in convergent squint. Unfortunately cure with glasses is not very common, and an operation then has to be performed; and even if the operation brings the eyes straight, binocular vision is seldom obtained. Tenotomy of the external rectus affords us only about 5°, so that tenotomy of both external recti is only suitable for divergence of 10° or less. For higher degrees, advancement of the internal rectus, combined with external tenotomy, is necessary. It is not advisable to operate for divergence of highly myopic eyes. *W. Tindall Lister.*

STAMMERING.

Preliminary Considerations.—In order that the rationale of the treatment of stammering shall be clear, it will be necessary to summarize briefly the etiological and pathological considerations upon which it is based. In the circumstances we shall state the facts dogmatically, and refer the reader elsewhere for the evidence in support of them.

Stammering is due to spasm of the respiratory muscles in the act of speech. The over-action of the respiratory nervous centres producing the spasm rapidly spreads into the centres controlling the laryngeal and oral mechanisms, and leads to spasm of the muscles of the throat, mouth, and face. In bad cases the disturbance may even spread so widely as to cause spasmodic movements of the arms and other parts of the body. Thus the spasmodic action of the articulatory muscles, although, as a rule, the most obvious phenomenon of stammering, is, in the great majority of cases, really a secondary event, due to the spread of a disturbance beginning in the respiratory mechanism. This fact must never be lost sight of in treatment; and where the patient is old enough to apprehend it, it should be carefully explained to him, although, when the articulatory difficulty is extreme, it will not be easy to convince him that the primary seat of his trouble is elsewhere.

The causes which lead to stammering are twofold; (1) *Predisposing* and (2) *Exciting*.

Of the former a neurotic inheritance is one of the most important, and a family history of stammering is not infrequent.

Under the latter head we have anything tending to interfere with and embarrass respiration early in life, as for example adenoids. Such an interference leads to faulty modes of breathing and a low respiratory volume or "vital capacity," which react unfavourably on the controlling centres. The result is an irritability and irregularity in the action of these centres which is especially manifest during speech, when the demands made on the respiratory mechanism are highly complex and, unless met in the best way, somewhat exhausting.

It will be evident, then, that treatment must be directed to (1) The removal, as far as possible, of respiratory defects, and such of the causes which have led to stammering as may still be operative; (2) The education of the amended mechanism until spasm no longer tends to occur, or, if it does, can be prevented by voluntary control. In other words, treatment must be (1) *Prophylactic*; (2) *Educative*. These two general indications are of equal importance, although the first is liable to be neglected—and is, indeed, always neglected by the numerous quacks who hold so large a share of the public confidence. It is unreasonable to look for any permanent benefit from educative treatment so long as the causes which have led to the derangement are in active operation. And further, while educative treatment is always difficult, and demands both patience and experience, the necessary prophylactic measures are readily taken, and may alone lead to considerable improvement in speaking.

1. **Prophylactic Treatment.**—The influence of a neurotic inheritance so often lying at the bottom of the trouble cannot, of course, be done away with, but it should be vigorously combated by measures directed to the control of the general health of the patient, and by dealing with any existing causes of nervous irritation or depression. Chronic dyspepsia, for example, is not infrequently a potent cause of nervous irritability, and highly detrimental to a stammerer. A sufficiency of fresh air and exercise must be secured in all cases. Regular work is very desirable. Too little work is probably as bad for stammerers as overwork, as discouraging the development of powers of mental control and concentration, which imply the rigid limitation of nervous discharge

to the part of the brain required for any particular action, the very thing the stammerer so egregiously fails in, during speech. Moreover, the habits of a daily routine will be very valuable to the patient, in that he will almost certainly have to undertake daily exercises for some years if he is to completely overcome his disability. In a word, it is important to do what is possible to increase the nervous tone and self-control of the patient, and such details of hygiene as the open window at night will well repay the attention given to them.

Having enquired into the general health and mode of life of the patient, and devised the appropriate hygienic measures, the chest and respiratory passages should next receive special attention. There should be a perfectly free respiratory passage through the nose. This may be roughly tested by asking the patient to blow out a match held about a foot from each nostril in turn, the mouth being shut and the other nostril closed by the finger. Adenoid vegetations in the nasopharynx are very common in stammerers, and although since atrophied, were frequently the original exciting cause of the condition. Thus in our analysis of twenty-seven consecutive cases in Mrs. Behnke's clinic, over 50 per cent presented a clear history of some nasal obstruction. Adenoid growths, with or without enlarged tonsils, were the most frequent cause. More rarely a deflected septum, a spur, or chronic hypertrophic catarrh, may be the cause of obstruction. In one case, lately recorded by Mrs. Behnke, a button had been pressed into the back part of the nose by the patient when a child. It had remained there a year or more, during which time the disturbance of speech began. Whenever there is obstruction there can be no doubt that the first thing to be done is to remove it, and then to instruct the patient to keep his mouth closed, and to breathe through his nose. Without removal, experience has shown that exercises of whatever sort are only waste of time.

The lungs should be carefully overhauled. A slight chronic bronchitis, such as is ignored by most people in the winter time, is of great disadvantage to the stammerer. Even a laryngeal catarrh, leading him to spare his voice, will encourage stammering.

Nearly every stammerer has a low "vital capacity" (complemental + tidal + supplemental air): thus, when correlated with stature in a series of 46 male stammerers it was found to average 35 per cent below normal. This would seem to imply that the amount of "tidal air" which the stammerer has conveniently at his disposal is also small, and perhaps a direct result of this is the not uncommon habit of speaking during *inspiration*. The existence of a low capacity is to be sought for in the type of respiration. It is thoracic (often upper thoracic) rather than abdominal, that is, costal rather than diaphragmatic. Dr. Arthur Keith has shown that it is by the descent of the diaphragm that the lungs are most effectively aerated, and that smaller movements of this wall are required for the respiration of a given quantity of air than of any other wall of the thoracic cavity. It is important for a stammerer to have as much wind as he requires for his sentences with the least possible effort. Hence he must be taught to make full use of his diaphragm in breathing; and in order to secure the maximum degree of efficiency, to this should be added the great thoracic enlargement which accompanies a free elevation of the lower costal wall. As the diaphragm contracts, it forces the abdominal contents downwards, and the muscular abdominal wall relaxes to make room: as the diaphragm relaxes, the contraction of the abdominal muscles restores the parts to their former position; for it must be remembered that expiration is as much a complete muscular act as inspiration, and not merely a passive relaxation or elastic recoil. Thus, in the abdominal type of breathing, the range of movement of the belly wall during breathing is, to an extent, a measure of the descent of the diaphragm. When, on the other hand, there is much expansion of the

thorax owing to the excursion of the lower ribs, the upper end of the abdominal cavity becomes considerably widened, and the contraction of the diaphragm now causes less protrusion of the anterior abdominal wall. Experiments with a spirometer show that it is this combined lower costal and diaphragmatic expansion which yields the greatest capacity. For purposes of training it is best at first to direct the patient's attention to the diaphragmatic and costal movements separately. He should be given the two following exercises, which may be performed either standing or lying flat on the back.

(1) *For Diaphragmatic Breathing.*—Placing one hand flat on the epigastrium, take a series of slow deep breaths, blowing out the belly as much as possible at each inspiration, and allowing it to sink in at expiration. In this, as in all the exercises described below, the breath should be taken in through the nose and let out through the mouth, thus imitating the proper manner of breathing in speech.

(2) *For Costal Breathing.*—Place each hand so that the backs of the fingers rest on the seventh or eighth rib in about the nipple line as shown in *Fig.* 44 *a*, and take a series of deep breaths, magnifying the costal movement as much as possible. In each exercise the attention must be riveted on the motion of the part beneath the hand.

Having practised these exercises separately, the patient should next endeavour to combine the two, and with one hand on the belly and one on the chest, to magnify the excursions of his diaphragm and ribs simultaneously.

When the patient has made some progress in diaphragmatic breathing he should be given a series of exercises which, as experience has shown, will both develop the muscles of his chest and increase his vital capacity. Such a series has been devised by Mrs. Emil Behnke, and fully described in her book on "The Speaking Voice"; but they form such an essential part of the treatment of stammering that it will be well here to describe a few in detail. These exercises may be practised in ordinary attire, provided there is nothing tight (such as corsets) round the waist or chest which can in any way impede the respiratory movements. Light dumb-bells may be used with advantage, but are not essential. While performing each exercise the patient must see that the accompanying respirations are full and deep, with ample diaphragmatic and thoracic play.

1. Stand upright and place the arms at the side in the military position of attention. Now raise both arms slowly into position *b*, *Fig.* 44, and from this carry them right up over the head; during the movement take (through the nose) a long inspiration. Now reverse the movement and lower the arms through position *b* back to the side again; at the same time slowly let out the breath (through the mouth).

2. Raise the arms from the side slowly to position *c*; at the same time take a deep breath. Swing the arms sharply back in a horizontal plane into position *b*, while forcibly expelling the breath; then drop them to the side again.

3. Begin with the arms in position *d*. During inspiration slowly extend them horizontally, setting the shoulders well back and "opening" the chest. During expiration, slowly return to the flexed position. The second (extended) position in this exercise is similar to *b*, except that the palms of the hands are turned up.

4. Stand upright with the arms to the side, and slowly swing over into the position shown in *e*. During this movement take a full breath. Now slowly swing back again and let out the breath. Repeat the movement on the opposite side.

5. Standing in position *f*, swing the arms right over the head back

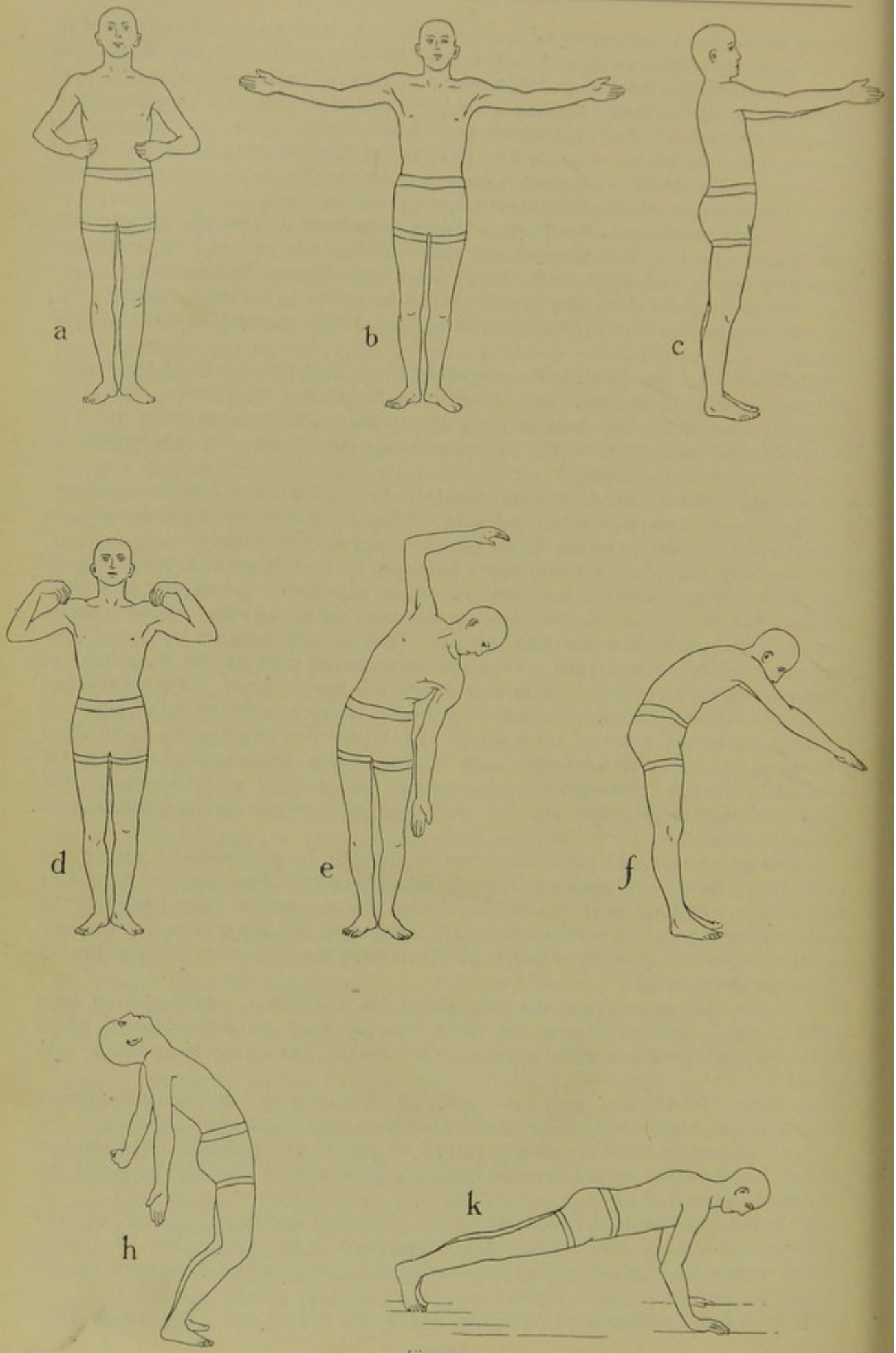

Fig. 44.

into position *h* while drawing a deep breath *and* letting it out again. Swing back again into position *f*, and again take a breath and let it out.

6. Lie at full length prone on the floor. Flex the arms and, keeping them close to the side, place the hands on the floor, palms down. Press the body up to arm's length into position *k*, keeping the trunk rigid the while, and drawing a deep breath. Lower again to the floor while breathing out. Those patients for whom the exercise is too arduous in this form may practise it leaning forward against a wall or the back of a chair.

Each of the above movements should be repeated six to twelve times ; and at first the exercises may be practised with advantage three or even four times a day. When the patient has reached a stable condition with little or no stammer, the performance of the exercises for a few minutes night and morning may be sufficient.

Before considering the education of the vocal mechanism in the act of speech, we would strongly urge the advisability of applying to all cases, at as early an age as possible, some such prophylactic treatment as we have indicated. And we would most emphatically protest against the common practice of withholding all treatment from stammering children until they are old enough to appreciate and profit by educative treatment intelligently. Stammering usually begins at about the fourth or fifth year, and it is probable that the removal at this age of large tonsils or adenoid growths, and the exhibition of simple breathing exercises, would in many cases be sufficient to lead to the disappearance of the habit before the channels of vicious nervous discharge had become firmly established.

2. **Educative Treatment.**—The treatment that we have so far described tends only indirectly to lessen stammering, and we have still to consider measures for directly preventing the respiratory spasm which, spreading from the vocal to the articulatory mechanisms, is the immediate cause of the disturbance in speech. The rational methods which have been devised to attain this end aim at establishing, by suitable exercises, a voluntary control by the higher centres of the whole or part of the mechanism of speech. Such exercises fall into two distinct classes.

1st Class.—Exercises in which the attention of the patient is directed towards the result produced ; the method of producing it being thus indirectly controlled.

2nd Class.—Exercises in which the attention is directed to the actual movements of some part of the mechanism of speech, so as to predetermine the result produced.

For example, if a passage be read aloud slowly and with exaggerated clearness and precision of enunciation, it would form an exercise of the first class in articulation. If, on the other hand, the reader has acquired a knowledge of the exact position that the tongue and lips should occupy for the pronunciation of each letter, and in reading the passage he were consciously to put his articulatory apparatus through the requisite movements, then the exercise would be one of the second class. The value of exercises of this latter class is very great, provided always *they are of that part of the mechanism of speech which is the seat of the primary disturbance.* Exercises of the first class may at the outset be very difficult for a stammerer, the indirect subconscious control of the seat of the disturbance being insufficient to prevent spasm. From exercises of the second class, however, he soon acquires voluntary control of the disturbance at its point of origin, and can in this way deliberately prevent it.

In the great majority of cases stammering begins, as we have stated, with a delay in the action of the respiratory mechanism, and hence the exercises we should naturally seek are such as will especially control the respiratory function. The patient must be told from the outset to ignore his articulatory difficulties, and to attend only to his respiratory movements and to the character of his vocalization, with the assurance that his articulation will then look after itself.

Now, there is a quality of speech which is solely determined by a proper and orderly management of the breath, namely rhythm. It has long been observed that stammerers read verse with greater facility than prose, and advantage has been taken of this fact in their treatment. Colombat, Merkel and, in recent years, Mrs. Behnke, have taught the advantage of emphasizing the natural rhythm of all speech. A rhythmical mode of speech is neither offensive nor *bizarre*, indeed it is characteristic of the best speakers. "The more natural and flowing the diction," says Mrs. Behnke, "the more evenly and regularly falls that pulsation to which the name of 'rhythm' is now usually applied." The observance of rhythm implies the raising of the intensity of the sound on the syllables on which the accent falls, and the maintenance of a certain time relation between those syllables. This rise in intensity is solely dependent on a more powerful blast of air at the moment, that is, on an instant acceleration of the expiratory act. In the adoption of a rhythmical in place of an arhythmical mode of speech, the demands on the respiratory muscular system are much

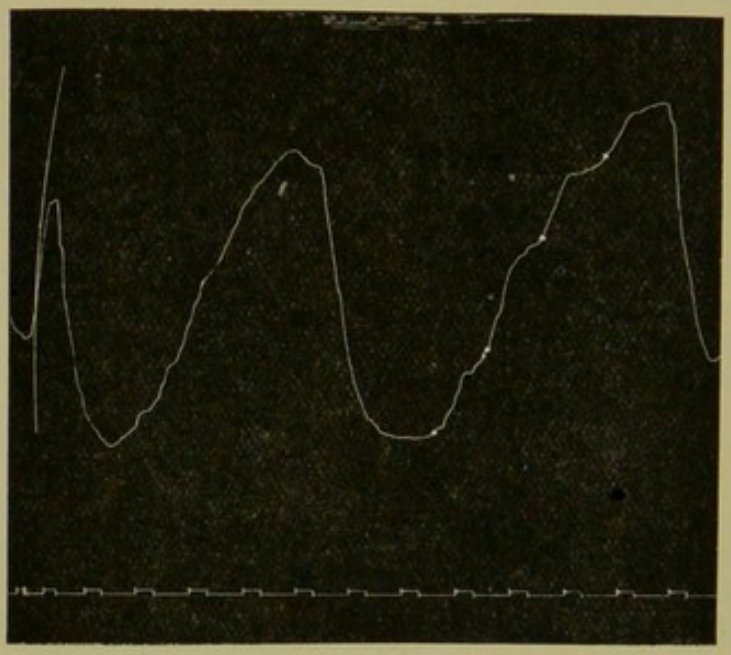

Fig. 45.—Respiratory tracings showing the effect of alterations in the intensity o the voice, uninterrupted by consonants, and the pitch remaining constant. The tracing reads from left to right. The expiratory part (up-stroke) of the first curve represents the vowel sound "*ah*" sung with (fairly) constant intensity, and at a constant pitch. The second curve shows the effect of raising the intensity of the tone on the beats of a metronome, and letting it die away between the beats. The small dots indicate approximately the points at which the intensity was raised. The finer undulations on both curves are due to the heart-beat. (It is to be noted that the pressure exerted by the respiratory muscles varies as to the square of the velocity of the out-driven current of air, so long as the laryngeal aperture is constant. Hence the variations in pressure which produce variations in the intensity of the voice are proportional to the square of the amplitude of the accompanying waves in the pneumographic tracing. Thus very slight undulations in the tracing may be evidence of quite appreciable variations in the muscular activity.)

simplified, for the variations in its rate of movement are reduced from an irregular to a regular series, i.e., to a series which the stammerer subconsciously forecasts independently of the words, and which is, therefore, less readily disturbed. Thus, whenever the patient accentuates and prolongs the rhythmical syllables in his speech, he is indirectly exercising the respiratory act in a series of augmentations and retardations—an exercise of the first class. In the slighter cases this form of practice may be sufficient to give the necessary respiratory control. And in order that this rhythmical control may be thoroughly acquired, the patient must read, first verse and then prose, with great exaggeration of the rhythm, the rhythmical syllables being both *accentuated* and *prolonged*.

As the actual marking of the rhythm in prose occasionally presents some difficulty to those whose attention has not been previously drawn to it, we have accented, for example, the following passage from Stevenson :—

" He was lóved and respécted by sóme of the bést and wísest mén in England. He was Président of the Róyal Socíety ; and whén he cáme to díe, people sáid of his cónduct in that sólemn hóur—thínking it néedless to say móre—that it was ánswerable to the gréatness of his lífe. Thús he wálked in dignity, guárds of sóldiers sómetimes atténding him in his wálks, súbalterns bówing before his périwig ; and whén he úttered his thoúghts they were súitable to his státe and sérvices."

Now, with many stammerers this mode of control may be insufficient and fail them at critical moments. The very power to accentuate the rhythm seems on occasion to vanish. Hence it is well in any but very slight cases to give also exercises of the second class, in order that a more direct control may be obtained over the source of the disturbance. Let the patient stand with his hands resting

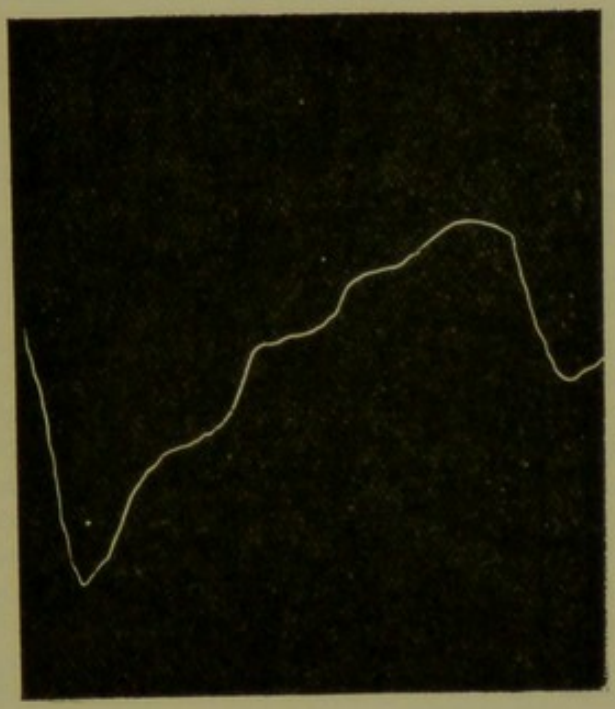

Fig. 46.—Pneumographic tracing of the line—*Wíth the ódours óf the fórest*, spoken slowly and with the rhythmical syllables accentuated and slightly prolonged. Reading from left to right, the first up-stroke shows a series of four undulations which correspond to the four accented syllables of the line. These variations in the rate of expiration may be readily appreciated by a hand laid on the epigastrium.

against the lower ribs (position *a*, *Fig.* 44) and utter any prolonged vowel sound—*ah*, for example—maintaining an even intensity of tone throughout. Bid him notice and fix his attention upon the even and continuous collapse of his thorax beneath his hands. Next let him say a long *ah* with rhythmical accentuations, about one a second, allowing his voice to die away between the accentuations, but not to fail altogether. He will then observe that the motion of the thoracic wall beneath his hands undergoes corresponding rhythmical accelerations and retardations. The difference between the former and the latter expiratory phase is well shown on the pneumographic tracing in *Fig.* 45. The first up-stroke describes the motion of the thoracic wall during an even *ah*, the second (undulatory) up-stroke exhibits the same during a rhythmically accentuated *ah*. The stammerer should practise this until he becomes acutely conscious of the variations in the rate of collapse of his thorax and abdomen which correspond to variations in intensity of the sound, and until he can alter the intensity by

deliberately altering the rate of motion of his chest-wall and diaphragm. He should next take some piece of simple poetry with a well-marked rhythm and learn it by heart, until he can say it almost subconsciously. He should then practise reciting it, again with an exaggerated rhythm, but now voluntarily directing the respiratory movements which predetermine the accentuations. If he can do this he will be giving his respiratory mechanism a perfect exercise of the second class in speech. The undulatory character of the expirations which he must recognize and consciously accentuate are illustrated in the pneumographic tracing in *Fig.* 46, recording the respiratory movements as a line of Longfellow's " Hiawatha " was being recited with a greatly accentuated rhythm. This poem is particularly well adapted to early practice, for (1) The lines are short ; (2) The rhythm is obvious ; (3) The first syllable in every line is accentuated. The patient will do well, however, not to confine himself to verse, but to extend this form of practice to the reading of prose ; always reading with a full voice, and a highly, even grotesquely, exaggerated rhythm.

If, then, the stammerer will practise these forms of exercise, he will, in the event, become possessed of two means of control in ordinary speech with which to check the onset of spasm—first, by attending to the rhythm of his sentences, and, secondly, by consciously directing his respiratory movements. The first should become his regular habit of speech. The second is not practicable for continuous use, but should be relied upon in case of emergency and a sudden inclination to stammer.

The above represents a general scheme of treatment for a typical case. Modifications, such as experience directs or necessity compels, must be made for individuals. And a careful study of the idiosyncrasies may reveal special indications for the application of educative methods. A brief reference to two or three further points will serve to illustrate this.

Many stammerers speak habitually in a thin voice, with little volume of sound. This may be partly due to an improper mode of delivery, but it is also due to the use of a feeble air-blast in vocalizing. And if, during expiration, the tension of the expiratory muscles is only just greater than that of the inspiratory group—as will be the case if the air-blast be feeble—there would appear to be a greater tendency to spasm than if the two groups of muscles were less nearly in balance. Hence, it is well to encourage all stammerers to speak in a full resonant voice. The increase in loudness may, however, necessitate the voice being pitched in a lower key, lest it should become unpleasant.

Again, anything which acts as a mechanical check to the breath stream is a stimulus to spasm, and so we find the explosive consonants are the most common excitants of trouble. But, as we have shown with the pneumograph, the time that the breath is arrested varies considerably, according as the consonant is firmly articulated or only lightly touched on. It may, therefore, be advisable in certain cases to pay some attention to lightness of articulation. But it must not be forgotten that the articulation is not the primary seat of the trouble, and any attention paid to it is liable to be at the expense of a more fundamental control.

Some patients stammer very severely on initial vowels, and it may be necessary to draw their attention to the fact that there are two distinct ways of initiating a vowel sound, one of which is easy to stammerers and the other difficult. In the first (easy or smooth method) the vocal cords move up at once into exactly the position required for the note, leaving a narrow slit between them. In the second (the difficult or explosive method) the cords move up, meet, and press against each other, and then open again into the position required for the note. In this way a consonant formed in the larynx itself precedes the vowel, and, similarly to other consonants, acts as a mechanical check to the breath. Now, in ordinary speech, it is usual to employ the second way in the case of vowels

standing at the beginning of phrases, but when the vowels present difficulty, even after vigorous respiratory training, it may be well for the stammerer to practise the smooth method.

Finally, a word on prognosis. It should be impressed upon patients that, in the main, their improvement will be slow, but that its rate is chiefly dependent on their own perseverance and exertions. As their first progress is rapid, so surely will it be short-lived, and their downfall early, should they kick away the ladder of practice by which they ascended. Again, having reached a certain point of improvement, they are liable to stand still for a time, blame the system, and seek another. It were as reasonable for a cricketer to foreswear the game because he finds himself "stale" at the end of the season. Let the stammerer, giving up all practice for a time, return to it later, when he will find the effect of exercises surprisingly renewed. Let him also seek variety in practice. A few minutes' pure respiratory gymnastics night and morning will at times restore a lost control when hours of reading fail. With regard to the ultimate prognosis, a stammerer cured is rarely the same as a man who has never stammered. Without incessant watchfulness on his part, his malady is certain to recur. These aspects of treatment are not unimportant, and it is well that the patient should be forewarned.

Robert Worthington.

STIFF NECK.—(See RHEUMATISM, CHRONIC.)

STOMACH, CARCINOMA OF.—The radical treatment of cancer of the stomach is undoubtedly surgical, and there is reason to believe that if the diagnosis can be made sufficiently early, the results would be more encouraging than they are. Better results can only be looked for if practitioners will consider the propriety of surgical interference so soon as the presence of carcinoma is suspected. Even where removal of the disease proves to be impossible, the performance of a gastro-enterostomy has often afforded great relief to symptoms, and has prolonged life. In cancer of the cardiac opening, a gastrostomy is obviously indicated when the difficulty of swallowing becomes great, and will, under these circumstances, if successful, prolong life. Apart from surgery, the means at our disposal are the use of liquid nutritious and non-irritating diet, which must in the main be composed of milk, eggs beaten up, soup, gruel, milk tea, coffee made with plenty of milk, or cocoa, and if any alcohol is necessary, a little good champagne.

In order to relieve the pain, it may be necessary to give opium in the form of hypodermic injections of morphia ($\frac{1}{6}$ to $\frac{1}{3}$ gr.), and if, as is often the case, there is some gastritis, we may use the same remedies as in chronic catarrh. Some writers think highly of the value of certain bitters, of which condurango made the greatest stir, being at one time vaunted as a cure for cancer of the stomach; it is now merely regarded as a stomachic bitter in the same class as calumba, quassia, and gentian.

Robert Saundby.

STOMACH DILATATION.

1. **Primary or Atonic.** As this condition depends as a rule upon serious derangement of the general health, it is of far more importance to use means to improve this than to apply any local measures to the digestive organs. In general, we should aim at giving relief from work and worry, with good and abundant food, and change of air to a bracing place. It should be borne in mind that sea air is often not bracing; this is especially true of the south and west coasts of England during the summer and autumn months; these patients often do better at upland stations like Buxton or Braemar. In many cases it is necessary to give prolonged rest by a course of Weir-Mitchell treatment, with massage and faradism, and it is desirable not

to hold out any prospect of a permanent cure being effected by less than a three months' course. Galvanism and high-frequency currents are both used by some as aids to this method, but I have not been impressed by the results; in cases where benefit has followed it has not been more than I have seen where no such means were used. The diet may need to be modified if there is gastritis, but not on account of the dilatation; but when the patient is going about, and, as is commonly the case, there is complaint of pain or oppression after food, she should be made to lie down for three-quarters of an hour after each meal.

As such dilated stomachs are always able to empty themselves, there is no need for the use of the stomach tube.

Medicinal tonics are often of service, such as the following:—

R	Ac. Nitrohydrochl. dil.	℥x	Succ. Taraxac.	℥j
	Tinct. Nucis Vom.	℥x	Aq.	ad ℥j

Two tablespoonfuls three times a day after meals.

These patients are very often constipated, and require the regular use of an aperient. If they are going about, it is better to avoid giving them saline aperients, which often seem to increase the feeling of exhaustion; but doses of cascara, aloin, or senna suit them better.

2. **Secondary.**—As this form of dilatation is due to structural changes which are not readily susceptible of modification by medicinal means, treatment must be surgical. Klemperer's thiosinamine treatment may be tried for a few weeks, but should not be unduly prolonged when surgery is ready and able to effect a cure. The formula is thiosinamine 10, glycerin 20, distilled water 70 parts, half to a whole syringeful to be injected under the skin of the back three times a week. It is only where surgical aid is refused that the case should be treated by the stomach tube; the patient should be taught the use of the stomach tube, with which he should empty and wash out his stomach once a day. This may be done either the last thing at night or the first thing in the morning; the advantage of the latter time is that it gives a longer time for the passage of food through the pylorus; but on the other hand it also allows the contents of the stomach to remain unduly long in contact with the gastric mucous membrane, thereby frequently setting up gastritis; so that on the whole it is preferable to use the tube the last thing at night. Secondary dilatation may, of course, be complicated by gastritis, and may call for appropriate treatment by diet and drugs. (See GASTRITIS.)

The most serious complication of dilated stomach is tetany, the most successful treatment for which is gastro-enterostomy; but other means that have been tried are infusions or enemata of normal salt solution, enemata of chloral (1 to 2 dr.) and morphine ($\frac{1}{6}$ to $\frac{1}{3}$ gr.) hypodermically. *Robert Saundby.*

STOMACH, INDICATIONS FOR OPERATION IN DISEASES OF.

During the last few years surgery has interfered with brilliant results in the treatment of diseases of the stomach which were regarded only a few years ago as peculiarly the province of the physician; but there is some difference of opinion as to the extent to which this intrusion is justified, and while surgeons complain that certain physicians take up an unfairly hostile and absolutely conservative attitude, physicians retort that the claims of certain surgeons are altogether unjustifiable, and go beyond anything that is warranted by the results which have been obtained. Under these circumstances it is highly desirable that the practitioner should have some guide to enable him to give sound advice to his patients.

It ought to be fully and frankly admitted that surgery has been able to cure cases of stomach disease previously regarded as incurable, and that it has prolonged many lives even where it has failed to cure; further, that it has rescued many patients from conditions of chronic suffering which, if they do not threaten death, render life a burden. It should be recognized that stomach diseases are common ground upon which the

physician and surgeon must meet, and that it is the duty of every practitioner who is himself unable to perform the necessary surgical operations, to associate himself with someone who possesses this skill, and to call him into consultation in all cases which present symptoms that can be relieved by surgical interference.

There are certain conditions which it may be presumed are universally admitted to require immediate surgical aid. These are :—

1. *Impermeable Stricture* of the œsophagus, where the patient is unable to swallow sufficient food to maintain life.

2. *Perforated Gastric Ulcer.*

3. *Subphrenic Abscess.*

4. *Foreign Bodies in the Stomach.*

5. *Pyloric Tumour*, with symptoms of pyloric obstruction.

The following conditions are more open to difference of opinion :—

6. *Hæmorrhage from the Stomach*, if recurrent, suggests the propriety of surgical interference, in order, if possible, to secure the bleeding point ; the objection to it is, that when the stomach has been opened it is frequently impossible to find the source of the bleeding ; but sometimes gastro-enterostomy is followed by good results, in spite of the failure to secure the bleeding point. This difficulty induces many surgeons to refrain from operating, and experience justifies their reserve, for, as a rule, the application of an ice-bag to the epigastrium, and rectal feeding, are followed by recovery. Where the hæmorrhage comes from a duodenal ulcer, gastro-enterostomy is more clearly indicated, as these cases do badly when left to themselves.

7. *Gastric and Duodenal Ulcer.*—Gastric ulcers generally recover under medical treatment. Indications for surgical aid are : (i) *Perforation ;* (ii) *Recurrent bleeding*, although, as just explained, it is often better not to operate ; (iii) *Duodenal Ulcer ;* (iv) Where the *pain is intense*, and cannot be relieved by ordinary medical means ; (v) Where there is *persistent vomiting*, which does not yield to medical treatment, and where, probably, the ulcer is situated near the pylorus, and is associated with great inflammatory thickening, causing obstruction.

8. *Dilatation of the Stomach.*—This is not by itself an indication for operative interference ; but where there is stasis, that is to say, where remains of food can be found in the stomach eight hours after a meal, this may be taken to indicate stenosis of the pylorus, and justifies us in advising the operation of gastro-enterostomy. The complication of tetany urgently calls for gastro-enterostomy. Simple dilatation, however great, in which the stomach empties itself in less than eight hours, does not justify operation ; and the experience of nearly all surgeons who have operated in these cases is unfavourable, the patient's condition not being improved.

9. *Hourglass Stomach.*—This condition only calls for operation where it gives rise to symptoms of obstruction and stasis.

10. *Hyperchlorhydria.*—This is frequently a symptom of organic disease, and may be associated with pyloric stenosis and stasis. Where this is the case, gastro-enterostomy is indicated ; but where the hypersecretion is a pure neurosis, surgical interference does not do good.

11. *Chronic Gastritis.*—Chronic dyspepsia and gastralgia are not conditions which, in themselves, require surgical treatment, and such interference should not be permitted, unless they are associated with pyloric stenosis, or spasm giving rise to stasis.

12. *Cancer.*—Surgical operation in cases of cancer of the stomach has in the past ten or fifteen years been followed by such remarkable results, that it deserves greater encouragement. It is obvious that only early operations are likely to be successful, and, therefore, it is much to be desired that practitioners should

keep their minds open on the subject, and should call for surgical assistance as early as possible. The real difficulty is in making an early diagnosis, but as it becomes more the custom to call in surgical assistance for pyloric obstruction, without reference to its cause, it is to be hoped that many early cases of cancer will be recognized and relieved. It is remarkable that the radical operation, in the hands of German surgeons, gives positively a lower mortality than gastro-enterostomy; that is to say, out of 563 cases of the latter operation there were 216 deaths, or a mortality of 38·36 per cent; while of 325 cases of pylorectomy there were 34 deaths, giving a mortality of 32 per cent. Moreover, it must be remembered that surgeons complain that such a large proportion of the mortality which has followed their operations for cancer, has been due, not to those especial dangers against which surgeons must guard their patients, but to want of strength on the part of the patient to support the operation.

Robert Saundby.

STOMATITIS, or inflammation of the mouth, affects the mucous membrane chiefly, although sometimes the deeper parts are involved. The inflammation is the result of injury or irritation of the parts by trauma, heat, cold, etc., but is chiefly due to the action of micro-organisms. The condition may be limited to the tongue (*glossitis*), or the gums (*gingivitis*), or may be distributed, more or less, over the entire mucous membrane. The inflammatory process may present various features; it may be *catarrhal*, *phlegmonous*, *exudative*, *ulcerative*, or *gangrenous*.

Catarrhal Stomatitis may be due to errors of diet, excess of tobacco or alcohol, rough or carious teeth, teething in children, and the internal use of iodine or mercury. It often occurs in the course of specific fevers. The mucous membrane becomes congested and exudes a watery, sticky discharge, composed of mucus and serum. Taste is perverted or lost, the tongue furred, swollen, and indented by the teeth, the gums swollen and of a deep bluish-red tint, and the ridges behind the upper incisors red, swollen, and tender. The treatment consists in removing the cause, regulating the diet, giving an aperient, and using a mouth-wash of chlorate of potash.

Phlegmonous Stomatitis is a diffuse inflammation of the submucous cellular tissue, due to infection by streptococci. It is usually due to injury by a foreign body, or by a blow forcing the lip or cheek against the teeth. The wound becomes infected from the mouth, takes on an unhealthy appearance, and the surrounding tissues swell up. The condition is closely allied to acute glossitis and to Ludwig's angina (see TONGUE, and ANGINA LUDOVICI). The treatment consists in making incisions through the swollen mucous membrane, and rinsing the mouth freely with antiseptics. A purge, followed by tonics, should be prescribed. In severe cases antistreptococcus serum should be injected.

Exudative Stomatitis is characterized by the occurrence of vesicles or pustules upon the surface of the mucous membrane of the mouth. It occurs in the course of specific fevers, such as small-pox and pneumonia, and as a separate disease in the condition called *herpes labialis*. The treatment is the same as for catarrhal stomatitis.

Ulcerative Stomatitis occurs chiefly in underfed sickly children living under unhealthy conditions. It usually begins acutely by swelling and softening of the gum, which becomes covered by a yellowish, greasy, putrid mass; when this separates, an ulcer is exposed, spreading along the edge of the gum and bleeding readily. The cheek opposite the interval between the upper and lower teeth is often affected in the same way. There is always profuse salivation, and the breath is very offensive. There is not much pain or constitutional disturbance.

A very similar condition may occur in adults suffering from scurvy or from mercurialism.

The treatment consists in attending to the general health and using suitable antiseptic mouth-washes: chlorate of potash is particularly useful, and it should be given in full doses, a child of four or five taking as much as 25 gr. a day in divided doses.

Gangrenous Stomatitis (Cancrum Oris) occurs in sickly children, especially during convalescence from specific fevers such as measles and scarlet fever. It usually begins as an ulcer on the inner aspect of the cheek near the angle of the mouth. The cheek becomes swollen, brawny, red, and shining. In the centre of the inflamed area a livid spot forms; this soon turns into a black slough surrounded by purplish mottling; it spreads with great rapidity, and often involves the whole side of the face. The inside of the cheek is lined by tough adherent greyish slough. When the disease involves the gums they become red, spongy, and ulcerated; dirty-looking sloughs form, and the teeth become loosened and fall out. There is profuse salivation and great fœtor of the breath. The general condition is one of profound toxæmia, and death from septic absorption is almost invariable.

The treatment consists in completely destroying all the infected tissues; this is best accomplished by clipping away all the sloughs and scraping the gums or jaw where diseased, until apparently healthy tissue is reached. Fuming nitric acid is then freely applied to the entire raw surface by means of a glass brush or rod; after the acid has been allowed to act for ten minutes, it is neutralized by mopping the parts with a solution of bicarbonate of soda until effervescence ceases; an antiseptic dressing is then applied. The patient's strength must be supported by all the usual measures. (See also THRUSH.) *Edmund W. Roughton*

STOMATITIS, APHTHOUS.—(See THRUSH.)

STONE.—(See CALCULUS.)

STRICTURE OF THE URETHRA.—(See URETHRAL STRICTURE.)

STRUMOUS DACTYLITIS.—(See BONE, TUBERCULOUS DISEASES OF).

STRYCHNINE POISONING.—(See CRAMP, and POISONING.)

STYES.—(See EYELIDS, DISEASES OF.)

SUBMAXILLARY ABSCESS.—(See ABSCESS.)

SUFFOCATION.—(See ASPHYXIA.)

SUNSTROKE.—In all countries, exposure to excessive heat, and where ventilation is bad, particularly in alcoholic subjects, may result in vertigo, nausea or vomiting, and attacks of syncope. In these cases of heat exhaustion, the patient should be placed on his back in as cool a place as possible, all clothing loosened, and cold water dashed on the face and chest. After recovery from the immediate effects, a brisk purge should be given, and errors in clothing, diet, and ventilation remedied, as attacks are liable to recur.

In the graver forms there is hyperpyrexia, and more active measures are required. Cold, or, if possible, iced baths should be given. If no bath is available, the patient should be rubbed with ice or placed in an ice pack. The rectal temperature must be constantly observed, and the treatment stopped when it falls to 104°, as the fall will continue and collapse may occur.

After the bath or pack, the patient should be wrapped in blankets and stimulants given, if required. In cases where the respiration ceases during the hyperpyrexia, artificial respiration should be carried on, as recovery may be possible even then.

Venesection is rarely of any value, and is often injurious. (See also COMA.)

C. W. Daniels.

SYCOSIS.—It is necessary in the first place to exclude the important imitators of this disease—ringworm and impetigo. That being done, the writer's experience is that the particular reason for the want of success which so often attends the treatment of this disease is want of vigour. The disease is treated with too much respect. The value of antiseptics is practically very much diminished by the fact that it is almost impossible to get them to penetrate to the bottom of the follicles in which lie the germs which cause the disease. Antiseptics have their uses in preventing the spread of the disease from one part to another along the surface, but they are powerless to destroy the germs at the bottom. For these counter-irritation is indicated, and it is to their counter-irritative powers that many antiseptics owe their reputation in sycosis. Blistering fluid is often most useful. Strong solutions of sublimate in spirit of wine really act as counter-irritants rather than as antiseptics, and the counter-irritating ointments, such as the acid nitrate of mercury, are often useful.

Although it cannot be claimed, and is not claimed, that these methods are always successful, they are at all events infinitely more so than the older methods of mild antiseptics.

Along with these applications there is no doubt that treatment is facilitated if the hairs growing from the follicles are removed. This is generally comparatively easy to do, but it is questionable whether much benefit results from wholesale epilation, except it be that it is a rather severe form of counter-irritation.

In the X rays we have a remedy which has the power of producing both epilation and counter-irritation. There is no doubt that far too much has been claimed for the treatment, and if some of those gentlemen who rushed into print with accounts of rapid cures of long-standing cases of sycosis after a short series of exposure of the rays, had only waited a while, they would probably not have written so enthusiastically. The improvement is often so striking at the early stages of the treatment that one regrets all the more that it is so often only transitory. All the same, we have in the X rays a valuable addition to our means of attack, and sometimes the continuance of the rays up to the production of a considerable reaction is followed by satisfactory results. In the majority of cases no general treatment is indicated, but there is a form of sycosis occurring in a delicate class of young men in whom the administration of cod-liver oil is most beneficial. It is to these cases probably that cod-liver oil owes a reputation in sycosis. *Norman Walker.*

SYPHILIS.—Syphilis first manifests itself in a local sore or chancre, indicating the locality where the virus was first introduced, and the chancre is subsequently followed by various cutaneous and other manifestations which signal the general infection of the blood and the invasion of the whole system with the poison.

The initial lesion of syphilis usually presents itself in the form of an indolent ulcer, the local treatment for which is the application of some antiseptic powder or lotion. Iodoform was formerly much employed for this purpose, but owing to its characteristic odour this substance was apt to arouse the suspicions of those familiar with its uses, and is now usually discarded, and replaced by other equally efficient substitutes, amongst which may be instanced dermatol, iodol, europhen, xeroform, and orthoform. The sore having been carefully cleansed in warm water, the powder is dusted lightly over its surface, and a piece of lint is superimposed with a view of retaining the powder in contact with the sore, and of absorbing its secretion, while if the sore is on the outer aspect of the prepuce or on the sheath of the penis, the dressing may be secured in position by adhesive plaster.

The lotions usually adopted as a dressing for the chancre, are the lotio nigra

or the lotio plumbi, to which may be added some tincture of opium (1 dr. to 1 oz.) if much pain is present.

Neglect, privation, alcoholism, and debility may give rise to an unhealthy condition of the chancre, manifested by sloughing or phagedæna, which may cause serious destruction and mutilation of the affected parts. Treatment of this condition must be prompt and energetic, and nothing is more effective than the continuous application of hot water ; this is best effected by the immersion of the patient in a hip-bath into which fresh supplies of water are constantly introduced, in order to maintain the temperature. The stay of the patient in the bath may be regulated by the severity of the destructive process, and in an acute case immersion for twelve hours daily is advisable. In the intervals between the baths, the application of a lotion of tartarated iron, 20 gr. to 1 oz. water, is a valuable adjunct to this treatment. Of far greater importance than these local measures is the constitutional treatment by means of which the syphilitic virus is eliminated from the system. This treatment resolves itself into the administration of two remedies, mercury and iodine, of which two the former is far the more important, since it seems to act as an antidote to the syphilitic virus, whilst the latter is used to alleviate certain symptoms, and to promote the absorption of some of the products of the disease.

Mercury may be introduced into the system in various ways : By the mouth, in the form of pills or solutions ; by the skin, in the form of inunctions or fumigations ; by injections, either intramuscular or intravenous. It is generally admitted that the treatment should be commenced as soon as the diagnosis of syphilis is made, but if there is any doubt as to the nature of the chancre, treatment should be withheld until the appearance of some secondary manifestation clears up the uncertainty.

The simplest method of administering mercury, and the one which proves satisfactory in a large proportion of cases, is ingestion by the mouth. At the outset of the disease this is usually effected by means of pills in the form of pil. hydrarg., pil. hydrarg. cum creta, pil. hydrarg. tannatis, pil. hydrarg. salicyl., in doses of 1–2 gr., three times a day, with a small quantity of pulv. opii in addition, should their ingestion be followed by colic or diarrhœa. In the later stages of the disease, a pill combining mercury and iodine may advantageously be prescribed, such as pil. hydrarg. iodid. virid. ½ gr., or pil. hydrarg. iodid. flav. ½ gr.. The liquor. hydrarg. perchlor. may be given in doses of 1 dr. three times a day, and is indicated in cases of relapse, or where it is desirable to continue the use of the drug for a prolonged period. A mixture of biniodide of mercury, 1 dr. liq. hydrarg. perchlor. with 5 gr. potass. iod., is valuable in the later stages of the disease, in cases of the gouty diathesis, or when superficial ulceration of the tonsils and fauces is present. Mercury may also be administered in combination with arsenic, in the form of Donovan's solution in 10 min. doses, in obstinate cases of syphilitic skin eruptions, especially in chronic desquamating papular syphilides.

In whatever form mercury is administered, the greatest attention must be paid to the hygiene of the mouth ; before the commencement of the course, any decayed teeth should receive the attention of the dentist, and all tartar should be removed from the teeth by scraping. The teeth should be carefully cleansed with some antiseptic tooth-powder or lotion after each meal, and the mouth should be frequently rinsed out with an astringent lotion, such as alum 10 gr. to the ounce, or a 20 per cent solution of Listerine. Moreover, every patient should be instructed at the commencement of treatment that his diet should be simple but nourishing, that exposure to cold and wet should be guarded against, and that the avoidance of stimulants is also advisable, since the therapeutic effect of mercury appears to be greatly modified if alcohol in any quantity is being

taken at the same time. Smoking may be allowed in moderation in the absence of any lesions of the buccal mucous membrane, but should there be traces of syphilitic ulceration in that region, it should be given up entirely. The patient should also be informed as to the serious nature of the disease, the various methods by which it can be communicated to others, and as to the length of time during which the treatment should be continued.

In a large proportion of cases the administration of mercury by the mouth is productive of a perfectly satisfactory result, and as it does not entail any pain or inconvenience, it is probably the most suitable form for general adoption. But there are some patients who are intolerant to mercury taken in this manner, amongst whom may be mentioned those suffering from gastric derangements such as gastritis, dyspepsia, or dilatation of the stomach, also those in whom the drug gives rise to intense colic and diarrhœa, which is not counteracted by the addition of opium. Further, since the absorption of mercury thus administered is slow and often uncertain, some other method must perforce be adopted in cases of severe and malignant syphilis, and where it is desirable to get the patient under the influence of the drug with as little delay as possible. More energetic and effective measures are at our disposal in the form of mercurial inunctions and intramuscular injections.

The inunction treatment consists in the rubbing into the skin of a varying amount of mercurial ointment, according to the condition, age, and sex of the patient, an average daily dose for an adult being 1 dr. The procedure may be carried out either by the patient or by a skilled rubber, preferably the latter, each application lasting for about twenty minutes, by which time all the ointment will have been absorbed by the skin. It is advisable to vary the locality of the applications as much as possible, in order to avoid irritation of the skin, and the hairy parts of the body should be avoided, since the ointment is liable to set up eczema if applied in those regions. An average course of treatment consists of a daily inunction for thirty to forty days, but its duration will materially depend upon the condition of the patient's mouth and gums. The advantages of this method of treatment are, the rapidity with which the mercury is usually absorbed, and that it does not as a rule interfere with the digestive functions; its disadvantages are, that the amount of mercury absorbed is variable and uncertain, that the treatment is uncleanly and consequently distasteful to many, and its success depends upon the manipulative skill of the rubber, or the patient; it is contra-indicated in the presence of a general pustular syphilide, or in patients with a delicate and sensitive skin.

The treatment by intramuscular injections is more efficient and reliable than the inunction method, and is now usually resorted to in cases of severe and intractable syphilis, in syphilitic iritis, and in syphilis affecting the brain or nervous system. It is recommended as a routine by the majority of our military surgeons, and is also initially adopted in my wards at the London Lock Hospital for women. For these injections both the insoluble and the soluble mercurial salts are utilized, but the former are far more effective than the latter, and are more convenient both for the surgeon and for the patient, seeing that only one injection is required weekly, whereas the soluble preparations have to be injected daily. The most powerful and undoubtedly the most effective of the insoluble salts is calomel suspended in sterilized olive oil or vaselin, the dose being $\frac{3}{4}$ gr. calomel to 17 min. olive oil injected once a week. The principal objection to its use is that it occasionally gives rise to very severe pain. Another efficient insoluble preparation is "grey oil," consisting of hydrarg. pur. 1 oz., adipis lanæ anhyd. 4 oz.. paraffin liquid (carbolisat. ad 2 per cent) ad 10 oz.; the customary dose of this preparation is 10 min. injected weekly;

this is the formula which is mostly adopted for the treatment of syphilis in our military hospitals.

In the absence of any symptoms of urgency, and where prolonged treatment is indicated, the basic salicylate of mercury has been recommended; the strength of the solution is 10 gr. suspended in 100 min. of liquid paraffin, of which the weekly dose is from 10 to 15 min.; it has the advantage of being less painful than the other insoluble preparations, but on the other hand its action is slow and uncertain.

Amongst the soluble salts may be mentioned merc. perchlor. $\frac{1}{3}$ gr. dissolved in 17 min. of distilled water, to which is added sodii chlor. $\frac{1}{6}$ gr.; merc. succin. $\frac{1}{3}$ gr.; merc. biniod. $\frac{1}{3}$ gr.; and merc. sozoiodol. $\frac{1}{3}$ gr., with sodii iodid. $\frac{2}{3}$ gr. The disadvantage of these soluble salts is that they have to be introduced daily or every other day; but this is to some extent counterbalanced by their comparative painlessness.

Whichever preparation is adopted, whether soluble or insoluble, every precaution must be taken against sepsis, and against injecting into blood-vessels or in the region of large nerve trunks. The skin of the patient, the hands of the surgeon, the syringe, and the material to be injected must be treated with the same precautions as regards asepsis as would be deemed necessary in any important surgical operation. The region usually selected is the buttock, the exact spot being the centre of a line drawn from the anterior superior spine of the ilium to the upper end of the intergluteal fold, this point being well above and to the outer side of the important vessels and nerves emerging from the pelvis through the great sacro-sciatic foramen.

Intravenous injections of 20 min. of a 1 per cent solution of cyanide of mercury into the median basilic vein have been used with great success, but can hardly be recommended as a routine procedure.

The extent and duration of the mercurial treatment will materially depend upon the constitution and idiosyncrasies of the patient, and also upon the form of treatment adopted, but it should certainly be prolonged with intermissions over a minimum period of three years. Each mercurial course should be followed by a period of intermission from treatment, the length of the former gradually diminishing, and the latter lengthening as the treatment advances. It is impossible to lay down any definite rule as to the amount of mercury to be taken, since its effects vary considerably in different individuals. The condition of the gums will give some indication as to the duration of the course, and as to whether the drug is producing the desired effect; a slight gingivitis and increase in the flow of saliva is not always an unwelcome sign, since it indicates that the remedy is affecting the system. The bodily weight of the patient should be carefully noted during the course, and any material diminution will indicate some modification in the treatment. The presence of albumin in the urine will necessitate smaller doses given under very careful supervision, and any gastric and intestinal derangement will call for an interruption in the treatment.

If treatment by the mouth is adopted, the first course should be extended, if possible, for six months, and should be followed by a rest of from two to three months, and during the three years at least two courses should be taken annually, the length of which will vary according to the peculiarities of each patient.

If preference is given to the treatment by inunctions, 1 to 2 dr. of mercurial ointment should be rubbed in daily for from thirty to forty days, and here again at least two courses should be given annually for the period of three years, the dosage and duration of which must be regulated according to the requirements of the case.

Should treatment by intramuscular injections be decided upon, with the

insoluble salts, a primary course of from 12 to 15 weekly injections may be prescribed, or if the soluble salts are preferred, from 25 to 40 injections, as first daily, then every other day, and finally twice a week. This form of treatment, like the others, should be prolonged over three years, gradually decreasing the duration of the later courses. Though it is impossible to state that any case of syphilis is ever cured, yet in the majority of instances a course of mercurial treatment, carried out according to one of the above-mentioned methods, will at any rate secure immunity from later manifestations of the disease; but there are cases in which the treatment by mercury fails to subdue some of the symptoms, and here recourse must be had to some of the preparations of iodine. This drug is as a rule only required in the later stages of the disease, when it is of value in promoting the absorption of the products of syphilitic inflammation; thus, it may be administered with advantage in cases of syphilitic ostealgia involving the cranial or other bones, such as the clavicle, ulna, or tibia, in tubercular and ulcerative syphilides, in syphilitic glossitis, and in tertiary affections of the brain, the eye, the viscera, and the bones. It is usually given in the form of iodide of potassium, but the iodides of sodium and ammonium are equally efficacious and less depressing. It may also be administered in the form of intramuscular injections of iodipin, 25 per cent, of which ½ oz. may be introduced on alternate days until the quantity injected amounts to from 30 to 40 oz.; this heroic treatment is only applicable in severe and destructive tertiary lesions; iodipin may also be administered by the mouth in doses of ½ oz. of the 25 per cent solution three times a day.

Brief allusion may be made to a method of treatment known as Zittmann's, which consists in the imbibition of a large quantity of a decoction of sarsaparilla, mixed with other ingredients, including calomel. Two quarts of this liquid are taken in the course of the day; the patient is kept in a room at a temperature of 80° F., is purged, and kept on a light diet. The treatment is depressing, and is only adopted in intractable cases which will not yield to the ordinary measures, and the ingestion of the same quantity of hot water will produce a very similar result.

In addition to the general treatment outlined above, the majority of the symptoms of the disease may be treated on general surgical principles, but there are certain manifestations which may call for special local measures. Ulcerating condylomata must be kept dry and treated by a dusting powder consisting of equal quantities of calomel and starch; ulceration of the tongue, throat, or any part of the buccal mucous membrane should be painted over with a solution of hydrarg. perchlor. 4 gr. to the ounce, and as a mouth-wash or gargle, a weaker solution of hydrarg. perchlor., ½ gr. to the ounce, may be used. Palmar and plantar psoriasis and the chronic desquamating papular syphilides may be treated by the application of oleate of mercury in strength of 5 to 10 per cent. *J. Ernest Lane.*

TABES DORSALIS (Locomotor Ataxy).—It will be convenient to consider treatment under the following headings: (1) Antisyphilitic treatment; (2) General therapeutic measures and drugs which appear to influence favourably the course of the disease; (3) Symptomatic treatment.

1. **Antisyphilitic Treatment.**—The existence of a very close relationship between tabes and previous syphilis is almost universally acknowledged; indeed, an increasing number of observers go so far as to say that without syphilis there would be no tabes. It is unnecessary here to do more than refer to this very intimate association. The circumstance that in only a very small proportion of those who have been infected by syphilis does tabes subsequently develop, shows that other influences must play a part in determining its incidence; for it

appears unlikely that peculiarities of the syphilitic virus in individual cases can be alone responsible for its development.

The establishment of this etiological relationship has hitherto not proved of great therapeutic value, for cases of tabes are rarely met with in which very striking improvement is attained by the exhibition of mercury and the iodides. In some, however, these remedies certainly do good, and there is pretty general agreement that an *antisyphilitic course is indicated:* (i) When syphilitic manifestations are present; (ii) When there is a history of comparatively recent syphilitic infection (say within five years), especially when the patient has never undergone a thorough syphilitic "cure"; and (iii) In doubtful cases in which it is difficult to exclude a true syphilitic process giving rise to symptoms closely simulating tabes (pseudo-tabes).

No benefit is usually derived from the use of antisyphilitic drugs when the tabetic symptoms are of long standing; indeed, in some cases these remedies have been said to have proved actually harmful. Further, the existence of optic atrophy must be regarded as a contra-indication to the treatment, since it is affirmed that both mercury and potassium iodide accelerate the degenerative process in the optic nerves.

If it is decided to subject the patient to regular antisyphilitic treatment, it is advisable, in the first place, that he should obtain a lengthened leave of absence from business. Two courses are then open to him: he may either visit one of the foreign watering-places, such as Aix-la-Chapelle, which has attained a special reputation for the treatment of syphilis, where he will be put through the orthodox "cure," or, if his means do not permit of this, he may be treated at home.

Mercury is conveniently administered in the form of unguentum hydrargyrum, ½ dr. of which should be used as an inunction twice daily. The inner aspect of the thighs and the axillæ are the most suitable places for the application. The ointment is to be rubbed in for twenty minutes at a time, the same piece of lint being used for successive inunctions. It is advisable so to apply the ointment that the same region of skin is not used oftener than once in two days. A tepid bath may be taken immediately before the evening inunction, since it appears to assist absorption. The mercurial treatment should be continued for a fortnight, but stopped on the appearance of redness or soreness of the gums, pronounced salivation, or marked loss of weight. This "course" may be repeated at intervals of two months.

If tertiary symptoms exist, potassium iodide should be given, and continued for six weeks in increasing doses of 10 to 40 gr. three times a day. In some cases, gastric disturbance is set up by the iodide, and may interfere with its administration; it is therefore important to correct, so far as possible, any pre-existing gastric irregularities before the iodide treatment is commenced. Aromatic spirits of ammonia or ammonium carbonate may be added to the iodide with advantage, with the object of counteracting the depressing effect of this drug when administered for a lengthened period. If the iodide is given in large doses, the patient should be confined to bed. Toleration of large doses may be regarded as an indication that the remedy is doing good.

After two months' treatment, the patient should be sent away to a stimulating climate, given a tonic, and encouraged to take plenty of food and a gradually increasing amount of exercise, in order to brace him up after the somewhat depressing effects of the antisyphilitic course. The *nachkur* should last for at least a fortnight, preferably for a month, before he returns to work. Any benefit derived from the treatment is not usually apparent until the *nachkur* is completed.

2. **General Prophylactic and Drug Treatment.**—Statistical enquiries, as well

as individual observations, have demonstrated that certain factors in addition to syphilis may take a share in determining the development of tabes. Thus chills, over-exertion, sexual excesses, and trauma appear in certain cases to have acted as exciting causes of the disease. It follows that special precautions should therefore be adopted to avoid these influences, which, since they can excite the disease, are no doubt capable of accelerating its progress.

The necessity of freedom from the worries of business should be emphasized, and the avoidance of over-fatigue insisted upon.

The peculiar susceptibility to falls in the barometric pressure, which is so often manifested in increased severity of the pains, is an indication for warm clothing. A warm, dry climate, such as that of Egypt or Northern Africa, is very suitable during the winter months for those who can afford it.

Loss of weight, which cannot but predispose to the development of complications and associated lesions, is a common accompaniment of severe cases of the disease; hence the need for a nutritious and fattening diet and of careful attention to the organs of digestion. Alcohol, if allowed at all, is to be strictly limited. Moderate smoking is permissible. The tabetic should be strongly advised not to marry, and he must be warned of the bad effect which indulgence in sexual excesses may have upon the disease.

General massage is of distinct service in cases in which there is much wasting. Faradism may be used with advantage when the muscular nutrition is defective; it is also sometimes of use in the treatment of certain subjective sensory disturbances. In the opinion of some authorities, the application of a weak galvanic current to the spine, for five to ten minutes at a sitting, one pole being placed between the shoulders, the other over the sacrum, has been attended with benefit. A course of hydrotherapy at some of the German baths, e.g., Wildbad, St. Moritz, may be worthy of trial by those to whom money is no object.

The suspension treatment, introduced some years ago, has been almost entirely abandoned, later observations having failed to corroborate the favourable impression at first created by this procedure.

Nerve stretching is no longer employed.

Drugs which have obtained some reputation in the treatment of this disease, as in so many of the degenerative affections of the nervous system, are arsenic and strychnine. Five minims of tincture of nux vomica, combined with from 2 to 5 min. of Fowler's solution, is a convenient form of administration. Strychnine must be given with caution, since in some cases it appears to increase the severity of the pains. Aluminium chloride, in doses of 2 to 4 gr. thrice daily, has been specially commended by Gowers; it may be given in combination with arsenic. Nitrate of silver, a remedy the efficacy of which was at one time greatly lauded, still has a few adherents. It may be given in the form of a pill, $\frac{1}{4}$ gr. twice a day, made up with unguentum kaolin. Gastric disturbance is apt to be produced, and discoloration of the skin results if the drug is long-continued; therefore, after a fortnight its administration should be stopped, to be again resumed after a month's interval. Other remedies, such as iron and quinine, may be of value from their general tonic action.

3. **Symptomatic Treatment.**—A peculiar feature of tabes consists in the multiplicity of distressing symptoms to which the disease may give rise, and the almost unrivalled variety of types which it may in consequence present, according to the predominance of one or more of these symptoms in the clinical picture.

Lightning pains, affecting especially the lower limbs, and presenting great variations both in their intensity and in the frequency of their occurrence, are rarely absent; indeed, they constitute the most common symptom of the

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disease. When the pains are not severe, 5 to 10 gr. of phenacetin will often disperse them. If they are more intense, phenacetin (20 gr.), antipyrine (20 gr.), or exalgin (2 gr.), may be exploited. Pyramidon (5 to 10 gr.), and aspirin (20 gr.), have been highly recommended by Oppenheim, and may be tried. Potassium iodide is sometimes of use, as is salicylate of soda. Osler is of opinion that nitroglycerin, in increasing doses, continued over a considerable period, is of undoubted value where the blood-pressure is raised.

Hot fomentations, massage, and a gentle faradic or galvanic current to the affected part, are sometimes beneficial. The local application of lint sprinkled with chloroform and covered with oiled silk, according to Gowers, may relieve superficial pain. Counter-irritation is occasionally useful. High-frequency currents have at times a temporary beneficial effect.

All these measures may be of use when the pains are not of great intensity; but in those cases in which their excruciating character is unbearable, morphia is usually the only drug which will bring relief. Only as a last resource should morphia be used, and the patient should not be allowed to give himself hypodermic injections; for not only is there a great risk of the development of the morphia habit, but, in addition, the drug has such a lowering effect upon the will and emotional control as to render the fight against the pains when they recur still more difficult.

Ataxia occupies a prominent place among the serious symptoms of the disease. It has long been recognized that an increase in the ataxia is apt to follow confinement to bed, but it is only of recent years that any real success has been obtained in the treatment of this symptom. To Fraenkel we owe the introduction of a new plan of treating the ataxia, which has been attended with most encouraging results.

The appreciation of the rationale of the method is essential to its successful application. The procedure consists in the re-training of co-ordination, the possibility of which is shown by the observation that if an ataxic patient repeats a movement several times in succession, the ataxia in connection with that movement becomes less pronounced. Before the treatment is commenced, it is advisable to point out to the patient that his difficulty in walking is not due to weakness of the muscles, but to an inability to co-ordinate. As a consequence of destruction of certain afferent neurons, the tabetic receives a defective and erroneous idea of the movement which he is performing, with the result that the movement is consequently at fault. The tabetic must learn to forget the "movement memories" which served his purpose while in health, and proceed to acquire a new series of "movement memories" corresponding to the impressions which he *now* receives through those neurons which remain intact. The patient must realize that it is the care and precision with which the movements are carried out, rather than their very frequent repetition, which are so essential for success. Suitable exercises will suggest themselves to the physician. For further details regarding this plan of treatment the reader is referred to Fraenkel's book on the treatment of tabetic ataxia, which has recently been translated into English; also to a short paper by the writer in the *Edinburgh Medical Journal* for September, 1901.

Even when the ataxia is slight, the value of simple exercises, such as walking along a straight line, is considerable. The exercises should be practised systematically two or three times a day, for half an hour at a time, stopping at once, however, if the patient's attention begins to wander, or if there are any indications of fatigue. A course of general massage and faradism is a valuable adjunct when the muscles are flabby and weak from disuse.

Such complications as grave cardiac disease, bladder trouble, a disorganized joint, or a perforating ulcer of the foot, may contra-indicate the treatment.

Again, mental changes interfering with the patient's power of concentration may render the treatment unsatisfactory; while severe and prolonged attacks of lightning pains and gastric crises, because of the confinement to bed which they necessitate, may counteract any improvement derived.

Hyperextension of the knees, which gives rise to difficulty in walking, may be materially benefited by suitable orthopædic appliances.

Disorders of micturition are among the most serious symptoms to which the tabetic is liable. Difficulty in emptying the bladder is very common, incontinence is of frequent occurrence, while occasionally complete retention is met with.

In every case of tabes it is necessary to impress the patient with the importance of passing water at frequent and short intervals (every two hours), and of attempting at each act of micturition to expel all the urine the bladder contains. It is well to keep in view the possibility of a co-existing stricture of the urethra, a complication not uncommonly overlooked in tabes, which, when present, calls for appropriate treatment. When there is difficulty in passing water, 5 min. of liquor strychninæ, thrice daily, is sometimes of use. Incontinence of urine is at times distinctly benefited when a like quantity of tincture of belladonna is taken three times a day. If there is reason for believing that the bladder is being imperfectly emptied, a catheter should be passed after the act of micturition, and the residual urine estimated: should it exceed ten ounces, it is probably best, as Sir William Gowers suggests, to draw off the urine at regular intervals, treating the case, in fact, exactly like retention dependent upon an enlarged prostate, and with the same object in view, viz., the prevention of cystitis and its dreaded sequela, pyelonephritis. The residual urine should be drawn off two or three times in the twenty-four hours, with the hope that in the course of a short time it will diminish in quantity. There is little, if any, additional risk of producing a cystitis in passing a catheter in cases of tabes, provided that rigorous aseptic precautions are taken. When cystitis actually exists, the bladder should be washed out twice daily with weak boracic solution; while remedies such as urotropin, acid phosphate of soda, etc., may be given internally, according to special indications.

Constipation is often a troublesome symptom. Liquid extract of cascara, 5–10 min., combined with tinct. nucis vom., 5 min., three times a day, may be sufficient to produce a daily evacuation of the bowel. It is often necessary, however, to employ enemata.

Crises.—Visceral crises may be a source of great distress to the tabetic. Among these, gastric crises are most often met with. During an attack, the patient should be fed per rectum. Oxalate of cerium, 5 to 10 gr. given in a wafer paper, has been said to do good, and may be tried. A minim of liquor trinitrini may be given, three times a day, in cases where the blood-pressure is raised. But, as a matter of fact, if the crises are severe, morphia given hypodermically is usually the only drug which is found to be of any real value. It is of great importance to feed up the patient in the intervals between the attacks, in order that he may recover his strength and make up the loss of weight which is produced thereby.

Laryngeal crises may sometimes be relieved by the inhalation of nitrite of amyl; if this fails, painting the vocal cords and neighbouring parts with a weak cocaine solution may be found to be of service.

In the case of rectal, vesical, and intestinal crises, the application of a mustard leaf or hot fomentation to the abdomen is worthy of trial. The various analgesics above mentioned may also be employed, but when the crises are severe, morphia, given in the form of a suppository, will usually be found to be the only effective remedy.

In cases which present optic atrophy, ataxia is often absent or ceases to progress if the amaurosis becomes complete, while the pains are usually slight.

Mercury and potassium iodide are contra-indicated in these cases. Strychnine given hypodermically is said to help in retarding the atrophic process in the optic nerves. An initial dose of $\frac{1}{100}$ gr. per diem should be gradually increased until the physiological action of the drug is apparent.

Pain in the back may sometimes be relieved by counter-irritation. Failing this, the remedies previously mentioned as effective in the treatment of the lightning pains should be resorted to. Girdle pains are to be treated on similar lines. Cutaneous hyperæsthesia—a somewhat uncommon symptom of the disease—is at times markedly benefited by the application of a weak faradic current with a fine wire brush electrode. The effect of a warm bath may also be tried in these cases.

The treatment of perforating ulcers or tabetic arthropathies which are giving rise to inconvenience may be relegated to the surgeon.

From these remarks on the symptomatic treatment of tabes, it will be seen that the physician has considerable therapeutic scope, with a distinct prospect that his endeavours will not be altogether in vain.

SUMMARY.—We may say that the first question demanding solution is a decision as to whether an antisyphilitic course is called for : this must be decided from the indications already laid down. In addition, the patient should be advised, in the words of Erb, " to live the life of an old man, simple, abstemious, quiet, and regulated." If the case belongs to the category of early stationary tabes with unobtrusive symptoms, prophylactic precautions alone are required ; if, on the other hand, the case is more advanced, active general measures and suitable symptomatic treatment must be adopted, according to the special indications present. *Edwin Bramwell.*

TACHYCARDIA.—(See also HEART, IRREGULARITY OF.) Tachycardia, or abnormal increase in the rate of the heart-beat, is brought about by a number of causes, resembling in the main those considered in the articles on arhythmia and bradycardia. The symptom may, as in bradycardia, be due to some inherent peculiarity of the individual. Leaving this idiosyncrasy out of account, the causes of tachycardia fall into three groups.

1. Diminished inhibitory influences are the commonest factors in producing the increased rate. Such diminution of the regulating action of the inhibitory nerves may be induced by structural changes in the vago-accessory nerves or their centres ; by pyrexia and by external heat ; by chemical poisons, such as alcohol and atropine; by microbic toxins, like those of influenza and diphtheria ; by organic secretions, as of the thyroid gland ; by mental emotion ; and by physical exertion. It is possible that increased accelerating influence may produce tachycardia, but of this the evidence is not yet definite.

2. Toxic agencies may interfere directly with the heart muscle. Many of the microbic, and some of the chemical, poisons undoubtedly act in this way by bringing about a state of weakness of the myocardium, and instability of stimulus production, whereby the rate is accelerated.

3. Lastly, structural changes in the heart, apart from nervous and toxic influences, lead to tachycardia. The condition of cardiac strain, as seen in the irritable heart of soldiers, and the loss of tonicity, leading to dilatation with lowered arterial pressure, are sufficient to bring about tachycardia ; while in more profound myocardial disturbances the tendency is still greater. When enquired into more closely, the increase of frequency is found to depend for the most part upon a reduction of the diastolic phase, and it is certain that this reduction may be due to a condition of increased irritability or diminished control, either of which will allow the normal stimulation of the heart to occur too soon ; in other words, there is a succession of premature systoles.

Tachycardia may be persistent or paroxysmal; the latter variety being usually, at least, due to acute heart failure. At times, the condition is characterized by absolute latency, with a total absence of all subjective sensations. More commonly, however, it is attended by palpitation, with uneasiness and breathlessness, occasionally associated with profound nervous disturbance. Tracings of the pulse prove that tachycardia depends upon the existence of premature systoles, whereby the rate may be increased to more than 200 pulsations per minute. As a general rule, there is not much irregularity of pulsation, and but little inequality in the beats. There is, in most cases, some increase in the size of the heart; various murmurs may also be present; if they are absent, the heart-sounds are high-pitched and ringing, as in most cases of dilatation. There may be symptoms connected with other parts of the body, but these are, as a rule, consequences of the cardiac condition, and have no causal relation to the tachycardia. Occasionally, disorders of the digestive system, mobility of the kidney, or other disordered condition, may be ascertained to have a real influence in producing the increased frequency. In every case it is well to guard against the presence of movable kidney, intestinal parasites, Graves' disease, and hysteria.

TREATMENT.—The same lines must be followed as are described for the management of palpitation. Physical and mental exercise, with adequate nutrition, must be kept in view. All gastric derangements and other abdominal disturbances must be removed. A tight bandage around the abdomen has often been found most valuable, probably by obviating distension of the abdominal vessels. If there be renal mobility, a satisfactory bandage must be employed or surgical intervention invoked, and if any intestinal parasites are present, they must be removed. The use of all forms of exercise which can improve the nutrition of the heart and the tone of the abdominal muscles, will be found most beneficial. All alcoholic and other stimulants should be avoided. Digitalis and nux vomica are extremely valuable; both are more useful than strophanthus. If there be much nervous disturbance, one of the bromides or hydrobromic acid may be administered. Thymus and suprarenal extracts are often of great utility, especially in cases on the borderland of Graves' disease, and may be given two or three times a day in 5-gr. doses.

In hysterical and neurasthenic affections, a combination of measures adapted to increase the tone of the body at large, and to diminish the irritability of the nervous system, should be adopted. When such conditions lead to tachycardia, the employment of baths, electricity, massage, and exercises will be found most useful.

Paroxysmal tachycardia is commonly an affection of middle or advanced life, associated with sclerosis of the vessels, and probably, in most cases, with interstitial myocarditis. For such cases the combination of iodides and digitalis will be found most excellent, e.g. :—

℞ Potass. Iod. ℥j | Inf. Digit. ad ℥vj

A tablespoonful in water three times a day after meals.

G. A. Gibson.

TÆNIA.—(See INTESTINAL PARASITES.)

TALIPES, ACQUIRED. — The term talipes, or club-foot, signifies an abnormal attitude of the foot, with consequent disturbance of its relationship to the leg, or of that of its component parts to one another. The expression "acquired club-foot" indicates that the faulty attitude has developed at some period after birth, and contrasts the condition with the congenital deformity which is present when the child is born. The deformity may occur in any one of the four directions in which the foot can be moved, or it may be compound, in

two directions at the same time. The subjoined table will show the more common varieties of acquired club-foot, and briefly indicate the attitude in each variety.

Simple Talipes	Equinus. Foot pointed—heel drawn up. Calcaneus. Heel dropped—front of foot raised. Varus. Foot inverted.
Compound Talipes	Valgus. Foot everted. Equino-varus. Foot pointed and inverted. Calcaneo-valgus. Heel dropped—foot everted. Equino-valgus. Foot pointed and everted.

Another deformity which falls within the scope of our definition of club-foot, but is not included in the above classification, is the condition called claw-foot, or pes cavus.

Acquired club-foot is essentially due to prolonged maintenance of a faulty attitude by the affected limb. There are many conditions which result in this maintenance of abnormal position, but granted that any one of them has come into action, the nature of the deformity produced will depend more upon the habitual attitude assumed by the foot under the new circumstances than upon the circumstances themselves. For example, if the muscles of the leg be paralyzed from poliomyelitis, and the foot be allowed to hang down habitually, the deformity will be one of equinus or equino-varus. If, on the other hand, the patient attempts to walk on the paralyzed limb, the superincumbent body weight will in all probability produce a condition of calcaneus or calcaneo-valgus. The maintenance of the foot in bad position is soon accompanied by contraction of such structures as the tendo Achillis, plantar fascia, tibialis posticus, or ligaments such as the plantar ligaments, and the posterior and internal lateral ligaments of the ankle joint. This contraction fixes the foot in its abnormal position, and it is impossible to rectify the deformity until the tight structures have been divided or stretched.

By far the commonest cause of acquired club-foot is infantile paralysis affecting the muscles of the leg to a greater or less extent, and as a consequence the condition is often called paralytic talipes. But club-foot can also be acquired as the result of contraction following burns, or during the course of disease of the ankle joint or of the bones of the leg ; it is a constant accompaniment of the central palsies of infants, i.e., spastic paraplegia and infantile hemiplegia. Again, talipes equinus can be acquired during the treatment of fractures or of any disease, because the bed-clothes have been allowed to weigh upon the foot and keep it in the extended position long enough to over-stretch the flexors of the ankle while the tendo Achillis contracts ; this condition has been called talipes decubitus. Acquired talipes may result from peripheral neuritis, or may be produced by accidental section of, or pressure upon, one of the popliteal nerves, or by forcible straightening of a flexed knee without section of the tendo Achillis. Lastly, the condition may be hysterical.

The only point in the diagnosis is the differentiation from the congenital deformity. The distinguishing features, such as the absence of deformity at birth, the history of symptoms suggesting an attack of poliomyelitis, the fact that movement of the foot is only limited in one direction, whereas the congenital club foot is a rigid one, the wasting of the calf, the poverty of the circulation, and under-development of the part, clearly indicate the paralytic talipes, and, should the deformity be due to any of the other causes mentioned above, the history and general features of the case will usually throw light upon the origin of the mischief. The hysterical club-foot is usually, but not always, an equino-varus, and is associated with much spasm and rigidity while the patient's attention is fixed upon the foot. The deformity disappears under anæsthesia, or even if the attention can be attracted to other things.

As a rule, acquired talipes is not accompanied by much osseous change in the foot, unless the deformity is an old-standing one or has been produced by actual bone or joint disease.

TREATMENT.—In the treatment of acquired club-foot the deformity must be corrected, and steps must be taken to prevent it recurring. Thus the means at our disposal fall under two heads : (1) Operative ; (2) Mechanical. The operative measures are tenotomy, with or without forcible correction with the wrench, tendon transplantation, removal of portions of redundant skin, and joint fixation or arthrodesis, with or without removal of portions of the tarsal bones. Mechanical apparatus has two great functions—it may be used to prevent the development of an acquired club-foot, and it is of the greatest value in the post-

operative treatment of the club-foot, once the deformity has been corrected—it cannot replace operation if the deformity has already developed. Splints and irons should combine simplicity with effectiveness ; they should tend to correct the deformity for which they are employed, and they should be designed so that they may be applied without interfering with the circulation in the affected limb.

In the detailed account of the treatment of each variety of talipes it is assumed that the condition is paralytic ; mention, however, is made of any modification necessary in dealing with cases due to other causes.

Paralytic Talipes Equinus is a simple deformity. The tendo Achillis is shortened, and the patient walks upon the heads of the metatarsal bones or even upon the dorsum of the toes ; the flexors of the ankle and often the extensors of the toes are overstretched and useless.

Tenotomy of the tendo Achillis usually allows the foot to be brought up to a right angle ; if the posterior ligament of the ankle-joint is shortened, the shortening can be overcome by the use of the Thomas wrench. As a rule, if the foot be kept in good position in a light rectangular splint for a sufficiently long time, and efficient massage be employed, the anterior tibial group of muscles will recover their tone and will themselves prevent the deformity recurring. As this process is often a tedious one, and it is difficult to keep a splint applied for a long period of time, the foot can be more efficiently splinted by removal of a good piece of skin from the front of the ankle, and stitching the edges of the raw surface together so as to tighten up the skin and suspend the foot in good position.

If it is thought that the anterior muscles will not recover, it is advisable to perform an arthrodesis of the ankle by removal of the cartilage covering the bones entering into the articulation, with the result that a short fibrous ankylosis is produced with the foot in good position. It is not advisable to resort to this measure in a young child, nor indeed is it often necessary in the case of simple talipes equinus, as the muscles frequently recover when the stretching effect of the deformity has been removed. In order to ascertain whether they will recover, it is only necessary to increase for the moment the equinus deformity and observe if any extending movement of the toes can be performed voluntarily or even reflexly ; if there is the slightest flicker of extension the muscles will recover their tone, provided the foot be kept at right angles for a sufficiently long time and the limb be well massaged. In talipes equinus due to spastic paralysis, simple tenotomy is not advisable, as the promixal end of the divided tendon will retract up the leg, and a condition of calcaneus will develop. The best procedure in such a condition is division of the tendon through an open incision, and mooring the two ends with strands of chromic catgut after the foot has been brought to a right-angle. Talipes equinus due to old disease of the ankle, or tarsus with ankylosis in the faulty position, is best dealt with by removal of a wedge of bone from the dorsum of the foot as near the ankle-joint as possible.

If a walking-iron is necessary in the post-operative treatment of talipes equinus, a simple and effective mechanism is a light iron running down the back of the calf and turning at right angles at the heel to run forwards for a short distance in the substance of the boot. This iron is secured at its upper end by a leather strap and buckle, and another strap should be applied round the ankle, so that the heel may fit into the angle of the iron.

Talipes Calcaneus is a condition which varies in severity with the age of the patient, and the treatment consequently depends upon the same factor. In the baby a few months old, the deformity may be corrected by shortening the tendo Achillis through an open incision—the tendon being split longitudinally, and stitched up so that the wound becomes transverse ; the wound in the skin may be treated in the same way. The foot must be kept pointed for

several weeks by means of a short straight splint applied over the front of the ankle, and massage of the muscles of the calf must be thoroughly carried out. The child should only be allowed to walk in a back iron such as described above, but bent at an angle rather greater than a right-angle at the heel. This method of treatment will fail if the child is old enough to walk before the surgeon is consulted. In such a case an arthrodesis of the ankle—the joint being attacked on the posterior aspect—will secure a much more permanent result. In performing this operation, in addition to removal of the cartilage from the bones, a wedge is taken from the back part of the body of the astragalus. This procedure results in an ankle-joint with an immeasurably strong posterior ligament which retains the foot in good position, and the long prominent heel which is such a feature of talipes calcaneus is shortened. In older cases still, there is not merely calcaneus, but the foot is arched and the plantar fascia contracted; this deformity is sometimes termed calcaneo-cavus, and there may be superadded an element of varus or valgus. For such cases two distinct operations are indicated :—

1. Tenotomy of the plantar fascia and removal of a wedge from the dorsum of the foot. In this way the hollow-arched condition of the foot is removed, even if the calcaneus deformity is made to appear more exaggerated.

2. Posterior arthrodesis, as described above, is performed, and the straight foot moved down at the ankle-joint into good position.

It is hardly necessary to add that some weeks ought to intervene between the two operations. Other measures which have been tried for this talipes calcaneo-cavus are implantation of the peronei and flexor longus hallucis tendons into the tendo Achillis, but the results obtained by the procedure first described are much more satisfactory.

Equino-varus is a common combination of deformity in two directions; the foot is pointed and inverted, the tendo Achillis is shortened, as is the plantar fascia, and possibly the tibialis posticus and the internal lateral ligament of the ankle-joint; the head of the astragalus usually forms a marked prominence on the dorsum of the foot. The flexors of the ankle are either permanently paralyzed or overstretched, and so weak as to be useless. Treatment here depends on the condition of the muscles; if they give any indication that they will recover their tone when the deformity is corrected and the foot has been kept in good position for the necessary period of time, then tenotomy of the plantar fascia and tendo Achillis is sufficient. The foot must be kept over-corrected in a club-foot shoe, and the muscles be well massaged until such a time that they can hold in good position without aid. This interval can be shortened by employing the operation of tendon transplantation. A slip of the tendo Achillis may be fixed to the peroneus longus tendon, but a better method is to shift the tendo Achillis to the outer side of the os calcis and to take a functionating tendon at the front of the ankle, say the tibialis anticus or the extensor proprius hallucis, and reinsert it into the outer side of the foot. In this way the foot is braced up in a good position, and the muscles, in virtue of their new insertions, serve to keep it right. If the extensor muscles be considered useless, the treatment to be adopted is an arthrodesis of the ankle-joint, with exsection of the wedge from the outer side of the body of the astragalus; this operation is usually the one adopted in adolescent or adult cases, and the results are extremely satisfactory. It is sometimes necessary to combine tendon transplantation with arthrodesis in order that a good and permanent correction of the deformity may be obtained.

Whatever be the operative measure in a case of talipes equino-varus, the after-treatment is the same. At first the foot must be kept over-corrected in a club-foot shoe, or in a plaster-of-Paris dressing reaching from the toes to below the

knee. Later on, when the patient is allowed to walk, he should wear an iron running down the inside of the ankle and twining to fit into a brass socket which crosses the heel of the boot ; the play which takes place between the iron and the socket allows movements of flexion and extension of the ankle. The upper end of the iron is fastened to the leg by strap and buckle, and an additional strap round the ankle holds it snugly to the iron and ensures that the foot is kept everted. In addition a strap of metal is worn along the outer edge of the sole of the boot, to lift up the front part of the foot. The patient should continue to wear the club-foot shoe at night, even though he is walking with a boot and iron in the day-time, as the foot tends to relapse into the old position during sleep.

Talipes Calcaneo-Valgus is one of the most common varieties of paralytic club-foot. In the child six months to two years old the condition looks more like flail ankle, or at any rate pure valgus ; the foot can be overflexed at the ankle and everted and abducted. In such cases the surgeon is tempted to perform an arthrodesis of the ankle, with removal of a wedge from the inner side of the body of the astragalus, but this operation will surely fail if performed at an early age—the ankylosis will not be a firm one, and so the deformity will recur. Therefore, if arthrodesis seems necessary, it is better to fit the child with a walking-iron until he reaches the age of six or eight years, when the operation can be performed with much greater likelihood of success. If investigation of the muscular power leads the surgeon to consider that a tendon transplantation will suffice, good results are obtained by shifting the tendo Achillis to the inner side of the os calcis, and at a subsequent operation implanting the extensor proprius hallucis tendon into the periosteum of the inner side of the neck of the first metatarsal bone. This procedure will only serve for pure valgus deformity. Calcaneo-valgus will require the treatment described under calcaneo-cavus.

Talipes Equino-Valgus is a not uncommon variety of acquired club-foot. Here the foot is pointed and abducted, the toes are often dorsiflexed, and there may be a condition of hallus valgus, resulting from attempts at walking on the deformed foot. The tibialis anticus and posticus are the muscles which are not acting, and the tendo Achillis is contracted. Excellent results can be obtained in this condition from treatment which is carried out in three stages : (1) Shifting the tendo Achillis to the inner side of the os calcis ; (2) Some weeks later, elongation of the Achillis tendon ; (3) Later still, implantation of the extensor proprius hallucis to the inner side of the foot.

In all cases of valgoid deformity the foot must be kept inverted for several weeks after the operation. This can be done with an outside straight splint, or by means of a plaster dressing. The iron with which the patient walks is planned in the same way as the iron for talipes varus, but is placed on the outside of the ankle. In addition, the heel of the boot should be elongated so that it comes under the instep, and it should be made deeper on the inner than on the outer side ; this throws the body weight on to the outer side of the foot.

Pes Cavus, or Claw-foot.—This condition, not falling under any of the headings mentioned above, is still included by our definition of club-foot. It is a deformity which causes extreme pain and interferes with locomotion to a very grave extent. The foot is short, thick, and stubby ; there is enormous exaggeration of the normal antero-posterior arch, so that the under surface of the foot presents in bad cases little more than a deep cleft between the prominent heads of the metatarsals. The toes are dislocated backwards at the metatarso-phalangeal joints, and acutely flexed at the first row of inter-phalangeal joints ; there are usually large corns over the prominent heads of the metatarsal bones, and pressure here causes exquisite pain. The plantar fascia and plantar ligaments are much shortened, as are the extensor tendons of the toes and the glenoid ligaments of the inter-phalangeal joints. There is often a degree of equinus or even varus

associated with claw-foot. No condition leads to greater disablement of the foot, and in none does the treatment demand more from the ingenuity and skill of the surgeon. The etiology of this deformity is obscure ; it has been attributed to infantile paralysis causing paresis of all the muscles, especially the flexors of the ankle and the lumbricales and interossei, but no explanation has been found for this particular deformity after the muscular paresis.

Treatment varies with the severity of the deformity. Division of the plantar fascia and correction of the over-arched foot with the wrench is a necessary preliminary in every case. The tendo Achillis may have to be divided, but this must not be done until all the wrenching is finished, as the resistance of the Achillis tendon is necessary while the arch is being straightened out with the wrench. In milder cases this is all the operative treatment necessary : the patient may be allowed to walk in a boot, the heel of which has been lowered, and which has a bar of leather half an inch thick running across the sole opposite the necks of the metatarsals. Some splint, e.g., a club-foot shoe which will keep the foot straightened out, must be worn at night.

In certain cases benefit has been obtained from implantation of one or more extensor tendons into the heads of corresponding metatarsal bones. Severe cases, and those which tend to relapse, are best treated by removal of portions of metatarsals near their bases. This should be done through separate incisions on the dorsum of the foot over each bone. Tenotomy of the extensor tendons and of the tight structures on the plantar side of the interphalangeal joints will allow the toes to be straightened. On no consideration should there be any operation wound in the sole of the foot. The after-treatment is the same as that described above.

Robert Jones.

TALIPES, CONGENITAL.—It is well to remember that congenital talipes is a distortion pure and simple, unaccompanied by paralysis of any of the muscles, and capable of complete cure if treatment is commenced sufficiently early. Certain muscles are, however, abnormally short, while others are too long ; the shortened muscles are stronger than the opposing and stretched ones, which tend to become still weaker from disuse, if the deformity is left untreated. Certain ligaments and bands of fascia are too short, but are capable of being stretched or divided. The bones are more or less deformed, but these will gradually acquire their normal shape if the deformity is corrected and the foot retained in its corrected position for a sufficient length of time. The earlier the case comes for treatment the more cartilaginous are the bones, the less distorted are they, and the sooner will they assume their normal shape.

There is no deformity which calls for a greater amount of patience and perseverance from both surgeon and parents than does the one under discussion.

Two points must never be forgotten : (1) Treatment must be commenced as early as possible ; and (2) Treatment and supervision of the cases must be continued till all tendency to relapse has disappeared, i.e., in the majority of cases for years. Many patients have to wear apparatus of some sort till they have reached the age of six or seven.

All varieties of this deformity are treated on the same general lines, and, since three-quarters of the cases fall under the head of equino-varus, this class of case may be taken as the type, and its treatment considered in detail. Equino-varus cases are usually more severe than those of other varieties ; they possess a greater tendency to relapse, and they therefore call for most care in treatment. In this deformity, the foot is inverted and adducted, as well as plantar-flexed. The two former movements take place at the subastragaloid and midtarsal joints, the latter at the ankle joint. The longitudinal arch of the foot is usually somewhat increased, and the plantar fascia contracted.

To obtain a complete cure the surgeon has to do three things :—

1. To correct, and to over-correct, the deformity.

2. To retain the foot in the corrected position till the muscles have regained their balance and the bones have acquired their normal shape.

3. To correct any accompanying deformity, such as rotation of the leg, genu-valgum, etc., the presence of which may prejudice the result of the treatment of the foot. In all but the mildest cases of equino-varus there exists an internal rotation of the foot and leg. This rotation may take place anywhere in the leg, most commonly at the knee-joint or in the tibia and fibula. So long as this rotation persists, though the distortion of the foot be fully corrected, the child will walk with the toes turned in, and there will exist a constant tendency to recurrence of the varus portion of the deformity.

We may consider the treatment under four heads arranged according to the severity of the cases to be dealt with. Thus we have (1) The mild cases, which can be cured without any operative procedure ; (2) The severe cases, the most numerous, which require tenotomies, fasciotomies, etc. ; (3) The relapsed and neglected cases ; (4) The inveterate cases in adolescents and adults.

1. *In the Mildest Cases* of varus the foot can be brought into line with the leg, or even slightly everted, but the moment the foot is released it springs back to its faulty position. The equinus is also slight, i.e., dorsiflexion is but slightly limited. These cases may be treated successfully by manipulation and fixation on a simple straight malleable iron splint, padded on one side. This splint is easily bent to fit the leg, and its shape is altered as the deformity improves. It is fixed on the antero-external aspect of the leg and foot by a calico bandage, which should take a couple of turns round the leg before the splint is applied. The mother or nurse is taught to manipulate the foot in two definite directions. For the first manipulation the heel and ankle are grasped firmly with the fingers and thumb of one hand, while the other grasps the forepart of the foot ; the latter is then gently but firmly turned outwards, at the same time everted as far as possible, held in the corrected position for some moments, and then let go. This movement is repeated again and again, the utmost possible correction being obtained each time. The second manipulation is then performed as follows : the malleoli are grasped in one hand, while the other seizes the foot and dorsiflexes it as far as possible, holds it in the corrected position, and then lets go. This movement is also repeated many times. The two manipulations should then be combined, the foot being forced upwards and outwards towards the calcaneo-valgus position. The foot and leg are then carefully massaged, special attention being paid to the muscles on the outer side of the leg. The splint is now bent to the required angle and applied to the leg, the foot being held in as good a position as possible. When the varus is fully corrected the splint may be bent to a right-angle and applied to the back of the leg ; the equinus is controlled better in this way. Two or three times a day the splint is removed, and the manipulations and massage repeated. Day by day the foot is further corrected until full over-correction is obtained, but the treatment must be continued till all tendency for the foot to return to its faulty position has disappeared.

In the mildest cases the child may be completely cured before he learns to walk. In others the foot may still need watching after walking has commenced ; in such cases it is well to manipulate the foot every night, and to let the child wear the splint during sleep, and in a few cases a boot with an inside iron and varus T-strap may be required. The tin shoe, to be mentioned later, may be used for the mild cases, especially when the equinus is obstinate, but the straight splint will be found better for the varus.

2. *Severe Cases.*—No hard and fast line can be drawn between mild and

severe cases, but it will be found a good rule to make use of tenotomy in any case in which the foot cannot be brought into line with the leg by ordinary pressure with the fingers. The varus should be corrected first, the equinus left till later, as the tendo Achillis serves as a useful *point d'appui* for the stretching of the contracted tissues in the sole of the foot. During the first week or two of life simple manipulations may be employed ; and in the third week, if the child is in good condition, tenotomy may be performed. What structures will require division ? It is usually necessary to divide the tibialis anticus tendon, the inner band or the whole of the plantar fascia, and very often the anterior part of the internal lateral ligament of the ankle-joint. These may all be divided subcutaneously, sometimes even through the same puncture in the skin. The tibialis posticus may also require division, but this is by no means always necessary. This tendon is best divided above the internal malleolus, through an open incision. Other structures which may want severing are the extensor

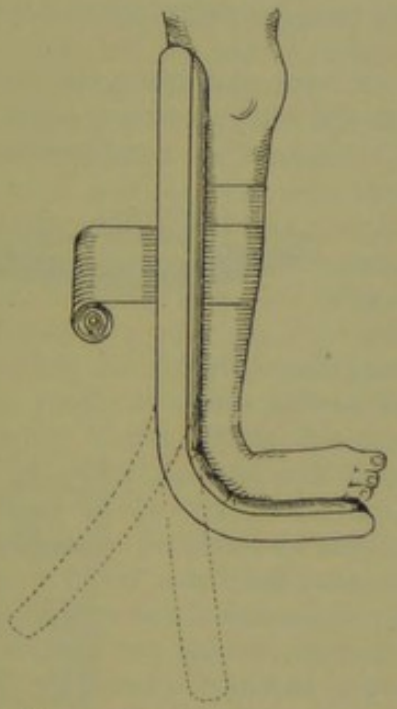

Fig. 47.—Equinus Iron Splint.

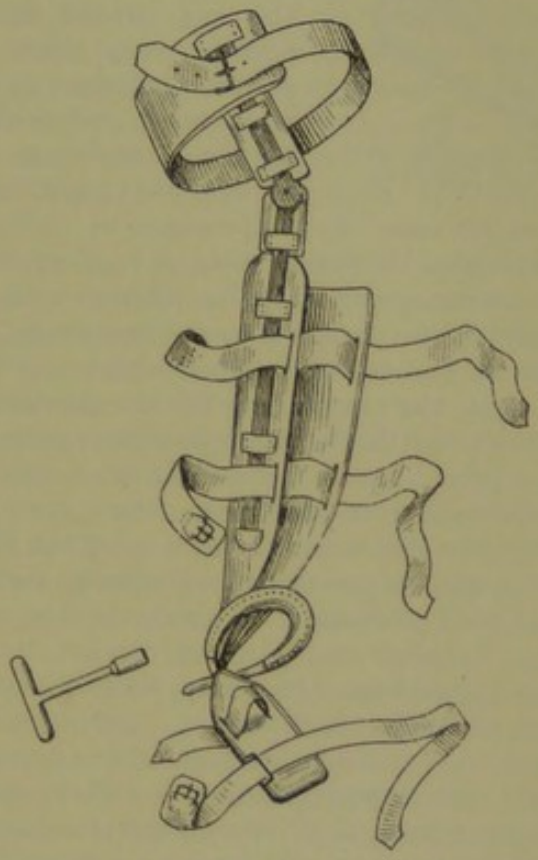

Fig. 48.—Adams's Varus Splint.

proprius hallucis, the abductor hallucis, and the flexor longus digitorum. After tenotomy a pad of gauze is placed over the puncture and a rather firm bandage applied ; the foot is then fixed in its *faulty* position (*Fig.* 47) by the iron splint, bent to a suitable angle round the outer side of the foot. After four days the splint is removed, straightened out, and reapplied, the correction of the deformity and the daily manipulations being now commenced, and continued till the varus is fully corrected.

This will occupy some four weeks, after which the second stage of the treatment is proceeded with. The tendo Achillis is divided subcutaneously, and the foot is put up with the varus corrected, but with the equinus still present, for four days. The foot is then gradually brought up by manipulations and the use of some simple fixation apparatus. Two splints are in common use. The better is Adams' varus splint (*Fig.* 48), which is quite simple and yet absolutely

controls the foot. The other is a tin shoe, with a quadrant and screw on one side (*Fig.* 49), so that the degree of flexion of the ankle may be altered. This latter instrument has the advantage of being cheap, and is suitable for all the milder cases; but for severe cases Adams' apparatus is the better. Although more complicated, it can be removed, replaced, and even adjusted by the mother or nurse. It has also some control over the internal rotation of the leg if such be present. The strap passing over the front of the ankle is fixed first, so that the heel is well down. It is also useful to have the sole-plate extended, and to screw it up after the heel is fixed, especially in the early stages of treatment. The tin shoe is fixed to the limb by a bandage. Whatever apparatus is used, it is removed two or three times each day, and massage and manipulations are performed as before. This treatment is continued till the child is allowed to walk, i.e., till about the end of the second year, though the correction of the equinus only takes from four to six weeks. If the case proves obstinate or is allowed to relapse, the foot may need wrenching under anæsthesia. Lorenz's padded wedge will be found useful, or the hands may be aided by some form of wrench, e.g., Thomas's.

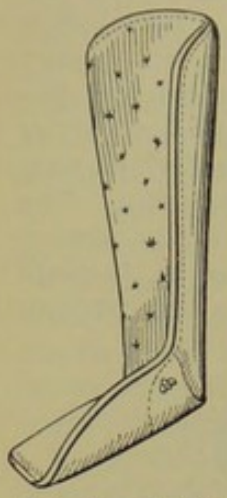

Fig. 49.—Tin Shoe with Quadrant.

In all cases it is advisable to order a surgical boot and irons for walking purposes. A varus T-strap is always used. In the worst cases a light toe-elevating spring may be added, with a "stop" to prevent over-dorsiflexion, while in the mild cases a "back-stop," to prevent plantar flexion,-may be sufficient. In the majority of cases the inner iron should reach to the upper part of the thigh, while the outer iron is continued to a pelvic band, and double knee-caps and a ring-catch added at the knee. By means of this large apparatus (*Fig.* 50) the internal rotation of the limb, wherever this may have taken place, is controlled, and, as the child grows, gradually corrected. Laxity of the ligaments at the knee, genu valgum and genu retrorsum, can all be dealt with by this apparatus. The irons should be worn for a year at least, and often for much longer. At night a simple rectangular tin shoe, e.g., Little's, without a quadrant, must be worn, and it is as well to manipulate the foot as of old every night. The cause of relapse is leaving off treatment too early: the more severe the case the longer must it be watched. Something may be done for the rotation of the leg even before the child walks, if the twist occurs below the knee. The upper and lower ends of the tibia and fibula are seized by the two hands, and an attempt is made to twist the lower end outwards (R. Jones). Osteotomy has been performed for this deformity (Tubby and Swan).

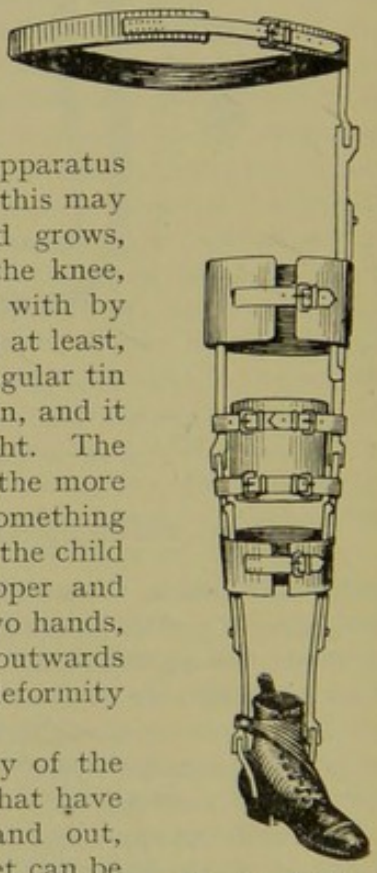

Fig. 50.—Walking Apparatus.

3. *Relapsed and Neglected Cases.*—General rigidity of the foot is a feature of these cases, particularly of those that have relapsed. Only too often no bands of fascia stand out, inviting division by the tenotome. Some of these feet can be successfully treated by the method already detailed. Forcible wrenching under anæsthesia will probably be necessary on more than one occasion. A more powerful appliance than those mentioned above, e.g., some form of Scarpa's shoe, may be necessary. In spite of all we

can do by these methods, some cases will still remain imperfectly corrected, chiefly owing to the deformity of the bones. Many operations have been devised for these cases, not one of which can be said to free the patient entirely from the possibility of a relapse. Phelps' operation, which involves division of all the resisting structures on the inner side of the foot down to the bones, has not found much favour in this country, owing to the frequency with which it is followed by relapse, even when the wound has been covered by skin flaps or grafts.

Subcutaneous division of the chief resisting structures will form part of the treatment in all cases. Beyond this two operations appear to offer the best prospect of restoring the foot to its proper shape without interfering with its functions. These are (*a*) Astragalectomy (Lund's operation), and (*b*) Ogston's operation. Astragalectomy is called for in cases in which equinus forms the chief part of the remaining deformity. Ogston's operation is based on the fact that for the first few years of life the tarsal bones consist of a shell of cartilage surrounding a bony nucleus. The operation consists in incising the cartilaginous envelope and scooping out the contained bone. The foot is then forcibly corrected, the shells being crushed. It should be noted that in this operation the small joints of the foot are not interfered with. The astragalus, cuboid, and anterior part of the os calcis are treated in this way. This operation may be performed up to the age of six or even later. Each case must be treated on its own merits, the major operations being more readily undertaken in hospital than in private practice.

4. *Inveterate Cases.*—Of these little need be said in a work of this kind. The best we can hope for is a more or less unshapely foot on which the patient can walk with comfort. If time is no object, tenotomies and frequent wrenchings with the use of a Scarpa's shoe may give a successful result. In most cases one of the major operations will have to be undertaken. Of these there are a great variety, but only two need be mentioned, namely, astragalectomy and cuneiform osteotomy. In the latter a wedge, with the base outwards, is removed from the tarsus, irrespective of the articulations. For a detailed account of the various methods which have been adopted in these difficult cases the reader is referred to works on Orthopædics. It must always be remembered, however, that, whatever operation is done, a relapse is possible, and must be guarded against by the use of retentive apparatus.

Of the other varieties of congenital talipes, the valgus, calcaneo-valgus, and calcaneus cases are, as a rule, of a mild type, and rarely call for tenotomies. In these cases the tendency to relapse is small. Manipulations in the direction of inversion and plantar flexion, with or without the use of a malleable iron splint, will generally suffice to cure the deformity before the child is old enough to walk. In cases of pure valgus the peronei may require division, if the deformity is severe; and when the child begins to walk, a boot with an outside iron and valgus T-strap should be ordered. In mild cases the deformity is often overlooked till the child begins to walk. In such cases the heel of the boot should be carried forwards on the inner side, and the whole of the inner edge of the sole and heel should be thickened so as to throw the ankle outwards. Massage and the use of the malleable iron splint at night should effect a cure in a year or so. Occasionally congenital valgus and varus are associated with partial or complete absence of the fibula or tibia respectively. The fibula is more commonly at fault, and in this case the valgus should be corrected and a boot, iron, and T-strap ordered for walking. The affected leg will be considerably shorter than the other. When the tibia is deficient the chance of obtaining a useful limb is extremely small.

H. A. T. Fairbank.

TAPE-WORM.—(See INTESTINAL PARASITES.)

TEETH, CARIES OF.

Dental caries is a bacterial destruction of the hard tissues of the tooth. It is pre-eminently a disease of young life, and makes most rapid progress in "young" teeth, e.g., of two teeth, the first and second permanent molars, attacked about the age of 13, the second molar will be far more rapidly destroyed. It begins invariably on some part of the exposed oral surface of the tooth, the sites of election being the pits and fissures of the crown, normal or abnormal, the interstitial surfaces of the teeth, and the bucco-cervical margins—any spot, in fact, where free cleansing is impracticable or not practised; hence caries at the necks of the teeth, by the gum-edge, is common in cases of prolonged illness where careful cleansing of the teeth is a great difficulty. At some undisturbed spot acid-forming bacteria gain a lodgment. Starches and sugars, which undergo an acid fermentation, form their pabulum, and in a longer or shorter time the enamel at the spot is destroyed, dissolved by the acid products of bacterial activity, and a way opened into the dentine. This, though calcified, is largely composed of organic matter. The acid-forming bacteria continue their work of destruction, decalcifying the dentine and attacking the enamel on its under surface; while other bacteria, whose activity is chiefly manifest by the production of liquefying enzymes, dissolve the decalcified dentine. The enamel, unsupported by dentine and thinned from inside, eventually gives way under the stress of mastication, and a large cavity is suddenly revealed. Since bacterial activity varies greatly with even the slightest changes of environment, e.g., the culture medium, the species of bacillus growing in association, many variants of dental caries are to be found, e.g., rapid, slow, or arrested caries.

The minute differences between the saliva of health and disease are probably enough to account for the absence or presence of dental caries, while the permanent absence of starch and sugar from the food would be an insuperable bar to the onset of caries. (Meat and albumins undergo an alkaline fermentation.)

When the dentine is reached there may be pain, varying from discomfort to a severe neuralgia minor, but it is when the tooth pulp becomes involved that the most severe pain is felt. Inflammation of the pulp is set up either by the access of bacteria or their products along the dentinal canaliculi or by exposure of the pulp in the course of extension of the carious process. Acute inflammation of the pulp is soon followed by its death, due to strangulation of blood supply from pressure of inflammatory exudation, and by equally sudden cessation of pain.

The intensity of the inflammation and the period of time during which the pulp survives its onset are very variable—from an acute process ending suddenly in death of the pulp in two or three hours, to a chronic condition resulting in a polypus of the pulp, analogous to the "hernia cerebri" of older authors—the differences depending on the intensity of the infection and the extent of exposure as leading to greater relief of pressure.

In general the dead pulp rapidly decomposes, and, via the apical foramen of the root, the bone becomes infected, leading to an "alveolar" abscess.

Thus, in the course of dental caries "tooth-ache" may be due to: (1) Lesion of dentine; (2) Inflammation of pulp; (3) Periodontitis and alveolar abscess. Usually the first of these conditions will only cause a moderate amount of pain and discomfort, but the symptoms vary from nil to a true neuralgia minor.

The distinction between the second and third may in general be made by consideration of the following points:—

Inflamed Pulp.—Pain intermittent, of a sharp, shooting character, often referred to other parts of the distribution of the fifth nerve, including the ear, or, in some cases of lower teeth, down the neck; made worse by changes of temperature, or by such chemical stimuli as sugar or salt. Tooth not tender on pressure; but if pressure is made on the exposed pulp a paroxysm of pain is set up.

Alveolar Abscess.—Pain constant, localized to site of lesion. Tooth very tender on pressure, and feels raised above its fellows, so that biting becomes impossible. Later there is swelling of soft parts, usually accompanied by relief of pain. As with an acute pulp inflammation, pain may cease suddenly, the cessation being due to the relief of intra-osseous pressure sequent on perforation of the outer plate of bone by the pus. Hence the pain of a dental abscess usually becomes less as the swelling of soft parts increases.

Though an alveolar abscess is usually an acute abscess of bone, palpable central necrosis is almost unknown.

Palliative Treatment of "Tooth-ache":—

1. *Due to Lesion of Dentine.*—Clear the cavity of débris and try to cover in with gutta-percha; failing this, insert frequently renewed plugs of cotton-wool dipped in an alcoholic solution of gum-mastic, after applying oil of cloves to the cavity in each case.

2. *Due to an Inflamed Pulp.*—(*a*) If the pulp is not exposed, treat as in the first case. Relief is not certain, but may follow when peripheral irritation is prevented by an antiseptic plug. (*b*) When the pulp is exposed, insert gently over the pulp a pledget of cotton-wool soaked in oil of cloves, pure carbolic acid, or creosote, and over this a containing pad of cotton-wool soaked in an alcoholic solution of gum-mastic. The first pledget must be large enough to prevent the gum solution reaching the pulp, and the containing pad must be put in without making any pressure on the pulp. While pressure exists there can be no relief of pain. Before there is room to insert any plug it will generally be necessary to clear away some of the softened dentine.

3. *Due to Periodontitis and Dental Abscess.*—In the early stages and in mild cases, painting the gums with tincture of aconite and iodine may give relief. Dry the gum over the affected part and beyond, and the cheek—this prevents the spread of the reagent. Hold the cheek aside, and with a pledget of cotton-wool held in the conveying forceps, paint the gum with the "aconite and iodine.' ℞ Lin. Aconit., Lin. Iod., āā ʒj.

Extraction of the tooth is the quickest and surest way of cutting short periodontitis or a dental abscess. The source of infection is removed and exit given to pus. Swelling of soft parts is no bar to extraction.

If extraction has been delayed, a subperiosteal, subcutaneous, or glandular abscess may need evacuating, whether or no the tooth be removed. In opening a subperiosteal abscess, keep close to the bone. A subcutaneous abscess should be opened early from outside. The scar of an early incision will be scarcely visible. A glandular abscess must be suspected when the trouble has existed for several days; it is frequently masked by the general swelling of soft parts.

If the patient desires to save the tooth, after syringing out the cavity insert a light plug of cotton-wool steeped in 5 per cent sol. carbolic acid in the hope that some may soak up the root canal and cut short the supply of infective material. Give opium if pain is severe, and release pus when detected.

In the case of a single-rooted tooth it may be possible to perforate the bone opposite the tooth-apex and so relieve tension, but with multi-rooted teeth this is seldom practicable.

In the absence of all else, frequently renewed, lightly inserted plugs of cotton-wool soaked in carbolic acid, oil of cloves, or creosote may be used in any of these forms of toothache; but when using these drugs, put in a small plug of the reagent first, and cover this with a simple cotton-wool plug to prevent burning the mouth.

A gum-mastic plug will be foul by the end of twenty-four hours, hence such temporary stoppings should be renewed every twelve hours.

Septic Socket.—After extraction of a tooth, severe pain may exist owing to the presence of septic osteitis. This may have been due to: (1) Infection by forceps; (2) Infection from the mouth at the time of operation—germs lying round the neck of the tooth may be carried up into the tissues by the forceps; (3) Persistence of osteitis already present.

To prevent infection, forceps must be boiled, the neck of the tooth well cleaned with an antiseptic just before extraction, and a septic tooth extracted early.

In many cases infection is to be expected, especially after difficult extraction of a lower third molar. When a socket becomes septic, the only treatment consists in thorough syringing at least twice daily. Between-whiles a light plug of cyanide or sal-alembroth gauze may be left in the socket. Care must be taken to syringe to the bottom of each separate socket. A small metal nozzle connected to a bulb syringe by two feet of light rubber tubing forms the best syringe. The nozzle is to be put down to the bottom of the socket and a

slight to-and-fro motion given to it during syringing. In bad cases six weeks of syringing may be needed.

As a general rule, at all ages every tooth which cannot be rendered aseptic and painless should be extracted.

Prevention of Dental Caries.—Well-cleaned teeth cannot decay. Bacteria may be present, but their food supply is cut off. Both natural and artificial cleaning should be made use of. Natural cleansing is obtained by thorough mastication, during which the scouring action of food particles, tongue, and cheeks is supplemented by a free flow of saliva flushing the interdental spaces. Firm meat and hard farinaceous food will best promote this natural cleansing; and it is worth remembering as bearing on many cases of indigestion at all ages, that thorough mastication also means thorough insalivation, and that salivary digestion of starches goes on for a long time in the stomach in a well-made bolus.

Starches and sugars, which undergo an acid fermentation, are the food-stuffs which promote dental caries. They are injurious according to their tendency to cling to the teeth when moistened with saliva. Dry stale bread, or genuine whole-meal bread, will be found to leave a far cleaner mouth than the white bread in ordinary use. Indeed to this food-staple may be attributed the greatest share of the causation of dental caries.

Artificial Cleansing.—Brush the teeth inside, outside, and on the coronal surfaces with a small firm tooth-brush (child's size) night and morning, especially night, and pass waxed dental floss silk between the teeth. On the brush use soap, or a weakly acid or alkaline tooth-wash.* Use a tooth powder only occasionally, to remove any more adherent stains.

After cleaning the teeth at night, eat nothing more—especially not sweets or biscuits.

Wherever possible, skilled dental attention for children should be secured early. They should early be accustomed to having their teeth examined, and the confidence gained by a painless visit to the dentist is of great value.

Joseph Geo. Turner.

TEMPORO-MAXILLARY JOINT, FIXITY OF.—This articulation is liable to the same diseases that affect other joints, although not with the same absolute or relative frequency. Non-suppurative arthritis may be due to injury, gonorrhœa, rheumatism, or syphilis. Suppuration within the joint may result from a penetrating wound, or it may occur in the course of pyæmia, scarlet fever, or measles. Rheumatoid arthritis may occur in young females or in those older subjects so often the victim of this disease in other joints. It may affect one or both sides; the cartilages of the joint become worn away, and the neck and condyle of the jaw may become absorbed. Tubercle very rarely attacks the temporo-maxillary joint.

All diseases of this joint must be treated on the same lines as diseases of other joints, but particular care must be taken to prevent stiffness or ankylosis, otherwise the mouth will be closed and mastication rendered impossible. In all acute inflammatory affections of the joint, passive movements and massage must be practised as soon as possible.

Fixity of the jaw is often due to spasm of the masseter and internal pterygoid, dependent on irritation produced by an impacted lower wisdom tooth. In such cases it is necessary to administer chloroform, open the mouth as much as possible, and remove the tooth. Often this is a matter of extreme difficulty, especially when the neighbouring parts are infiltrated with inflammatory material.

In cases of fixity of the jaw due to ankylosis, the best treatment is to excise

* The use of weak acids daily will in no way damage the teeth. Both weak acids and weak alkalies are solvents of mucus, but the acids are the more potent removers of "dirt."

the condyle through an incision one and a half inches long made along the lower border of the zygoma, care being taken to avoid wounding the facial nerve. The neck of the condyle is then divided by a saw, trephine, or chisel. In bilateral cases both condyles must be removed.

In some cases the surgeon is called upon to deal with fixity of the jaw due to extensive scarring following gangrenous stomatitis, lacerated wounds, or operations on the cheek. Attempts to stretch the cicatrices by mechanical means are not often successful. As a rule the best result is obtained by performing Esmarch's operation; this consists in removing a wedge-shaped piece of the jaw so as to form a false joint in front of the cicatrix. When only one side of the mouth is affected, this operation restores the power of mastication. When it is necessary to operate on both sides, this function is necessarily lost, but the introduction of soft food is greatly facilitated. *E. W. Roughton.*

TETANUS.—The treatment of this disease naturally falls under two headings: (1) *Prophylactic*, certain measures that should be taken in all cases of wounds that have been contaminated with soil or manure, especially crushes and compound fractures; and (2) *Systematic*, the actual treatment required when symptoms of the disease have made their appearance.

1. **Prophylactic Treatment.**—Modern bacteriology has shown us that not only is an incubation period usual before the development of symptoms after infection of a wound, but that this period is the most favourable for the employment of that valuable remedy, antitoxin, in those cases where, from the nature of the accident, there is a possibility of tetanus supervening.

Although we now know that tetanus can develop without actual suppuration in the damaged area, nevertheless crushed limbs, where suppuration is profuse, are specially liable to this dangerous complication.

Apart, therefore, from the ordinary measures that would be undertaken for the cleansing of any contused or lacerated lesion, such as washing, irrigation, removal of foreign bodies and of dead or dying tissue, and the provision of adequate drainage, it may be urged that in all cases where soil, cinders, refuse, etc., have obtained access to a wound, protective or immunizing doses of antitoxic serum should be given. Although tetanus is one of the few organisms for which we possess a specific antitoxic serum, this serum is not particularly potent or satisfactory when once symptoms of the disease are manifest; and granting that, under the above conditions, the serum will be administered unnecessarily in a certain number of cases, the nocuous effects are not serious, and such treatment will undoubtedly lead to the saving of life and to the successful control of severe types of the disease. The mode of administration and action of the serum will be considered later.

2. **General Systematic Treatment.**—When once the appearance of typical symptoms has placed the diagnosis beyond doubt, the patient should be moved to a quiet room, or surrounded by screens, and protected as far as possible from sudden noises. Rest and quiet are very important factors in dealing successfully with these cases. The banging of a door or the falling of a tray will often bring on a painful convulsion which might have been avoided.

In tetanus, as in strychnine poisoning, the nerves and nervous system generally are hypersensitive, and every effort should be made to avoid sudden or violent stimulation of the senses. The blinds should be drawn, or curtains hung so that the bed is in the shade, and no gas or other light should shine on the patient.

As the result of the violent contractions of the muscles, profuse sweating occurs, and it is advisable to bear this in mind, since the bed linen must be changed frequently.

Diet.—Milk and fluids generally will be found most suitable. In mild cases the patient may be fed through the mouth—a tooth if necessary being extracted—though in cases of moderate severity this is often not required. When the spasms are severe, nasal or rectal feeding will be called for, and in the worst types of cases the disturbance created by attempts to pass the nasal tube is so great that the operation must be performed under chloroform anæsthesia. In all instances the greatest care must be exercised in this matter of feeding, since the spasm of the constrictor muscles greatly interferes with swallowing, and the patient often shows a tendency to choke if the food is given too quickly.

The Wound must be treated on ordinary antiseptic principles. Free incisions should be made for drainage, and antiseptic lotions and dressings applied. When once the symptoms have appeared, the local treatment of the wound seems to have little influence on the course of the disease. Amputation for tetanus is not called for as far as the tetanus itself is concerned, though it may be necessary for other reasons. It has been shown that during their period of incubation the tetanus bacilli produce the toxins in the wound, and that these toxins are rapidly taken up into the nervous system, where they combine with the nerve cells. Afterwards the bacilli die; they do not remain and manufacture fresh poison. This being the case, it is only necessary to deal with the wound on ordinary principles, cleansing it thoroughly and swabbing it out with strong antiseptics.

Micturition and Defæcation.—Owing to the spasm of the muscles of the perineum, a catheter may be required, and some trouble will be experienced in obtaining satisfactory actions of the bowels.

Medicinal Treatment.—Nearly every drug that can exercise a sedative action on the nervous system has, from time to time, been vaunted as a valuable remedy in cases of tetanus. Calabar bean, curare, hyoscine and others of the belladonna group have been employed. On the whole chloral combined with bromide of potassium, and chloroform have given the best results.

Chloral, since it diminishes the activity of the anterior nerve-cells and damps the conductivity of the nerve fibres, is most valuable. It is, however, a poison, a powerful cardiac depressant, and must therefore be used with care. In the case of a strong adult, chloral 25 gr., brom. potass. 30 gr., should be given per rectum as soon as possible, and this should be followed by 15 gr. of each drug every four hours. There is no doubt that this combination affords the greatest possible relief to the unfortunate sufferer.

Chloroform should be reserved for those very severe cases where the spasms threaten the patient's life by asphyxia, or where the chloral and bromide do not control the convulsions.

It has recently been suggested as an alternative to the above treatment that anæsthesia of the spinal cord should be induced by the injection of cocaine into the spinal canal. In severe cases this might be given a trial, but there are not sufficient data to hand to allow us to pronounce definitely upon the method at present.

Antitoxin Treatment.—When the specific toxin and its neutralizing antitoxin were isolated, great hopes were raised of curing all cases of tetanus by this serum. Unfortunately, insufficient knowledge of the mode of action of the tetanus toxin led to the employment of this remedy in an entirely empirical manner. Doses of varying amounts were given beneath the skin, injected into the subdural space, and even into the brain itself.

Recent investigation, especially the valuable work of Smiedeberg, has cleared up many debated points in connection with the spread of the disease. During the latent period, or period of incubation, the toxin is slowly spreading, not along blood-vessels or lymphatics, but along the axis cylinders of motor

nerves, and the shorter the path and the more powerful the toxin the sooner does it reach the cells in the spinal cord. From this situation it has been proved to spread both along the cord to the basal centres and through it to the cells which influence reflex action and the tonic contraction of the voluntary muscles.

Now the toxin of the tetanus bacillus has a specific selective action upon nerve tissue, and the union of the two results in the formation of a relatively stable compound which it is difficult to analyse.

Under these circumstances the antitoxin is almost powerless to cut short the effects which will necessarily be produced by the dose of toxin already received by the nervous system, and the series of events which result from this accident must run their course. On the other hand, antitoxin can neutralize any toxin that may be free in the nerve substance, sheath, or lymph spaces, and by such injections, clearly prophylactic, further affinity between nerve-cell and toxin may be averted. With this knowledge before us, it becomes imperative to inject the antitoxin in those situations where the toxin will be most readily encountered; that is to say, along the motor nerves of the limb or into the arachnoid sheath of the spinal cord, and as the poison has to pass along this path before it can reach the general circulation, the administration of the antitoxin subcutaneously cannot be supported.

It has been suggested that a large dose of antitoxin subcutaneously or into the cerebral substance can, by exerting a "mass effect," succeed in disintegrating the product of the toxin and nerve cell, but so far there is little experimental proof of this assertion.

Many forms of antitoxin are supplied, the best being made by the Pasteur Institute in Paris, the amount of the injection made along the nerves or into the spinal theca varying from 10 to 100 cc., according to the age of the patient and the severity of the disease and the subsequent reaction.

On the whole, small doses, 10 cc. repeated, are likely to be more satisfactory than a large single injection. All precautions must be taken to avoid sepsis.

Although, with standardized and carefully prepared serum, serious ill results are unlikely to follow this treatment, certain complications occasionally attendant on the administration of the antitoxin must be mentioned; of these rashes, urticaria and painful effusion into the joints are sometimes encountered. Beyond simple symptomatic treatment they do not require further attention.

Bacelli's treatment of the disease by the injection of carbolic acid should not be undertaken unless it is impossible to obtain an antitoxic serum. (See also BACTERIOTHERAPEUTICS.)

W. H. Clayton-Greene.

TETANY IN CHILDHOOD.—(See also CRAMP.) Tetany, with its carpo-pedal contractions and irritability of peripheral nerves, is commonly seen in conjunction with laryngismus, convulsions, and rickets (*q.v.*).

It is practically always due to gastro-intestinal affections, and is cured by treatment similar to that for other rachitic neuroses. Fatal cases are rare; but tetany arising in marasmic weakly infants is often fatal. The stomach is usually dilated in such cases, and regular lavage, together with carefully selected diet, afford the only chance of recovery. Food should consist of peptonized milk and barley-water, or albumen-water and whey. Citrate of soda, in doses of 1–2 gr. to the ounce of milk, may render it more capable of absorption. Rectal alimentation is often necessary.

A more tractable form of tetany is sometimes seen in young girls at the time of puberty. It usually yields to treatment by purgation, tonics, and attention to general health.

Rickets is present in the majority of infants who suffer from tetany, convulsions, and laryngismus, and needs appropriate treatment. Potted milk

and patent foods should be discontinued, and pure cows' milk, unsterilized and unpasteurized, should be given if procurable. Suitable clothing should be worn night and day, but the child should not be over-clothed. Fresh air is essential. Coddling in close rooms should be discouraged. *Leonard G. Guthrie*

THORACOCENTESIS.—(See PLEURISY).

THREAD WORMS.—(See INTESTINAL PARASTITES.)

THROMBOSIS, CEREBRAL.—(See APOPLEXY.)

THRUSH.—Care should be taken to ensure cleanliness of the teat and "comforter." The bowels should be opened with a dose of castor oil, and any indigestion corrected by a mixture of rhubarb and soda.

R Tinct. Rhei	℥iij	Glycerin.	℥iij
Sodii Bicarb.	grs. ij	Aq. Menth. Pip.	ʒj

For a child of one year or less, given thrice daily.

Locally, one of the following should be thoroughly applied with a soft camel's-hair brush several times a day :—

(1) Glycerin of boracic acid or borax and honey.
(2) A solution of salicylic acid (1 in 250).
(3) A solution of sulphite of soda (1 dr. to 1 oz.).
(4) Solution of sulphurous acid (B.P.) 1–6 of water.
(5) Borax and chlorate of potash (10 gr. of each) in 1 oz. of water sweetened with a little glycerin.
(6) Permanganate of potash (1–1000). *Robert Hutchison.*

THYROIDITIS, ACUTE.—Acute inflammation of the thyroid gland is a rare condition, and as a rule only occurs as a complication of some general infective disease, such as influenza. Acute strumitis, i.e., inflammation of a goitrous thyroid gland, is less uncommon, especially in districts where goitre is endemic.

During an acute thyroiditis the patient must be kept at rest in bed, and if there is much pain on movement of the head, it may be fixed by pillows. The diet should consist chiefly of milk, as long as the temperature is raised, light solid diet being given as soon as the temperature falls and the patient is free from pain on swallowing. During the acute stage, cold should be applied to the front of the neck by means of an ice-bag, an ice-poultice, or Leiter's tubes. If these measures fail to check the progress of the inflammation, and if there is much pain, belladonna fomentations should be applied instead, and may be renewed at intervals of three or four hours until relief is obtained. At the onset of the attack it is advisable to give 5 gr. of calomel or blue pill at night, followed by a saline aperient in the morning. During the febrile stage, sodium salicylate in 10–15 gr. doses may be given every three or four hours, and in some cases 3–4 gr. of potassium iodide may be added to the mixture with advantage. If pain is excessive, small doses of opium or of Dover's powder may be given for its relief. If suppuration occurs, it is important to incise and drain the abscess as early as possible. *George R. Murray*

TIC IN CHILDHOOD (Convulsive, Co-ordinated, Psychical, Gilles de la Tourette's Disease).

In **Convulsive Tic** the movements are more violent and severe than in ordinary tic, and habit spasms (*q.v.*), and are associated with imperative impulses to perform ridiculous and unaccountable actions. For instance, the child will strike its head and body violently with its fist, several times in succession, at short intervals. There may be explosive utterances of obscene words

(coprolalia), or imitation of animal sounds, or of the gestures and words of bystanders (echokinesis, echolalia).

The first symptoms are usually noticed in children between the ages of ten and fifteen years. These are often physical and mental degenerates, with neuropathic inheritance.

Mental and physical shock, or acute illness, form the exciting cause as a rule.

The affection is known as **Psychical Tic** when the mental symptoms are more in evidence than the motor. In such cases there may be agoraphobia, acrophobia, mysophobia, or arithmomania, and signs of gradual mental deterioration make their appearance.

Treatment of these forms of exaggerated tic is unsatisfactory, but in some instances they may be closely imitated by hysteria, when the prognosis is more hopeful. When hysterical stigmata are found, isolation, with moral discipline, followed by healthy pursuits and mental occupation, will usually yield good results.

Co-ordinated Tic is only a form of simple tic, in which the habit spasms are complicated co-ordinated movements. In many cases these are merely harmless eccentricities, and not in any sense a disease. For instance, the writer has known a highly intellectual man who, from early childhood, would break off in the midst of any absorbing occupation, thrust his tongue into his cheek, making a curious groaning noise, and thump his knees vigorously as though playing a drum, for several seconds at a time. *Leonard G. Guthrie.*

TIC DOULOUREUX.—(See NERVES, PERIPHERAL, and NEURALGIA.)

TINNITUS.—(See EAR, AFFECTIONS OF.)

TOE-NAIL, INGROWING—May be treated in the following manner :—

1. In mild cases a small pledget of cotton wool should be introduced beneath the nail so as to raise it from its bed, the end of the nail being cut square. This ingrowth results from the nail curling round and growing in on the delicate and sensitive papillæ. If this simple treatment be undertaken with care and patience, the condition can be rectified. If there is much pain and tenderness the nail may be softened by painting it with 20 per cent solution of caustic soda, the whole toe being then wrapped up in a moist, antiseptic dressing.

2. In more severe cases recourse may be had to a small metal lever introduced beneath the side of the nail, so as to gradually lever it up over the fleshy tissue of the toe. This method is rarely satisfactory.

3. If the patient is willing to undergo an operation, the method advised by Watson Cheyne should be adopted. It is infinitely superior to avulsion of the nail. Under anæsthesia, an incision is made along the nail fold right down to the matrix ; in this way a flap is formed of the soft parts that lie alongside the ingrowing nail. Rather less than half the nail is then cut away, care being taken to see that the cut extends well down to the matrix and that the nail-bed is thoroughly destroyed. If this precaution is not taken, the operation will be a failure. The flap is now readjusted, so that the nail lies on a higher level than the soft parts, and it is secured with one or two sutures. This is a radical and very satisfactory method, and one which will completely cure the trouble.

W. H. Clayton-Greene.

TONGUE, AFFECTIONS OF THE.

Tongue-tie.—This condition is due to incomplete development of that part of the tuberculum impar which forms the projecting part of the tongue ; often the process of development continues during infancy, and the "tongue-tie" disappears. It is very rare for the condition to persist. For these reasons division of the frænum should only be undertaken after due consideration, and

should never be done by a midwife or other unqualified person. When it is necessary to divide the frænum, two fingers of the left hand are placed under the tip of the tongue, one on each side of the frænum ; a minute snip is then made in the tightened band near the inner surface of the jaw with a pair of scissors.

Careless or unskilful division of the frænum may lead to severe or even fatal hæmorrhage, to falling back of the tongue, causing tongue swallowing and suffocation, and to septic ulceration, which may lead to serious fixation of the tongue by scarring. If called to a case of hæmorrhage and threatened tongue swallowing, the surgeon should pass a silk ligature through the tip of the tongue, draw it forwards, and gently wipe out the mouth, clean the wound, and see if there is a definite bleeding vessel. If so, a ligature should be applied, great gentleness being observed, as the parts are friable and apt to tear. If there is a general oozing, the wound may be packed with antiseptic ribbon gauze, the end of which, together with the ligature in the tongue, may be fixed under the jaw with strapping or a bandage.

Wounds of the Tongue.—These are most often inflicted by the teeth, but are sometimes caused by a pipe-stem or other foreign body. As a rule hæmorrhage is not severe and requires no treatment, but in cases of hæmophilia, fatal bleeding has occurred. Epileptics have been found pulseless in the morning from severe hæmorrhage, due to biting the tongue during sleep.

Severe hæmorrhage from a wound of the tongue should be effectually dealt with as soon as possible. The ordinary surgical rule of exposing the bleeding vessels and securing both ends should be followed. This will be comparatively easy when the wound is in the anterior part of the tongue, but very difficult when it is far back. It will then be necessary to open the mouth with a gag, and hook the base of the tongue forward against the jaw by means of a finger introduced into the back of the mouth. In this way the bleeding may be stopped whilst the patient is being put under chloroform. The tongue is then drawn out by two stout threads passed through the tip of the tongue, and the wound carefully examined in a good light. Any bleeding vessel thus exposed should be ligatured ; but if blood wells up from a deep punctured wound it may be necessary to enlarge it to bring the damaged vessel into view ; it should be remembered that the ranine arteries are very deeply placed. Venous hæmorrhage or general oozing may be arrested by deep sutures. Ligature of the lingual artery in the neck is very seldom required. If a foreign body is embedded in the wound, it should be sought for and removed, otherwise the bleeding will very likely recur. When the bleeding has been arrested, the sides of the wound may be brought into apposition by means of catgut sutures ; these may be left to separate spontaneously.

Acute Glossitis is due to micro-organisms (staphylococci and streptococci) having gained access to the parenchyma of the tongue through some trivial abrasion of the mucous membrane. The onset of the disease is very rapid. The tongue swells up to two or three times its natural size in twenty-four hours ; there is usually severe pain, salivation, and dysphagia, sometimes aphonia and dyspnœa.

The milder cases may be treated by a purge, leeches below the jaw, and sucking ice ; but as a rule, when there is much swelling, two longitudinal incisions, half an inch deep, should be made on the dorsum of the tongue. This gives great and rapid relief ; often the patient is well again in a few days.

Chronic Superficial Glossitis.—Under this head are included several conditions, such as smokers' patch, leucoplakia or leucoma, icthyosis, the smooth tongue, etc. They are all well known, but imperfectly understood. They all have in common a chronic inflammatory condition of the mucous membrane of the tongue, leading to an increase of the stratified epithelial layers, and diminution

or disappearance of the papillæ, so that smooth white patches are formed of various extent and thickness. The real cause of the inflammatory changes is unknown, although smoking, alcohol, highly spiced food, and carious teeth are often largely responsible.

The appearances in chronic superficial glossitis are so well known as to require no description here. It is, however, of great importance to recognize the fact that although the condition cannot be cured, it must be very carefully watched, as it is so often a precursor of cancer of the tongue. In some cases the epithelium in one part of the leucomatous patch becomes heaped up into a warty growth. Such warts are, if not cancerous from the first, certain to become malignant sooner or later. In other cases fissures occur, and sometimes one of them deepens, becomes indurated, and develops into an epitheliomatous ulcer.

It is therefore imperative that leucomatous tongues should be guarded from all the well-known causes of irritation. Smoking should, as a rule, be prohibited, although inveterate smokers may be allowed the occasional use of mild tobacco ; chewing must be entirely stopped. Very hot, very cold, or highly spiced food must be avoided, and alcohol, if taken at all, must be well diluted. Carious stumps, rough teeth, ill-fitting dentures, etc., must receive proper dental treatment. Dyspeptic conditions should be attended to, and if the patient is gouty, rheumatic, or syphilitic, the appropriate drugs should be prescribed.

All local applications to the tongue must be unirritating ; caustics, especially nitrate of silver, must be avoided entirely. Alkaline mouth-washes, such as bicarbonate of soda 10 gr. to the ounce, chlorate of potash 10 gr. to the ounce, are often useful and relieve the subjective symptoms. Sometimes ointments consisting of a basis of lanolin, containing drugs such as borax, morphia, cocaine, etc., may be of more service, as they are not washed away so soon as the liquid applications.

The common broad thin patch of leucoma is not suitable for removal by surgical means ; but in the rare cases where there is a small thick patch, removal by knife or scissors, and closure of the wound by catgut stitches, may be advantageously done. Warts or indurated fissures or ulcers occurring on a leucomatous tongue should be regarded as young cancers and dealt with accordingly.

It is well to remember that most tongue affections are made worse by breathing through the mouth ; great relief may result from attention to any nasal obstruction that may be present.

Ulcers.—The tongue is subject to ulceration from many causes, both local and constitutional.

Dyspeptic Ulcers usually occur on the tip of the tongue, and may extend backwards on the dorsum ; the neighbouring portion of the tongue is often red, irritable, excoriated, or deeply furred. The treatment should be begun by giving an aperient. The bowels must be kept acting daily, and remedies such as bicarbonate of soda, rhubarb, and gentian, given internally. The diet must be regulated, all food being soft and unirritating. A mouth-wash of chlorate of potash, sanitas, or listerine may be prescribed. If healing be slow or the ulcer painful, it may be painted with a 5 per cent solution of chromic acid.

Traumatic Ulcers occur on the tip or edges of the tongue, and are usually due to the continued rubbing of a rough or carious tooth or a badly-fitting denture. These "dental" ulcers may vary in character. When the mouth bacteria take an active hold on the excoriated surface, the ulcer assumes an *acute* character ; its surface is sloughy, its edges are sharp cut, and the surrounding area is swollen, sodden, and thickly furred. Removal of the offending tooth, a purge, and a suitable mouth-wash will soon bring about a cure. In other cases the ulcer is of a *chronic* character, and very little is to be seen on examination ; it may be

a mere crack or fissure opposite a rough tooth, or sometimes opposite a gap between two teeth. These chronic ulcers, if left untreated, are apt to become indurated and to develop into epithelioma. The treatment consists in removing or stopping carious teeth, rubbing down rough or prominent corners, or filling up gaps in the alveolar arch by proper dental methods. The ulcer may be painted with a 5 per cent solution of chromic acid. On no account should a chronic indurated ulcer be allowed to remain. If it does not quickly yield to treatment it should be excised and the wound sewn up with catgut. It is always well to examine the portion removed microscopically.

Syphilitic Ulcers may affect the tongue in all three stages of the disease. Primary chancres of the tongue are rare. They occur on the tip or anterior part of the dorsum. They are apt to be overlooked or mistaken unless one adopts the very useful rule of suspecting that any sore of peculiar appearance which defies diagnosis may be a primary sore; the diagnosis can then be easily confirmed by the co-existence or subsequent appearance of signs of secondary syphilis.

In secondary syphilis the most important lesions are the mucous tubercles or plaques and the ulcers to which they give rise. On the dorsum and under surface of the tongue mucous patches remain smooth or may acquire a warty appearance, but on the tip and edges of the tongue where they are irritated by the teeth they readily ulcerate, forming a sinuous ulcer surrounded by a pearly-white, smooth, rounded border.

In the tertiary stage gummata may occur in the mucous membrane or muscular substance of the tongue. In the former situation they are usually small and multiple, apt to break down into small superficial ulcers, giving the tongue a fissured or furrowed appearance; when they heal they pucker the surface, causing great disfigurement. The deep or parenchymatous gumma occurs on the dorsum near the centre; when it breaks down it produces a deep cavity, the size of which is only fully appreciated when its sides are separated by the fingers.

The treatment of syphilitic affections of the tongue necessitates the administration of internal remedies suitable to the stage of the disease. In primary and early secondary syphilis a course of mercury must be prescribed; a very satisfactory preparation is the hydrarg. cum creta in 2½-gr. doses thrice daily. In bad cases it may be necessary to bring the patient rapidly under the influence of mercury; intramuscular injections are then valuable.

In late secondary or early tertiary syphilis the administration of mercury must depend upon the severity of the disease, the presence or absence of syphilitic manifestations in other parts of the body, and the amount of mercury the patient has taken in the earlier stages. In tertiary affections, iodide of potassium is essential. It should be given at first in 10-gr. doses thrice daily, and the dose increased to 30 gr. or more until the desired effect is produced. In early tertiary cases, especially when there is doubt as to the previous administration of mercury, this drug may be advantageously combined with the iodide. Local treatment is of more importance, and attended with more success in secondary than in tertiary affections. Mucous patches should be carefully dried with blotting paper and painted with 5 per cent chromic acid solution, or dusted with calomel and starch powder. Under these remedies mucous patches often disappear very quickly, and the patient gives up all treatment, to his subsequent detriment.

Various local remedies are used for tertiary ulcers, viz., nitrate of silver, alum, sulphate of copper, bicyanide of mercury, tannic acid, Mandl's solution, etc. As a general rule it is better to avoid caustic applications and to rely upon a mild alkaline mouth-wash of bicarbonate of soda. When there is much pain on

eating, the surface of the sore should be dried and dusted with orthoform before each meal.

It is important that all sources of irritation should be removed as far as possible. The food should be plain and unirritating, smoking should be given up, and alcohol used but sparingly and well diluted. The condition of the teeth should be attended to, and the wearing of artificial dentures suspended.

When a chronic syphilitic ulcer has lasted for some time and induration is developing about its base, a portion should be excised for microscopic examination. The practice of giving a course of iodide with the idea of making the diagnosis between a syphilitic and a cancerous ulcer cannot be too strongly condemned.

It must be borne in mind that secondary syphilitic affections of the tongue and mouth are highly contagious ; it is therefore important that patients should be cautioned as to the risk of infecting others, and that dentists and others operating on the mouths of infected persons should be scrupulously careful in disinfecting their hands and instruments.

Tuberculous Ulceration may be primary or secondary. *Primary* ulcers are rare, but ulceration *secondary to tuberculous disease of the lungs* or larynx is not very uncommon ; it may affect any part of the tongue, but most often the tip or border. The fully-developed ulcer has no characteristic shape ; it is usually roughly oval, with sinuous borders, uneven pale granulated surface covered by dirty yellow viscid mucus, and sharply-cut or bevelled edges. In the later stages there is salivation and much pain. The submaxillary glands are often enlarged.

When the ulcer is small, single, and unaccompanied by active phthisis, it may be excised, especially if it be causing much pain and interference with eating and speaking. A wedge-shaped piece including the ulcer should be excised and the edges accurately sutured ; if a raw surface is left it is sure to become infected.

In cases unsuitable for excision, much improvement sometimes results from scraping the ulcer under local anæsthesia and applying pure carbolic acid. If the disease is too advanced or the patient too ill for scraping, the ulcer may be painted daily with 20 per cent lactic acid solution. Shortly before meals the surface of the ulcer should be dusted with orthoform, or painted with a 5 per cent solution of eucaine. Morphia may be necessary at night. The condition of the teeth must be attended to and an antiseptic mouth-wash employed. The food must be soft and unirritating. General anti-tuberculous treatment will of course be prescribed.

Edmund W. Roughton.

TONGUE, CARCINOMA OF.—The treatment may be divided into *preventive*, *radical*, and *palliative*.

Preventive Treatment.—There are many simple ulcers, warts, etc., which are very prone to become cancerous if untreated or irritated. It is therefore a matter of the very greatest importance that all such conditions should be efficiently treated by the methods already described. In this way many a person may be saved from a horrible death by a trivial but timely operation. (See "Glossitis", and "Ulcers" in previous article).

Radical Treatment. — The success of radical treatment depends entirely upon early diagnosis and thorough removal by operation. It appears that the best results at present obtained are the cure of twenty out of every hundred cases operated on. Although cancer of the tongue will probably always remain a very deadly disease, it is hoped that earlier diagnosis and more thorough operations will lead to greater success.

In deciding upon the suitability of any particular case for operative treatment, we must take the following points into consideration. :—

(*a*). *The Extent of the Disease.*—Whenever it is possible to remove the disease in the mouth completely, it should be done (other conditions permitting, *vide infra*), even though there does not seem to be much chance of effecting a permanent cure, because although the patient may die of glandular disease in the neck, he will be spared the great agony and discomfort of the growth in the mouth. When, however, it is obviously impossible to remove all the disease in the mouth, it is better to leave it alone.

(*b*). *The Situation of the Disease in the Tongue.*—The further forward the disease, the more superficial it is, and the more it is limited to one half of the tongue, the better the prospect of successful removal. When the disease has extended to the floor of the mouth, the pillars of the fauces, the tonsil, the palate, the pharynx, the larynx, or the lower jaw, the prospect is much worse. A limited extension on one side only, especially if the disease be superficial or not very far back, may be successfully attacked; but when the disease spreads backwards towards the orifice of the larynx, and involves the base of the tongue on both sides, operation is contra-indicated.

(*c*). *The Condition of the Glands in the Neck.*—Moderate enlargement of the glands, so long as they are movable and do not involve the skin, does not preclude success. Glands which are movable from side to side, but not up and down, are often found to be adherent to the carotid sheath, and may be successfully removed with perhaps the sacrifice of a portion of the jugular vein, or even the vagus. When the glands cannot be moved laterally, they are usually inoperable. Extension of the disease to the parotid region, into the root of neck and thorax, and extensive involvement of the skin, should contra-indicate operation.

(*d*). *The General Condition of the Patient.*—Thin old men in good health often stand extensive operations very well, but fat alcoholic patients are very bad subjects. They are apt to become delirious, and their tissues are unable to withstand sepsis; they often succumb to shock, secondary hæmorrhage, or septic pneumonia. Well-marked albuminuria would contra-indicate a large operation, but slight albuminuria without marked arterial degeneration would not preclude a limited removal of the anterior part of the tongue.

Having decided that the case is operable, the next thing is to select the most suitable method of operating. This will depend chiefly upon the situation and extent of the disease. If it is superficial and situated near the tip or one of the edges of the tongue, it may be removed by excising a wedge-shaped or quadrilateral piece, including the disease and an area of half an inch of healthy tissue all round. The sides of the wound are brought together with catgut stitches. When the disease is more extensive, but still limited to one side of the tongue, the organ should be split along the median plane and the affected half clipped through with scissors well behind the disease. When the disease affects both sides of the tongue, the whole organ must be removed by cutting well behind the disease. It is better not to split the tongue and remove it in two halves, as by so doing the cancer is cut into and the wound may become infected. When the disease occurs far back in the tongue and extends to the floor of the mouth, it cannot be effectually dealt with by any intrabuccal operation, and it becomes necessary to expose the disease more freely. This can be done by splitting the cheek from the angle of the mouth to the anterior border of the masseter, followed if necessary by division of the jaw at the level of the last molar tooth, as recommended by Langenbeck. Kocher's submaxillary method is also employed for the same class of case. When the jaw is involved, the affected portion must be excised, but if possible the lower border should be spared, so as to preserve the continuity of the arch.

Many other methods of removing the tongue are described in text-books of operative surgery. Removal by ecraseur or galvano-cautery is now obsolete.

Whatever method of removal is decided upon, it is most important to devote a few days before the operation to getting the mouth as clean as possible. A dentist should be requested to remove all stumps, scale the teeth, and put temporary fillings into any carious teeth worth keeping, and the patient should be directed to use an antiseptic mouth-wash frequently. As a further preventive against sepsis, injections of antistreptococcus serum may be employed.

Removal of Secondary Glands in the Neck.—It is now recognized that no operation for cancer is complete that does not deal with the corresponding lymphatic area. In the case of the tongue it is found that cancer cells do not lodge in the lymphatic vessels between the tongue and the glands, and that consequently it is not necessary to remove the primary growth and the glands in one continuous piece, as in the operation for cancer of the breast.

Opinion is divided as to the best method of dealing with the glands in the neck. Some surgeons do not touch the neck unless there is palpable glandular enlargement; some operate on the tongue first, and the glands a week or ten days later; others attack the glands first; and others, again, recommend attacking both parts at the same sitting. It is impossible to lay down one rule for all cases, beyond saying that the glands in the neck, if operable, will require to be removed sooner or later. If the disease in the tongue is superficial, limited in extent, and easily removable, the best plan is to begin with the neck, whether glands can be felt or not. The anterior triangle must be thoroughly opened, and all the cellular tissue, with the glands contained in it, should be cleanly dissected off the jugular vein and carotid sheath, from the clavicle up to the mastoid process and into the submaxillary region, where the lingual artery may be tied. The operation must be very thorough, as any subsequent operation for recurrence would be extremely difficult, owing to the presence of scar tissue. On completing the operation in the neck a dressing is applied, and the primary growth in the tongue removed. If the disease in the tongue is too formidable to allow of the double operation at one sitting, the operation on the neck must be postponed for a week or ten days. When the glandular affection is extensive it is wise not to attack it at the same time as the tongue, unless the method of removal of the tongue involves opening up the neck (as in Langenbeck's or Kocher's methods).

After-Treatment.—After removal of the disease, the raw surface should be covered up as much as possible by suturing the cut edges of the mucous membrane with catgut. The parts that cannot be closed in this way should be mopped over with chloride of zinc, 40 gr. to the ounce; this diminishes the subsequent sepsis. It is not necessary to pack the wound with gauze, and the free use of iodoform powder for dusting the raw surface is attended by risk of poisoning. It is better to leave the wound in the mouth alone as much as possible, being content with washing the mouth out as often and as thoroughly as possible with sanitas, listerine, or any other suitable mouth-wash. Unless the patient is much debilitated it is better to give no food by the mouth for two or three days, but to trust to rectal alimentation. If his condition necessitates more nourishment, it should be given by means of a tube slipped down into the upper part of the œsophagus; the mouth must be well rinsed out after each feed. As soon as the patient has recovered from the anæsthetic he should be propped up in bed with the head bent forward or towards one side, so that discharges can run out of the mouth freely. An aperient should be given on the second or third day to get rid of any blood which may have been swallowed.

Palliative Treatment.—In many cases the disease cannot be removed by operation, or recurrence may have taken place. It is then necessary to consider what can be done to relieve the patient's sufferings. In these cases oral sepsis is the chief cause of the patient's misery, and must be dealt with as thoroughly

as possible by the methods already mentioned when describing the preparation of cases for operation ; further, the ulcer may be painted twice a day with a 1-1000 solution of bicyanide or perchloride of mercury, care being taken that no excess of the solution is allowed to run off, and the mouth should be well rinsed after each painting. Pure carbolic acid is sometimes useful applied in the same way.

Pain, especially on taking food, may be much diminished by drying the ulcer very gently and dusting it over with orthoform half an hour before each meal. Morphia or cocaine may be freely used when necessary. The question of establishing a drug habit does not require consideration in these cases. Deep ulcers in the floor of the mouth are often best treated by painting with 20 per cent cocaine and packing lightly with antiseptic ribbon gauze.

Resection of a portion of the lingual nerve may give great relief, but it is often impossible to get at the nerve owing to the position of the disease. Atropine may be added to the morphia injections with the object of diminishing the excessive secretion of saliva. When fœtor of the breath is the most prominent symptom the ulcer should be powdered with iodoform, to each drachm of which a drop of attar of roses has been added.

The food must be as soft, bland, and unirritating as possible. It is sometimes necessary to use a tube passed into the œsophagus, or to supplement mouth feeding by rectal suppositories or enemata. It is but seldom that hæmorrhage calls for any special treatment ; slight bleeding does not need treatment, and copious hæmorrhage either stops by itself or relieves the patient from further suffering.

Edmund W. Roughton.

TONGUE, TUMOURS OF.

Lymphangioma of the tongue is usually congenital. The lymphatic spaces are greatly enlarged, owing, it is supposed, to malformation of the efferent lymphatics. The tongue is greatly enlarged (*macroglossia*), so that it may protrude from the mouth ; by constant pressure on the front teeth and their alveoli, great deformity may result.

The only satisfactory method of treatment is to excise a wedge-shaped portion of the tongue, including as much of the lymphangioma as possible, and large enough to reduce the tongue to its proper size. Before operating, the mouth must be made as clean as possible, so as to minimize the risk of lymphangitis. The hæmorrhage is not usually very great, and stops when the sides of the wound are brought together by deep stitches.

Other methods of treatment, such as electrolysis, scarification, igni-puncture, and injections of irritating substances should be avoided, as they usually do more harm than good.

Nævi of the tongue may be capillary or venous. They are nearly all congenital, but may sometimes commence to grow in adult life. They are easily recognized. When small they cause no symptoms unless accidentally wounded ; when large, they are apt to be repeatedly injured by the teeth, giving rise to hæmorrhage and septic infection.

Small nævi may be easily destroyed by the galvano-cautery at a dull red heat ; the platinum needle is introduced into the substance of the growth and moved in all directions so as to break it up. Larger nævi should be excised, if possible, by the wedge-shaped method, cutting clear of the disease and approximating the sides of the wound with deep catgut sutures. For widely diffused nævi it may be advisable to tie the linguals, or to pass a temporary ligature around the tongue behind the growth, before proceeding to excise it. It may be necessary to use the cautery to arrest hæmorrhage, but this should be avoided if possible, as it interferes with primary union.

Papillomata usually occur on the dorsum of the tongue, but are sometimes seen on its under surface near the frænum. Care should be taken to avoid mistaking warty-looking condylomata for true warts. In young persons, warts (especially of the pedunculated variety) may be removed by the galvano-cautery under local anæsthesia. In older patients they should be more freely removed, more especially if they are sessile and occurring on a leucomatous tongue; for such warts, if indeed they are not actually cancerous, are sure to become so sooner or later. The best plan is to excise the wart by two elliptical incisions going deeply into the substance of the tongue, so that the wound may be closed by sutures and healing by first intention secured.

Fatty, Fibrous, Cartilaginous, and **Osseous** tumours are extremely rare in the tongue. If recognized they may be enucleated after incising the tissues by which they are covered.

Sarcomata of the tongue are extremely rare. They have seldom been correctly diagnosed before removal. The proper treatment is to remove the portion of the tongue in which the growth is situated. *Edmund W. Roughton.*

TONSILLITIS.—This term is generally confined to inflammation of the faucial tonsils. It is either acute or chronic.

I.—ACUTE TONSILLITIS.

This may be grouped under the following heads:—

(1) Follicular Tonsillitis; (2) Parenchymatous Tonsillitis and Peritonsillitis (Quinsy); (3) Ulcerative Tonsillitis: (*a*) septic, (*b*) chancre, (*c*) tuberculous; (4) Tonsillitis as a complication occurring in the course of an acute specific fever: (*a*) scarlet fever, (*b*) rheumatism, (*c*) syphilis (2nd stage), (*d*) diphtheria.

1. **Acute Follicular Tonsillitis.**—In the treatment of this affection it is most important to isolate the patient, especially if a child, at once, and before applying any local application, to take a swab and have a bacteriological examination made. If the Klebs-Löffler bacillus be present, the case should be treated as one of diphtheria and be injected with antitoxin. The possibility of scarlet or rheumatic fever should also be remembered. General malaise and pain in the throat are the two most prominent symptoms, and very often a high temperature, running up to 103·5° or 104°.

Treatment.—The first indication is a mercurial purgative, either a blue pill and the conventional, black draft or a large dose of calomel. Many patients cannot take calomel, owing to the intense griping it occasions. In such cases, a pill containing euonymin, scammony, and aloin may be substituted. Where the temperature is high, it is most readily reduced by drop doses of tincture of aconite continued every hour until it falls to 100°. In the case of children, it may be combined with teaspoonful doses of liquor ammonii acetatis. The natural salicylate of soda in 10-gr. doses to begin with, and then continued in 5-gr. doses every hour until either buzzing in the ears occurs or the temperature falls to 100°, is sometimes very efficacious. Salicylate of quinine may be substituted for it, but it must be given in smaller doses. In the case of adults who do not object to the intensely bitter taste, the writer has often obtained striking results by giving a combination of 10 gr. quinine and 10 gr. powdered guaiacum. This should be taken into the mouth and allowed to dissolve slowly in contact with the inflamed tonsils. It seems to have both a local and general effect, and may be repeated every three hours. Of the synthetic drugs, aspirin gives the best results, and may be substituted for the salicylate of soda.

Local treatment does not seem to have much effect, but the following may be tried. The tonsils may be swabbed every hour with a solution of peroxide

of hydrogen (20 vols. per cent). This sometimes has the effect of clearing out the follicles. The best way to relieve the intense pain is by steaming the throat for a few minutes and then sucking ice for an equal length of time. This manœuvre should be repeated about four times every two hours. Painting the tonsils with a strong solution of carbolic acid (1–20) sometimes gives great relief, the carbolic acid acting as a local anæsthetic. In the case of children, this should only be done by the medical attendant or a trained nurse, and the child should be directed not to swallow the saliva, as children are very susceptible to carbolic acid poisoning.

2. **Parenchymatous Tonsillitis and Peritonsillitis.**—This may lead to formation of abscess in the tonsil itself, but more usually in the tissue above and around it.

The general treatment has been already indicated, but the following prescription should be given every four hours :—

℞	Liq. Ferri Perchlor.	gtt. xx–xxx	Liq. Strychnin.		gtt. iv
	Potass. Chlor.	gr. x	Aq. Chlorof.		ad ℥ss
	Glycerin.	gtt. xxx			

When an abscess has formed, it should be evacuated as soon as possible. (See Abscess.

3. **Ulcerative Tonsillitis.**—

(*a*). *Septic.*—This generally occurs in those who are run down and exposed to microbic infection. Nurses and house surgeons are especially subject to it. Treatment should be on the lines already indicated, combined with change of air and tonics.

(*b*). *Chancre* is not so common in this country as it is on the Continent. Antisyphilitic remedies should at once be applied, and the chancre may be painted with tincture of iodine.

(*c*). *Tuberculous.*—The patient should be sent to a sanatorium, and the ulcer destroyed with the electro-cautery.

4. **As a Complication.**—

(*a*). *In Scarlet Fever.*—The throat should be sprayed every two hours with a mixture containing equal parts of " hazeline " and peroxide of hydrogen, 20 vols. per cent, and the nose be washed out with an alkaline spray.

(*b*). *In Rheumatism.*—Mandl's solution, containing 10–25 gr. potassium iodide, 5–10 gr. iodine, 2 drops oil of peppermint, and glycerin to one ounce, should be painted on the throat every three hours.

(*c*). *In Syphilis* (2nd stage).—The ulcerated surface should be painted with a weak solution of cocaine, and then be carefully swabbed with tincture of iodine, care being taken that none of it gets into the larynx.

(*d*). In *Diphtheria.*—In addition to antitoxin treatment, the tonsils should be carefully swabbed with a solution of 1–40 carbolic acid every four hours. (See Diphtheria.)

II.—CHRONIC TONSILLITIS.

After an attack or repeated attacks of acute follicular or parenchymatous tonsillitis, the tonsils may become permanently enlarged, and should be removed. This can be done by means of (1) The Guillotine; (2) The Snare; (3) Morcellement; (4) Galvano-cautery; (5) Enucleation.

1. *The Guillotine.*—The best instrument to use is Mackenzie's, as it is the simplest. A general anæsthetic is not necessary unless there are adenoid growths present as well. In that case the tonsils should be removed after the adenoids, as they bleed more, and the patient being then less under the influence of the anæsthetic, the laryngeal reflex is more perfectly established. In the case of older children or adults, nitrous oxide gas, alone or combined with oxygen, may

be used if the patient be very nervous, but as a rule it will suffice to paint the tonsils twice or thrice with a 10 per cent solution of cocaine.

The patient should be placed in a chair with an assistant behind to hold the head and also to push in the tonsil from the outside. As most surgeons are right-handed, it is best to take the right tonsil first, as the tonsillotome is then held in the left hand, and as a rule children do not begin to struggle until the first tonsil has been removed. The great mistake that beginners in the operation make is by trying to use too big an instrument. The operator should have at least three sizes ready to hand, and use as small a one as possible. He should also remember that the tonsil will be smaller after the application of cocaine than when he first examined it.

The patient should be in front of the operator, and be asked to hold tightly to the arms of the chair or give his hands to an assistant or nurse to hold. It is most important that he should not have them free to catch hold of the instrument. He should also be seated on a level with the operator, so that the latter can throw a good light into the mouth. In the case of the right tonsil the operator depresses the tongue with the right forefinger, and taking the guillotine in his left hand passes it into the mouth edgeways. The process of getting the tonsil into the lumen of the guillotine really consists of four movements :—

(*a*) The back of the guillotine is pressed against the tongue, and its edge slipped under the dependent part of the tonsil and hooked up under it, and the guillotine is turned more flatly against the tonsil. (*b*) The hand is then carried across the mouth, and the top of the guillotine is made to slip in behind the back of the tonsil between it and the posterior pillar of the fauces. (*c*) The guillotine is then turned quite flat against the tonsil and manœuvred until the top of the tonsil is also brought into the lumen. (*d*) The hand is then brought back to the right side of the mouth and strongly pressed, so that the anterior pillar of the fauces is kept out of the way. The blade is then pushed home, either by means of the left thumb alone or by the thumb of the right hand.

In the case of children, the instrument should not be withdrawn from the mouth, as they may object to open the mouth again. It should be shifted to the right hand, and the left tonsil should be removed in the same way. Where the tonsils are of markedly different sizes, so that it is necessary to use different instruments, the new one should be introduced into the mouth before the old one is withdrawn.

The only danger after tonsillotomy is that of hæmorrhage. It is always well to enquire beforehand if the patient belongs to a family of "bleeders," and if so the tonsil should be removed by means of the cold snare, or, preferably, left alone. In ordinary cases the hæmorrhage generally stops after a few minutes, but if it does not do so, the throat should be well illuminated to see if a tag has been left, which sometimes happens. The hæmorrhage will generally stop with its removal; but if the patient is restless and faint from loss of blood, and cannot, or refuses to, show the throat properly, it is imperative to give a general anæsthetic so that the exact source of bleeding may be discovered. If a small artery can be seen spouting, it should be caught with a long pair of forceps, and be either twisted or tied. Free capillary oozing generally stops when the patient becomes faint, but before that untoward condition is reached an emetic will lower the blood-pressure and so stop the hæmorrhage. Local stypsis is obtained by means of a sponge or swab dipped in pure adrenalin or hazeline, and held against the tonsil with one hand, while the other applies pressure to the outside. Ice applied to the back of the neck, and also sucked, will be found very useful.

The patient should remain quiet for two or three days, and only take cold milk

or soft food. The bowels should be kept freely open by means of a saline purge. Where possible the writer always gives children full doses of bromide of potassium combined with arsenic for three or four days before and after the operation. It helps to soothe the patient's nerves, and certainly lessens the pain and sensibility of the pharynx.

For local after-treatment, Condy's fluid, diluted to a pale pink colour, or carbolic lotion (1–80), or hazeline, or Pond's extract diluted to a half, may be used in the form of a spray or gargle several times a day, especially after taking food. If the pain be very great, which is generally due to the anterior pillars of the fauces having been cut, orthoform or anæsthetin will often be found very efficacious. Where the throat remains in a sloughing condition for a long time, the process of healing can be hastened by swabbing with solution of peroxide of hydrogen (20 vols. per cent).

2. *The Snare.*—This may be used either hot or cold where the tonsils are very big and fibrous and likely to prove very hæmorrhagic. As its virtue consists in slowly tightening the wire, it is an extremely painful process. It should therefore always be done under a general anæsthetic.

3. "*Morcellement*" is extremely useful where the tonsils are long and flat, and cannot be removed by the guillotine. By means of Tilley's punch forceps the operation can easily be performed under cocaine.

4. *Galvano-cautery.*—This is used in the case of adults, and may be done under cocaine, but as the cocaine only reaches the surface, it is best to inject a few drops of a ½ per cent solution made up with normal salt solution. It is a painful process if the cautery point gets beyond the region that has been anæsthetized. For that reason it involves a good many sittings.

5. *Enucleation* has been described as a very simple and effectual way of removing tonsils that cannot be removed by the guillotine. As far as the writer's experience goes, it is only simple in cases where the guillotine would have done equally well, or in young children where there has not been very chronic inflammation. Where it is really useful, in very old-standing chronic cases, it is a long and tedious operation, and must be done under a general anæsthetic.

George C. Cathcart.

TOOTHACHE.—(See TEETH, CARIES OF.)

TRACHEOTOMY.—(See LARYNGEAL OBSTRUCTION.)

TRACHOMA.—(See CONJUNCTIVA, DISEASES OF.)

TROPICAL DIARRHŒA.—(See DIARRHŒA, TROPICAL.)

TRYPANOSOMIASIS.—The treatment of this disease during the early stages of pyrexia has sometimes succeeded. In the advanced stage, when cerebral symptoms have supervened, no treatment is effective.

Arsenic is the drug that has been most efficacious, but large doses are required. Liquor arsenicalis causes symptoms of arsenical poisoning, even when the dose is very gradually increased. Few persons can acquire tolerance for the large doses required, and its use has to be discontinued in the majority of cases, as symptoms of poisoning supervene.

Hypodermic injections of various preparations, usually in combination with an aniline dye, enable larger doses of arsenic to be administered with less risk of poisoning. The preparations now used are those that have been successfully employed in infections of lower animals with the *Trypanosoma gambiense.* The doses given to men with promising effects are those mentioned.

Trypanroth Treatment.—Two injections are used. One is composed of sodium chloride 1·7 grams, sodium arsenite 1·63 grams, dissolved in 250 cc. of distilled

water. This solution contains $\frac{1}{10}$ gr. of arsenious acid in 1 cc. The other contains 6 grams of trypanroth and 0.6 gram of sodium chloride, dissolved in 100 cc. of water. In this solution, 0·9 gram of trypanroth is contained in 1 cc.

The urine must be frequently tested, as the drug sometimes causes albuminuria. The trypanroth may cause a general red coloration of the skin and of the urine. Neave and Balfour advocate the use of chrysoidin. The doses used were $\frac{2}{20}$ gr., gradually increased to $\frac{1}{2}$ gr., hypodermically. At first the injections were given daily, but later twice a week.

Atoxyl, a compound of arsenic, has given good results in the lower animals. Todd proposes the administration of large doses intravenously. Intramuscular injections in man appear to control the course of the disease, but even with doses of 30 min. of a 10 per cent solution, symptoms of poisoning have occurred. It is well to begin with small doses, such as 10 min., and gradually increase the dose, stopping the treatment for a day or two if any symptoms of poisoning occur.

In cases of apparent cure the treatment must be continued for a long period, as recrudescences occur, even in cases where no parasites have been found for several months.

Sleeping Sickness.—Negrolethargy is one of the fatal terminations of chronic trypanosomiasis. When the symptoms are established, no treatment appears to have any effect. It is justifiable to try large intravenous doses of any of the drugs that exercise a beneficial effect in trypanosome disease, as the sleeping sickness is invariably fatal. Life may be prolonged by careful nursing and feeding.

C. W. Daniels.

TUBERCULOSIS. — (See BACTERIOTHERAPEUTICS; BONE, TUBERCULOUS DISEASES OF; PERITONITIS, TUBERCULOUS; PHTHISIS, Etc.)

TUBERCULOUS GLANDS.—The infection of the various groups of cervical lymphatic glands by the tubercle bacillus is a very common affection, and one from which no age can claim immunity.

The pathological process represents the development of a tuberculous lesion in a singularly perfect manner, and according to the mode of response which these tissues offer to the infecting agent, we are able to distinguish several grades of the disease.

It may be argued that the lymphatic glands, being peculiarly rich in low-formed cellular elements, are able to oppose a better resistance to the tubercle bacilli than is, for example, the kidney, with its more highly specialized epithelium; and it is undoubtedly true that the natural resistance of the patient in overcoming the tuberculous invasion is better exemplified in disease of the glands than in many other structures. At the same time it is more than doubtful if nature can ever effect a permanent cure; and there is every reason to believe that glands which have become caseous, and even calcified, retain within them a source of latent infection which in after years may be roused into activity. Possibly in the earlier stages, before caseation has been produced, the protective substances and phagocytic activity may destroy wholesale the pathogenic bacteria; but for the present it may be said that in the later stages the disease, though apparently inactive, must be dealt with surgically, lest a focus for future trouble be left untreated.

In this connection, the value of tuberculin in the treatment of this condition should be considered, for the effect of the vaccin inoculation which is discussed later in this article is simply to aid the natural process of repair.

When a focus of tuberculous infection has passed into the stage of caseation and calcification, although an apparent shrinkage may be noted, the exact pathological condition is a mass of necrotic cells surrounded by a fibrous or

calcareous envelope. The bacilli remain embedded in this caseous cemetery, but the impervious surroundings which prevent their emigration prevent also the permeation of the protective substances from the blood-stream, and act as barriers to the passage of the leucocytes.

It will be clear then that while we may temporize with the early stages, and expect and receive valuable assistance from the "tuberculin" vaccin, the later stages, when caseation and softening have supervened, are more insidious and dangerous than is recognized, and more out of the range of successful therapeutic inoculation.

Clinically, three main grades may be recognized, but these are simply stages of the same pathological process, and though in one form only a single gland appears to suffer, while in another a group of glands is attacked, and a very large amount of periglandular inflammation occurs, both forms will require, as a rule, the same plan of treatment. The three grades, which will be considered as affording examples of the stages of the disease encountered clinically, are as follows :—

1. *The Single Gland.*—This gland, frequently situated opposite the angle of the jaw, becomes enlarged and swollen, and on casual examination appears to be the only one affected. A more careful investigation will often reveal a local source of irritation in the mouth, and in some instances a number of smaller but definitely palpable glands in the vicinity of the primary swelling. This grade of glandular enlargement tends to caseation and softening, and by spread of the infection may rapidly pass into the second stage.

2. *The General Enlargement of the various Groups of Lymphatic Glands.* (*a*) The submaxillary ; (*b*) The tonsillar ; (*c*) The concatenate chain ; (*d*) The para- and subtrapezial glands of the posterior triangle. Any or all of these groups may be attacked, and this particular stage is most commonly met.

3. *A stage where Fibrosis has occurred around the Caseous Centres*, when there is a great amount of peri-adenitis, matting the glands together and to surrounding structures. This stage is found in adults and old people, when the resistance to the tubercular invasion is well marked. Single glands rarely show this phase : it is commoner when larger groups have been affected, and a mass of great firmness and density is formed, which closely simulates a secondary carcinoma.

But while it is possible to classify cases under these main divisions, there are many other phases, especially of the second group. The appearance of these phases will depend upon many factors. (1) Upon the activity and virulence of the tubercle bacilli. (2) Upon the general health and resistance of the patient. (3) Upon the presence of a source of continual irritation. (4) Upon the occurrence of a "mixed infection."

In very young children, especially in those who are ill-nourished, there is an early tendency to fusion and breaking down of the glands. In some adults, on the other hand, the process may be characterized by such chronicity in development, by such absence of peri-adenitis and fixation, that the cases appear clinically like those of benign lymphadenoma. (It may not be out of place to point out that the exact status of benign lymphadenoma has not been clearly settled, and many cases which have been diagnosed as such have turned out later to be tuberculous.) (See LYMPHADENOMA.)

The subject of local irritation in respect to the development of tuberculous glands is an exceedingly important one, whether the region under discussion be the neck, thorax, abdomen, or thigh, and it has been proved satisfactorily that in the vast majority of cases the incidence of a tuberculous process in a glandular group has been preceded by injurious irritation in some part of the region drained by those lymphatics.

In the region of the neck there are so many sources of possible irritation that the most thorough investigation must be undertaken in all cases before any radical treatment of the actual glandular affection is contemplated. The scalp must be examined for patches of seborrhœic eczema, for other lesions, and for pediculi. The mouth must be examined for carious teeth, the ear for any evidence of chronic suppuration, and the nasopharynx and throat for adenoids and chronic tonsillitis.

The relative importance of these various sources of irritation differs according to the age of the patient. In children it is rare to find a carious tooth at the bottom of the trouble, but in them we find a fertile soil for the cultivation and dissemination of micro-organisms in the lymphoid masses and the enlarged tonsils which are so common at this age. Adults are rarely affected in this respect, but a carious molar, hitherto unrecognized as the source of the mischief, can often be found on careful examination.

While considerable attention has been directed to these accessory or predisposing causes of tuberculosis, very little has been said about the many adventitious microbes which find their way from these local lesions to the lymphatic glands; and it would not be incorrect to state that, in the vast majority of cases of tuberculous glands, not only has a local irritative cause been responsible for the early enlargement of the glands, but organisms other than the tubercle bacillus have entered the lymphatic circulation, and the resulting infection is essentially "mixed." It is doubtful if this point has been sufficiently emphasized, and as it is extremely important, both in prophylaxis and treatment, more attention should be directed to it. It should be clearly understood that the local lesion is "irritative" not merely in a mechanical sense, but bacteriologically, and forms a source of bacterial infection, not of the tubercle bacillus alone, but of many other micro-organisms.

It has been possible, in a few cases, to isolate and distinguish these additional agents, but the great difficulty that attends their thorough recognition lies in the fact that many of them, especially some of the streptothrix group (an organism nearly always present in the mouth) cannot be cultivated.

It is now clear that the first essential in all cases of glandular enlargement is a thorough search for, and adequate treatment of, any local condition which may be considered a source of infection, and with this end in view, enlarged tonsils and adenoids must be removed. Carious teeth must be extracted or filled. Eczematous conditions of scalp must have special attention, and discharges from the ear must be carefully treated. Until all further infection has been prevented, as far as possible, by the recognition and treatment of these various sources, no radical operation upon tuberculous glands is to be considered.

The treatment of tuberculous glands must be considered under:—

1. **General and Prophylactic Treatment.**—This will resolve itself into a careful consideration of the details mentioned in the previous paragraph, and by the administration of cod-liver oil, iron, and malt—remedies which are of undoubted value in this as in other tuberculous conditions. The influence of fresh, and especially of seaside, air, as an adjunct to this treatment, must be duly appreciated.

2. **Operative and Immunizing Treatment.**—The particular operation to be performed in cases of glandular enlargement involves the consideration of the three groups of cases previously mentioned.

When a single gland is involved, or where at least the chief infection appears confined to that gland, this should be removed as soon as thorough treatment of any predisposing cause, such as a carious tooth, has failed to bring about a

marked diminution in the glandular swelling. After the local lesion has been treated, iodine ointment should be applied to the skin over the swollen gland, and the patient should be watched. If this fails the gland should be excised, for by this means the whole process may be arrested and the further involvement of adjacent groups prevented.

Should the gland soften and break down, a small incision should be made over it, the contents removed with a scoop, and the cavity swabbed out with pure carbolic acid ; a drainage tube should be inserted, and the wound be allowed to close gradually. There must be some difference of opinion as to when excision should be attempted or when scraping only should be tried ; but, in general, when the skin over the swelling is red and when the mass is adherent, it will be wiser to deal with the abscess by scraping and drainage, since, if an attempt be made to remove the whole of the affected gland, there is great risk of wound infection. The small scar can be dissected out later when healing has taken place.

The treatment of the second variety will depend upon the condition of the glands. If, in the enlarged groups, there are several points where the glands are breaking down and adherent to the skin, it is wiser to deal with them as advised above. Since in these cases there is nearly always a " mixed infection," there is considerable risk in making an extensive dissection of the triangles of the neck. If the various abscesses be opened and drained, and general measures be taken to improve the resistance of the patient, a radical operation may become unnecessary or at least rendered much safer.

Where, however, large groups of glands are affected, or where contiguous chains have been attacked, no marked softening or suppuration having taken place, it may be advisable to undertake the radical operation. This is an operation of major surgery, and requires as much care and skill as any that the surgeon may be called upon to undertake ; further, it is distinctly a dangerous one, since, apart from the risk of injuring important structures, the mixed infection which is present may give rise to serious, even fatal, complications, a virulent form of septicæmia sometimes supervening.

The actual extent to which the dissection is carried will depend upon the needs of the case, but the same general principles should be observed in dealing with the localized groups of enlarged glands as in the more extensive cases which alone will be described.

Incision.—Either a curved incision following the lines of natural cleavage of the skin, as recommended by Kocher, passing from the mastoid region to the middle line in front below the jaw, may be made, or an oblique incision in front of or behind the sternomastoid. There is little doubt that the " collar " incision of Kocher, which can be employed in the lower as well as the upper part of the neck, leaves a less conspicuous scar than the commonly employed oblique incision. At the same time, the latter gives a better exposure of the parts, and if care be taken to suture the investing layer of cervical fascia and platysma as well as the skin, the scar will not stretch to any great extent.

The incision should always be a free one, and it is much better to err on the side of a long, than of a short, incision in this dangerous region. When the incision has been made, the dissection should be begun from below, the surgeon gradually working upwards until the uppermost gland, usually the tonsillar or jugulodigastric, is reached. This gland lies deeply, in relation to the posterior belly of the digastric, the jugular vein, the spinal accessory nerve, and the transverse process of the atlas. It drains the tonsil, is usually the first gland to be infected, and some difficulty attends its removal. The dissection must be systematic, all the lymphatic glands, fat, and intervening cellular tissue being removed until the anterior and posterior triangles are completely bared.

Much stress must be laid on this detail, for it is usually futile simply to remove those glands which are obviously enlarged, leaving countless small infected masses lurking behind in the fatty cellular tissue. A recurrence of the trouble after an extensive operation is a disappointment to all concerned, and it is best prevented by a thorough dissection.

From the moment the incision has been deepened through the fascia lata, four structures claim the greatest attention from the surgeon, according to the position of the mass of glands that has to be removed : (1) The spinal accessory nerve ; (2) The internal jugular vein ; (3) The facial nerve ; (4) The thoracic and right lymphatic ducts. Many other important structures are exposed, but are less likely to be injured.

1. *The Spinal Accessory Nerve* is met with in both triangles. In the posterior it crosses from the middle of the posterior border of the sternomastoid obliquely to the lower third of the anterior border of the trapezius. In the anterior triangle, it will be found passing round the prominent transverse process of the atlas and entering the deep surface of the sternomastoid in an adult, 1½ inches below the lip of the mastoid process. If, in a patient of any age, a line be drawn between the angle of the jaw and the tip of the mastoid, and another line at right angles to the centre of this, passing obliquely across the sternomastoid and cutting the middle of the posterior border of the muscle, and if this line be prolonged across the region of the posterior triangle to the trapezius, a very fair idea will be gained of the course the nerve pursues, and it is advisable for the surgeon to keep this in his mind during his dissection. Unfortunately the nerve is intimately connected with the affected glands, and in some cases is displaced from its normal line, but it may be remembered that when the chief mass of glands lies below the middle of the posterior triangle, the nerve will be displaced upwards ; conversely, when the mass is in the upper part, it will be displaced downwards. When the region of the nerve is reached, blunt dissection must be employed, and every band must be tested for motor nerve fibres. Fortunately, the slightest stimulus from the director or blunt dissector will cause a contraction of the trapezius, and in this way the nerve may be isolated. In spite of the fact that the nerve appears to be embedded in the glandular mass, it is nearly always possible to free it completely without damage. The same rules apply to the nerve in the anterior triangle, but its greater depth renders the dissection more difficult. Should the nerve be accidentally divided, the ends must be sutured.

2. *The Internal Jugular Vein* is in evidence in most operations on enlarged cervical glands. In the majority of cases it is easy to clear away the glands of the concatenate chain which lie along it, for the vein, though naturally very thin, becomes thickened by the pressure of the glandular mass. During the dissection, the vein may be wounded or small branches torn from their point of attachment to the vein wall. Neither accident is serious if properly treated. The opening must be picked up accurately with artery forceps, and a ligature must be applied very tightly, so that the opening is satisfactorily closed. The vein wall is very elastic, and several points may be tied in this manner without the smallest ill effect.

Serious injury to the vein is best avoided by clearly exposing it in the early stages of the dissection. In cases where the vein is so matted to the mass of glands that it cannot be removed without serious damage to its walls, a double ligature must be placed on the vein below the mass, and the vessel must be divided in this position. The lower end is allowed to drop back into the wound, but the upper end, together with the mass of glands, is dissected up until the mastoid process is reached. Another ligature is now placed on the extreme upper part of the vein, and the vein and glands removed *en masse* below

this ligature. Although no serious consequences arise from ligature or removal of the vein, it must be preserved if possible.

Wounds in the upper part of the vein require further mention. Lying deeply beneath the mastoid process, and in relation to the tonsillar gland, an injury here is of more serious consequence than lower down. The sudden flooding of the wound with a quantity of blood is sufficiently alarming, and added to this there is the difficulty that will be experienced in applying forceps or a ligature. Should this accident occur, the wounded vein must be immediately plugged with the finger or gauze packing, and all excess of blood must be mopped up; then a pair of large artery forceps must be passed along the controlling finger, and an attempt must be made to grasp the opening. Sometimes this results in an increase in the rent, and if this be the case, or if it be found impossible to apply a ligature, gauze plugging must be carefully packed on to the vein, in an upward direction, so as to control the supply of blood coming from the cranial cavity.

Although bleeding furiously and alarmingly when injured, the internal jugular is a cowardly vein, and bleeding can at once be arrested by judicious plugging. The plugging should be changed in forty-eight hours, a smaller strip being inserted, but if the removal causes fresh bleeding, a strip similar in size to the original must be used.

Another accident which may result from injury to the internal jugular is the entry of air into the veins. Fortunately this is of very rare occurrence, and can be prevented by prompt treatment of the wounded vessel.

3. *Injury to the Facial Nerve* or its main trunks is most unlikely to occur, since the nerve lies so deeply in the parotid; one branch, however, may be damaged: this is the "ramus anastomoticus," the lowest branch of the cervicofacial division, which runs below the body of the lower jaw to innervate the platysma and the risorius, and to communicate with the transverse cervical nerve in the neck. If the curved incision is made too near the mandibular margin, this nerve is divided, and some weakness of the angle of the mouth will result. The skin incision should lie at least one inch from the lower border of the jaw.

4. The position of the large lymphatic trunks in the lower part of the neck must be remembered. They are most likely to be injured when the dissection is being carried out over the lower part of the scalenus anticus muscle. The thoracic duct looks like a vein, so great care must be taken of all deep veins in this region. Should it be injured, an attempt may be made to suture it.

After the dissection has been completed, and all vessels have been secured, the wound is closed. It is advisable to employ separate sutures of catgut to bring the edges of the incision in the deep fascia together. A drainage tube should be employed for twenty-four to forty-eight hours.

After-Treatment consists in keeping the patient absolutely still in bed until primary union has occurred (ten to twelve days). Sandbags should be placed on either side of the head, or better still, a poroplastic splint should be fitted on over the dressings.

The treatment of cases which fall under the third group is conducted on the same main lines. In most instances, owing to the firm matting of the glands to the surrounding tissues by the peri-adenitis, it will be inadvisable to attempt more than the extirpation of the central caseous areas, after the manner previously described. Occasionally some radical operation may be indicated, but this must be left to the discretion of the surgeon.

The keloid form of scar which often develops at the site of a tuberculous sinus, or in the line of an incision for the removal of these glands, will be found to yield rapidly to the influence of tuberculin.

No account of the treatment of a tuberculous lesion would be complete without reference to the "tuberculin" treatment introduced by Sir A. E. Wright.

Undoubtedly it is of benefit, and in many cases produces marked amelioration, even subsidence of the glandular swellings, but whether it is destined to remove these cases from the hands of the surgeon entirely is a matter of doubt, at least for the surgeon. Owing to the fact that in most cases the infection is mixed, the "tuberculin" treatment will fail to bring about complete resolution, and although it is possible to vaccinate successfully against many other organisms, as has already been pointed out, the infecting agent in these cases cannot always be cultivated. Again, it is generally conceded that when softening and suppuration have occurred, the vaccin treatment will be unsuccessful.

On the whole, the position at present with regard to the vaccin treatment is this: as a preliminary to surgical treatment it should, when possible, be employed. If the case fails to benefit from it, or if caseation and softening of the glands occur, one of the operations described above is to be recommended.

W. H. Clayton-Greene.

TUBERCULOUS OSTEITIS.—(See BONE, TUBERCULOUS DISEASES OF.)

TURBINATES, HYPERTROPHY OF.—(See RHINITIS.)

TYPHLITIS.—(See APPENDICITIS.)

TYPHOID FEVER. — (See also BACTERIOTHERAPEUTICS.) In most cases of typhoid the diet and treatment of pyrexia will be the same as that given under FEVERS, ACUTE INFECTIOUS. But in consequence of the ulceration of the bowel which doubtless occurs in most cases, and may be slow to heal, it is advisable to be cautious during the early convalescence as well as during the acute stage of the disease. The patient should be kept on slops till the temperature has been normal for at least a week, and then he must very gradually be allowed more solid food.

Purges should be avoided, except during the first three or four days of the illness, when a moderate dose of calomel or castor oil may be given. At a later date it is dangerous to set up anything like vigorous peristaltic action of the bowel. If there is constipation during the febrile stage, and especially if, as is frequently the case during convalescence, the stools are hard, an ounce of the following mixture three or four times a day will be found very useful; it serves to keep the motions soft, and so prevent straining:—

℞	Ol. Oliv.	℥ x	Sod. Bicarb.	gr. v
	Liq. Potass.	℥ j	Aq.	ad ℥ xij
	Saccharin.	gr. iij		

An occasional soap and water enema may be necessary in addition. Unless a very experienced nurse is in attendance, the physician should inspect the patient's stools daily, otherwise some of the conditions to be mentioned may be overlooked. If there is diarrhœa, that is, if there are more than five or six stools in the twenty-four hours, the ordinary milk and water should be replaced by whey or peptonized milk. The same diet should be adopted if, with only two or three loose stools daily, the milk is not being digested. If the diarrhœa is very frequent or offensive, some antiseptic should be given, such as perchloride of mercury $\frac{1}{32}$ to $\frac{1}{16}$ gr., or 1 dr. of the liquor, resorcin 3–10 gr., or carbolic acid 1–3 min., or quinine and chlorine mixture.* Turpentine is useful when the diarrhœa is accompanied by tympanites. If there is abdominal pain, 10–15 min. of laudanum every

* Forty minims of strong hydrochloric acid are poured on 30 gr. of powdered chlorate of potassium in a 12-oz. bottle, which is filled up gradually with water: the mixture being frequently shaken while the water is being added, so as to absorb the gas as it is evolved. To the solution when made, 24 gr. sulphate of quinine are added. An ounce should be given every 3 or 4 hours.

three or four hours, with hot fomentations to the abdomen, will usually give relief. Troublesome vomiting is occasionally met with. This is best treated by omitting everything by mouth, except a little water, for twelve hours, and then letting the patient have whey or peptonized milk.

All the antipyretic measures mentioned in the general article, FEVERS, ACUTE INFECTIOUS, may be employed in typhoid fever; but children and old people do not bear cold packs or baths well, and baths are contra-indicated when there is peritonitis or hæmorrhage. Baths, cold or warm, may safely be given during menstruation.

Tympanites.—Ice, or a Leiter's coil with iced water, should be applied to the abdomen. Turpentine may be given internally in 5–10-min. doses every four hours; or 2½–5 min. of the essential oil of cinnamon of the best quality, every two hours. But both these drugs may cause unpleasant symptoms if pushed.

Hæmorrhage.—The writer has tried various drugs, including acetate of lead, turpentine, and adrenalin chloride; but, after considerable experience, he believes that subcutaneous injections of morphia and ergotine, with ice, or a Leiter's coil with iced water, to the abdomen, and iced-water injections into the rectum, are the best remedies.

Should much collapse follow severe hæmorrhage, subcutaneous injections of two pints or more of sterilized salt solution (1 dr. of sodium chloride to a pint) should be given. The patient's extremities should be wrapped in wool.

Perforation.—Directly the diagnosis of perforation is made, laparotomy should be performed, unless the patient is in too collapsed a condition to stand the operation, which must in that case be put off till he rallies. The writer has operated on several cases, and believes the following remarks may be useful to other practitioners.

As time is of great importance, everything should be ready. This can easily be ensured in a hospital. In private practice Dr. Hector Mackenzie's suggestion is a good one, that the medical attendant shall have made an arrangement whereby he can secure the attendance of a surgeon ready to operate at the shortest notice.

Generally, the most useful incision is one in the right iliac region (through the linea semilunaris if it can be hit off readily); but if there is any reason to suspect that the perforation is not in the lower portion of the small intestine, then the incision should be in the middle line below the umbilicus.

If the perforation is not seen at once upon opening the peritoneal cavity, find the ileo-cæcal valve and examine the small intestine from the valve upwards. If no perforation is found, examine the cæcum and vermiform appendix, and then the sigmoid flexure and rest of the large intestine. Remember, too, that the symptoms of intestinal perforation may be caused by perforation of the gall-bladder and by the rupture of a suppurating mesenteric gland or splenic infarct; though these last three lesions are, fortunately, very rare. In some cases, too, where perforation has been diagnosed, peritonitis only has been found on operation, and even, in one or two unusual cases, nothing abnormal within the abdomen. Having found the perforation, clear away any fæcal exudation, and invaginate the perforation with five or six Lembert's sutures of the finest silk, using an ordinary sewing-needle. The row of sutures should be placed longitudinally. Having inserted the sutures, make certain that none of the contents of the bowel can escape. It is well, before putting in the sutures, to pack round the coil of bowel concerned with sterilized gauze, so that if, during the insertion of the sutures, any fæcal matter is accidentaly evacuated, it will not escape into the peritoneal cavity. An assistant must hold the portion of bowel that is being dealt with.

Unless the whole, or nearly the whole, of the peritoneum has become inflamed, and the inflammation is purulent or offensive, the writer believes that it is best not to flush out the peritoneal cavity. It should be swabbed as clean and dry as possible with pledgets of sterilized gauze. No drainage is required except in very septic cases.

In the few cases where the perforation is too large, or the ulcer too extensive or thickened, to permit invagination, the affected piece of bowel should be brought to the abdominal wound, and secured there with the hope of dealing with it later; or, if the patient's condition and the state of the neighbouring portions of the intestines permit, resection of the perforated ulcer may be performed.

As it is necessary to get through the operation as quickly as possible, the abdominal wall should be sewn up with gut sutures passed through all the layers.

In cases of suspected perforation, opium or morphia should not be given until it is definitely decided whether an operation is to be performed or not. As a rule, while doubt still exists, the pain is not severe and may be relieved by hot fomentations. Opium masks the symptoms and renders diagnosis more difficult: but when a decision is arrived at, whether for or against, a subcutaneous injection of morphia should be given.

Cystitis.—For this the best treatment is urotropin, 10 gr. three times a day. In any case of typhoid fever where the catheter has to be used, it is advisable to give urotropin to prevent cystitis. Urotropin acts best when the cystitis is due to the *Bacillus typhosus*. In the ordinary form of cystitis, with ammoniacal urine, the usual treatment should be adopted.

Thrombosis, usually of the veins of the lower extremities, especially of the left, must be treated by keeping the limb raised and bandaged (from the foot upwards). If the thrombosed vessel is painful, glycerin and belladonna, equal parts, should be smeared over the affected region. Citrate of sodium should be given in 10-gr. doses three times a day.

Quarantine period: three weeks, but it is seldom necessary to enforce it.

E. W. Goodall.

TYPHUS FEVER.—It is most essential that abundance of fresh air should be allowed to circulate freely round the patient. If this condition be fulfilled, not only will the disease progress more favourably than if there is a want of ventilation, but those in attendance upon the patient will be less likely to catch the infection.

For the most part the general directions as to treatment given in the articles Fevers, Acute Infectious, and Typhoid Fever, will apply to typhus. But it is not necessary to be quite so careful about the diet in typhus as in typhoid fever.

Hypostatic pneumonia is common during the second week; to avoid it, the patient should not be allowed to be too long in one position.

During the end of the first and beginning of the second week of the disease, the delirious patient requires constant watching; he may be noisy and even maniacal, and will have to be prevented from getting out of bed. A patient may have strong delusions, on which he may act, without being delirious.

Stimulation is frequently called for towards the end of the second week.

The patient should not be allowed to sit up, even in bed, too soon after the crisis in severe attacks, for muscular and cardiac weakness are usually pronounced. Moreover, complications, especially affecting the lungs, may arise during the early days of convalescence.

The patient may be considered to be free from infection four weeks from the beginning of the illness.

Quarantine period: three weeks.

E. W. Goodall.

ULCERS.

General Treatment.—Ulcers are wounds which are slow in healing as the result of either constitutional disorders—diabetes, albuminuria, anæmia, etc.,—or of imperfect local treatment. The first essential in the treatment is to deal with the constitutional disease as far as possible, so that the tissues may the better respond to local surgical measures. When grave constitutional disturbance is present, no active operative treatment should be undertaken.

Local Treatment will consist in encouraging a healthy reaction, so that fresh, active granulations may form which can be covered either by the natural growth of the epithelium at the periphery, or by skin grafts transplanted on to the surface. When once an ulcer has become healthy, and shows signs of active healing, all that is necessary is to protect the part from undue pressure or irritation, and to facilitate the growth of epithelium. For this purpose nothing is better than strips of green protective, perforated to allow the discharge from the granulating surface to escape, the whole area being subsequently covered by an antiseptic gauze dressing. The gentle pressure of the protective keeps the granulations flat and allows the epithelium to grow unchecked and uninjured over the surface of the ulcer. The limb should, when possible, be kept at rest until healing has taken place. In any case of ulcer, the venous return from the parts should be assisted as much as possible, either by the position of the limb, or by firmly bandaging from its extremity to a point well above the situation of the lesions. Certain kinds of ulcers, however, will require special treatment.

The Inflamed Ulcer is one in which an active infective process is at work, causing increasing destruction of the tissue and acute inflammatory phenomena. It arises in old neglected ulcers which have been contaminated by dirty dressings. The patient should go to bed, and the leg should be elevated and dressed with moist antiseptic gauze or carbolic acid fomentations. If the surface is not a large one, it should be painted with a solution of strong carbolic acid. A careful watch must be kept for a spreading cellulitis.

The Callous Ulcer is one the edges of which are everted and indurated, and the base covered with small, unhealthy granulations. There is usually a considerable amount of matting together of the surrounding tissues, and sometimes in long-standing cases the ulcer is adherent to the bone. In order to procure healing, it will be necessary to stimulate the callous surface, either by applying blisters to the edges and margins of the ulcer, or by scraping away the everted, indurated margin. In addition, it is often advisable to incise the tissues deeply, about one inch from the margin of the sore, so that contraction may take place. If such ulcers are thoroughly scraped, and carefully dressed, or if the limb be kept at rest and elevated, they will soon become healthy. Skin-grafting may be required in the later stages. Calcium iodide in 3-gr. doses thrice daily has been stated to give marvellous results in cases of chronic ulcer. It may be used in conjunction with any of the above methods of treatment.

The Anæmic Ulcer is a weak, avascular condition which occurs in anæmic women. There is no thickening as in the callous variety, but there is no attempt at healing. The administration of iron by the mouth, and the application of stimulating dressings—lotio rubra, Unna's plaster, or Friar's balsam—will give satisfactory results.

The Irritable Ulcer is a painful condition due to the exposure of an inflamed nerve filament in the base of the ulcer. The point of tenderness should be accurately localized, and the nerve fibres divided a little distance above the ulcer or the tender point. Subsequently the ordinary treatment should be undertaken.

The Varicose Ulcer is the common variety seen in the out-patient department.

It is very difficult to treat unless the patient will consent to remain in bed. If the so-called ambulatory treatment be adopted, a certain number will heal slowly: this consists in "strapping" the ulcer with Unna's gelatin bandage, which supports the limb and prevents it swelling. The objection to this treatment is that the dressing has to be frequently renewed when the discharge is copious. Another method is to encourage a healthy reaction by stimulating lotions or ointments—the cyanide of mercury ointment is an excellent application—and to bandage the limb firmly from below upwards with a crêpe Velpeau bandage: this should be put on first thing in the morning before the foot begins to swell, and the patient should walk or stand as little as possible. In some cases benefit will result from excision of the dilated veins.

Varicose ulcers are liable to bleed when the destructive process has attacked one of the dilated veins. Properly treated this is not a serious matter, but neglect or carelessness may lead to fatal results. A firm, antiseptic dressing should be applied over the bleeding ulcer, and the limb should be carefully bandaged from below upwards. The patient should be confined to bed until the ulcer shows signs of healing, and the limb should be elevated above the level of the trunk.

The Perforating Ulcer is a destructive condition of the tissues arising from suppuration in a bursa beneath a callosity or corn. The suppuration tracks into the joints, and may burrow for a considerable distance into the sole of the foot. It is usually associated with tabes dorsalis, but occurs in other conditions. The ulcer should first be cleaned by moist, antiseptic dressings, fomentations, or baths, and all the thickened epidermis should be cut away. If the sinus is unhealthy it should be scraped. The cavity should be plugged with gauze soaked in lotio rubra or Friar's balsam, and the track should be allowed to close from the bottom. During treatment the patient should not walk on the affected foot.

The Phagedænic Ulcer is an acute destructive process, occurring in alcoholics or diabetic patients. It may or may not be associated with syphilis. In appearance the ulcer resembles the inflamed variety, but the process is more acute, the tissue destruction and sloughing are more extensive, and the constitutional symptoms are more severe. The ulcer should be cleaned with peroxide of hydrogen, sloughs should be cut away, and the surface may be swabbed over with strong carbolic acid. After this preliminary treatment the limb should be placed in a bath, or constant irrigation should be employed. Stimulants and tonics will be required, and the general treatment be as in cellulitis (see ERYSIPELAS). In the later stages of healing, care must be taken that undue contraction does not interfere with the function of the limb (see BURNS). Exuberant granulations should be touched with silver nitrate.

The method of exposing ulcers to a current of oxygen has given very satisfactory results, and is to be recommended. The gas is allowed to play on the surface of the ulcer for periods varying from ten to twenty minutes, after which a dressing is applied in the ordinary way.

W. H. Clayton-Greene.

URÆMIA, RENAL TOXÆMIA (Acute and Chronic).—(See also COMA, and NEPHRITIS, CHRONIC.) Uræmia is commonly described as occurring in two forms. In the one, the symptoms are of acute onset of great severity, and of grave prognostic significance. In the other they are of more gradual onset, of less apparent severity, and of very indefinite character. They are often called, respectively, acute and chronic uræmia. But as the two groups stand in strong clinical contrast with one another, it would be well if different names were employed to designate them. For the acute cases, "acute uræmia" might be retained; for the chronic, "chronic renal toxæmia" might be a better term.

By **Chronic Uræmia**, or chronic renal toxæmia, is meant that gradual failure of health and nutrition, with the various and often indefinite symptoms which are met with, especially in the third or later stages of granular kidney, but in some degree also in the later stages of chronic parenchymatous nephritis. These have already been dealt with at some length in the article on NEPHRITIS, CHRONIC.

Closely allied to this group, and equally distinct from acute uræmia as ordinarily understood, are the symptoms associated with total or almost complete suppression of urine, such as is met with sometimes in acute nephritis, but more commonly where the excretion of urine is prevented, either by complete obstruction to both ureters, or, one kidney having been already destroyed by disease or surgical operation, by obstruction to the other. In these cases the patient dies in eight to ten days or so of rapidly increasing asthenia, but, as a rule, without fits or any acute uræmic symptoms.

Acute Uræmia.—From both the above conditions acute uræmia is clinically distinct. The great characteristic is the suddenness with which the symptoms arise. Without any warning, the patient is seized with twitchings, which rapidly develop into violent epileptiform convulsions. The patient becomes unconscious, and dies within a few hours unless the fits cease. In acute nephritis the symptoms may subside, so that the prognosis is by no means so hopeless as the condition of the patient during the fit might suggest. Indeed, the patient's recovery seems sometimes almost to date from the attack of uræmia. With granular kidney, on the other hand, uræmia is almost invariably fatal.

When the patient is already under observation with acute nephritis, the diagnosis of uræmia is easy ; but by no means so with granular kidney, when the attack of uræmia may be the first grave sign of illness. Thus, it is not uncommon to find patients brought into hospital unconscious and dying, without the diagnosis being certain as between uræmia, epilepsy, and apoplexy.

In granular kidney, the symptoms of acute uræmia have by no means the definite character which is often assumed. The cases really vary from one another almost as much as do cases of so-called diabetic coma.

Fits and coma are the two most characteristic symptoms. Yet patients may not have fits, or at any rate no marked convulsions, and they need not be comatose. A patient may be comatose without fits, or at most with only slight twitching, the condition very closely resembling apoplexy. In other cases, the condition closely resembles that of narcotic poisoning.

In some instances, symptoms of the most profound collapse develop, as if the patient had been suddenly poisoned. The symptoms are then very much like those met with in ptomaine poisoning.

Frequently signs of cerebral irritation develop ; the patient becomes extremely restless, sleepless, more or less delirious, and sometimes passes into a condition of noisy, active delirium, simulating delirium tremens, with which it may be confused. At other times the patient becomes, for the time, violentiy maniacal. If death does not supervene, the attack may subside, and in a day or two pass off. But even then the general condition rapidly deteriorates, and other symptoms develop which, before long, end in death. The most interesting fact about acute uræmia in any of its forms, in the course of granular kidney, is that it often develops without any warning, and in the midst of apparent health.

If acute uræmia threatens, still more if it has already developed, active measures are imperative.

The patient should be put into a hot bath, or, if too ill for this, should have a vapour or hot-air bath, or be packed. At the same time diaphoretic remedies should be given ; but if the symptoms are very urgent, nitrate of pilocarpine

should be administered by subcutaneous injection. $\frac{1}{6}$ gr. dose is sufficient, not more, repeated as required at intervals of an hour. At the same time brandy or gin and citrate of caffeine may be given to obviate any depression which might be produced by the drug, though these doses are, as a rule, borne without detriment. The bowels should be relieved by some rapidly acting purge, of which elaterium is the best, in the form of the pulv. elaterini co. (1–4 gr.), aided, if necessary, by an enema.

If the tension be high, nitro-glycerin or the nitrites might be given, but this is best reduced by the other measures employed. If the fits are very severe, a whiff or two of chloroform has been advocated, but it is best avoided if possible. The bromides and chloral are too slow in their action, and are fitted rather for restlessness and sleeplessness. For this purpose also morphine may be given, and without the risks formerly attributed to it.

Should the fits persist, the question of bleeding will arise, with the object of removing the peccant poison. To do any good the bleeding must be free, and many ounces of blood removed. This is in many cases followed by immediate improvement; but the loss of so much blood necessarily leaves the patient very feeble, and where asthenia has been a prominent feature of the case, it is obviously to be used only as a last resource.

With the object of diluting the poison and promoting its elimination, hypodermoclysis has been employed, that is, considerable quantities of water or weak saline solution have been injected sub-cutem. This is a measure which is impossible with acute or chronic parenchymatous nephritis, where the patients are œdematous, but is not irrational in cases of granular kidney, where there is little or no œdema. Another method recently advocated has been lumbar puncture, or lumbar drainage. Improvement has been said to follow this operation in certain cases.

The continuous inhalation of oxygen for some hours seems on the whole, in these urgent cases, to yield the best results. Under its influence the intolerable restlessness often subsides, and the patient may fall asleep; and even the fits seem to be reduced in severity. Its administration must be persisted in continuously for some hours. To give it for ten or fifteen minutes only every hour or so is practically useless. The inhalation of oxygen has this further advantage, that it can be combined with any of the other methods of treatment.

Whatever form acute uræmia may take, the prognosis is grave. If any one of the forms has a less serious significance than another, it is, strange as it may seem, that in which epileptiform convulsions occur. *Samuel West.*

URETHRA, RUPTURE OF.—Rupture of the urethra may occur with laceration of other viscera in severe injuries of the pelvis, or it may be the solitary lesion produced by violence applied to the perineum. Only the latter class need be considered here. Laceration of the urethra may be produced by the unskilful passage of instruments (see URETHRAL STRICTURE), or by injury from without, such as falls astride a beam, or kicks or blows on the perineum.

The history of an injury to the perineum should always be the signal for a careful examination of the urethra, whether signs of laceration to this tube be present or not. The signs of rupture of the urethra are the appearance of blood at the meatus apart from micturition, and the presence of a tender swelling at the injured area. Retention of urine frequently accompanies these signs.

1. A patient seen after such an accident before he has attempted micturition, should be prevented from passing urine, and an immediate attempt made by catheter to ascertain the extent of the injury to the urethra. With the utmost gentleness a large-sized metal catheter is passed down to the point of injury, and it should be guided along the roof of the canal, for this is the portion of the

urethral wall that is most likely to escape injury. If on gentle manipulation the catheter passes onwards smoothly, and the position of the instrument, the freedom of its beak, and the flow of urine show that it has entered the bladder, the laceration has affected only part of the wall of the urethra. Two questions now arise : (*a*) Is the catheter to be tied in ? (*b*) Should any operation be done to relieve the perineal hæmaturia and unite the edges of the tear in the urethral wall ?

If the instrument has passed easily, it may be withdrawn and a gum-elastic catheter substituted, and this should be fixed in position by tying a silk thread or thin tape round the projecting end of the catheter and fixing the ends to the sides of the penis by means of a strip of plaster. Should the passage of the metal instrument have been attended with difficulty, and a doubt exist as to whether a second could be introduced if it were withdrawn, the metal instrument should be tied in. This treatment should be undertaken at the earliest possible moment, for a mere shred of urethral wall may remain to hold the torn ends together and guide the instrument into the deeper part, and this shred is likely to slough after the first few hours. The perineal hæmatoma should only be incised when it is large, and there is no probability of the early assistance of an experienced surgeon. In such a case the most careful antiseptic precautions should be adopted. The patient is placed in the lithotomy position, the perineum shaved and purified, and a free incision made on the catheter in the middle line. The clots are turned out, and any obvious bleeding point picked up and ligatured. If the torn edges of the urethra can be found, they should be brought together with catgut sutures. A drain is inserted, and the edges of the perineal wound are brought together. The catheter should be retained for a week. Probably before that time some of the urine will trickle alongside it and out of the perineal tube, and a variable amount of urethritis will be set up. After two or three days there will probably be little difficulty in replacing the catheter with a fresh instrument and washing the urethra.

2. In a patient under similar conditions who has made attempts to pass water, incision of the perineal swelling becomes imperative. Only a few drops of blood-stained urine are passed from the meatus, and the rest of the fluid is forced into the lacerated peri-urethral tissues. The infiltration passes forwards into the scrotum and penis, and mounts up over the pubes on to the abdomen. The symptoms of extravasation of urine rapidly supervene. The treatment is the same as in cases where the extravasation has followed other conditions, such as stricture.

3. Where attempts to pass a catheter into the bladder have failed, it is probable that a complete rupture of the urethra has occurred. The patient should be placed as soon as possible in the hands of an experienced surgeon, for the conduct of such a case is extremely difficult. There is usually retention of urine in these cases. If it is probable that surgical aid will be obtained soon, the bladder should not be emptied, for the distended bladder is an easy object to approach, while the collapsed bladder is an uncertain goal.

If, however, the practitioner must carry out the treatment himself, the objects to be kept in view are two : (*a*) The bladder should be drained ; (*b*) The severed ends of the urethra should be brought together. The patient is placed in the lithotomy position, and a metal catheter or a guide is passed to the point of rupture, made prominent in the perineum, and a free incision is made on this in the middle line. The clots are turned out, any bleeding points are secured, and after thorough washing from a douche can with hot weak perchloride lotion, the distal edge of the ruptured urethra is secured with toothed forceps, and a search for the proximal end of the tubes commenced. A good light and patience are required. The retraction of the tube may be considerable, and it is collapsed

and appears like a half-twisted large-sized artery. Pressure on the distended bladder above the pubes will cause the discharge of some urine, and may direct the operator to the position of the retracted tube among the bruised, blood-sodden tissues. When the proximal end is found and its edges secured with toothed forceps, they are approximated to the edges of the distal portion, and a gum-elastic catheter is passed along the whole length of the urethra into the bladder. The torn edges are now sutured with catgut over the catheter, which is tied in position. A large drain is inserted in the perineal wound, the edges of which are brought together with a few silkworm-gut stitches. Should the search for the proximal end of the urethra have failed, retrograde catheterization after suprapubic cystotomy is the only resource, and the discovery of the vesical end of the urethra will enable the operator to introduce a catheter from the penile end along the whole length of the tube.

4. Should the patient have already attempted micturition and catheterization have failed, the position is less favourable for the discovery and union of the separated ends of the urethra. In such a case the search may prove unavailing, and the practitioner will have to content himself with free incision of the swollen tissues, and the insertion of large drainage tubes.

The patient should be supported by stimulants, such as alcohol by the mouth, and strychnine subcutaneously. Urinary antiseptics, such as urotropin (10 gr.) and boracic acid (15 gr.) should be given after the operation.

Suppression of urine occurs in some cases, and is treated in the same manner as when due to other causes (see URINE, SUPPRESSION OF).

The patient should be warned of the stricture which will inevitably follow the lesion, and the passage of instruments commenced a few weeks after the rupture.

J. W. Thomson Walker.

URETHRAL STRICTURE.—(1) A diagnosis of stricture having been made the treatment consists in dilatation by means of instruments. (2) Certain complications may arise during this treatment which require special consideration. (3) Some cases of stricture are not suitable for dilatation, and a cutting operation is required.

1. **Treatment of Stricture by Dilatation.**—Metal bougies or flexible bougies of silk or cotton web coated with certain preparations are used.

Metal instruments may have a conical or, better, a bulbous end. The graduation varies slightly with the individual instrument-maker, and the instruments bear two numbers, which show the size at the tip and at the thickest portion of the shaft. Metal instruments have the following advantages: they withstand boiling, and last for many years; they have a smooth, highly-polished surface, that is easily kept surgically clean. They are specially useful in certain tortuous strictures, in cartilaginous strictures, and in strictures that have been dilated up to a large size and still require the occasional passage of an instrument. In the lower sizes they readily injure the urethral mucous membrane, and should be handled with the greatest caution. When not in use they should be smeared with vaselin before being laid aside. They should be re-plated on the first sign of cracking or scaling of the nickel.

Gum-elastic instruments or bougies should be pliable and resilient. A good bougie tapers gradually to a bulbous or olivary tip, and presents no abrupt shoulder. The shaft should be stiff, but the half of the instrument next the tip should bend readily to the touch. Whalebone bougies are dangerous instruments and should not be used. Bougies are graduated according to a French scale which indicates the circumference in millimeters, or to an English scale similar to that used for metal instruments.

The French bougies possess the advantage of an exact and constant measure,

and they ascend by finer gradations of size (roughly 3F. to 2E.). The finer woven instruments made in England are as well-shaped and durable as the French, but the less expensive bougies are much inferior.

Pliable bougies are less likely to damage the urethral mucous membrane than metal instruments. They are especially useful in the smaller sizes, and are preferable for the dilatation of most strictures up to 21 or 22F size. Beyond this size they are stiff and unwieldy, and are better replaced by steels.

The most useful sizes of bougie are from 10 to 16F., but one or two filiform bougies are a necessary part of the surgeon's outfit. The following numbers will be found useful in selecting bougies: two filiform bougies, and numbers 6, 10, 12, 14, 16, 18, of the French scale.

There are three essentials to the satisfactory passage of an instrument in a case of stricture of the urethra: the instrument must be aseptic, well lubricated, and used with a gentle hand.

Metal instruments are prepared by boiling for ten or fifteen minutes in a supersaturated solution of ammonium sulphate. Elastic bougies may be plunged into boiling water and then placed in cold carbolic solution, care being taken to remove the carbolic before using the instrument. After use these instruments should be washed in running water and the oil carefully removed, swabbed with a solution of perchloride of mercury or carbolic, and carefully dried. They are kept in a glass tube or an enamelled metal box with a little lycopodium powder.

The efficient oiling of the instrument is of the utmost importance. Olive oil, liquid paraffin (paroleine), liquid vaselin, or one of the following formulæ may be used as a lubricant for urethral instruments.

℞	Phenol.	1 part	Ol. Amygd.	8 parts	
	Ol. Ricini	7 parts			
℞	Cocain.	gr. v	Ol. Ricini		
	Ol. Eucalypt.	♏x	Ol. Oliv.	āā	℥ss
℞	Hydrarg. Oxycyanat.	gr. iiiss	Tragacanth.	gr. xlvj	
	Glycerin.	℥vss	Aq. dest. steril.		℥iij

A ready method of use is nearly to fill a tall narrow beaker with carbolic lotion and pour into it several teaspoonfuls of boiled olive oil or paroleine, which will float on to the top. The instrument is placed in the jar while the patient is being prepared, and is lubricated by the floating oil as it is withdrawn.

The third essential is a delicate touch. The want of this accounts for most of the accidents which result from the passage of urethral instruments.

The method of passing instruments is as follows. The surgeon stands upon the left side of the recumbent patient and handles the instrument with his right hand while he manipulates the penis with his left. In the introduction of a steel instrument the penis is grasped behind the glans by the thumb and forefinger of the left hand, and the tip of the instrument inserted into the meatus, while the shaft of the instrument lies transversely across the left Scarpa's triangle. The handle of the instrument is now carried gently towards the patient's abdomen and onwards to the middle line, and gradually raised meanwhile, so that the point drops downwards and backwards. During this manœuvre the left forefinger and thumb thread the penis upon the instrument. The handle is lightly held between the right forefinger and thumb, and the slightest hitch receives instant attention. If the instrument is stopped at the stricture, a smaller is tried, until one is found that will pass. As the point passes down to the bulbous urethra, the left hand leaves the penis, and the fingers are used to

support the perineum. The point of the instrument passes into the membranous urethra as the handle becomes vertical and swings downwards, and the left forefinger and thumb replace the right, while the handle is gently depressed between the thighs and pushed onwards.

In passing elastic bougies it must be remembered that the operator has little power of changing the direction of the point of the instrument, and the passage of the bougie into the membranous urethra depends upon its pliability. The penis is grasped behind the glans by the thumb and forefinger of the left hand, and the penis kept on the stretch to render the urethra straight and obliterate the folds in its walls. The bougie is introduced and lightly held by the corresponding digits of the right hand. If the instrument engages in the stricture, it is pushed gently onwards. If the point is arrested, it is withdrawn a little and again pushed on. If the attempt fails, a smaller instrument should be selected, and so on until the size that will pass is reached. If, on the other hand, the bougie first passed lies loose in the stricture, a larger instrument is passed, until the size is reached which is lightly gripped by the stricture. This "fitting" a stricture with an instrument must be distinguished from dilatation of the stricture.

In attempting to pass an instrument through a small stricture, filiform bougies are employed. They should not be resorted to until the operator is satisfied that he is really dealing with a small stricture, for the point of a filiform bougie readily catches in any fold of mucous membrane, and for this reason may fail to pass where a stricture of comparatively wide calibre is present, or where the obstruction is spasmodic in character. If the filiform bougie fails to pass, it is withdrawn and gently advanced again. On further failure, the tip of the instrument is bent to an angle and the bougie again introduced. The face of the stricture is now searched by turning the bougie round and testing the different parts of the circumference. If this manœuvre fail, it should be repeated with another filiform bougie. A syringeful of oil may be injected into the urethra and the meatus gripped with finger and thumb to retain the oil, while at the same time the searching of the face of the stricture is continued. If this is unsuccessful, a number of filiform bougies should be passed into the urethra and will engage in any pockets or false passages. By trying each bougie separately, one of them may pass on through the narrow opening.

It is sometimes of assistance to pass a large bougie down to the face of a stricture, and after withdrawing it to pass a filiform. In this way the opening of the stricture may be centred, and obstructing folds of mucous membrane pushed aside. If these attempts fail, and no retention is present, the patient should be replaced in bed and a brisk purge administered. A further trial should be made next day, and will usually be successful. An instrument sometimes passes readily when the patient is under an anæsthetic when all other methods have failed.

When several strictures are present, a bougie smaller than will fit the anterior strictures will be required to negotiate the second narrowing, for if the instrument accurately fits the first stricture, it can only be pushed straight onwards without in the least altering the direction of the point. A stricture which lies immediately in front of the membranous opening of the urethra will give rise to difficulty in the passage of instruments, for the membranous opening is on the roof of the bulbous urethra, and the bougie impinges upon the floor of the canal which rises up towards this opening. In these cases it is often necessary to resort to a rigid metal instrument, the point of which is more easily guided into the membranous opening.

Routine Treatment of Stricture.—The majority of strictures of the urethra are amenable to dilatation by instruments. Dilatation is carried out in three ways :

(*a*) As intermittent dilatation; (*b*) As rapid dilatation; (*c*) As continuous dilatation.

Intermittent dilatation is the best method of treatment of the majority of strictures, and is carried out in the following manner. Having made the diagnosis of stricture by the passage of a bougie of large size (say No. 20F.) down to the stricture, the next step is to "fit" the stricture with its proper size of bougie. A much smaller instrument is at once tried (say No. 10F.) and, if this fails to pass, successively smaller numbers are used, resorting at length, perhaps, to a filiform.

When a bougie is found that passes, it may lie loosely in the stricture, and if so a larger size is passed until the proper size is reached which passes, but can be felt to fit the stricture. This size is noted, no attempt being made to dilate the stricture by passing larger instruments. An interval of four to six days is now allowed, and the size which fitted the stricture is again passed, and is followed by the next larger size in the scale, and this is repeated after a similar interval. The scale is thus gradually ascended until the size of the stricture has reached 21 or 22F. Above this size the gum-elastic bougies become too rigid and difficult to guide, and steel instruments should be employed.

During the ascent of the scale the interval between the instrumentation should gradually be extended. At 14F. a week may intervene, at 18F. a fortnight, at 20F. three weeks, and with the larger steel bougies (12–14, 13–15, 14–16) a month should elapse. If all goes well this will be extended to two months, three months, and finally the patient will call once in six months or once a year to have an instrument passed.

No absolute rule can be laid down as to the largest size to which the urethra should be dilated. The natural size of the canal varies in different individuals. If necessary, the meatus should be incised in order to let large-sized bougies pass. In most individuals the urethra should admit a bougie of 22F. calibre, and it is advisable to dilate a stricture beyond this if possible.

The urethra should be syringed before and after the passage of the bougie with a weak solution of permanganate of zinc (1-5000) or of silver nitrate (1–10,000).

During the dilatation, and especially during the earlier part of the treatment, urinary antiseptics should be administered. Urotropin (5 gr. thrice daily), hetralin (7 gr.), helmitol (7 gr.), and boric acid (10 gr.), are among the best of these. The following prescription may be found useful:—

R	Urotropin.	gr. v	Syr. Aurant.	℥xx
	Acid. Boric.		Inf. Buchu.	℥j
	Ammon. Benzoat.	āā gr. x		

To be taken thrice daily.

When the intervals between the passage of instruments is prolonged to a month, the patient may take these medicines for two days before and two days after the operation. A slight gleet often accompanies stricture, and should be treated by the patient using an injection night and morning with a hand syringe. Permanganate of zinc, ½ gr. to the ounce, or sulphocarbonate of zinc in the strength of 1 per cent, is a suitable injection. The dilatation of the stricture will remove the principal cause of the discharge. The time taken for the treatment varies according to the behaviour of the stricture. At the end of three months the patient may be in the position that a large steel is passed once in two months. It is seldom that a case can be dismissed before the end of six months or a year. Some patients, especially those belonging to the hospital class, are careless and irregular in their attendance, and after a time the stricture gets into a callous condition which is beyond the hope of complete cure.

Strictures which have not become tough and leathery from long duration, irregular treatment, and prolonged irritation from chronic inflammation, will be cured by this means. A few of these relapse after a year or two, and require an instrument at long intervals, and hard, tough, leathery strictures of long standing will not be cured by this treatment.

In cases where the patient gives a history of dribbling, when the clothes are saturated and the prepuce sodden with the leakage, the surgeon should at once resort to filiform bougies; for the stricture is of very small calibre. Where a filiform bougie is the largest instrument that will pass, we have to deal with either a very narrow stricture, or a moderate sized stricture in which congestion or spasm is superadded. After a brisk saline purge and confinement to bed for two days, spasm or congestion will have subsided, and a bougie of moderate size (10 to 12F.) will pass, and intermittent dilatation may be commenced. On the other hand, the stricture may still grasp a filiform bougie, and a choice of the following methods is open: rapid dilatation, continuous dilatation, a further attempt at intermittent dilatation, or a cutting operation. Rapid dilatation is to be condemned: it means rupture of the stricture and a more dense scar at a later date. Continuous dilatation is useful in these cases. The patient is kept in bed, and the filiform bougie which was passed after so much difficulty is fastened in by tying a silk ligature round it and fixing the ends to the sides of the penis by means of strapping. The urine trickles alongside the bougie. After twelve hours a slightly larger instrument can be substituted, and after twenty-four hours a 6 or 7F. can be passed. The continuous dilatation is now abandoned and intermittent dilatation commenced.

It is not always possible to have the patient in bed for the passage of urethral instruments, but it is essential during the earlier operations until the surgeon is familiar with the "temper" of the stricture with which he has to deal.

2. **Complications of Dilatation.**—When blood appears at the meatus, the mucous lining of the urethra is torn, and a peculiar sensation of fine grating is felt if the point of the instrument tears up the urethral wall and forms a false passage. The further passage of instruments on the occurrence of such an accident must be suspended. The urethra should be washed with a warm boracic or permanganate of zinc solution, to which a little hazeline or the tincture of hamamelis (B.P.) may be added if the oozing is pronounced. Copious bleeding rarely occurs. An ice-bag should be applied to the perineum.

A fortnight should elapse before further attempts are made to pass instruments (see URINE, RETENTION OF). Additional gentleness should be exercised in the first passage of instruments after this accident, and the urethroscope is invaluable in demonstrating the position of the urethral opening and the false passage. Where a false passage of old standing is known to be present, it may be avoided by passing a fine bougie gently into it and then introducing a second into the urethra alongside the first bougie.

The appearance of a urethral discharge, and of signs of urethro-cystitis in frequent and urgent micturition and murky urine, are the result of imperfect asepsis. They are prevented by the sterilization of instruments, of lubricant, and of the hands, and the washing of the penis and urethra before the passage of instruments. Urinary antiseptics (*vide supra*) are also valuable in preventing the occurrence of the infection and in its treatment. An injection with a hand syringe of a solution of permanganate of zinc ($\frac{1}{2}$ gr. to the ounce), or of sulphocarbolate of zinc ($\frac{1}{2}$ per cent), or a copious daily urethral lavage by means of a douche-can and urethral nozzle with permanganate of zinc (1–5000) will quickly cure the urethritis.

A sense of faintness or actual syncope may occur during the passage of instruments. For this reason the patient should invariably be in the recumbent

position for the operation. The usual remedies for syncope are adopted, and the instrumentation is suspended. On succeeding instrumentations a solution of eucaine (8 per cent) should be injected into the urethra as a precaution against this accident. Cocaine should not be used as a routine measure, for, besides the danger of absorption of the drug, the surgeon loses a very important guide and check to his manipulation when he abolishes the urethral sensation.

Rigors and catheter fever result from rough handling of instruments, from attempts at rapid dilatation, and from want of asepsis. The measures of precaution against this have been stated above. Some patients are specially sensitive in this respect, and a cutting operation may become necessary.

On the occurrence of a rigor the patient is put to bed, surrounded by hot bottles; and hot drinks, such as tea or hot gin and water, and the following draught should be administered:—

R	Quin. Sulphat.	gr. v	Sp. Æther. Nitr.	℥ xv
	Urotropin.	gr. x	Inf. Buchu.	℥ j

A brisk saline purge should be given.

3. **Cutting Operations in Stricture.**—The patient may desire operation on account of the time taken by dilatation, or the impossibility of carrying out this treatment from residence at a distance from a doctor.

Urethrotomy becomes necessary in strictures where dilatation has failed in the following manner: (1) The stricture is readily dilated but quickly returns to its previous size (resilient stricture); (2) The stricture is dilated up to a certain size (10 or 12F.), but no further progress can be made (tough, cartilaginous strictures); (3) A rigor, and perhaps partial suppression of urine, follows the most gentle attempts at instrumentation (irritable stricture); (4) Hæmorrhage: a very few strictures bleed at the slightest touch, and are better cut on this account; (5) Very narrow strictures, where a filiform bougie is passed after much difficulty; (6) Failure to pass any instrument (impassable stricture).

Strictures complicated in the following manner also require urethrotomy: (7) Complication by some bladder condition which requires investigation or treatment, such as tuberculous disease, stone, chronic cystitis, etc; (8) Peri-urethral abscess; (9) Extravasation of urine; (10) Fistulæ; (11) Urethral stone.

Spasmodic Stricture.—The spasm affects the constrictor urethræ, and the obstruction is in the membranous urethra. The obstruction is intermittent; in an organic stricture it is continuous and increasing if untreated.

In spasmodic stricture a large instrument, if gently handled, will pass on after a slight delay. The use of cocaine (10 or 15 min. of a 2 or 5 per cent solution) is permissible and advantageous if the diagnosis has been clearly established.

The cause of the urethral spasm must be diligently sought, for upon it depends the treatment. Causes of reflex irritation, such as anal fissure, inflamed piles, etc., should be treated, when present. Most frequently the spasm results from some urethral irritation, such as subacute inflammation in the prostatic urethra, or a small stone caught in this portion of the urethra in its outward passage. The latter accident will be treated by passing a large steel bougie and pushing the calculus back into the bladder, when it will be dealt with as a bladder stone. Posterior urethritis is treated by the passage of a large metal instrument and the instillation of a few drops of nitrate of silver solution (5 gr. to the ounce) into the prostatic urethra by means of a Guyon's syringe. Two or three instillations at intervals of a week will usually suffice. Retention of urine as a complication of this condition should be treated by a hot sitz bath and an opiate, and failing these by the passage of a catheter.

Meatal Stricture.—This is best treated by meatotomy. A few drops of solution of cocaine and adrenalin are instilled into the urethra just behind the meatus, and are expressed again after five minutes. A blunt probed bistoury is introduced into the narrowed meatus with the cutting edge downwards, and the lower lip of the meatus freely incised in the middle line. Free oozing may result, and is controlled by the application of a pledget containing adrenalin solution, and a little pressure. Sounds must be passed after the first three days, as the lips rapidly unite and the outlet may return to its original size.

J. W. Thomson Walker.

URINE, RETENTION OF.—This results either from a loss of expulsive force of the bladder muscle, or from obstruction at some part of the urethra. The diagnosis must be accurately made before treatment can be undertaken. The surgeon must distinguish between anuria and retention, and between retention due to atony and that due to obstruction.

A patient with anuria refers to previous attacks of renal colic, hæmaturia, or other signs pointing to progressive renal disease, and the cessation of periodic micturition may have immediately followed such an attack. Symptoms of bladder trouble are absent, and have been absent or insignificant during the course of the disease. The patient is in no pain, there is no distension of the bladder, and an instrument passes readily along the urethra into the bladder, but draws no urine.

In retention of urine there is usually a history of gradually increasing difficulty in micturition, the stream has become progressively smaller and more feeble, and there may be some involuntary dribbling of the urine. The bladder is distended, and usually appears as a smooth rounded swelling above the pubes, firm on pressure and dull on percussion. In retention from atony of the bladder muscle, there is no pain and no desire to empty the distended viscus. In obstructive retention, recurrent spasmodic attempts of the bladder to overcome the obstruction usually double the patient up with cramp-like pain. Sometimes a few drops of urine may be squeezed out in one of these attacks. In some patients, however, pain is remarkably absent, and this is especially the case in old men where the obstruction results from enlargement of the prostate. Diagnosis is made by the passage of a large-sized instrument, which enters the bladder easily if the retention is due to atony, but is arrested or retarded if a stricture or other obstruction is present. The absence of obstruction and the discovery of signs of spinal disease clinches the diagnosis.

The following are the chief types of cases that will be met with in practice. :—

1. *In Acute Inflammation of the Urethra (Gonorrhœa, etc.)*, every means should be adopted to relieve the retention without passing a catheter. The patient should be placed in a hot bath or made to sit in a hot sitz-bath, and directed to pass his water in it, and a large hot-water injection be introduced into the rectum. Should this fail, a suppository containing extract of belladonna ($\frac{1}{4}$ gr.) and aqueous extract of opium ($\frac{1}{2}$ gr.) should be given. The following have also been recommended ; a minim dose of ferric chloride every five minutes, and half a teaspoonful of spirits of nitrous ether in half a glass of water every fifteen minutes. If relief is not obtained in half to three-quarters of an hour, a catheter must be passed and the urine withdrawn. An anæsthetic will usually be necessary, for the urethra is intensely sensitive. The canal must be thoroughly washed with a solution of permanganate of potash (1–5000) or protargol (1–10,000) from a douche-can, allowing the fluid to flow in and out of the canal. A glass nozzle and a bell shield are used, and prevent splashing. To this 10 or 15 min. of cocaine solution (5 per cent) may be added, and may suffice to numb the inflamed urethra for the passage of an instrument. A soft rubber catheter, or, failing this, a metal catheter, is passed very gently and the urine withdrawn.

It is advisable to wash out the bladder with the weak permanganate or protargol solution before withdrawing the catheter. If a morphia and belladonna suppository has not already been given, one should now be inserted into the rectum, and the patient returned to bed.

If acute prostatitis and a prostatic abscess be present, operation is indicated as soon as possible.

2. *Blocking of the Urethra by Stone, Foreign Bodies, Pedunculated Bladder Growths, Blood-Clot, etc.*—The diagnosis is made by the history, and relief by catheterization should be given without delay.

The filling of the bladder with blood-clot from a sudden copious hæmorrhage in a case of bladder growth will cause retention of urine. The condition is serious on account of the grave danger of septic infection of the clot. Very little time should be spent in attempts to break up the clot with metal catheters and washing, or by means of a lithotrite. Suprapubic cystotomy, with washing out of the clot masses and drainage of the bladder with a large rubber drain, is necessary, and should be done by an experienced surgeon.

3. *The Distended Atonic Bladder of Spinal Disease* should be relieved by catheter with the same precautions as are adopted in enlarged prostate. The introduction to catheterization is similar to that of enlarged prostate. After a few weeks the condition of the bladder improves, so that it regains some of its power, and a varying quantity of residual urine persists, which must be drawn off at regular intervals. Liquid extract of ergot (15 min. thrice daily) is a useful bladder tonic in these cases.

4. *Retention from Reflex Spasm in Disease of, or after Operation on, the Rectum, Anus, Testicles, etc., and Hysterical Retention.*—In operation cases the catheter is passed without delay in order to avoid distress. In other cases hot baths and other means (*vide supra*) should be tried before resorting to the catheter. A metal catheter is the best form of instrument in such cases. After relief of the retention, the cause of the spasm should be treated, to prevent recurrence of the symptom.

5. *Retention with Enlarged Prostate.*—The diagnosis is made by the history of the case, the age at which the symptoms commenced, and rectal examination. The preliminary measures already detailed above may be tried, but recourse to the catheter will nearly always be necessary. Three points must be insisted upon : (*a*) The most rigid asepsis ; (*b*) The delicate handling of instruments ; and (*c*) All the urine of an over-distended bladder must not be withdrawn at once, or at least must be drawn off very slowly.

(*a*). The catheters, whether gum-elastic or metal, must be boiled, the hands carefully cleansed, the penis washed with antiseptic, and the urethra washed with permanganate solution.

(*b*). The instrument selected should be either gum-elastic or metal. Coudé and bicoudé catheters are useful, and may pass very easily. Where a difficulty is encountered it may be due to the distorted shape of the prostatic urethra, and the greatest gentleness should be exercised in pushing the instrument onwards. Sometimes the urine does not flow because the catheter has not been pushed sufficiently deeply along the elongated urethra to reach the bladder.

If the coudé and bicoudé instruments fail, a metal instrument may be tried. Special prostatic metal catheters which possess a very long curve are a part of every set of metal catheters. A method that may be adopted where other means have failed is to bend an English gum-elastic catheter containing its stylet into a curve, which commences by dropping downward from the plane of the shaft of the instrument and then forms a very complete curve. This may pass, and if not, it has been recommended to pull the stylet out with the catheter in the urethra, so that the beak of the instrument seeks still further forwards and enters

the bladder. Failing these manœuvres, it may be necessary to puncture the bladder suprapubically with an aspirator needle (see URETHRAL STRICTURE).

(*c*). Two dangers attend the rapid emptying of an over-distended bladder: hæmorrhage from the vessels of the bladder or kidney, and suppression of urine. The patient must be in bed and in a warm atmosphere. Only 10 or 15 oz. should be drawn off, and an interval of half an hour to an hour should elapse before a similar amount is again withdrawn, and so on until the bladder is empty, the catheter being kept in the urethra meanwhile.

Another method is to withdraw a pint of the urine and introduce in its place half a pint of warm boracic solution, and so on until only boracic solution is left. Or, again, a catheter of very small calibre may be introduced and the urine allowed to dribble slowly away. When the bladder is empty a few syringefuls of silver nitrate solution (1–15,000) should be injected and allowed to flow away. Stimulants will usually be necessary in these cases. A mixture containing urotropin 5 gr., liquor strychninæ 5 min., and infusion of buchu 1 oz., every four hours, combines stimulation with antisepsis. Whiskey may be given at regular intervals in feeble patients. The catheter should be tied in, and the patient confined to bed for several days. At the end of this time a decision will have to be made as to whether "catheter life" is to be commenced or an operation performed.

6. *Retention with Stricture.*—A hot sitz-bath and hot rectal injection followed by a morphia (¼) and belladonna (¼) suppository may be tried, but recourse to instruments will in most cases be necessary. The passage of instruments in a narrow stricture has been described elsewhere (see URETHRAL STRICTURE). In cases where a No. 7 or 8 French bougie can be passed, it should be withdrawn and a catheter of this size introduced. Where a filiform bougie only will pass, it should be tied in with a fine piece of silk, the ends of which are carried along the sides of the penis and fixed by means of strapping. The urine trickles past the filiform, and after a few hours the stricture will allow of a larger instrument being passed, and eventually a catheter is introduced.

A more rapid method is to use a special instrument, consisting of a metal catheter with conical end which screws on to a filiform bougie. The bougie acts as a guide, and the catheter is forced through the stricture. Harrison's whip bougies are sometimes useful in these cases. They consist of a long tapering gum-elastic bougie, the end of which is filiform, while the shaft rises to a calibre of 18 or 20F. These may be made with a groove along one side by which the urine trickles away. Catheters of this description may now be obtained, and are a useful means of drawing the urine in a difficult case. Another special instrument is a tunnelled catheter, which can be threaded upon the filiform bougie and pushed through the stricture.

There is less danger in completely emptying a distended bladder in a case of stricture than in enlarged prostate, for the age of the patient is less and the kidneys are usually less extensively diseased. At the same time precautions are necessary to guard against suppression of urine. If instrumentation fails, the bladder should be emptied with an aspirator needle. The most suitable point for the puncture is an inch above the upper margin of the pubic symphysis in the middle line. The percussion note should be dull. The skin is first incised with a sharp scalpel, and then the aspirator needle introduced. The urine will flow from the cannula without a negative pressure being produced.

The dangers connected with suprapubic aspiration of the bladder are puncture of the peritoneum with subsequent peritonitis, leaking of the wound in the bladder, and the formation of a prevesical abscess. The peritoneum should not be injured where the bladder is distended and the percussion note dull. The aspirating needle should not be a large one, lest some leakage at

the point of puncture take place. A prevesical abscess may result from a septic needle or from a leakage of septic urine.

Usually after a single aspiration an instrument can be introduced through the stricture and tied in, but rarely the puncture must be repeated several times. In all these cases urinary antiseptics (urotropin 5 gr., boric acid 10 gr., ammon. benzoat. 10 gr., syr. aurant ½ oz., infus. buchu 1 oz.) should be administered. (For *Nervous Retention*, see ENURESIS.) *J. W. Thomson Walker.*

URINE, SUPPRESSION OF.—This may occur as an accidental complication of surgical disorders, and requires prompt and energetic treatment; or it may represent the last phase of a progressive incurable disease, such as cancer of the bladder or uterus, and, as such, treatment is unavailing.

The surgical forms of anuria that call for treatment are calculous anuria, post-operative anuria, infective anuria, and hysterical anuria. The latter is included as it may complicate surgical operations. Calculus anuria may be due to the blocking of one ureter with a stone, where the other ureter is free. The suppression of the urinary flow during an attack of renal colic may continue for some hours and pass off with the subsidence of the pain. If it is continued for a longer time it is likely that the other kidney has already been destroyed by calculous disease, and surgical interference becomes urgently necessary. This form of suppression (obstructive) is at first unaccompanied by symptoms of uræmia. The operative measures consist in exploring the kidney and ureter of the side at which pain was most recently felt. The earlier such cases are submitted to a surgeon the better will be the prognosis. About 50 per cent may be saved by prompt operative interference.

Post-operative anuria may be met with in any form of surgical interference in the urethra or bladder or in the kidney. The practitioner is most likely to meet with it after the use of instruments for dilatation of stricture of the urethra, or after the passage of a catheter in a case of enlarged prostate with retention or urine. Some hours after the passage of instruments, often after the first passage of urine, the patient has a rigor, the temperature rises to 102° or 103°, the urine rapidly diminishes, the secretion ceases, and the patient becomes restless, delirious, and finally dies comatose.

The prophylaxis of this very fatal complication has been described under URETHRAL STRICTURE. It is summed up in the following: avoidance of traumatism in passing instruments, asepsis, protection against chills, administration of urinary antiseptics during the treatment of stricture.

When suppression sets in there are three objects to be aimed at: (1) To re-establish the flow of urine; (2) To remove toxic bodies from the circulation; (3) To maintain the strength of the patient.

Diuretic drugs should be given, e.g., citrate of potash 7 to 10 gr., spiritus ætheris nitrosi 20 to 40 min., infusion of buchu or infusion of scoparius 1 to 2 oz., every four hours. The rectum should be washed out and a large saline enema introduced. Counter-irritation to the kidneys should be applied in the form of local poultices, mustard leaves, or turpentine stupes, or as dry cupping.

Should those means fail, infusion of saline solution (1 dr. to the pint) should be given into the median basilic vein. Two pints of normal saline solution are introduced under strictest aseptic precautions. In the writer's experience this is the most powerful means of producing diuresis at the command of the surgeon.

The bowels should be freely opened. If the patient is not vomiting, an ounce or more of magnesium sulphate in a small quantity of warm water may be given by the mouth. A large, hot saline injection may be passed into the colon by means of a long rectal tube, or an enema of soap and water, or one containing turpentine 1 oz., or sulphate of magnesia 1 oz. and glycerin ½ oz.

The skin should be made to act as freely as possible, but in producing diaphoresis it must be remembered that there is some tendency to collapse in these cases. A hot pack, hot dry air, or vapour bath may be given. Pilocarpine should be used with caution. A hypodermic injection of $\frac{1}{60}$ gr. may bring about a copious and beneficial diaphoresis.

Stimulants should be freely given. Alcohol, ammonium carbonate, digitalis, and strophanthus may be administered by the mouth, and strychnine hypodermically in doses of $\frac{1}{30}$ gr. every four hours. *J. W. Thomson Walker.*

URTICARIA.—The successful management of this troublesome and intractable malady consists in discovering the cause—if one can.

Amongst common causes the following should be borne in mind: (1) External parasites; (2) Articles of diet, e.g., shell-fish, mushrooms, pickles, pork, eggs, cheese, oatmeal, strawberries or other fruits, and sour wines (but almost any article of diet may cause it in persons who have an idiosyncrasy: an intelligent patient, by keeping a watch on his diet and noting the incidence of attacks, may sometimes discover for himself the offending article); (3) Certain kinds of clothing, e.g., flannel, or the wearing of dyed materials next the skin; (4) Uterine and ovarian irritation in women; (5) A gouty constitution. Enquiry should also be made as to the use of any possible external irritants, e.g., skin or hair lotions.

In *acute cases* it is well to begin treatment with a purge and, if there be any signs of gastric irritation, by the administration of an emetic. These may be followed by sod. phos. 1 dr. every four hours. Meanwhile the diet should consist of milk only. Locally, one of the applications mentioned below may be used to relieve itching.

In *chronic cases*—failing the discovery of any cause—the treatment is: (1) Local; (2) General.

1. Itching may be relieved by warm baths containing either 2 oz. of potass. sulphurat., or 4 oz. of sod. bicarb. to 30 gal. of water; or menthol or naphthol soap may be used with an ordinary warm bath. After remaining for ten to fifteen minutes in such a bath, the skin is lightly dried and one of the following applied:—

(*a*). Lotions:—

℞	Acid. Carbol. or Menthol	ʒj
	Glycerin.	ʒij
	Sp. Rect.	ʒiij
	Aq. Camph.	ʒv

℞	Lotio. Carbol.	1–40

℞	Acid. Hydrocyan. dil.	ʒj
	Liq. Carbon. Deterg.	ʒij
	Aq.	ʒx

(*b*). Ointments:—

℞	β-Naphthol	ʒj
	Lanolin	ʒij
	Ung. Simp.	ʒj

℞	Vaselin. Salicyl.	2 per cent

℞	Ung. Diachyl.	pt. æq.
	Ung. Picis	

(*c*). A dusting powder of oxide of zinc, talc, camphor, and starch.

Linen or silk should be worn next the skin both day and night, and the bedclothes should not be too heavy.

2. Many *internal remedies* have been recommended, some of which succeed in one case, some in another. Amongst these are the following: salol (10 gr. thrice daily); ichthyol (5 min. in capsule thrice daily); calcium chloride (10–20 gr. thrice daily for three days); citric acid in effervescing mixture; antipyrin

or phenacetin ; colchicum in gouty cases ; thyroid extract, gradually increased ; atropin (gr. $\frac{1}{100}$ – $\frac{1}{120}$ in pill at bedtime).

The use of the high-frequency current (fifteen minutes on the couch, current of 300 ma. and local effluve) is also said to have cured some obstinate cases.

In **Giant Urticaria** the above internal remedies may be tried, but those most likely to be useful are calcium chloride, colchicum or the salicylates. In acute cases a purge of pulv. rhei. co. may cause the disappearance of the swelling.

Lichen Urticatus is the form of urticaria most commonly met with in children, and must be treated on the above lines. Worms must always be remembered as a possible cause in such cases. Locally, the writer has found tar applications relieve the itching best, with or without the aid of the baths mentioned above. Internally, small doses of rhubarb, soda, and grey powder are sometimes helpful, or 5-min. doses of ichthyol with an equal quantity of glycerin. Quinine ($1\frac{1}{2}$ gr. for each year of the child's age) may be given at bedtime.

(See also PRURITUS.)

Robert Hutchison.

UTERINE HÆMORRHAGE.—(See HÆMORRHAGE, UTERINE.)

UTERUS, CARCINOMA OF. (See MENORRHAGIA.)

UTERUS, DISPLACEMENTS OF.—These do not occupy their former high place in gynæcology, but require treatment if they cause pain or discomfort.

1. **Anteflexion and Anteversion.**—The virgin uterus is generally markedly anteflexed and anteverted, and unless the uterus is bent forward by the contraction of inflammatory adhesions—a very rare condition—anteflexion and anteversion require no treatment. The fact that the cervix can be felt " bulging into the rectum " does not prove the presence of any abnormal condition The presence of marked anteflexion in a case of spasmodic dysmenorrhœa does not prove that the anteflexion is responsible for the dysmenorrhœa.

2. **Retroflexion and Retroversion.**—These conditions, which may be considered together for our present purpose, are very common, and are often of no importance, causing no symptoms and needing no treatment.

If the retroversion is due to a slight degree of prolapse, this should be treated, usually by a ring pessary. If there is no prolapse, and the patient complains of backache, increased in severity just before the periods, pain on defæcation, and dyspareunia, and it is found that pressure on the body of the uterus or ovaries through the posterior fornix causes pain, we may conclude that the retroversion is responsible for some or all of the symptoms. The treatment consists in pushing up the fundus, preferably by one or two fingers, and then anteflexing and anteverting the uterus by bimanual pressure. If the reposition is successful, a Hodge's pessary should be inserted to keep the uterus in the proper position. If attempts at digital or manual reposition fail, the sound should be used *secundum artem.*

Insertion of a Hodge's pessary without previous correction of the faulty position is useless. After insertion of the pessary an examination should be made to ascertain whether the uterus is remaining in the proper position or not, as the presence of the pessary will only aggravate the symptoms if the retroversion returns.

If the fundus of the uterus is found to be fixed, probably by adhesions, no forcible attempt at reposition should be made. The choice of treatment in such a case lies between attempts to secure absorption of the inflammatory adhesions by rest, hot douches, medicated tampons, etc., and abdominal section.

It is most unwise to tell the patient that her uterus is bent, or in the wrong position. To do so is to sow the seeds of neurasthenia and chronic invalidism.

3. **Prolapse of the Uterus and Vaginal Walls.**—The treatment of these conditions depends on the degreé of prolapse. It can be considered most easily under the following five headings: (*a*) Cystocele; (*b*) Rectocele; (*c*) First degree of prolapse of the uterus, i.e., when the uterus is lower down than it should be, but is still entirely inside the vagina; (*d*) Second degree of prolapse, i.e., when the uterus is partly inside the vagina and partly outside; (*e*) Third degree of prolapse, i.e., when the uterus is entirely outside.

(*a*). *Cystocele.*—If there is simple relaxation of the anterior vaginal wall, this may possibly be remedied by douches containing alum. If a pessary is needed, a ring is best when the vagina is roomy, and a small Graily Hewitt's pessary when the vagina is atrophied in elderly women.

(*b*). *Rectocele.*—This condition is often found by itself, particularly in middle-aged and elderly women. No form of pessary, except perhaps Zwancke's butterfly pessary, will do any good. The best treatment is posterior colporrhaphy, with advancement of the perineum.

(*c*, *d*). If the vaginal orifice is not too large, a ring pessary should be used, except in cases where the rectum is tender. In such cases a Hodge's pessary often gives better results, its surface in contact with the rectum being "bevelled" as it were. If the vaginal orifice is too large for a ring to be retained, the choice lies between a cup and stem pessary attached to a waist-belt, or some operative procedure.

(*e*). In cases of complete prolapse, the first thing to do is to push the uterus, bladder, and inverted vaginal walls upwards. This is done easily as a rule, but occasionally it is impossible until the patient has lain in bed for twenty-four hours or so, preferably with the pelvis raised. In rare cases an anæsthetic is necessary. To keep the uterus up, recourse must be had to a cup and stem pessary, or to operation.

The friction ulcers seen commonly on the exposed surface of the cervix and vaginal walls usually heal in a short time when the uterus is kept in its place. A douche of lead lotion is to be advised.

A patient who is wearing a pessary should use an astringent douche, e.g., a solution of alum or tannic acid, and should be told that she must not go longer than three months without having the pessary changed.

4. **Chronic Inversion of the Uterus.**—This should be treated by continuous pressure with Aveling's repositor. The vagina should be packed with gauze so that the repositor cannot slip, and the patient should be examined at short intervals while the instrument is *in situ*. If these precautions are not taken, the edge of the repositor, blunt though it is, may cause ulceration, or the instrument, having done its work, may become gripped by the cervix and retained in the cavity of the uterus.

H. Russell Andrews.

VAGINISMUS.—In cases where sexual intercourse is impossible on account of spasmodic contraction of the sphincter vaginæ, often accompanied by adduction of the thighs and sometimes by opisthotonos, a careful search should be made, under an anæsthetic if necessary, for any tender spot. If any such local cause can be found it must be treated (*vide* DYSPAREUNIA). In some cases it is found that the hymen has never been satisfactorily stretched or torn, and incisions or removal under an anæsthetic may cure the vaginismus. In other cases nothing abnormal is found. These should be treated by forcible dilatation under an anæsthetic, or, better, by incisions made at each side of the vulva, outwards and backwards, dividing some of the fibres of the levator ani. These

incisions should be sewn up so that skin is brought to vaginal mucous membrane, not skin to skin and mucous membrane to mucous membrane. By this method of suture permanent enlargement of the orifice is secured. Some operators dissect off the whole of the hymen. In many of these cases there is a neurotic element, which must be treated by improvement of the general health, etc.

H. Russell Andrews.

VARICELLA.—(See CHICKEN-POX.)

VARICOCELE.—The treatment required for this condition may be either palliative or radical. Palliative treatment is sufficient for the great majority of cases, but radical measures are sometimes indicated when the local trouble is great, and are inevitable when "Service requirements" call for their employment. When free to choose, the surgeon will but seldom operate. The slighter cases do not require such treatment, and the graver ones often suggest the co-existence of an underlying psychological abnormality which no operation can reach or benefit. There are, moreover, some special risks connected with the operation itself. The local trouble—entailing pain and distress as it does—may indeed act as a natural check to unwholesome outbreaks of excessive emotional excitement, and so even subserve on the whole to the advantage of the patient. It is a fact that the melancholia which is sometimes associated with these cases may be increased by an operation which is quite successful in its local results. On the other hand, when the local trouble is serious, but at the same time unaccompanied by the graver symptoms of neurosis, excellent results may be expected. Even then, however, the operation is not one to be undertaken lightly.

It has been stated by eminent authorities that atrophy of the testicle never follows varicocele. It seldom does, though an abnormal softness and flabbiness of the organ is not infrequently noticeable; but that atrophy may occur I am certain, for I have watched its development. It must be admitted, however, that atrophy of the testicle following varicocele occurs most commonly as a direct result of hopeless anatomical injury inflicted during operation, and which has sometimes included not only destruction of the small veins of the areolar tissue surrounding the vas—on which the parts below the seat of operation depend for venous return after the main trunks have been ligatured—but even ligature of the spermatic artery itself. These risks are to be avoided by careful operation. The areolar tissue surrounding the veins which are to be tied and removed must not be wounded or injured, except in so far as is necessary to expose the veins for dissection. The dissection must then be made close and clean off the veins, conserving most carefully the tissue in which they lie embedded. On no account are the veins to be separated by any crude incision through the connective tissue uniting them with the other constituents of the cord. It is also to be remembered that even in careful and experienced hands the maintenance of an adequate venous return is not absolutely assured. The risks are slight if due care be exercised, but the minute veins of the connective tissue have been known to prove unequal to the task imposed on them.

For the majority of cases treatment is simple. We are to enjoin obedience to well-known laws of health. Regular exercise, attention to the state of the bowels, avoidance of sexual excess, and sometimes the desirability of marriage, should be specially recommended, and for local measures the use of a suspensory bandage and frequent cold bathing. The indications for operation are: (1) A large varicocele with pain on standing or after exercise, and increased by hot weather or sexual excitement; (2) "Service demands." Many young men otherwise eligible are refused admission to the public services for a small

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varicocele. It is necessary for their admission that this should be removed, though there are no surgical indications for the operation.

The Operation.—The veins are to be carefully dissected from other structures of the cord through an inch-long transverse incision over the external abdominal ring, and excised between ligatures, one above and the other below. The cord may be shortened at the same time by transfixing the stumps of the cut veins and tying their ends together. No drainage is required. The patient should be kept in bed, or in a recumbent position, until the wound has soundly healed and a strong cicatrix has formed. In from twelve to fourteen days he may get about with a suspensory bandage, but it will be from four to five weeks before the full beneficial effects of the operation will be experienced. Before undertaking the operation, any atrophy of the testicle present at the time should be noted.

Rutherford Morison.

VARICOSE VEINS.—Treatment as affecting the leg only will be considered. Varicocele and hæmorrhoids are separately dealt with elsewhere, and other varieties of varicose disorder are by comparison of minor surgical importance, and their treatment in the main is deducible from the general features of that applying to the leg. The treatment may be either palliative or radical.

In many cases no appreciable discomfort is experienced from even large varicose veins, and for these, beyond cold bathing and rubbing, nothing is needed.

In a large number of instances fatigue is felt after walking or prolonged standing, and there is a sense of fullness and heaviness in the limb. The indications will generally be to remove any hindrances to the return of venous blood from below, such as tight garters and corsets, fæcal accumulations in the sigmoid flexure, abdominal tumours, etc., and to forbid prolonged standing.

Local treatment by an efficient support is of the greatest importance. A well-fitting elastic stocking is most easily applied and most serviceable. These require, however, frequent renewal, as they soon become useless, and the yearly cost of their upkeep is considerable. An elastic bandage, or one possessed of elasticity, such as of flannel or crape, if carefully applied from the foot upwards every morning before rising from bed, serves the same purpose as the elastic stocking, and without expense. Rubbing the limb, especially from below upwards, and cold bathing are valuable aids towards keeping the skin healthy and the veins free from engorgement. For the majority of patients I know of no exercise so suitable as cycling.

Cases for Operation.—In most instances the varicose changes occur in the internal saphenous vein and its tributaries. In these cases—and in these only—operation gives very satisfactory results.

The Indications for Operation are : (1) Nutritional disturbances of the skin of the leg, e.g., eczema and ulcer ; (2) Adhesion of the dilated veins to the thin, stretched, overlying skin, which makes rupture possible ; (3) Swelling, pain and weakness in the leg, which have resisted other treatment ; (4) In some instances inflammation and thrombosis of the diseased veins.

Thus operation may be specially called for when thrombosis is gradually extending upwards towards the saphenous opening, and threatening to invade the deep trunks, or when portions of the thrombus have been detached, and have caused symptoms of embolism. In these inflammatory conditions the upper end of the vein should be ligatured at the commencement of the operation, in order to obviate *immediate* risks of embolism.

The Operation. — Many operations are described, but only two require serious consideration. These are : (1) Excision of the upper part of the internal saphenous vein (Trendelenburg's operation) ; (2) Excision of the vein from

the ankle to the saphenous opening. Our choice between these two operations can be settled by a test. The veins are to be first emptied by elevation of the limb. Then, if the finger be placed over the upper part of the vein, and pressure on it prevents distension of the vein when the patient stands up, excision of the upper portion of the vein will give a satisfactory result. Otherwise excision of the whole leg and thigh portion of the vein is indicated. The very long incision required for this has always in my experience healed without trouble, though it must be remembered that any operative interference with veins, apart from the risks of sepsis, which are avoidable, are attended by the danger of pulmonary embolism, from which several deaths have been recorded.

The incision should as far as possible avoid the most unhealthy portions of skin. Though it must cross the bends of a sinuous dilated vein occasionally, it should on the whole take a marginal course, so as to run clear of the thin, stretched skin by which the vein is covered. When skin and vein are adherent, the skin must be excised with the vein. *Rutherford Morison.*

VARIOLA.—(See SMALL-POX.)

VERTIGO—Is the result of many pathological states ; the following include the more common of these :—

1. **Ocular Vertigo.**—Treatment consists in the correction of the ocular defect (paralysed muscle, myopia, etc). (See EYE, INJURIES OF).

2. **Aural Vertigo** (Auditory vertigo, Ménière's disease).—It is first necessary to negative the existence of any removable exciting cause (cerumen, tympanic catarrh, active middle-ear disease). Gout and syphilis are held to act in some cases as a predisposing cause ; any evidence of active manifestation of either will call for their appropriate treatment. (See EAR (Internal), GOUT, and SYPHILIS.)

In all cases, counter-irritation behind the ear is useful. Iodine should be applied every night until the skin is blistered : tinct. iodi., liniment iodi., āā. Internally, the bromides and iodides are of great value, especially if combined with belladonna.

R	Potass. Bromid.	gr. xv	Tinct. Bellad.		℥v
	Potass. Iod.	gr. x	Aq.	ad	℥ss
	Liq. Arsenic.	℥iij			

Thrice daily in a little milk after food.

In obstinate cases, quinine sulphate is worth a trial, 3–10 gr. thrice daily in milk.

Another remedy which has been strongly recommended is the administration of salicylate of sodium with gelsemium :—

R	Sod. Salicyl.	gr. xv	Tinct. Gelsem. Semp.		℥xx
	Sp. Ammon. Co.	℥xv	Aq.	ad	℥ss

Three times daily.

In some of these cases the condition is associated with, perhaps dependent on, senile cardiovascular changes, and due attention to arrest of high blood-tension will give relief. In a considerable number, spontaneous cure may be looked for, usually with more or less complete deafness. The possibility of surgical interference should always be considered. (See also EAR, AFFECTIONS OF.)

3. **Gastric Vertigo.**—Recurring vertigo sometimes occurs in the subjects of various stomach ailments. Some authorities insist that in such, the dizziness is always due to a coincident aural cause. In treatment, it is certainly important to make sure that no other origin for the vertigo is present. The stomach

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affection may be comparatively trivial, or grave. Relief can only be given by treatment appropriate to the gastric condition. (See STOMACH.)

4. **Neurasthenic Vertigo.**—The subjects of neurasthenia not infrequently complain of recurring dizziness, and this symptom may be a very prominent feature of their sufferings. Their disordered imaginations conceive it to indicate grave cerebral peril. To reassure the patient is an important part of the treatment, which otherwise consists in the general management of the neurasthenic state. (See NEURASTHENIA.)

5. **Epileptic Vertigo.**—Epileptics are prone to vertigo; the attacks may alternate with, or replace, the more typical fits. The treatment is that of epilepsy.

6. **Migrainous Vertigo.**—True migraine may manifest itself in dizzy fits. (See MIGRAINE.)

7. **Vertigo from Organic Diseases of the Central Nervous System.**—Attacks of vertigo are sometimes an early or late sign in grave disease of brain or cord. They may occur in acute brain conditions such as cerebral hæmorrhage, or in chronic states, as cerebral or cerebellar tumour Tabes dorsalis, or insular sclerosis, are examples of spinal cord disease in which vertigo is common.

8. **Cardiovascular Vertigo.**—The subjects of arteriosclerosis are exceedingly prone to vertigo, which, with or without epileptiform seizures, is frequently a prominent feature. In association with bradycardia, it constitutes the Stokes-Adams symptom-complex. The vertigo calls for no special treatment beyond that of the associated circulatory changes. (See ARTERIOSCLEROSIS.)

In addition to the above, a considerable number of diseased states may manifest themselves by vertiginous symptoms. In anæmia from any cause, and chronic uræmia, vertigo may be the prominent complaint. Constipation, and the presence of certain intestinal parasites, also may give rise to troublesome giddiness. Sea-sickness and cliff-sickness are examples of vertigo occurring in healthy people. For the treatment of all these, the reader must be referred to the appropriate sections of this work.

Lewis Smith.

VOMITING IN CHILDHOOD.—In children, as in older persons, vomiting may be due to gastric derangement or may be symptomatic of a general disturbance, such as an eruptive fever; or of the onset of a local disease outside the alimentary canal, such as nephritis, cerebral disease, etc.

Symptomatic vomiting need not be interfered with unless it becomes distressing. Should it be so a sedative may be given, such as $\frac{1}{12}$ gr. of cocaine in a teaspoonful of water (to an infant of six months old), or a hypodermic injection of $\frac{1}{60}$ gr. of morphia. Obstinate vomiting may result from a hernia or invaginated bowel, and must be treated, of course, by appropriate measures for relieving those conditions. Vomiting arising towards the end of an attack of diphtheria is suggestive of heart failure, and the proper steps must be taken at once to meet this formidable complication.

When vomiting occurs in gastric derangement, it is the result of catarrh of the stomach set up either by a chill or by inappropriate or excessive feeding. It is common enough in infants, and is one of the chief causes of the high mortality amongst the children of the poor. Mere regurgitation in a healthy child, immediately after a meal, of a portion of the food taken is not to be looked upon as a sign of gastric disturbance. The milk is returned without retching or any sign of effort, and its appearance merely shows that more food has been swallowed than the stomach can comfortably retain. Even sucking infants who are strictly confined to the breast are subject to catarrhs, during which the milk is vomited sour and curdled, with every sign of gastric distress. But it is a mistake on this account to wean the child. All that is necessary is to forbid suckling for twenty-four

or forty-eight hours, feeding the child in the meantime with barley-water, flavoured, in alternate bottles, with a teaspoonful of extract of malt. The mother's milk can be drawn off with a breast pump, but it must not be given to the infant. For medicine we may order :—

℞ Zinci Sulphat. gr ¹/₁₂ | Inf. Chirettæ ad ʒss
Glycerin. ♏v |

To be given three times a day before food:

Or, 3 gr. of citrate of potash in the same bitter infusion.

In hand-fed babies, vomiting from gastric catarrh at once suggests a revision of the dietary, for, as in the case just referred to, a diet which is well suited to a healthy stomach often ceases to agree in the altered conditions. If the vomited matters are sour, special attention should be paid to the quantity of milk given in each meal, and it may be necessary to reduce this to a half, a quarter, or a sixth part of that originally allowed, or even to forbid it altogether. Its place can be taken by veal broth made weak and thickened with barley and strained; fresh whey with cream and barley-water; or whey and barley-water with Mellin's food. The size of the meal is also of importance. Vomiting of the food must be taken to show that too much has been swallowed, and therefore less must be allowed for the next meal. In bad cases, 1 teaspoonful at a time is often all that can be retained. If so, this must be given every quarter of an hour. If the child is very weak, cold white wine whey in teaspoonful doses may be given frequently.

It is, of course, essential that everything ordered should be perfectly fresh and in good condition, and that attention be paid to the absolute cleanliness of the spoons and feeding-bottles. For medicine the remedies used may be those above recommended. But we may also order small doses of arsenic or ipecacuanha with an alkali and bitter infusion, or a combination of the tinctures of rhubarb and nux vomica. Thus, for a child of six months old :—

℞ Liq. Arsen. (aut Vin. Ipec.) ♏ss | Glycerin. ♏x
Potass. Citrat. gr iij | Inf. Chirettæ ad ʒss

To be given three times a day.

Or,

℞ Tinct. Nucis Vom. ♏½ | Glycerin. ♏x
Tinct. Rhei Co. ♏ij | Aq. Menth. Pip. ad ʒss

To be given three times a day.

In cases where the vomiting is obstinate, ingluvin in doses of $\frac{1}{6}$ gr. every three hours is often a successful remedy. Another equally valuable one is calomel: $\frac{1}{8}$ gr. to be laid upon the tongue every hour.

If the stomach contractions are violent, a poultice containing $\frac{1}{6}$ part of mustard should be applied for several hours to the epigastrium. If the vomiting has persisted for several days before the child comes under observation, and the gastric irritability is not quickly allayed, it is well to wash out the stomach.

In hand-fed babies, vomiting, if neglected, or unskilfully treated, is apt to become chronic. In such cases it will be noted that the feet and legs are habitually cold, and the first step in the treatment will consist in covering the lower limbs and feet with a thick layer of cotton-wool. This simple measure in itself is often successful, and the sickness ceases when the feet are warm. At the same time, measures must be taken to prevent a fresh chill, and it is well to revise the dietary upon the lines already laid down, and, for medicine, to prescribe one or other of the remedies recommended above.

An occasional form of vomiting which, if it continues, may reduce an infant to a state of extreme emaciation, and even prove fatal, is that which results from monotony of diet, the child being fed morning, noon, and night on the same thing. Each meal is vomited with little effort, quite unchanged, and the infant seems to keep almost nothing on his stomach. If a change be made to another food the vomiting ceases for a day or two, but returns as soon as the stomach has got used to the alteration. The simple remedy for this state of things is variety in the meals, and a mere difference of flavour is all that is needed. A teaspoonful of Mellin's food or extract of malt added to each alternate bottle during the day, with a third food for the night, usually makes a sufficient variety ; but in exceptional cases the diet must be so arranged that no two meals in the twenty-four hours shall have quite the same taste.

In the case of older children, vomiting must be treated on exactly the same lines. A revision of the dietary is essential. Sweets and fruit must be forbidden, and milk and starch only allowed in very small quantities ; indeed, in many, if not in most children, vomiting is apt to persist as long as milk continues to be taken. If the attack is acute, it is best to allow nothing but water, hot or cold according to the taste of the patient, and to apply a hot linseed-meal poultice containing $\frac{1}{8}$ part of mustard to the epigastrium for six or eight hours. The withholding of food is readily submitted to, as there is complete distaste for nourishment of every kind. It is judicious, however—more, perhaps, for the sake of the friends than for the benefit of the patient—to make use of a nutritive suppository several times in the day.

While the vomiting goes on, the washing bath must, of course, be discontinued, for so sensitive does the patient become to impressions of cold that the smallest exposure tends to keep up the derangement. It is best to forbid washing of any kind except sponging of the face and hands, and to keep the child in bed with a hot bottle to his feet and a layer of cotton-wool over his abdomen and chest. For medicine he may take the sulphate of zinc mixture recommended above, increasing the dose of the sulphate to $\frac{1}{10}$ or $\frac{1}{8}$ gr. ; or use, as alternatives, any of the other remedies which have been suggested.

When vomiting ceases, weak veal or chicken broth with rusk or dry toast can be given ; afterwards, as the appetite improves, an ordinary diet can be returned to, but the change must be made cautiously and by gradual steps.

These attacks are probably due to acute gastric catarrh. They are accompanied by a rise of temperature, which may reach 103° or higher on the first day, and the liver is generally congested. If it can be felt to be obviously enlarged, an aperient dose of calomel should be given as soon as the stomach can keep it down.

In cases where the attacks occur, as they may do, at regular intervals—every few weeks or months—they are often spoken of as periodic or cyclical vomiting.

There is one other form of vomiting in infants which must not be omitted. It begins at or soon after birth, and is the consequence of interference with the passage through the pyloric opening of the contents of the stomach. The obstruction at first is probably purely spasmodic, but its continual repetition sets up hypertrophy of the pyloric wall and narrowing, or even practical closure at that point, of the channel of the tube. If the case be seen and treated early, before the muscular hypertrophy has begun or made much way, the spasmodic contractions may often be put a stop to and the thickening process averted by suitable measures.

The spasms seem to be set up by the mere presence of food in the stomach. We must, therefore, take care that the food is as little irritating as possible. If, then, the mother cannot suckle her infant herself it is advisable to procure

a wet-nurse. Failing this we may give peptonized milk freely diluted with three parts of barley water, or any of the foods recommended elsewhere for new-born infants. (See INFANT FEEDING.) At the same time the three rules laid down at the beginning of the article referred to must be scrupulously observed. As a help to digestion ½ gr. or 1 gr. of Finckler's papain, according to the size of the meal, should be given with an equal quantity of bicarbonate of soda in half a teaspoonful of water at each time of feeding. The quantity allowed must be regulated according to the degree of irritability of the stomach. Sometimes a few teaspoonfuls are all that can be borne. Even if the infant be at the breast, due regard must be paid to the quantity of milk drawn at each meal, so that no more is allowed at one time than the patient can retain. If only small quantities can be kept down, it is best to give the breast milk through a feeding-bottle.

In addition to providing an unirritating food we have to control the abnormal sensitiveness of the gastric mucous membrane. With this object the stomach should be washed out with normal saline solution every other day, in order to clear away undigested and fermenting food and irritating mucus. Afterwards a small dose of opium ($\frac{1}{8}$ to $\frac{1}{6}$ min.), as recommended by Heubner, must be given in a few drops of water. If no hypertrophy have occurred, these measures are often successful. If, however, the symptoms persist in spite of treatment, a surgical operation becomes inevitable if life is to be saved.

Eustace Smith.

VOMITING, CYCLICAL.—Recurrent pyrexia, and vomiting, with or without headache, are common, especially in neurotic children, and are regarded by some as pure neuroses dependent upon instability and hypersensitiveness of medullary and higher nerve centres. In a certain proportion of cases, when no other cause can be ascertained, these curious periodic attacks are no doubt the outcome of an emotional temperament. But in some they are attributable to excess in carbohydrates. Eustace Smith claims that these are cured by supplying a diet free from starch and sugar, and describes them as instances of "food pyrexia."

In another class of cases, cyclical vomiting and pyrexia are associated with the presence of diacetic acid in the urine and an odour of acetone in the breath. Bicarbonate of soda in large doses, during and after an attack, is said to give good results.

It cannot be denied that idiosyncrasies with regard to diet are many and various in neurotic children. No set rules can be laid down for feeding them. They may like or dislike articles of food which disagree with them, but are wholesome for children in general. The healthy child's meat may be the neurotic child's poison. One only learns by experience how to diet them. The simplest, and on the whole most satisfactory procedure, is to prescribe an ordinary mixed diet, with a caution against excess in any particular article which has been found to upset them. A rigid regimen seldom agrees permanently, although it may be advantageous for a time. Freedom from emotional excitement and mental and physical fatigue, and a healthy country life, are in all cases essential to success in the treatment of periodic vomiting, fever, and headache.

Leonard G. Guthrie.

VOMITING, NERVOUS OR HYSTERICAL, should be treated by isolation, and where the food is regurgitated from the œsophagus it may be necessary to feed with the stomach tube. As a rule the threat is sufficient.

Robert Saundby.

VOMITING OF PREGNANCY.—(See PREGNANCY, DISORDERS OF.)

WARTS—May be treated either by caustics or excision. Caustic treatment, which leaves little scarring, is sometimes satisfactory. The wart should be pared down so that the caustic can act on the deeper layers, and either nitric acid, or a mixture of salicylic acid 100 gr. to collodion 1 oz., recommended by Cheyne and Burghard, should be painted over the area. This treatment is repeated twice a day for about a fortnight, at the end of which time the warts will have disappeared.

If more radical treatment be desired, the whole wart should be excised. This must be done cleanly, since if any part is left recurrence will take place.

If an extensive crop of warts develop on the prepuce, the best treatment is to perform circumcision.

W. H. Clayton-Greene

WEIR-MITCHELL TREATMENT.—(See NEURASTHENIA.)

WHITLOW.—The suppurative condition of the fingers known as whitlow or felon usually results from a punctured wound with a septic instrument, or is due to subsequent infection of a simple cut.

It is usual to speak of four different varieties of whitlow, which depend upon the depth of the infection; and as the particular variety met with in a given case may require special treatment, all four will be alluded to under their respective headings.

1. *Subcuticular.*—The pus collects beneath the epidermis; there is often an exudation of blood-stained serum with very little pus, and the epidermis may be stripped up for some distance from the underlying dermis.

2. *Subcutaneous.*—In this form the infection tracks into a deeper level, and the tough tissue of the finger pulp becomes attacked. It is excessively painful owing to the tension which is produced, and if neglected may lead to the following varieties.

3. *Thecal.*—This is a suppurative tenosynovitis. The synovial membrane which accompanies the tendons along the flexor sheaths becomes infected, and the whole canal may in this way become filled with pus. In the case of the thumb and little finger, the results may be still more serious, owing to the communication which usually exists between the synovial membranes of the flexor sheaths and the great synovial membrane or palmar bursa which envelops the flexor tendons in the palm. Fortunately this accident is rare, but its occurrence is a very serious matter, often leading to destruction of the hand and permanent crippling.

The flexor sheath cannot be said to extend beyond the distal extremity of the second phalanx, so that whitlows which are confined to the region of the terminal phalanx and carefully treated should not give rise to this complication.

4. *Subperiosteal.*—In this form the infection gives rise to a periostitis, the periosteum of the terminal phalanx being attacked and necrosis of the bone a common result. The intimate connection of the skin and periosteum by the fibrous ligaments which traverse the superficial fascia favours this result.

GENERAL TREATMENT.—This consists in incising the tense and suppurating area as soon as possible, providing rest for the affected finger by a suitable splint, and in the application of antiseptic dressings. But while these directions appear sufficiently simple, it will be necessary to elaborate them according to individual cases.

In the subcuticular variety, which is practically painless owing to the pus lying superficial to the sensitive papillæ, a free opening can be made without any anæsthetic, and all undermined skin can be snipped away with scissors without the least discomfort to the patient.

The subcutaneous form is more difficult to treat, and it may be said at once that the causes of failure are usually an insufficient incision, and the absence of rest to the part. It often happens that an incision has to be made without an anæsthetic, and the timidity of both the operator and his patient results in an insufficient opening being made. Although with thorough cocaine anæsthesia the operation may be quite satisfactory, it is always advisable to give a general anæsthetic when possible.

In making the incisions into the swollen infected area, two precautions must be taken : (1) To see that the opening is adequate, so that the pus can discharge freely. This is not so easily achieved. Owing to the dense fibrous tissue in the part, as soon as the greater part of the exudation has been let out, the edges of the wound tend to close, and there is retention of the pus. To obviate this it is recommended that two elliptical incisions should be made, and a portion of skin and subcutaneous tissue be excised, so that the pulp is freely opened up, and sloughs should be carefully removed with a spoon ; (2) Care should be taken in making the incision that the flexor sheaths be not damaged. This precaution is very necessary, for it has often happened that an energetic operator, with the above rule in mind, has carried his incision right down to the synovial membrane of the sheath, and has caused an infection of it.

In the thecal form free incisions will be required opposite the centre of the second and first phalanges ; either central or lateral incisions may be made, but there appears to be no special advantage in the latter.

The subperiosteal form is treated in the same manner, but subsequently it will be necessary to remove the necrotic bone.

The After-Treatment is of much importance. Fomentations and baths of weak antiseptics are of undoubted value, but they are often overdone. It is rarely that a whitlow requires fomentations for more than three or four days, and much harm results from allowing the tissues to become sodden and unhealthy from too much water treatment. In favourable cases dry dressing may be applied in the first week, and as soon as pain has disappeared, gentle passive movements of the fingers should be undertaken to break down the adhesions which have a tendency to form in the thecal variety.

Unfortunately, the result is too often a stiff and useless finger, which may require amputation ; but this must be looked upon as a last resort. It is true that where the process tends to spread, and where there is a risk of infection of the hand and arm, amputation must be seriously considered, and again, where after careful treatment a useless appendage remains ; but while it is impossible to lay down absolute rules for these cases, it should be clearly understood that amputation is only called for in the acute stages, to avert a more serious condition ; and even where the finger appears totally and irretrievably destroyed, it is much better to wait until the suppurative process has subsided before venturing on the amputation. By such a course the free opening up of lymphatic spaces in the presence of an acute infection is prevented, and the surgeon is often able to save some part of the finger in the form of a stump, which will be of service to the patient. It is astonishing how often a bad suppurative condition of the fingers results in an almost complete cure.

The above remarks apply to the whitlows met with on the palmar aspect of the digits, but the allied condition on the dorsum—" perionychia "—is to be treated on similar principles, plus the free removal of the nail.

W. H. Clayton-Greene.

WHOOPING-COUGH.—The following contribution is based on the careful study of over 550 cases which have been under the writer's care in the whooping-cough ward at the Hospital for Sick Children, Great Ormond Street.

The treatment of whooping-cough constitutes one of the reproaches to the art

of medicine. We have no method by which we can shorten the disease, nor can we do more than pilot the case to recovery, modifying symptoms, guarding against complications, and making our patient as comfortable as we can during an illness which has no rival in its discomforts. A specific for whooping-cough has yet to be found. To all those I have tried (and they are over thirty in number), the handwriting on the wall is literally applicable : "Tekel" ("Thou art weighed in the balances, and art found wanting"). Nevertheless, much can be done to alleviate the sufferings of the patient both by general management and by the use of suitable drugs.

Treatment can be best considered under the heads of (1) General hygienic management ; (2) Special drug treatment ; and (3) The treatment of complications.

1. **General Hygienic Treatment.**—As soon as the disease is recognized, the patient should be isolated, and two rooms should be set apart for occupation by the patient and his attendant. The rooms should communicate with one another, or at least be on the same floor, and should be freed from superfluous furniture and hangings. If gas is laid on, the presence of a ring burner will be found of great utility, both for the preparation of food and for the vaporization of medicaments. One room should be kept as the day, the other as the night room. Carpets are not desirable in the sick-room, and in the absence of a cork linoleum floor covering, a waxed drugget, properly lined, should cover the whole floor. Nothing, however, is so suitable as cork linoleum, which is warm to the feet, quiet to walk on, and can also be readily cleaned with antiseptic solutions.

In the case of infants and small children, the cot should have a side which can be let down next to the nurse's bed, up to which it must be drawn. The nurse is then able to attend to the child without having to get out of bed. Cots with fixed high sides must be discarded. A bed-board or bed-table will be found most useful, not only as a support against which a child can lean during paroxysms of coughing or vomiting, but also as a place where he can always find a vessel into which he can vomit or expectorate, and where he will find a handkerchief, or rather its equivalent.

Preparation in the way of draw-sheets must also be made, as the involuntary passage of urine and motions during the paroxysms of coughing or vomiting are very common. On this account, older children may also be pinned up with a napkin. Because of this liability to accidents, the use of combination sleeping-suits is to be condemned, and a flannel nightgown or pyjamas should be adopted. Nothing tight should be worn around the neck. When it is impossible to provide a special attendant for the patient, it is most desirable that those who come in contact with the infected children should, when in the sick-room, wear an overall garment of a washing material, preferably a glazed holland.

Precautions against infection and reinfection should include the disinfection of all vessels, cups, dishes, and utensils used by the patient, before they leave the sick room. All accidental contamination of floor or clothing by vomited material should be rectified by the use of antiseptic solutions (carbolic acid 1–40, izal, sanitas, formalin), and handkerchiefs should be replaced by small squares of linen which can be burnt after use, or by pledgets of absorbent cotton wool. In older children, an enamelled basin (not an earthenware one) will be found most useful when vomiting is at all frequent. Its use not only makes for cleanliness, but affords a sense of security which is not unimportant in nervous children.

Ventilation.—Both rooms should be well ventilated and be capable of being thoroughly aired, but it is not advisable to adopt, in the early stages of the disease, what is now called the "open-air treatment." Ventilation is essential,

but the reduction of the temperature of the room below 60° is not advisable, and tends to increase the liability to bronchial catarrh and bronchopneumonia. On the other hand, it must be borne in mind that the temperature of the room is apt to become unduly raised by the means employed for the production of vapours used therapeutically. In the earlier stages, and as long as there are signs of bronchitis, the patient should be kept to the two rooms; but in warm weather, if the attack be not a severe one, there is no need to keep the child to the house, provided he does not associate with other unprotected children. In towns, the practical impossibility of isolation except within the house, makes it advisable to keep all cases of whooping-cough confined to the house during the first three or four weeks of the developed disease.

A recognition of the increased liability to pulmonary catarrh during and after whooping-cough, should make us insist on the careful clothing of children during convalescence. Both arms and legs should be kept covered. Prudence and not fashion must regulate the clothing.

Diet.—On account of the severe gastric disturbance, which is so marked a feature of many cases of whooping-cough, attention to the diet is essential. It must be light and nutritious. The meals must be small and frequent, and when vomiting is at all marked, considerable discretion as to the amount, character, and frequency of the feeds must be exercised.

In the early stages, the diet should consist of milk duly diluted with barley-water, water, or lime-water, of animal broths, milk puddings, jellies, custard, and eggs. When the febrile stage is subsiding, fish, and minced or pounded meat may be given, but all rich foods are to be forbidden. If vomiting is severe, iced milk, malted milk, peptonized milk, milk and soda water, or albumen water, may be tried; but if not retained, I have found nothing so useful as meat juice. This, in cases of extreme exhaustion, may be administered every quarter or half hour in 15- to 20-min. doses in a dessertspoonful of water. Sanatogen or plasmon may be used temporarily where milk is not tolerated, and if emaciation is marked, plasmon or virol may be tried.

2. **Drug Treatment.**—Perhaps for no disease have so many preparations been claimed curative as whooping-cough. No one drug can claim in any sense of the word to be a specific. A serum prepared by Dr. Leurieux was tried by me in three cases, without producing the least beneficial result.

The treatment can be divided into (*a*) Local, and (*b*) General or internal.

(*a*) *Local.*—Of these applications, undoubtedly the most useful are various inhalations. These are best administered by means of vaporizers, which cause the atmosphere of the room to become permeated with the medicament. Carbolic acid or cresolin I have found most useful. Cresolin has the advantage that it does not require such an aqueous vapour for its diffusion, and consequently the atmosphere is drier, while the risks of scalding or of accidental poisoning with carbolic acid are less. Cresolin is vaporized by means of a small lamp.

Creosote may either be used in a kettle, or sprinkled on a towel hung in the vicinity of the bed. The vapour is unpleasant and irritating. Creosote may be used in combination with other volatile disinfectants, as thymol, eucalyptol, carbolic acid, by sprinkling these on absorbent wool and then enveloping them with cotton wool and gauze, so that the irritant material cannot come in contact with the skin. With some such preparation balls, dolls, and other toys may be stuffed. Ten drops of the following preparation may be employed in this manner:—

℞	Thymol.	℥jss	Ol. Caryoph.	℥ij
	Creasot.	℥ijss	Æther. Acetic.	℥iv
	Acid. Carbol. pur.	℥ij		

Ten drops on cotton wool as an inhalation.

Turpentine, thymol, terebene, or eucalyptol may also be used as inhalations, in the strength of 1 dr. to 3 oz. of spirit and 7 oz. of water.

Many writers have advocated the employment of local applications to the mucous membrane of the throat, nose, and larynx by means of sprays, douches, or by direct application. I cannot speak at all favourably of any of these methods. Steam sprays are risky, and frighten children. The hand sprays are much less objectionable, but the results obtained from their use are quite incommensurate with the trouble, upset, and frequent aggravation of coughing and vomiting which too often attend their use. Painting the throat is useful if we wish to excite vomiting, but, apart from this, even applications of perchloride of mercury, repeatedly used, with the object of exercising germicidal influence on the suspected organisms of whooping-cough, have proved utterly useless at my hands. Cocaine has been used for its anæsthetic effects on the respiratory mucous membrane, and it is said with good effect, but it is far too risky a drug to employ without the greatest circumspection, on account of the susceptibility of some children to cardiac syncope from quite small doses of cocaine. Removal of enlarged tonsils or of adenoids is frequently of the greatest benefit to the patient, especially in the later stages of the disease, and I have seen obstinate cases promptly subside after the operation. Many a case of whooping-cough is unduly protracted by the omission to attend to this requirement.

While local applications to the throat are of little service, applications to the chest are most useful. Liniments produce local hyperæmia, some of their constituents are absorbed, the volatile constituents are inhaled, and in addition to this, the rubbing of the child's chest improves its musculature. Turpentine liniment is the most useful; another not unpleasant one is the following :—

R	Ol. Carui Ol. Succini	āā 3 parts	Ol. Eucalypt. Lin. Camphor.	2 parts 24 parts

M. Ft. lin. To be rubbed on the chest night and morning.

The chief indication for the use of liniments is the existence of bronchial catarrh or of collapse of the lung.

If the child is very weak or drowsy, and has extensive bronchopneumonia, a turpentine stupe should be given after the chest has been rubbed with vaselin.

After the application of a liniment, the chest should be covered with a cotton-wool jacket, which should be worn during the day, to be exchanged for a similar one, put on after the evening rubbing and worn during the night.

Recently, applications of fluorine have been recommended, but I understand from those who have tried them that they are unable to substantiate the exaggerated claims made as to their utility.

(*b*). *Internal Medication.*—The treatment of whooping-cough by internal medication can be divided into that of the catarrhal and of the paroxysmal stages, and that of decline and of convalescence.

In the catarrhal stage, the drugs of most use are the expectorants : ipecacuanha ; carbonate, chloride, and acetate of ammonia ; iodide of potassium ; spirits of nitrous ether ; squills. In this stage, phenazonum (antipyrin) or citrophen is often of use. When the secretion in the bronchi is thick and tenaceous, as evidenced by the sticky râles, iodide of potassium in 1- to 3-gr. doses is useful, but chloride of ammonium and apomorphia have both proved of little use in my experience.

In the paroxysmal stage, the drugs which are most likely to be useful are phenazonum, a combination of iodide of potash and chloral hydrate, glycerin of carbolic acid, and bromoform. In some cases heroin, belladonna, and bromides and cannabis indica have been useful, but for none of them can a

specific action be claimed. As a routine treatment the following mixture may be given :—

℞	Phenazon.	gr. iij	Vin. Ipec.		℥ v
	Pot. Iod.	gr. ij	Sp. Chlorof.		℥ v
	Ammon. Carb.	gr. j	Aq. Menth. Pip.	ad	℥ij

For a child seven years old. Two teaspoonfuls to be taken every six hours.

Chloral hydrate has been much more useful when given in combination with iodide of potash than when given alone.

Should vomiting be a marked symptom, a combination of 1–3 min. of glycerin of carbolic acid with 5 gr. of carbonate of bismuth, is most useful.

Belladonna, which is perhaps the drug most commonly used in the treatment of whooping-cough, has proved in the majority of cases of very little, if any use; but here and there cases are met with in which full doses of belladonna do seem to control the severity of the attacks. Cannabis indica has yielded just as satisfactory and unsatisfactory results as belladonna.

Should the paroxysms be very severe, a whiff of chloroform vapour will be found to be the best method of relieving them. Among the drugs tried, but which did not give definitely satisfactory results, were bromides, quinine, aristochin, drosera, grindelia, tinct. blattæ, salol, benzol, antimony, alum, arsenic, perchloride of mercury, pilocarpin, apomorphiae.

Bromoform, in doses of 5 min. is sometimes useful, but it must be remembered that on exposure to the light it decomposes and becomes inert, and what is much more serious, that bromoform is very apt to separate out of the mixture containing it, settle at the bottom of the bottle, and the patient, in more than one case which has come under my notice, has received a toxic, though fortunately never a fatal, dose from the bottom of the bottle.

When pulmonary catarrh is persistent, creosote is often of great use, and in combination with bismuth, acts most beneficially in cases of chronic intestinal catarrh.

During convalescence, nothing has proved so useful as cod-liver oil, given either with iron or with maltine. Quinine is much more useful during convalescence than during the acute period of the disease. Most of the iron preparations are useful during convalescence. When emaciation has been marked, the addition of plasmon or somatose to the food may be tried, or virol added to the diet.

Change of air is perhaps the best restorative, but the necessity for protection from exposure to cold must be impressed on parents and nurses.

3. **Treatment of Complications.**—Most of these should be treated as if the whooping-cough were not present, bearing in mind, of course, the risk which attends the use of sedatives in acute bronchial affections.

When there is much collapse of the lung, and the chest walls are unduly yielding, as in cases of rickets, I have succeeded in improving the thoracic breathing by applying a Martin's rubber bandage over the abdomen, so as to limit the abdominal and encourage the thoracic movements of respiration. The tightness of the bandage requires careful graduation, and it should only be applied intermittently at first ; but after a time it will be found that the child tolerates it quite well. In such cases, rubbing of the chest is a necessary adjunct to the use of the bandage.

Sublingual ulcers, which are surprisingly painless, are best painted with a solution of ½ dr. of salol in 2 dr. of glycerin and 1 oz. of rectified spirit. Should they spread, they are best treated by touching with solid nitrate of silver. Sores about the nose and mouth are often very tiresome and painful. In treating

them, preparations containing glycerin should be avoided, as should ordinary vaselin. Lanolin may be used, or white vaselin, which should form the basis of ointments used for the lips and nose.

The treatment of hæmorrhage, of subcutaneous emphysema, of hernia and prolapse, and of dilatation of the heart, calls for the addition of sedatives, but otherwise is conducted on the same lines as if no whooping-cough existed, except that operative procedures for the cure of hernia must be postponed. Empyemata should be opened and drained without delay. The liability to pulmonary tuberculosis, during and after an attack of whooping-cough, calls for the exercise of special attention to general hygienic measures, directed towards the prevention of infection with tuberculous material.

Isolation should be maintained for six weeks, and although for some months after an attack of whooping-cough, a child on catching cold will have a paroxysmal cough and will occasionally whoop, yet such cases need not call for isolation.

Arthur Francis Voelcker.

WORMS.—(See INTESTINAL PARASITES.)

WOUNDS OF THE ABDOMEN, PERFORATING.—These naturally fall into two groups: (1) *Those limited to the abdominal wall*; and (2) *Those that enter the peritoneal cavity.*

1. **Wounds of the Abdominal Wall.**—The treatment of the penetrating wounds of the abdominal wall sometimes offers a rather difficult problem to the surgeon, especially those cases in which it is doubtful whether the peritoneal cavity has or has not been reached.

There has been a good deal of discussion concerning the advisability of using a probe. One eminent authority solves the problem by stating that, as his probes are always sterilized, he has no necessity to hesitate in using them. But a probe, however clean, may become infected with dirt at the superficial part of the wound, and thus carry the germs towards the deeper planes, and if the parietal peritoneum be wounded, into the peritoneal cavity itself. Each case must be judged on its merits: in some the surgeon feels quite certain that the puncture does not extend far enough to be serious. Whenever there is doubt, instead of using a probe, it is best to enlarge the part of the wound in the skin and to carefully dissect this down to the deeper structures, step by step, until the end of the track is reached. If the peritoneum is wounded, the peritoneal cavity should be opened either at this spot, or through some other part of the abdominal wall, according to the situation and nature of the penetrating wound. The object of this is to explore the region of the perforation, so as to make sure of the condition of the adjacent structures. In these cases I am assuming that the wound of the parietal peritoneum is a slight one. Whether the wound perforates the peritoneum or not, it should be carefully cleaned with antiseptic lotion, and any injured tissue be removed; the skin incision should be sewn up with or without a drainage tube according to the judgment of the operator.

2. **Wounds Penetrating the Parietal Peritoneum.**—For treatment, these wounds divide themselves into three groups.

(*a*). *Slight cases* where the parietal peritoneum has been penetrated, without damage to the underlying structures. Here the only danger is that of septic infection, either at the time of the injury or subsequently; this infection may also take place at the time of the operation, although with care this should seldom occur. Once within the surface of the peritoneum, however, no amount of sponging or washing will get rid of germs. The area exposed should be gently sponged, any loose or frayed-out tissue removed, and the edges of the peritoneal

wound trimmed up and carefully brought together in the usual way. It is much open to discussion whether drainage tubes are really of much service in cases of peritonitis, a question which is dealt with at greater length under PERITONITIS, ACUTE GENERAL (q.v.). If the damage is slight and limited to the parietal peritoneum, it is advisable to leave in a small tube and a small plug of aseptic ribbon gauze, removing them after two or three days, at the end of which time, if no abnormal symptoms are present, they may be dispensed with. In these cases it is unwise to leave the tube projecting into the peritoneal cavity. If peritonitis should develop, the tube would probably be shut off from the general cavity by adhesions and be quite useless for drainage purposes. If signs of septic peritonitis should develop later, it may be necessary to open and drain the pelvis, as discussed in the treatment of that trouble.

(*b*). *Where the wound is extensive and has obviously penetrated the abdominal wall.*—In these cases an examination of the wound leads to the perforated spot at once. The wound must be laid open sufficiently freely to determine the nature and extent of the damage. Usually it will be found necessary to open up the peritoneal cavity through an incision in the middle line, or (to avoid the chances of ventral hernia) just to one side of it through the rectus abdominis. As a rule it is better to make this incision rather than to expose the viscera through the original wound. It is easier to limit any extravasation of intestinal or stomach contents, and to ascertain the extent and nature of the damage when the abdominal wall and viscera at the injured spot are not disturbed; for instance, in the case of a wound near the middle line in the region of the umbilicus, it would be best to make an exploratory incision through the linear semilunaris. In this way the injured region can be cautiously examined and dealt with without the disturbance of structures which would necessarily follow the opening up of the wound. Having learnt something from this exploratory incision, the penetrating wound itself should then be carefully opened up.

(*c*). *Cases where the viscera, generally a coil of intestine, escape through the wound into the abdominal wall* are generally easily diagnosed, but sometimes the coil of gut may escape into the plane of tissue lying between the parietal peritoneum and the abdominal muscles and, owing to the reflex contraction produced, it is impossible to diagnose this complication; but, if the case is seen some hours after the injury, the spasm may have diminished and the coil become distended, so that a definite and palpable swelling is present. The various features met with in these large perforating wounds depend, of course, upon the way in which they were caused, and their situation. In the last two groups we may have a wound of any of the abdominal viscera or even of the large vessels of the abdomen.

Wounds of the Large Vessels generally lead to the death of the patient in a very short time; sometimes, however, hæmorrhage from a large vein such as the common iliac may have been stopped by pressure. As soon as this pressure is released the bleeding starts again, and it may be impossible to tie the vein without the patient losing too much blood. In these cases, if the common iliac artery is tied, the bleeding ceases. It is best to apply a temporary ligature, taking care not to injure the vessel, so that as soon as the wounded vein is safely secured the ligature may be removed.

At first sight one might expect that a wound of the inferior cava at the upper portion and back of the liver would be immediately fatal; this, however, is not the case. As soon as the vessel is wounded the negative pressure produced by the suction of the diaphragm prevents the blood escaping.

The Liver.—Hæmorrhage from wounds of the liver itself can generally be stopped by passing a catgut suture deep through the substance of the liver on each side of the wound, so that when the ligature is tied, the oozing vessels are

pressed together with sufficient force to overcome the blood-pressure in them. If this method is not applicable, or should fail, the wound should be plugged with sterilized gauze brought out through the external wound and removed at the end of three or four days. It is necessary to have some form of drainage between the wounded liver and the exterior, because bile nearly always escapes from the wounded liver, and is very active in setting up peritonitis.

The Spleen.—If this organ receives a penetrating wound, and is actively bleeding when the peritoneal cavity is opened, the only satisfactory treatment is its total removal. Attempts to stop the hæmorrhage from this turgid organ by other means generally fail, whereas removal of a normal spleen does not seem to affect the patient afterwards, and is not accompanied by much shock. On the other hand, if the spleen is diseased (as for example in malaria), wounds have a greater tendency to continue bleeding than in the case of a normal organ, and the patient nearly always succumbs when a diseased spleen is removed. The right treatment therefore in an enlarged diseased spleen is to try and stop the hæmorrhage by suture, or plugging with gauze.

Penetrating wounds of the Stomach carry a higher mortality than wounds of the intestine ; the gastric juices seem to excite a most rapid and intense peritonitis, and further, the shock from wounds in this region is the greatest of any to which the body is liable. If the wound in the stomach can be found, the stomach wall should be enfolded by Lembert's sutures placed in the usual way.

Wounds of the Intestine must be treated in the same way as those of the stomach. One must remember that more than one coil may be wounded.

The experience of modern warfare seems to indicate that bayonet wounds of the abdomen involving the gut are by no means so fatal as was formerly held. Abdominal section followed by a search for the wounded gut on the field of battle is very unsuccessful, so that unless there are symptoms pointing to extensive perforation of intestine, the patients have a better chance when left alone, kept quite quiet, and sent carefully back to the base hospitals.

For a reason difficult to explain, wounds of the lower part of the colon seem to be more fatal than those of the cæcum or ascending colon.

In wounds of the *Kidneys* the hæmorrhage very often ceases spontaneously. If the bleeding continues, a tumour can easily be felt in the loin ; this should be cut down upon, the blood-clot turned out, and the wounded kidney examined. The wound should then be stitched together with catgut if possible, but if the kidney is badly wounded, it must be removed.

Penetrating wounds of the *Bladder* are nearly always caused by splinters from the pelvic bones, and are very often extra-peritoneal. The exact injury to the bladder must, of course, vary with the distension of the organ, direction of the wound, etc.

We know very little how penetrating wounds affect the *Pancreas*. Damage to other important organs and to the great nerve centres generally co-exists. In fact it would be almost impossible to get an uncomplicated penetrating wound of the pancreas.

H. P. Dean.

WRITER'S CRAMP.—(See CRAFT PALSIES.)

WRY NECK, SPASMODIC.—In this condition there is a clonic spasm of some of the muscles of the neck. The sternomastoid is more often affected than the trapezius. But other muscles may be involved: the splenius, the complexus, and the muscles of the sub-occipital triangle.

Many of the patients are the subjects of nervous inheritance, and the condition in others supervenes on a severe shock. The cause is probably cortical.

Careful examination is necessary in order to discover the muscles at fault. Before the patient comes under the care of the surgeon, the usual antispasmodic remedies and nerve tonics will have been employed. Before proceeding to the direct treatment of the nerve supply of the affected muscles, the possibilities of a reflex origin must be borne in mind; in other cases it has been said to originate in the position of the head assumed in astigmatism; these causes must be treated.

Injection of alcohol deeply around the nerves supplying the affected muscles may be tried before employing more radical measures. Failing this, neurectomy must be performed. If the sternomastoid or sternomastoid and trapezius are alone affected, it is usual to remove a portion of the spinal accessory nerve. This may afford immediate relief, but the result is as a rule quite transient, as a consideration of the nerve supply of these muscles would lead us to conclude.

The operation most generally necessary is that devised by Gardner and Reen independently—removal of a portion of the posterior primary divisions of the cervical nerves. This may be carried out by raising a triangular flap of skin, with its base in the mid-line extending from the occiput to the sixth cervical spine, and its apex at the mastoid process. The sub-occipital triangle and semi-spinalis muscles are exposed by dividing the muscles covering them and as much as possible of the nerves excised. *James Sherren.*

XEROSIS OF THE CONJUNCTIVA.—(See CONJUNCTIVA, DISEASES OF.)

XEROSTOMIA.—(See SALIVARY GLANDS, AFFECTIONS OF.)

YAWS (Frambœsia Tropica).—This disease is rarely met with in Europeans; when it does occur it is usually in neglected children who have lived in close contact with natives. Cleanliness, good food, and careful attention to the evacuations, greatly facilitate and expedite the cure.

There is no specific treatment that appears to reduce the duration of the disease, but iodide of potassium, and mercury in full doses, have a decided effect in aborting the successive crops of the eruption, though they do not prevent their occurrence.

Beyond cleanliness, and protection from flies and irritation, no local treatment is required in most of the growths. When ulcerated, ordinary antiseptic dressing will suffice; but touching with blue stone or nitrate of silver is useful if there be any tendency for the ulcers to become chronic.

The painful yaws, "crab yaws," on the soles of the feet are best treated by strong solution (20 per cent) of nitrate of silver dropped in, or the painful granulation at the base may be touched with nitric acid and so destroyed. *C. W. Daniels.*

YELLOW FEVER.—The older plans of treatment were more active than those employed now, but venesection was abandoned long before the general reaction against it set in. Calomel and quinine, in large doses (20 gr. of the former and 22 gr. of the latter) were at one time largely employed. A brisk purgative (calomel or a saline), is now used at the commencement of the attack, but should not be repeated. Hot baths and sinapisms to the epigastrium check the vomiting and relieve cerebral congestion. The food should be fluid, well iced, and given in frequent small quantities, but the total amount of fluid given should be large.

A number of drugs have been used, many of them of an antiseptic nature. Carbolic acid, in doses of 1–2 min. every hour, has been much employed. Alkaline

carbonates relieve the thirst, check the vomiting, and correct the burning acidity of the mouth so often complained of.

Sternberg's treatment is to give an ounce and a half of a mixture composed of 150 gr. sodium bicarbonate and $\frac{1}{3}$ gr. perchloride of mercury dissolved in a quart of water, every hour. It certainly checks vomiting, both in this disease and in blackwater fever, and recoveries under it have been numerous. As the causal agent of yellow fever circulates in the blood, this treatment is not likely to be a specific one.

Alcoholic stimulants should not be resorted to at the commencement, but will usually be required on or after the third day. Like all other fluids, they must be well iced, and given in small quantities at a time. *C. W. Daniels.*

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