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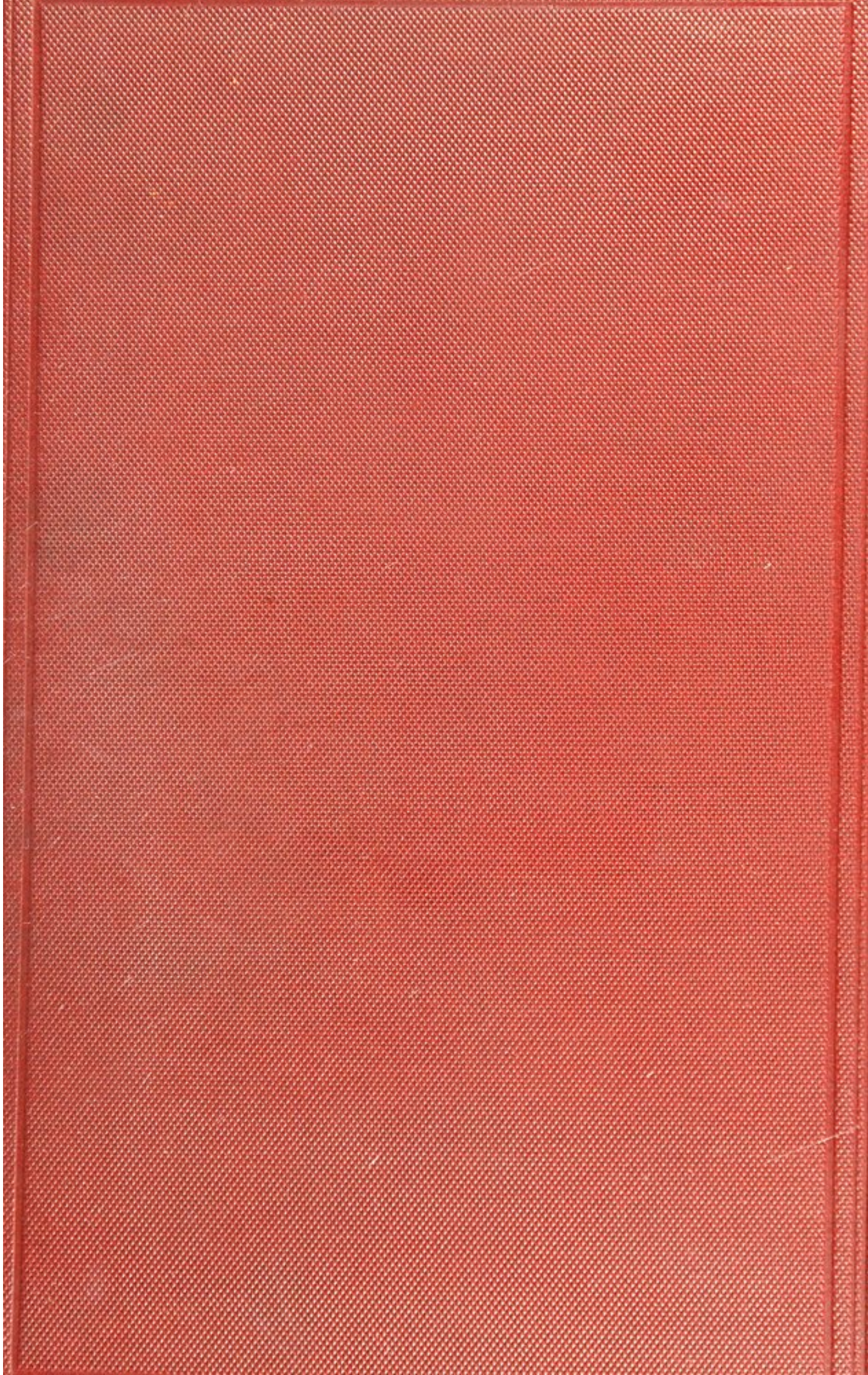
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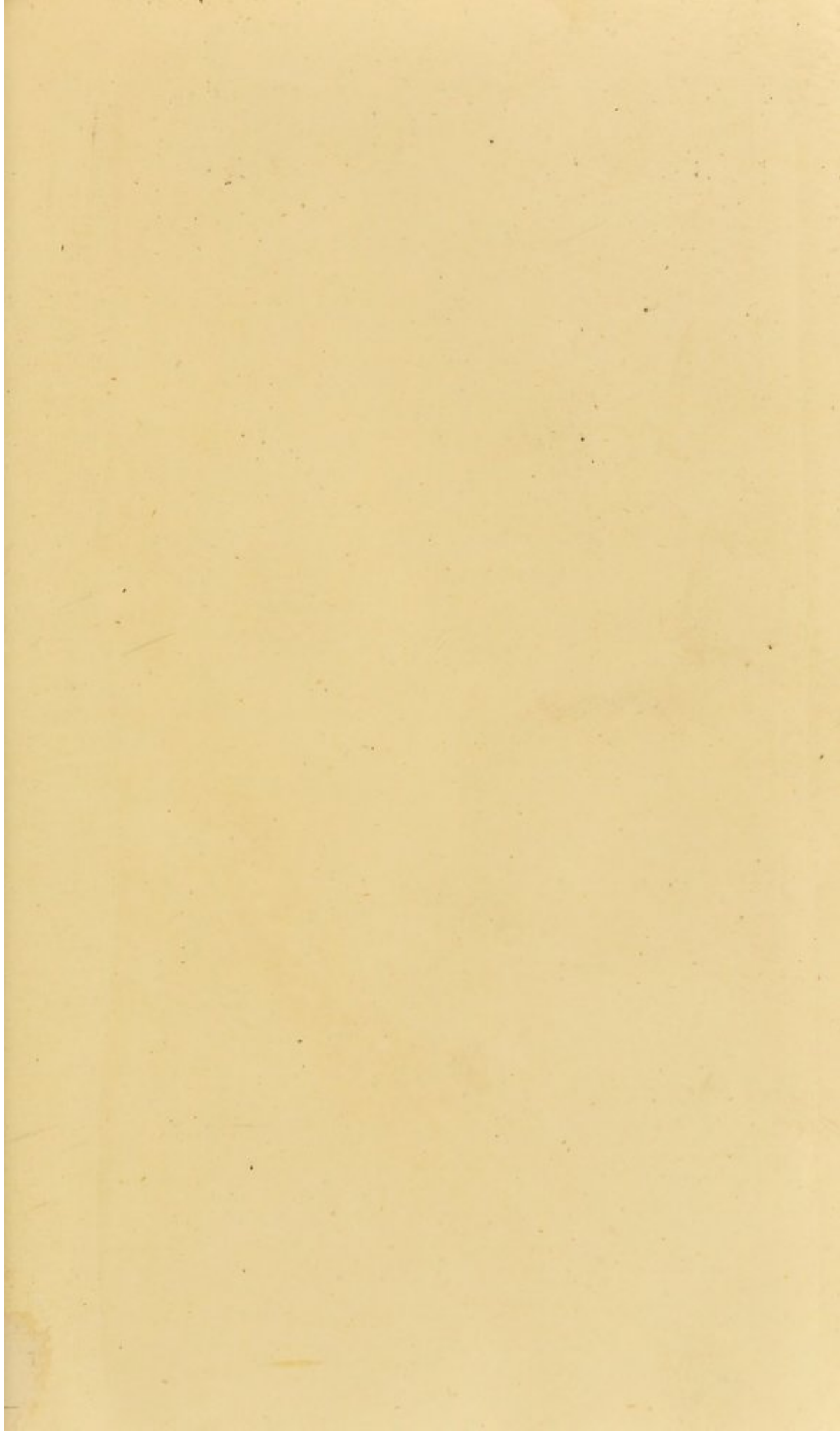


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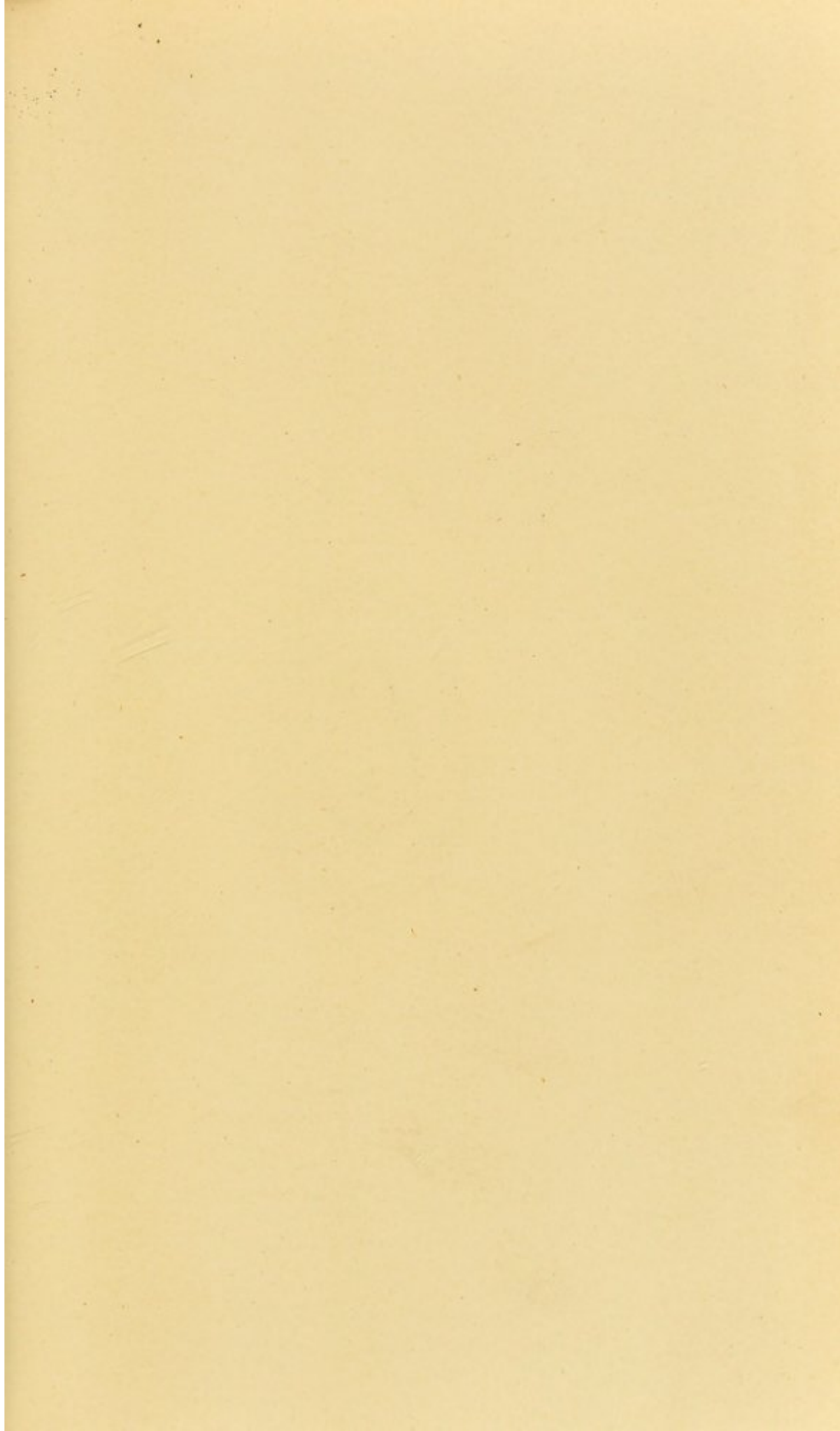
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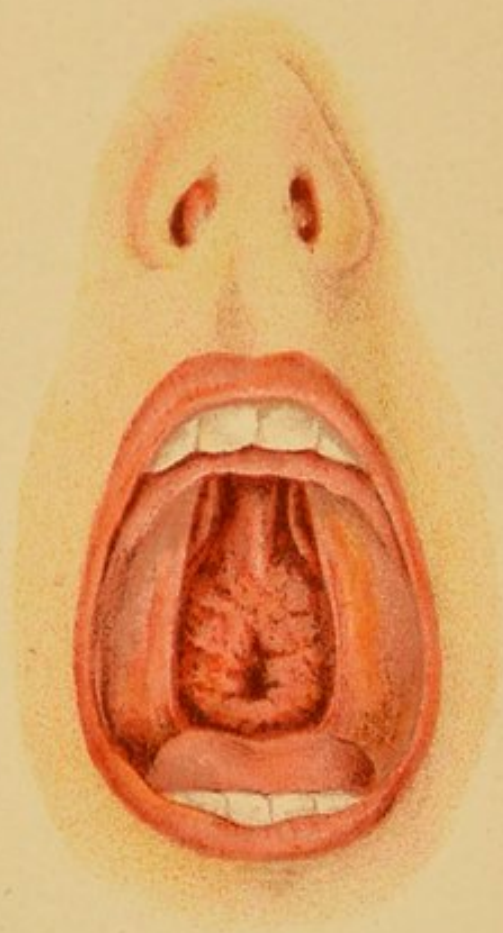


THE SURGICAL DISEASES
OF
CHILDREN

THE BIOLOGICAL HISTORY

OF THE





CLEFT OF HARD AND SOFT PALATE.
With view of Enlarged Pharyngeal Tonsil (Adenoids).

THE SURGICAL DISEASES

OF

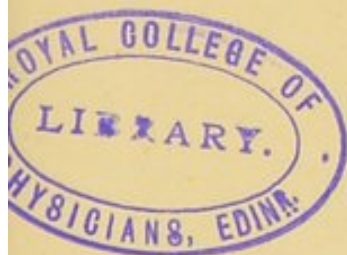
CHILDREN

BY

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SENIOR SURGEON TO, AND LECTURER ON SURGERY AT, ST. MARY'S HOSPITAL
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COLLEGE OF SURGEONS OF ENGLAND

*ILLUSTRATED WITH FIVE CHROMO-LITHOGRAPHS
AND 120 ENGRAVINGS*



Third Edition
REVISED AND ENLARGED

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1897

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To

ARTHUR LUCAS, ESQ.,

CHAIRMAN OF THE COMMITTEE OF MANAGEMENT OF
THE HOSPITAL FOR SICK CHILDREN,
GREAT ORMOND STREET.

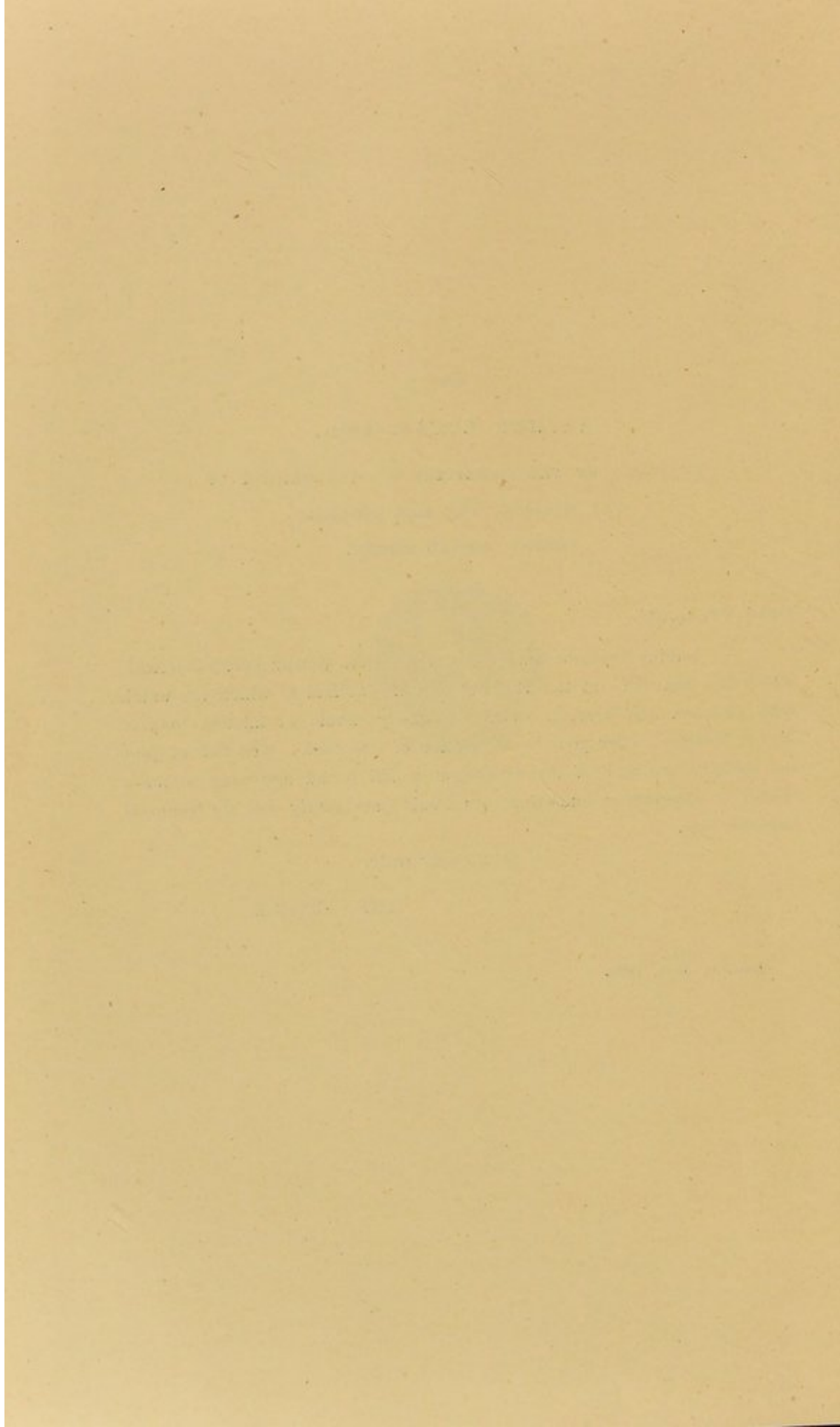
DEAR MR. LUCAS,

I think that the outcome of work (even though purely Surgical) which has been done at the Hospital over the welfare of which you watch with devotion and success, cannot be wholly devoid of interest to you. May I, therefore, offer you the Dedication of this book? The fact of your not being a member of my Profession would be an assurance to me—though a superfluous one—that you would pass gently over its technical imperfections.

Yours very truly,

THE AUTHOR.

London, May, 1897.



PREFACE.

It is hoped that, in the endeavour to compress within an allotted number of pages, an account of the entire subject of the Surgery of Infancy and Childhood, theory has not been unduly sacrificed to practice, nor clearness to condensation.

Thanks are tendered to Dr. Gee for permission to use sketches from the portfolio of the Hospital for Sick Children, for Figs. 28 and 29; to Mr. Thomas Smith for Fig. 39; to Dr. R. Lee for Fig. 13; and to Mr. Hutchinson for Fig. 16; and to a former House Physician, Dr. John Thomson (now of the Royal Hospital for Sick Children, Edinburgh), for making the drawing from which the chromo-lithograph, Plate I. Fig. 1, was executed. To a late Student of St. Mary's Hospital, Mr. A. Sanders, I am indebted for the water-colour drawing from which the Frontispiece was made; and to Dr. Macintyre, of Glasgow, for the beautiful photogram from which Plate V. has been prepared.

In the matter of Development, reference has been made to Dalton's "Human Physiology," and to Quain's "Anatomy."

The author begs to express his thanks to the artists for the care which they have given to the illustrations, and to Mr. George Templeton, Surgical Registrar to the Hospital for Sick Children, Great Ormond Street, for supervising the proof-sheets, and for many useful suggestions.

Advantage has also been taken of many valuable notes which Dr. O. Laurent, of Brussels, inserted in the French translation which he made from the second edition of "The Surgical Diseases of Children."

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THE SURGICAL DISEASES OF CHILDREN.

CHAPTER I.

INTRODUCTORY REMARKS.

DR. WEST makes the observation, that though the infant cannot talk it has a language of its own, a language of signs; and that when little children are ill they will express their real feelings, whether by words or signs, to none but those whom they regard as friends.

To secure the confidence of little children much tact is demanded. The surgeon should not go straight to the patient and begin asking questions bearing on the case. Generally it is advisable that he take no notice of him for some little time after entering the room, endeavouring rather to allay suspicions by talking in a quiet and kindly voice about the relations, toys, or other subjects of interest to the child. After communications have been opened up with the patient, and the utmost information obtainable by eye and ear has been secured, the actual examination may be begun. But attention should not, even then, be directed straightway to the affected part. Supposing, for instance, that the soundness of the right elbow be suspected, examination should begin with the left arm. As this causes no pain it excites no apprehension, and inspection of the other elbow is readily permitted. It may be advisable, moreover, to keep up a running fire of small talk with the child during the whole course of the examination, so that his attention may never have the opportunity of directing itself to what is going on. At the same time his face should be regarded continuously, yet with apparent carelessness; for some slight, involuntary

movement of the mouth may give evidence of the manipulation causing pain, though the child, from very bravery, does not confess to being hurt. If at the time of the visit the child be asleep, part of the examination or inspection may be carried out before he wakes.

The first part of the examination should consist in the careful comparison of the land-marks; little by little, further information may be sought. The endurance of the child must not be overtaxed; and he must not be made to cry, as the case might then be spoilt for complete examination. But having once told the child that something *must* be examined, some little thing done, the same must be accomplished; he will soon find that firmness is not incompatible with kindness, and on the next occasion he will behave better. When about to inflict necessary pain, the surgeon should on no account assure the child that he is not going to hurt. If it be a question of obscure pain or weakness in spine or limbs, it is expedient to have the child stripped of all his clothes, and to watch him leave or enter his bed; to see him walk (page 166), stoop (page 251), or run. This can be accomplished without needless exposure and chilling; but a child cannot be satisfactorily examined with his clothes on.

Temperature.—Useful as the thermometer is in clinical work, too close an attention to its readings in the case of sick children may cause unnecessary alarm. The temperature has to be considered in conjunction with other indications; but anxious parents, nurses, and not a few young practitioners seem to regard the thermometric chart as the one, almost the only, trustworthy index of the child's physical condition. Sometimes, indeed, in private practice, I forbid a child's temperature being taken, well knowing that, in my absence, the entire household is apt to be upset by an unfavourable change in its reading. There is an art in taking a temperature, and not everyone, not even every nurse, has acquired it. Gifford Nash (*Lancet*, vol. ii., 1895) has instanced two curious examples of error which resulted from the thermometer being put into the mouth shortly after the patient had taken hot food.

A high temperature may be of little moment if the aspect of the child be serene, and there be neither irritability nor

hebetude; if the appetite continue good, the respiration, pulse, and secretions normal, and there be an absence of rash, local inflammation, or sore throat. Thus it is generally advisable that the record be kept as a confidential communication between the nurse and the surgeon. The temperature may be taken in the groin, or, if the child be very restless, in the rectum. Even in perfect health the child's temperature may be a degree or so above "normal"—normal (rectal) being about 99° F.

The temperature may have no direct connection with pathological processes; its variations may be the result of a want of due organisation of the nervous system. In a boy, after lithotomy, the temperature suddenly ran up to 105° F. It was evident, however, that there was no cause for alarm; the child was lying calm and contented, and was interesting himself in a picture-book which he was holding up for view. In a few hours the reading of the chart was again normal, and convalescence was duly completed. It is the steady ascent of the temperature that forebodes ill, just as it is the gradual fall in the barometer that surely tells of the coming storm:

" Long foretold, long last ;
Short notice, soon past."

In the peevish or excitable child a trivial incident may send up the mercury several degrees; and time after time has one found the administration of a dose of castor oil, the alteration of a splint, or the change of a dressing bring the index again to normal. This much is certain—that if after several trials with the thermometer the reading be found normal, there is no need for anxiety; in this way the instrument may prove of great value even in the hands of those who are but little skilled in the matter of diagnosis.

The **pulse**, which is exceedingly rapid in childhood, affords but slight trustworthy information of the physical condition; one requires to know the child, and to know the pulse also, before proceeding to draw inferences from what seems to be a departure from the normal. The normal pulse-rate of a little child is about 100 in the minute. The pulsations, especially in the case of a nervous child, may vary by fifteen or twenty

in the minute from insignificant causes. During sleep the pulse is about ten beats slower.

Towards the end of the examination the child should be asked to put out his **tongue**. If he refuse, and remain deaf to entreaty, a view may be generally obtained by compressing the cheeks between the finger and thumb; on the next occasion he will probably yield at the first request. If a child complain of feeling ill, or be suspected of being out of sorts, it should be an invariable practice to inspect the throat (page 19), otherwise diphtheria or scarlet fever may occasionally advance without detection and without being suspected.

Operations which are not urgently called for should be carried out only after careful consideration and preparation. Should there have recently been a case of scarlet fever in the ward or in the house, it will be advisable to postpone operation until time, and a thorough disinfection, shall have diminished to the utmost the risk of infection.

The urine should be carefully examined for a day or two previously, especially for the presence of albumen. The throat and tongue should be inspected, and the morning's record of the temperature be specially noted. These precautions are necessary in order that the child may not be submitted to active surgical interference when, perchance, he is sickening for measles, scarlet fever, or other zymotic disease. In some instances it is necessary that a cutting operation be performed on a child whose urine is decidedly albuminous; as in the case of the child with albuminoid disease of the liver and kidneys, secondary to chronic suppurative arthritis (septic), or in the subject of interstitial nephritis from vesical calculus. But one should decline to operate for cleft palate, hiatus of bladder, or any other condition not included under the head of "urgency," unless the working of every organ be deemed efficient. If, for instance, the child were the subject of diarrhoea, or the bowels were unusually loose; if his appetite were failing, or if he were not looking well, any operation, not deemed urgent had better be put off until he had settled down again into good health. His body and limbs should be well covered up, and if the weather is at all cold, or if the operation is likely to be a long one, he had better be laid upon a hot-water mattress, so that the

inevitable shock of the operation may be reduced to a minimum.

Early morning is the best time for operating, as the child is thus less disturbed by being kept without food. He should know nothing about what is going to take place; certainly he should not see any instruments or preparations for the operation, and the anæsthetic should be administered before he is taken out of his bed. In private practice I keep out of sight until the child is insensible, and allow the anæsthetist to bear the charge of having "hurt" him; in the matter of subsequent dressings, I come as a sympathetic friend to heal the wound which "the other man" has inflicted.

In private practice, when the operation is of any considerable importance, it is advisable to secure the services of a trained nurse. I am fully conscious of the difficulty of getting the mother to realise the fact that maternal affection is no substitute for skilled supervision, but, beyond all question, such is the case. By preference I have operation cases in a surgical home. My experience is that children are generally in complete oblivion of their parents when they have been an hour or so amongst kind and cheerful strangers.

When an operation is to be performed upon a child, the surgeon should insist on the parents not remaining in the room. Their presence is apt to be embarrassing, especially if anything go wrong either with the anæsthetic or with the operation. It is advisable, too, that, unless the understanding between the surgeon and parents be thorough, the former should not commit himself to an absolute expression of opinion as to the nature of the fluid in a fluctuating tumour of a child until that same fluid has been removed. Serum may be found where pus has been thought to exist, while the exploration of a suspected abscess may reveal sanguineous effusion, or, worse still, malignant disease.

Anæsthetics.—No painful operation or wearying examination should be conducted without the aid of an anæsthetic: I entirely agree with Ashby and Wright that a child should never be allowed to suffer pain if it can be avoided. Acute pain is very badly borne, and quickly causes collapse. Chloroform is best adapted for the purpose, given on a piece of lint. If it can be given whilst the child is sleeping, so

much the better; but the child generally awakens. After the operation, and when the child has shown evidence of recovery from the narcosis, the room should be darkened and kept quiet, and he should be encouraged to have a long sleep. The stomach will not be ready for food for two or three hours; and then only water, or a small quantity of milk and water, should be allowed. If by chance the child become alarmingly feeble during the operation, he should be held head downwards, so that the vascular supply of the brain may be restored, artificial respiration being performed if necessary (page 47). When chloroform is to be administered, the anxious parent should be promised that nothing shall be done until the little patient is sufficiently under its influence—that any cries which may be heard will certainly not be the expression of pain. And this promise should be loyally kept. The subcutaneous injection of cocaine is, in my opinion, neither safe nor satisfactory for children.

Fatal accidents in the administration of chloroform are occurring with increasing frequency. But so long as people think that chloroform is “perfectly safe” for children, whilst they let it drip through the saturated flannel-mask held over the open mouth, and whilst they dash it wholesale on folded towels and handkerchiefs, there is small likelihood of an improvement setting in. There is always risk in giving chloroform or any other general anæsthetic to a child. But this risk is diminished in proportion as the vapour is administered in a careful manner, and by a well-instructed person. The administrator should assure himself that the child has not a tooth so loose that it may possibly get adrift into the larynx during the anæsthesia.

Promises.—The surgeon who has received the parental sanction to any operation should never promise anything which it is not in his absolute control to fulfil. More than this, he should never undertake any operation with his hands in any way tied; he should be trusted for all. If he cannot get permission to operate on a child without giving assurances to the parents that there is “no danger” in what he proposes, or that there shall be little or no scar left, or that the child can be put to sleep with chloroform “with perfect safety,” he had better altogether decline the case. There

are risks beyond human control in every operation, and though they may be in most cases insignificant, the prudent surgeon will reckon with them, for he cannot eliminate them.

Children who are out of condition.—A child under prejudicial hygienic influence is a bad subject for a surgical operation, slight injuries being followed by much disturbance. The wound left after circumcision may become foul and sloughing, and healing may be long protracted. Or if the child be operated on for hare-lip or cleft palate, no attempt at primary union may follow. Such are the children with whom a slight sprain is apt to be followed by synovitis, or even by suppurative arthritis, and with whom an injury which would pass almost unnoticed in a strong child is followed by cellulitis or abscess. Many a fat and heavy child is of this weak and flabby nature; the limbs may be large and dimpled and the frame apparently robust, but the bones may be soft and friable, the blood wanting in coloured elements, the muscles ill-developed, and the power of resistance feeble.

Pressure sores are extremely apt to occur, often without previous complaint of pain. In the course of time all soft padding becomes hard, so that, however carefully cotton-wool may be arranged at the time of adjusting a splint, the surgeon should make an inspection of the part every now and then; and he should never disregard the child's complaint of "soreness" under a splint or jacket. The heel is a very likely place for the appearance of a sore, and in arranging a limb, after an excision, for instance, there should be plenty of padding along the calf and down as far as the hollow above the insertion of the tendo Achillis; but no padding should be stuffed under the heel itself. If a child develop a sore about the sacrum—and in certain weakly subjects this happens in spite of every care—he should at once be placed in the prone position, with his head turned to the foot of the bed so that as he lies he may see what is going on in the room.

A commencing sore, or a threatening redness, should be washed twice daily with brandy and water, or with a weak mercuric solution, and, having been carefully dried (not rubbed), should be dusted with starch powder. In making the bed of a child who has to lie long on his back, the clothes

should be very smoothly arranged, and crumbs and such-like things should not be allowed to collect in the hollow.

Scarlet fever is strangely apt to occur after any cutting operation, the fever germs being probably absorbed through the wound; the disease may be manifested within twenty-four hours of the operation. The rash is not to be euphoni-ously called "erythema," or "surgical scarlatina"—it is genuine scarlet fever;* it can convey infection even to an adult, and it is likely to be followed by desquamation and albuminuria. The child thus attacked should at once be isolated; it does not follow that the result of the operation will be a failure. It has twice been my experience after operating for cleft palate to find that complete union followed in spite of scarlet fever. Sir James Paget has suggested † that children who have died with obscure symptoms a day or two after operation may have succumbed to the influence of scarlet-fever poison, which had been hindered in some way from making its usual progress. Erysipelas occasionally follows this so-called "surgical" scarlet fever. In the case of a boy with post-pharyngeal abscess which was opened in the neck, scarlet fever set in, and subsequently facial erysipelas, from which, however, he ultimately recovered.

The occurrence of a rash, however, after an operation, even when accompanied with a sore throat and a disturbed temperature, does not necessarily betoken scarlet fever; the rash may be *septicæmic*, and some time may have to elapse before its nature is clearly manifested.

Medicines should be given in the most palatable form. Castor oil loses none of its efficiency by being shaken up in a bottle with a little warm milk and sugar. The smallest bulk is desirable as a dose, and the less medicine given to children the better. One must not lose sight of the fact, however, that *opium* is a very valuable drug in the surgery of childhood. It is well to begin with small doses, and to go on increasing them until the desired effect is produced. The simple tincture or camphorated tincture is the best form for administration. The first doses should be given every half-hour, or every hour, until ease of pain, drowsiness, or

* Harveian Lectures: *British Medical Journal*, March 6, 1880.

† "Clinical Lectures," p. 352. 2nd edition.

commencing contraction of pupil gives evidence of the effect being produced. The dose is a minim of the tr. opii for each year up to five or six, the child being carefully watched.

If a child refuse to take medicine, it may be administered by a small syringe, fitted with a piece of indiarubber tubing long enough to reach beyond the back of the tongue.

Leeches should not be entrusted to the care of an unskilled nurse. It may prove a difficult matter to stop the bleeding from the bite, acupressure or suture being at times required. I do not think, however, that children bear the loss of blood badly; it is extraordinary to see with what speed they recover strength after an exhausting operation, as for cleft palate.

Antiseptics.—Caution must be given in connection with the employment of corrosive sublimate solutions and of carbolic acid lotions. A word must be said also about *iodoform*, which is now being used so much. As a rule, it does no harm, though I doubt if ever it does much good. Personally, I regard it somewhat as a superfluity, even in the treatment of tuberculous disease, and I find that I get on perfectly well without it. Indeed, I never employ it. Sometimes it has a directly poisonous effect. The child becomes restless and excited, and perhaps vomits; the temperature goes up, and the pulse quickens. In some cases an erythema is set up by it, the urine being highly coloured. The symptoms are often a good deal like those of pyæmia, but on discontinuing the use of the drug they promptly disappear. But unless the drug be quickly discontinued the child may become dull or excited, the excitement passing into delirium or mania. Sometimes the symptoms of iodoform-poisoning resemble those of tuberculous meningitis (page 65). Children are now and then extremely intolerant of the usual antiseptic measures. Not long since I saw in consultation a delicate child who had been seriously affected by the application of, as I was informed, the ordinary wet dressings of carbolic lotion previous to the performance of an operation; extensive gangrene followed the application. Carbolic dressings, previous to operation, must be applied with discretion. Lotions of carbolic acid and of mercuric salts owe their antiseptic value to the fact of their being energetic chemical agents. But

a child's skin or ulcerated surface is an active area of absorption.

Poultices are inconvenient; the warmth and moisture which they afford are better supplied by a fold of boracic lint wrung out in warm water, and applied under india-rubber tissue to prevent evaporation. The waterproof may be secured by a bandage. But the greatest care must be taken lest the application be needlessly warm; a child's skin is extremely delicate, and a hot-water dressing may cause most serious sloughing and ulceration (page 158). Similarly, the application of **blisters** may give rise to gangrene or to profuse suppuration, conditions which may also follow the subcutaneous injection of ether.

Vaccination should be performed in the second or third month. The skin just above the insertion of the left deltoid is cleansed, and scratches are gently made into it in cross lines by the point of a clean needle or lancet. This should be done in four places, distant from each other about half an inch. Fresh lymph is applied over the places, and is allowed to dry before the arm is again put through the sleeve. Thus done, the operation is associated with neither pain nor bleeding. Subsequently the dermatitis may be relieved by smearing the part with cold cream, and by dressing it with a layer of cotton-wool. A "shield" should not be worn, as it is apt to become soiled and septic, and, by shifting its place, to bruise the sores. If the discharge becomes offensive or thick, and if hard scabs form, wet boracic lint, or lint soaked in sanitas lotion, may be applied; unhealthy ulcers may be dressed with vaseline and sanitas, or with mild carbolic lotion.

If more care were paid to improving the general health of an infant before subjecting him to vaccination, there would be still less complication, and wild and ignorant objections to it would decrease. Vaccination should never be performed from an infant about whom there can be the least suspicion of venereal taint; nor should lymph be taken from a puny or unhealthy child. The lymph should not be stained with blood, and the family history of the child from whom the lymph is obtained should be known to be good. The more extensive use of fresh calf lymph, which in England, at least, is always obtainable, is very desirable.

Food, etc.—Human milk is the proper food for babies, and they should have nothing else. But if that cannot be got, or if it prove insufficient, fresh cow's milk is the next best food. The bottle should be filled with a mixture of cow's milk and hot water, in which a lump of white sugar and a very small pinch of salt have been dissolved. For the first few months there should be more water than milk—perhaps *twice as much water* as milk; as the infant thrives the proportion of milk may be gradually increased. No other food should be given before the sixth month; baked flour, arrowroot, and oatmeal cannot yet be digested, and they are apt to cause sickness and diarrhœa. Milk for the nursery should first be boiled, as the curds formed during digestion are thus rendered less hard and massive, whilst the risk of any infection being conveyed by the milk is greatly diminished. It is not desirable that the milk come always from the one cow.

For the first month a baby should be fed every two hours, and, by gradually increasing the interval, he is in time fed every three, and eventually every four, hours. He should not be fed because he cries; very likely he is in pain because his stomach is already overloaded. When he is sick, he should be fed for a less time, and at shorter intervals, and if the bottle is being used, a larger proportion of water should be put in it. If a fair sleeper, he should be woke up for his regular meals. A tablespoonful of lime water may be added to each bottleful of food, especially in summer.

Feeding-Bottles.—The best kind of bottle is the old-fashioned, long, straight one, with a short indiarubber teat, and with no tube. It is often called the slipper bottle, and its neck is fitted with a large glass stopper which has a water-tight screw. The worst kind is that with the long india-rubber tube; the Alexandra I think it is called. There should be two bottles, one for day and one for night. After use, the bottle should be washed in hot water, in which a little soda has been dissolved, and should then be rinsed in cold water. Till next wanted it should be kept in a basin of clean cold water.

When six months old, the baby may be allowed, in addition to milk, boiled bread and milk, oatmeal, baker's

rusks, arrowroot, or wheat flour. When about nine months old, the mother should begin to wean him by giving him less of the breast or bottle and more of the foods just mentioned, or beef-tea or mutton broth. At a year old he should be entirely weaned, and soon he should have daily a little undercooked meat pounded up into a pulp with gravy and salt; some potato finely mashed and covered with gravy; an egg, or a little milk pudding. On no account should he be allowed wine, beer, tea, or coffee, though he may have cocoa and milk. He should be given his meals regularly, and should not pick at bread and butter, cakes, and sweetstuff in the intervals. Children flourish best on fresh foods. The worst nourished patients are generally those reared on Swiss milk and certain patent foods.

Babies and young children must be kept always warm; they cannot be hardened by scanty clothing or cold baths. Neck, thighs, legs, and arms need to be covered as well as the chest and body.

Sunshine is of great value in the treatment of sick children. If a child be not making satisfactory progress in one part of the ward, it is well to put him into a bed where the sun shines during a good part of the day. Even early after a serious operation, it is advisable to get the little patient carried out on to a balcony, into a garden, or to an open window, and there laid in the sunshine—due precaution being taken against cold.

Children should be taken out of doors daily when the weather is fine. If they be sent out in a perambulator, the feet and legs should be warm to start with, and well covered throughout the ride. It is a curious error to keep a child, even though he be "delicate," shut up in the house. Every day, and twice a day if possible, the child should be taken out into the fresh air. Unless a bitter wind blow, or it be foggy, the windows should be opened for a while for the sake of fresh air. If a child wet the bed, perspire freely, or kick off the bed-clothes, he should wear a flannel bed-gown long enough to be tied below his feet, and the bed-clothes should be securely tucked in. He should not be rocked or patted to encourage sleep; sleep should come naturally, and, like food, at regular intervals.

Morning and night he should be washed over in warm water, but he should not be exposed long enough to feel chilly afterwards. A handful of sea-salt, thoroughly dissolved, may be added to the bath. Except in the very warmest weather, no child should be put into a cold bath.

CHAPTER II.

"CROUP," DIPHTHERIA, AND MEMBRANOUS LARYNGITIS.

DIPHTHERIA.

"CROUP," diphtheria, and membranous laryngitis are forms of the same disease, produced by the reception and cultivation in the body of poisonous germs. The germ of true diphtheria is a bacillus. It was first discovered by Klebs; and subsequently Loeffler showed that pure cultivations made of this bacillus, when planted upon the throat-membranes of birds and guinea-pigs, produced genuine diphtheria. It was therefore called the Klebs-Loeffler bacillus. The bacteriologist readily discovers the bacillus, and its absence from cultures made from fresh pieces of membrane is usually taken as evidence that the case is not an ordinary diphtheria. The implantation of micrococci upon a faucial membrane produces a disease greatly resembling true diphtheria, and it is only by experimentation in the laboratory that the diagnosis of an obscure disease can be made with certainty. A highly fatal form of diphtheria is that in which pus-producing micrococci are mixed with Klebs-Loeffler bacilli. Evidently there are several varieties of diphtheria, and the absence of the Klebs-Loeffler bacillus must not be regarded as proof that an angina is not diphtheritic. A child sickened in my ward with what we thought was nasal diphtheria, and some of the discharge was sent to experts for examination. They could find no diphtheria bacilli. Nevertheless, the child was kept isolated and disinfected. Eventually returning to her home in Surrey, a serious outbreak of diphtheria occurred in her family, and under such conditions that the child had almost certainly brought in the infection.

Membranous exudation in the windpipe may be produced by mechanical and chemical irritants apart from laryngeal diphtheria, and there is some evidence that membranous laryngitis has followed exposure to cold; but the more

that I see of "sore throats" with laryngeal obstruction, the more firmly do I believe that they are all diphtheritic.

Like tetanus, diphtheria is due to the inoculation and local cultivation of micro-organisms, the general symptoms being due to the absorption into the circulation of the toxic products elaborated by them. And it is an interesting fact that the injection of the filtered fluid from a cultivation of the Klebs-Loeffler bacillus (without any of the bacilli) into the lower animals produces the symptoms of true diphtheria.

In an outbreak of diphtheria the earlier deaths "may be referred to croup, the later to diphtheria" (Thorne Thorne). The subjects of "croup" were those in which the exudation was confined to the larynx or trachea. "Diphtheria appeared to be developed from what was originally a simple sore throat, and the infectious character was gradually increased." Without doubt, nasal and pharyngeal catarrhs are favourable to the development of the parasite. The sore throat of scarlet fever is apt later to become diphtheritic, and occasionally diphtheria follows measles, especially if the latter disease has been associated with a sore throat. It is sometimes impossible to differentiate diphtheria from scarlet fever. Even the most experienced practitioners are not proof against error in this matter.

If an attack of diphtheria does not predispose a child to future attacks, it offers him no immunity from them.

The common *age* of the subjects of diphtheria is from two to six years. As regards the period of *incubation*, if we say "a little less than a week," we shall not be far from the mark, though sometimes the uvula is found red and swollen, and the fauces are inflamed within twenty-four hours after exposure to infection.

The *cause* of the outbreak of the disease is not always to be determined, especially if there have been no cases of sore throat in the neighbourhood for some time. The drains or closets may be grossly at fault; or in some direct or round-about way a sewer may be ventilating into the house, or even into the room in which the child sleeps; or the drinking water may be poisoned by a neighbouring soil-pipe or cesspool. I know of three instances in which the disease seemed directly due to the inhalation of air laden with the odour of manure

which was being carted along the road or spread upon a field. Children are highly susceptible to such influences. (*See "Report" to Local Government Board, by Dr. Airy, 1890.*)

The disease seems specially fond of damp weather and clayey soil. A direct association may exist between moist walls, or the mouldy patches clinging to them, and an outbreak of diphtheria. Therefore, the land about the dwelling-house should be thoroughly drained, damp rooms be well ventilated, and mouldy walls be frequently covered with lime-wash. A child with an ordinary catarrhal sore throat, if exposed to the atmosphere of sewers, faulty closets, or sinks, is peculiarly liable to be attacked with diphtheria, the organisms eagerly seizing upon and undergoing their malignant cultivation in the enfeebled membrane. They are primarily entangled in the saliva, and are then absorbed into the pharyngeal or tonsillar membrane; or, entering the larynx with the inspired air, they rest in the delicate lining of the larynx.

If the receptive tissue were in perfect health, it might, perchance, be able to withstand their attack, but if it be rendered peculiarly vulnerable by "weakness," "cold," or catarrh, the worst results follow. The child who has a "weak throat," or who is "croupous," is specially liable to be attacked with diphtheria, and thus a simple local inflammation—and in the beginning diphtheria is but a local affection—becomes malignant and infecting. Further, with a persistence of unhealthy surroundings, diphtheria may become a chronic disease, breaking out from time to time with renewed energy. In America it is far more often encountered as an epidemic than it is in England, probably because that country possesses larger tracts of ill-drained land.

There are cases on record in which diphtheria broke out directly after a fall into foul river water. Children should be kept away from stagnant water, manure-heaps, cesspools, piggeries, and open drains. They often get sore throats when exposed to such sources of infection, and fortunately the disease sometimes shows itself in no more serious form. In London a large proportion of the cases of diphtheria come from the neighbourhood of stables and cowsheds. The disturbance of heaps of manure or decaying refuse, and the cleaning out of stables and cowsheds, are apt to be followed

by an outbreak; and so, also, after heavy rains, by foul water contaminating drinking water.

Diphtheria may affect, and be propagated by, cats and other tame animals, including poultry. In his Report on an outbreak at Enfield, Dr. Bruce Low referred to the case of a little boy who took fatal diphtheria; on the first day of his illness he vomited, and the cat licked the vomit on the floor. In a few days the cat became ill, and her sufferings being severe, and similar to those of the dead boy, the owner destroyed her. During the early part of her illness this cat was let out in the back yard, and in a few days the cat of a neighbour became similarly affected. This cat also had been out in the back yard at night. This second cat recovered, being carefully nursed by four little girls, all of whom developed diphtheria. There was no other known source of infection to which these girls had been exposed but this cat.

Dr. W. C. Cole published a valuable series of references showing the relationship existing between human and avian diphtheria; and he quotes the statement of Dr. Nicati, of Marseilles, to the effect that an outbreak of the malady among the fowls coincided with an increase of diphtheria among the inhabitants of the city. When a domestic dog, kitten or cat, bird or monkey, is sick, it should be taken far out of the reach of children, and I am not at all sure that it should be brought back to them again when it is apparently convalescent. It would be a fault on the right side—if, indeed, it be a fault—if the ailing pet were promptly hurled down the nearest Tarpeian rock, and its body consigned to an adjacent crematorium.

In the case of diphtheria spreading amongst families who are served with milk from one particular dairy, it is quite possible that the cows have some disease allied to diphtheria. Indeed, this is practically demonstrated by Dr. Klein in his masterly Report to the Local Government Board (1889-90). The risk of infection in this way is obviously diminished by having all nursery milk, and all drinking water, boiled.

Symptoms.—The term "Croup" was suggested by the peculiar sound which accompanies inspiration; its associations are with larynx and trachea. We should do far better

without the word; there is no such disease as "Croup." The word merely expresses a single symptom. "Diphtheria" is derived from *διφθέρα* ("leather"), from the appearance of certain patches or skins of grey exudation upon the soft palate or pharynx. These patches may be seen on depressing the tongue, or even on getting a child to open the mouth in a favourable light. But it is not always easy to view a child's throat, and much less to apply remedies to suspicious patches on the mucous membrane. When diphtheria attacks a wound, covering it with an unhealthy film, the constitutional effects are manifested without the throat being implicated. But such cases are, in my experience, rare.

Patches in the windpipe would not be visible, though they would be associated with dyspnoea, exhaustion, and other urgent signs. "Croup" is the disease when diagnosed by the ear, "diphtheria" when diagnosed by the eye; but "croup" is not necessarily due to the presence of diphtheritic inflammation, nor is diphtheria often confined to the larynx. It has almost invariably spread thither from the pharynx.

Moreover, all cases of diphtheria do not run the same course, any more than do all cases of scarlet fever. In the latter disease, we know that sometimes there is an absence of rash, and at other times there is no angina, or no marked rise of temperature. Some of the milder and more anomalous cases of diphtheria look like "herpes of the throat" merely, and throughout the entire course of such an attack there may be neither enlargement of cervical glands, albuminuria, nor rise of temperature. In fact, as Jacobi remarks, the continuance of a low temperature with the croup-symptom points to its diphtheritic nature; catarrhal laryngitis begins with fever. The first symptoms may supervene on exposure to wet or cold, or they may follow what was thought to be an ordinary sore throat; indeed, this is the general rule.

Sometimes the diagnosis of diphtheria is masked by the presence of a septicæmic *rash*, which may be highly suggestive of measles (especially if there be much nasal discharge), or of scarlet fever. Though it may be impossible to form a correct opinion as to the nature of the case till after the lapse of several days, strict quarantine is, of course, to be observed. The rash may appear early or late in the course of diphtheria,

and, though chiefly upon the chest and abdomen, it may occur upon the limbs, and may be followed by desquamation. In some epidemics diphtheria closely follows scarlet fever and also measles, and at the same time the child may be the subject both of diphtheria and scarlet fever.

When asked to see a child who is feverish without apparent cause, the surgeon should at once inspect the throat. Such a rule is necessary, as diphtheria often comes on very insidiously. There may be no prominent symptom, though the lymphatic glands about the angle of the jaw may be perhaps enlarged and painful, and the urine albuminous. Sometimes, on looking at what was thought to be an ordinary "sore throat," one is shocked to find it covered with ominous patches. A grey patch with ulceration upon the soft palate, or palatine folds, can be nothing but diphtheritic, but patches upon the tonsils—the soft palate being free—may not improbably prove of a harmless nature. Although prostration is one of the chief characteristics of diphtheria, still, children may be seen with one or both tonsils swollen and marked with these grey patches, when there is nothing to suggest the existence of serious illness. The presence of such cases in a school, or in the out-patient waiting-room, may widely spread the disease. A mild diphtheria often runs its course without attracting attention and without recognition. It may be only when the inflammation spreads to the glottis that its urgent nature becomes manifest, or when perhaps some form of paralysis denotes its identity. But sometimes it clears off so happily and completely that the correctness of the diagnosis of diphtheria is seriously questioned; a well-directed quarantine may be thus prematurely relaxed, and disaster follow. The patient with a mild attack, imperfectly isolated, may spread infection which produces the disease in its most virulent form. Too much care cannot be paid to the matter of isolation, and so long as a doubt exists as to the exact nature of a suspicious tonsillar or pharyngeal inflammation, risk should be studiously avoided.

In my own practice tracheotomy had been performed on a child for, as it was thought, simply acute laryngitis; and next day the child was playing happily with its toys. In four days she was quite well again. We felt fully satisfied

that the case was not one of diphtheria; but in a few days the father, who was much with the child, contracted diphtheria. Tracheotomy was performed, but he died, notwithstanding.

The more that one sees of diphtheria, the more fully does one recognise the difficulty of speaking positively, in the early days at least, as to the exact nature of certain "sore throats."

In a doubtful case the knee-jerks should be persistently investigated: their absence would be strongly suggestive of diphtheria with its inseparable nerve-degeneration.

Further symptoms are cough and feverishness; then increasing trouble with respiration, the voice becoming hoarse. Later the cough becomes loud, ringing, and "brassy." When once heard it cannot be mistaken. The restlessness and fever increase, the voice grows weaker, and though the poor child's lips are seen to move, the words cannot be heard. He is extremely anxious, and if he fall into a doze he wakes up with spasmodic dyspnoea; he grasps his throat, or puts his fingers into his mouth as if to clear away the cause of suffocation. When the spasm passes off, the face and body are covered with beads of sweat, and the night-dress and pillow may be wet. Between the attacks the inspiration improves, but the air still enters with a noise which is not unlike that made by a saw working through a board.

At first the disease is an entirely local affection. Sometimes, as already remarked, its whole course is run without disturbance; manifestly the diagnosis of such a case might for a time be obscure. But a high temperature, the possible existence of albuminuria, and the occurrence of like cases in the same house or neighbourhood, would be highly suggestive. Yet the temperature may be but little elevated, although the disease is raging. The glands in the neck and at the angles of the jaw, however, soon become enlarged and tender, and the connective tissues swollen.

The **false membrane** is a tough and fibrinous exudation in which pus corpuscles and various micro-organisms are entangled, as well as epithelial elements shed from the inflamed tissue. The film may be so intimately connected with the mucous membrane that after it has been detached the exposed surface is raw or ulcerated. During life a bright

inflammatory border surrounds the patch. The natural loosening of the exudation-film is effected by the infiltration of muco-purulent fluid beneath. The exudation may extend down into the smallest bronchi. In certain cases it may be first formed in the trachea, whence it may spread into the larynx or pharynx, or down into the lungs.

When a patch is found upon the tonsil, the inflammation may extend deeply through the mucous membrane, and involve the subjacent tissue in moist gangrene, extensive excavations, foul and bleeding, being formed, the breath being very fœtid. This condition shows the disease in its most virulent form. The sloughing sometimes causes fatal hæmorrhage, but more often the child dies from the acuteness of the ptomaine-poisoning. An opposite form of the disease is that in which, when the false membrane is detached, the mucous lining beneath it is found merely hyperæmic, and with no trace of ulceration. This is known as *superficial diphtheria*, and though the course taken by it may be short, and attended with but slight constitutional disturbance, it may prove highly contagious. If there be nasal discharge, the disease germs may be widely scattered by a sneeze.

It does not follow that because a child has pharyngeal diphtheria the larynx will be involved. But even if the inflammation do eventually spread to the glottis, the virulence of the disease may have been so far expended that dyspnœa may not advance to an extreme degree.

There is no line between the pseudo-membranous slough of diphtheria and the fibrinous exudation of laryngitis; one passes gradually into the other. The sloughing corresponds to the more intense, the simpler exudation to the milder, action of the morbid cause. The sloughs may involve the vocal cords, and from thence downwards the deposit may become of a simple membranous nature.

Sometimes the virulence is so great that the child sinks of blood-poisoning before membrane has had time to be produced, the throat appearing merely congested or inflamed. The toxic product is the result of the growth of the micro-organisms, and its filtered culture has been shown experimentally to be highly poisonous. Bright red patches on different

parts of the fauces are highly suggestive of diphtheria ; they quickly become covered with the grey film.

Nasal diphtheria may be the starting, or a complication of the attack, and is often of an extremely virulent form. The discharge excoriates the nostrils, and may even set up dermatitis of the lip ; it is sometimes associated with epistaxis and with the escape of shreds of false membrane. The local treatment consists in, if practicable, hourly syringings with warm sanitas lotion, the child being placed upon his side and the injection being made by the upper nostril. The injection returns partly by the other nostril and partly by the mouth, and if some of it enter the stomach no harm is done, as might occur if a mercuric or carbolic wash were used. The flakes of false membrane which come from the nasal fossæ are not so firm as those from the pharynx.

The **dyspnœa** is due partly to the muscles of the vocal cords being thrown out of working order (so that when an inspiration is taken the cords are driven into the rima by atmospheric pressure), but chiefly to the blocking of the glottis by false membrane. When *expiration* is prolonged and difficult, as well as inspiration, the presence of obstruction from exudation is evident ; prolonged and noisy expiration is, therefore, a bad sign. The dyspnœa may come on in paroxysms, the child being comparatively comfortable between the attacks. A surgeon arriving, by chance, during the peaceful interval, must not fall into the error of underrating the urgency of the case, and promptly deciding against the need of tracheotomy. He should at least wait before deciding *against* operating.

As the dyspnœa increases, the veins of the head and neck swell, the pale face becomes dusky, and the extremities grow cold. Then drowsiness steals in. Death may supervene from carbonic-acid poisoning, bronchitis, pneumonia, pyæmia, or exhaustion ; but the child often remains sensible till death is close at hand.

Albuminuria is by no means a constant symptom ; though it does not necessarily forebode ill, its presence is ominous. It is associated with parenchymatous inflammation of the kidneys and hæmorrhages, and may appear as early as the first day of the disease, but it does not occur in all cases. It is due to irritation of the renal tissue by absorption of the toxic

albumens; it is only exceptionally caused by the irritation of the micro-organisms themselves.

The **prognosis** is always grave, diphtheria being one of the most dangerous diseases to which childhood is liable; the smaller the child, the more easily does the glottis become obstructed, and the less is the chance of his struggling successfully against the toxin.

Increased frequency of respiration is invariably a bad sign, especially when it is accompanied with a rising temperature. Pneumonia is then to be feared. Cellulitis of the neck and enlargement of the glands about the angle of the jaw are unfavourable signs; so also are the complaints of pain about the ear. The pains about the ear may be the result of inflammatory pressure upon the auricularis magnus, or some other nerve, or of an extension of the inflammation along the Eustachian tube. A fatal result is sometimes preceded by emphysema of the neck, resulting from rupture of the pulmonary vesicles and escape of air under the pleura, into the mediastinum, and into the cervical connective tissue.

Concerning the *temperature*, something may occasionally be learnt as regards the probable termination of the case, but one must not make too great a point of its observation. In certain cases one sees as much attention given to its registration as if this were actually a therapeutic measure. A persistently high temperature forebodes ill; so also does a rapidly falling one, especially if, at the same time, fresh patches are forming. Other unfavourable signs are anæmia; failing strength, or increasing prostration and restlessness; an unsteadiness or irregularity in the pulse, and dislike of food. Vomiting is a grave sign; it suggests uræmic poisoning, or an irritable condition of the stomach, and its continuance must necessarily be attended with increasing exhaustion. It is apt to be a precursor of cardiac failure. Other signs of cardiac failure are the slowing of the pulse to 50 or 40 in the minute, and a dusky colour in the cheek. This is caused by the ptomaine acting on the vaso-motor centre, and it goes hand in hand with increasing nerve-degeneration. It is a bad sign, moreover, when the urine diminishes in quantity, becomes darker in colour, and shows an increasing amount of albumen.

Though the **treatment of diphtheria** will be further alluded to in the next chapter, it may be here remarked that any medicine administered must be with the view of keeping up the strength. Iron and quinine are the most useful drugs; but if the child can swallow only with the greatest difficulty, it is inadvisable that he should be nauseated with medicines. So long, only, as he will take the dose with a little persuasion should it be given. Five to ten drops of tincture of iron given every hour or so in a teaspoonful of sweetened water is, I believe, the best medicine. Solid beef-jelly, port wine, or brandy with egg and milk, or beef-tea, may be given freely, but not so as to nauseate the child. Fresh orange juice and iced water, with a little brandy and sugar, make a good drink.

The throat should be regularly swabbed with glycerine and perchloride of mercury (1 in 1,000) or of iron. But this local treatment, valuable as it is, should not be persisted in if it greatly distresses or frightens the child. It is well nigh impossible thoroughly to disinfect the patches, and to worry a child until he is exhausted by resisting the local treatment is more likely to do harm than good.

In the hours when diphtheria is a local disease, the application of a solution of carbolic or of sulphurous acid, perchloride of iron, or other germicide to the patches is of the greatest value, and should in every case be most thoroughly and persistently carried out; but when the whole constitution is affected, local treatment can be only supplemental. The use of corrosive sublimate is not free from objection. Though children bear mercury well, absorption of the sublimate salt may cause griping, sickness, or diarrhoea; still there is no more trustworthy solution (1 in 1,000) than this. It may be conveniently used every three hours, in the form of a spray, the tongue being depressed by a spatula. Another efficient way of dealing with the patches is by blowing sulphur upon them by means of an insufflator. In my opinion, no attempt should be made to clear the throat by emetics. Such treatment is sadly exhausting, and the child needs all his strength.

Hot compresses may be applied to the front of the neck, but no other external application is likely to afford relief. The compresses may be sponges from which almost boiling

water has just been squeezed by wringing them in a towel, and they should be constantly changed. This may give much comfort to the child and may help to relax spasm, but it should not delay an inevitable tracheotomy.

The **sick-room**, cleared of all unnecessary hangings and furniture, should be kept at about 65° or 70° F. The cot should not be brought close up to the fire, nor should steam be directed upon it. The cot should not be made into a tent, as the hangings shut out the needful supply of fresh air, and are in the way of doctor and nurses. A close and stuffy atmosphere is highly prejudicial; the air should be fresh, and moistened by a spray-producer or bronchitis kettle; carbolic vapour, or cresolene, should be liberally diffused as well as steam, so as to destroy the fœtid odour of the breath. I strongly object to a steam spray being sent on, or even near to a child who is craving for *oxygen*—not watery vapour. Indeed, inhalations of pure oxygen may be found of service. A sheet kept moistened with carbolic acid solution or sanitas should be fixed at the doorway, and there should be no needless passing to and fro. Friends and relations must be kept out of the room; there is danger of the infection being spread by them; moreover, the sick child is disturbed by the sight of anxious faces.

Even if the attack came on in the height of summer, a large fire should be kept up day and night. Thus a thorough ventilation is maintained, and, the current of air setting in from the door to the fireplace, there is less chance of infectious particles being carried into the rest of the house. The carpet and all superfluous furniture should be removed. Now and then the window may be thrown open for a few minutes, and from time to time sulphur may be burnt in the room; the more fresh and pure the air the better.

Probably no chemicals have the power of dissolving the false membrane *in situ*. Experiments in the laboratory may give results which clinical observation entirely fails to endorse.

Antitoxin.—As regards the value of the antitoxin treatment, I am not in a position to speak definitely, though I employ it in every case. We cannot yet know its exact value, and we must not allow enthusiasm to carry us in advance of

facts. The tuberculin craze of a few years ago should have taught a useful lesson in that respect.

The antitoxin can promptly be obtained from the British Institute of Preventive Medicine, 101, Great Russell Street, W.C.—or from their agents, Messrs. Allen and Hanburys—and the sooner that its injection is resorted to in any case the better. Whatever its therapeutic value may be, it is obviously unfair to expect much from it when it is injected into a child whose blood is already saturated by the diphtheritic toxins which he has absorbed. Indeed, he may sink before the antitoxin has had sufficient time to work its effects. The effects of the antitoxin seem to be that it causes the membranes to loosen and peel off, that it improves the appearance and the general condition of the patient, and that it checks the spread of the disease. The injection, however, disturbs the kidney to such an extent that when, for instance, it is done in healthy children as a prophylactic, it causes albuminuria. But this, after all, would be a comparatively unimportant matter provided it be found an antidote to diphtheria.

As the difficulty of breathing increases, the question of **intubation** or **tracheotomy** (page 38) presents itself, and the sooner the operation is resorted to, the less will be the chance of inflammation of the lungs or of exhaustion impairing its success. The following are the advantages of an early recourse to the operation: The patient is better able to undergo it, the strength is preserved, more nourishment can be taken and more sleep secured; time is gained in which, it may be hoped, the disease will have run its course, and it is not unlikely that by the re-establishment of the free entrance of air into the lungs, pulmonary complications may be averted. I recently performed laryngotomy on a lady, who had caught diphtheria from her child. A few hours after the operation she made signs for paper and pencil, and wrote, "Such perfect bliss from suffering." Surely the prospect of this bliss should be offered to *every* patient suffering from the dyspnoea of laryngeal obstruction. It is not easy to perform intubation or tracheotomy too early; it is often resorted to too late. It should be regarded as a therapeutic measure of extreme value, not as a last resource.

Intubation.—Recently it has been again suggested, and actually demonstrated, that the introduction of a flexible catheter through the natural air-passage may temporarily overcome a spasmodic attack of dyspnœa; but this is not a trustworthy substitute for tracheotomy. The catheter would become quickly blocked with exudation, and it could not be cleaned without constant removal, and no nurse could be entrusted with the management of such an arrangement.

In Dr. O'Dwyer's improved method a laryngeal tube of metal is used; it is introduced by raising the epiglottis with the index finger. The "introducer" and the tubes are extremely ingenious, and in America they have acquired a considerable reputation; and in England, also, there are many who have experience of the method and who speak well of it. As regards statistics, there is little to choose between it and tracheotomy. The tube is, however, apt to be coughed up, to slip into the trachea, or to pass into the alimentary canal; it may be choked by mucus or blocked by false membrane; and it may prove inefficient, and have to be discarded in favour of tracheotomy. Though the tube may be found useful in certain cases, it is not likely to meet with such wide adoption as tracheotomy at present enjoys. In an urgent case of laryngeal diphtheria the surgeon stands in need of treatment which can be depended upon to supply complete, immediate, and uninterrupted relief. These demands tracheotomy alone affords. Even when about to use intubation in a serious case, the tracheotomy instruments should be in readiness.

It is by no means an easy matter to extract the tube. In one of Dr. Hailes's cases he had great difficulty in removing the tube on account of the swelling about the ary-epiglottic folds:—"I never had had such serious trouble before in extracting, and began to feel very anxious. The parents were unreasonable, and said, 'You put it in; take it out now.' On the seventh day the last and successful attempt was made." Though I am satisfied that intubation can never do for laryngeal diphtheria all that tracheotomy is able to accomplish, still I am watching the progress of the bloodless method of treatment with great interest, and will gladly adopt it whenever conviction is brought home to me.

But to say that intubation may first be tried, and that if this fail, tracheotomy may then be resorted to, is to deal unfairly with the patient, and to discredit tracheotomy. Tracheotomy, though a delicate operation, is not a "dangerous" one, and can better be carried out by the unpractised hand than can intubation; moreover, when the silver tube has entered the trachea, much of the anxiety of the case is at an end. The argument which is sometimes advanced that parents will allow a bloodless operation and refuse consent to a cutting operation is altogether outside the question: everything depends upon the way the proposition is placed before them. So far as I remember, I have never known consent refused to the performance of tracheotomy when the surgeon has said, "The operation which is recommended is not a prolonged or dangerous one; the child, being under chloroform, will feel nothing of it; it will surely prevent his dying from imminent suffocation, and it may be the means of saving his life."

Probably life has never been saved by intubation in a case in which tracheotomy would have failed, whereas the very fact of intubation being not infrequently supplemented by tracheotomy shows that the converse of the proposition by no means holds good.

According to Prof. Escherich, the disadvantages of intubation comprise a troublesome cough and the risk of ulceration by pressure of the tube; the difficulty of swallowing fluids, and of expectorating, and, lastly, the insufficient supply of air—as compared with that admitted by tracheotomy. Briefly, my opinion of intubation is similar to that of my colleague, Mr. Morgan, who said in a clinical lecture on this subject: "It is sometimes a useful plan to follow after tracheotomy has been performed, and where there is difficulty in dispensing with the tracheotomy tube. But with these exceptions the plan has not given such satisfactory results as were promised." Mr. Pitts also says that, without special study, tracheotomy is undoubtedly the safer operation.

The **convalescence** from diphtheria is full of anxiety. Frequently, when it seems well established, the child begins to fail from an unwillingness to take food, or from an inability to retain or digest it. Sometimes a sudden attack of dyspnoea or rapid exhaustion ends the scene. Fatal collapse may be

due to arrest of the heart's action, through paralysis of some of the pneumogastric or other cardiac nerves, to fatty degeneration of the ventricular walls, or to the slow formation of a thrombus. The child may be quietly amusing himself with his toys when, after a few convulsive gasps, all is at an end. Such a calamity may supervene without any warning, and when least expected. The convalescent should, therefore, be constantly watched, and kept absolutely quiet.

Muscular paralysis often follows diphtheria; the power of accommodation is lost, letters and pictures are confused, and perhaps squinting occurs. The voice becomes thick and "nasal." The child coughs and chokes as he drinks (for food goes the wrong way), and he becomes thin. The soft palate is motionless, and flaps with respiration, so the child snores in sleep. The muscles of the palate are often the first to be affected and the last to recover. In those cases which are attacked by paralysis this symptom generally appears in the second or third week from the beginning of the illness.

The *absence of "knee-jerk"* may be an early, prominent, and lingering symptom, but the legs may have become weak or unmanageable before it is detected, and in certain cases of diphtheritic paralysis the knee-jerk is unaffected for a while; but, if looked for day by day, it will sooner or later be detected. The leg paralysis may begin with a numbness, or with an exaggeration of the knee-jerk. The child stumbles as he walks, and he may become clumsy with or ataxic in his hands. The limbs, intercostals, and even the diaphragm, may be affected, death occurring from asphyxia, pneumonia, or syncope. The muscles show the reaction of degeneration—response to faradism being diminished, but to galvanism increased; still, the muscles do not waste. Sometimes there is considerable anæsthesia in the neighbourhood of the affected muscles.

The fact of the paralysis so frequently passing off must be taken as evidence of its not being due to destruction of ganglion cells; it is probably due to degeneration of the nerves, brought about by the tox-albumens in the blood which have been set free by the bacilli of diphtheria. Serious paralysis may come on with great suddenness, and after the most

transient form of the disease. In one case a child was well advanced in convalescence after a mild attack of diphtheria, and in the morning was found hemiplegic and unable to speak. Very gradually did muscular power return. An erratic selection of certain groups of muscles for paralysis—those of the soft palate and larynx to begin with, and then those of the orbit, trunk, or extremities—affords unmistakable evidence of the paralysis being a diphtheritic complication. Even after the subsidence of the diphtheria the reflexes should be daily examined. Exaggeration of knee-jerk may foretell a coming paralysis, although the muscles of the lower extremities themselves may never be affected; then, after a while the knee-jerk may be lost, although merely the palatine muscles are paralysed.

On rare occasions, moreover, trophic *lesions of the joints* are associated with affection of the muscles, synovitis occurring. The knees are the most likely joints to be attacked.

The *prognosis* is uncertain. When the branches of nerve which are associated with circulation, or preside over respiration, are involved, the prognosis is more unfavourable than when only the nerves of the palate or extremities are implicated. Sometimes the fact of a slight and transient "sore throat" having been diphtheritic is recognised only by the subsequent occurrence of a squint, or some other paralysis. Paralysis may follow diphtheria confined to a wound or to the genitals. It is very important to remember that a child with diphtheritic paralysis is apt to convey infection.

Treatment.—The child should be kept constantly in bed in the recumbent position. Strychnia and belladonna, as a tonic to respiratory muscles, may be tried, and, later, galvanism. The belladonna may be given every hour in doses of from five to twenty minims of the tincture. A boy under my care with phrenic paralysis, whose bronchi were loaded with mucus, and who, on account of diphtheritic paralysis of the pharynx, was unable to swallow, was successfully treated by the hourly administration of gr. $\frac{1}{60}$ of atropine hypodermically. One minim of liq. strychniæ with one minim of liq. atropiæ may be given beneath the skin until a definite result is obtained. The most important matter is to keep up the nutrition of the child if deglutition be

interfered with. If he cannot swallow without food passing into the larynx, he will abstain from swallowing; then it will be necessary to feed him by a very soft catheter introduced through the nares (page 50). Inunctions of cod-liver oil, and the administration of nutrient enemata, are also of service.

General advice.—If there be grave suspicion as to the nature of a sore throat, the child should be at once isolated, and, if possible, a trained nurse should take charge of the case; all other children should, if practicable, be taken out of the house; or, better still, the child should be sent into one of the Local Government Board Hospitals, or into some such institution. The mother must understand that resigning her child to a nurse is all to his advantage, and should be considered as a mark not only of common sense but also of affection. It is difficult, however, to get parents to take this practical view of the matter, and sometimes they will not be persuaded that the child is really suffering from diphtheria.

If there be doubt as regards the nature of an inflammation or patch about the fauces, let the benefit of that doubt be accorded to hygiene. A few days' quarantine is a simple matter, and it may be the means of obviating great distress. It is sometimes impossible for the most experienced practitioner to say what is the exact nature of the sore throat without watching it and the child for a day or two. He should not be offhand in expressing his opinion in a doubtful case, nor should he make light of it. He should be very careful; for a mistake on his part may involve the entire household in distress and himself in discomfiture. Institutions have recently been established in which, in the case of a doubtful sore throat, specimens of membrane or mucus, sent thither for the purpose, can be promptly submitted to bacteriological and microscopic investigation. Thus, within twenty-four hours, the practitioner can be informed whether the specimen contained the Klebs-Loeffler bacillus or not. From a case of mine, however, in which competent investigators could detect no diphtheria-bacilli in some suspicious nasal discharge, diphtheritic infection was unfortunately spread. Too much reliance, therefore, must not be based upon a "negative" report. In the case of diphtheritic

hemiplegia mentioned above the disease had been taken from the mother, who had so slight a soreness of the throat that not only was she not laid up, but was doing her work without interruption. Others of her children were also affected, some fatally. The nature of the disease is sometimes declared with certainty only on the occurrence of albuminuria, exhaustion, or characteristic paralysis; or by the individual becoming the centre for fresh infections.

Brothers and sisters who have been with the sick child must not go back to school or mix with other children, lest, though they at present show no signs of disease, their breath or saliva be the means of spreading infection. It is through some direct source that the contagion is usually propagated, but particles coughed upon a coat or dress, drying there, and subsequently brushed off and inspired as dust, may give rise to infection. Such particles may hang about the furniture or walls of the sick-room and cause subsequent infection. The greatest care should be taken about disinfection, even though the disease is rarely propagated except by direct contagion. Sponges and feathers should be burnt, and towels plunged in a pail containing a solution of carbolic acid or corrosive sublimate. The fumes of burning sulphur, with steam, are the best general disinfectant for rooms and clothing. Indeed, the periodical burning of sulphur in the sick-room is expedient; children are but little irritated by the fumes. Discharges from the patient should be received in vessels containing carbolic acid powder or some other trustworthy disinfectant.

Those in attendance should be liberal in the use of disinfectants, and should, as a special precaution, wash out the mouth, and gargle the throat from time to time with some mild astringent. And when the atmosphere of the room is abundantly laden with the germs of the disease, and mucus from some cause or other is hanging about the fauces of the surgeon, he need not hesitate to set the example of clearing his throat, and ridding himself, in what may not be generally considered the most refined method, of a likely source of infection. In order to reduce to the utmost the chance of carrying infection, everyone whom duty calls into the sick-room ought to have a loose dress, hanging at the entrance, with which he

can cover his other clothes. But it is usually impracticable to carry out this desirable precaution. At any rate, it must be remembered that infection may be carried about by the clothes, by the surgeon's beard, and particularly by the nurse's frizzled hair.

Those about the child should be careful not to inspire whilst leaning over to swab the throat or to free the tube. And when the child coughs through the mouth or tube, there should be no thoughtless exposure to the column of expired air.

Lastly, if death should release the child, the sooner the body is removed from the house the better. On no account should friends or relatives, who have hitherto been denied intercourse with the sick-room, be now admitted. The last offices should be quickly performed, the body being enclosed in the shell together with plenty of carbolic acid powder, chlorinated lime, or other disinfectant. The funeral should take place within forty-eight hours after death, and should not be an occasion of a gathering of friends or relations. Books and playthings which were used during the illness should be burnt; the pillows and bed-linen should be efficiently "stoved," and the room and its contents disinfected with sulphurous acid vapour and steam.

Convalescents from diphtheria should be regarded with suspicion, and kept apart from playmates and schoolfellows. Though the attack may have been slight, and its manifestations have definitely passed away, convalescents may carry about with them, probably on the pharyngeal or nasal lining, bacilli which may cause the disease in a far more serious form than that from which they have so happily recovered. As to what the length of the quarantine should be I cannot say definitely, but I would insist on forty-two days. It has been suggestively remarked that there is as much diphtheria out of bed as in bed, and nearly as much out of doors as indoors. The tonsils may long remain swollen, and their dilated crypts may contain diphtheritic membrane which, at this stage of the disease, if seen for the first time, might suggest simple follicular tonsillitis. In the case of a child at school having been the subject of diphtheria, I

would oppose his being sent back among his little companions for at least two months. No child with a "sore throat" should be allowed to attend school; who can say into what the apparently slight affection may be developing?

LARYNGITIS.

Acute catarrhal laryngitis.—"Croup," let it be repeated, is but a symptom of a disease, and it occurs in two forms of laryngitis: in the inflammation of diphtheria, and in the acute laryngitis which may come on after a child has been exposed to wet or cold. In the preceding pages the two kinds of laryngitis may be taken as described together; the practitioner is no more able to dissociate them on paper than, in early cases, he can at the bedside. In diphtheritic laryngitis an exudation membrane is formed; in the acute catarrhal form it may not be. This latter disease is not infectious. But who can venture to say that an attack of acute laryngitis is of the non-infectious variety? If a child happily recover from an attack of membranous (diphtheritic) laryngitis, its true nature may escape recognition, unless it have occurred in association with other cases. Some cases begin as an ordinary laryngitis, diphtheritic inflammation supervening. Without seeing patches upon the fauces, it may be impossible to affirm that a laryngitis is diphtheritic, though, if it occur in an epidemic, there can be little doubt as to its nature. In each case the voice is harsh and rasping, and steadily decreases in force; the child speaks with pain, and has evident difficulty in swallowing. In acute catarrhal laryngitis the inflammation does not descend into the trachea and bronchi; there is no enlargement of the lymphatic glands, nor is there altered knee-jerk or albuminuria; these features may, however, be absent in unmistakable diphtheria.

Acute catarrhal laryngitis comes on suddenly, and gives the good figures for tracheotomy and intubation. These are the cases which occur after the floor-scrubbings of the Saturday afternoons; but even in them there may be some exudation membrane in the larynx. It is a good plan to suspect diphtheria in every case of "croup." Time or bacteriological examination will, in all probability, make

the diagnosis clear; and if eventually it be found that the precautions which were adopted were superfluous, so much the better.

It would be very rash to affirm that an acute laryngitis is not diphtheria, even after the rapid establishment of convalescence. On the other hand, when on the tonsils of the child with the croup-symptom grey patches are found; or when the child rapidly sinks, even in spite of tracheotomy; or when the croup-symptom occurs in an epidemic of "croup," diphtheria, or scarlet fever, the identity of the virulent disease is only too evident.

Treatment will correspond in most particulars with that advocated above. If one could say for certain that the laryngitis is not diphtheritic, strict isolation of the child would not be demanded; but this is often impossible. An apparently clear case of acute catarrhal laryngitis may show its nature by conveying infection when convalescence has set in. Amongst the most valuable remedies are calomel; emetic doses of ipecacuanha; hot, moist compresses, and leeches; intubation and tracheotomy being kept in reserve.

Chronic laryngitis, which is often the result of congenital syphilis, renders the voice rough and harsh, and impedes respiration: it may give rise also to an irritating cough. Expiration, as well as inspiration, is prolonged. The attacks of dyspnoea are liable to periodical and serious exacerbations; especially are they apt to come on at night, when the cough may have something of the peculiar metallic ring.

A running from the nose may be taken as evidence that the laryngeal trouble is of the simple catarrhal nature, and is, therefore, a good omen. I would offer the caution against shutting up children in the house, even though they have suffered from laryngitis. They should be kept in the open air. In bad weather they should be warmly clad, but they should go out all the same, and the neck should not be heated with a thick comforter. The child should not talk loud, nor sing, and he should be instructed to moderate his cough. A couple of leeches placed over the trachea, counter-irritation, wet compresses, emetics, steam inhalation, medicated vapours, very small doses of morphia often repeated, iron and quinine, are all useful in various phases of the disease. If the dyspnoea

become extreme, intubation or tracheotomy will be demanded. Indeed, this is the kind of case for which intubation is specially suited.

Laryngismus stridulus, or laryngeal asthma, is a spasmodic affection of certain muscles about the glottis preventing the ingress of air. It is particularly apt to occur in weakly male children, and between the ages of two months and two years, especially in the rickety. The later it appears the less amenable is it, as a rule, to treatment. Frequently it is associated with tetany. The distress comes on without warning, the child waking up in the night in great alarm. It often appears with weaning, and seems to be directly caused by improper feeding. There is no fever, expectoration, or cough, the condition being probably the effect of some disturbance of the pneumogastric nerve or of its recurrent branch. The mucous membrane of the larynx is unaffected and the voice unchanged. Sometimes the attack is solitary, but it may be repeated at intervals; urine and fæces may be voided during a paroxysm. The carbonic acid intoxication caused by the spasm renders the reflex centres torpid; thereupon the contraction yields, and the breathing becomes calm again. In those instances in which the spasm is associated with convulsions, the prospect is serious, and the case may end fatally. Possibly this is not an infrequent cause of sudden death in weakly infants, who, it has been supposed, have been overlaid. The disease is probably caused by a toxæmia which is the result of the absorption of products of imperfect digestion.

The *diagnosis* rests chiefly on the facts that the attack comes on suddenly and without elevation of temperature; that, having passed off, the infant resumes its normal aspect, the air coursing quietly through the glottis, and that the cry or the voice is unaffected when the attack is over.

Treatment.—The condition of the alimentary canal and of the gums must be inquired into, and special care be given to the matter of feeding. If the disease be indeed a neurosis of a branch of the pneumogastric, its dependence on indigestible food is intelligible. The child is most likely rickety; this condition, therefore, must receive special attention. Hand-fed

infants are far more liable to laryngismus than those brought up at the breast.

Occasional small doses of rhubarb and soda are useful; counter-irritation is of doubtful value. The atmosphere of a hot room is depressing. The infant should be taken out of doors daily, no matter how cold the air may be. If, however, a child be liable to bronchitis, he should be kept indoors when the weather is unusually severe. When the child cannot be taken out of doors the air of the rooms in which he lives must be always kept fresh by thorough ventilation. Cod-liver oil by the mouth or by the skin may be tried, and bromide of potassium in doses of four grains and upwards. With the bromide small doses of chloral may be given.

If the infant be unconscious, convulsed, or cyanosed, he may be placed in a warm foot-bath, while cold effusions are used for his head and neck. After the bath he may be found to breathe better sitting. The inhalation of a little vapour of chloroform will be required if the attacks of spasm are severe.

If, after a crisis, the child be found apparently dead, the medical man should at once set about the performance of artificial respiration by slow, alternating pressure of the hand, and relaxation, upon the chest walls.

CHAPTER III.

TRACHEOTOMY ; THYROTOMY.

TRACHEOTOMY is likely to be one of the first operations the young practitioner is called upon to perform. It is often demanded after daylight, and when skilled assistance is out of reach. The operator may consider himself fortunate if he have a friend to administer chloroform and to lend a hand with a sponge, and a nurse to hold a candle. Even with the most competent surgeon, the operation does not always go smoothly. But difficulties must be met with equanimity, and the surgeon must doggedly proceed to open the trachea and insert the tube. Even if the chloroformist exclaim, when the operation is but half way through, that the child is dead, the surgeon must not be disconcerted ; the tube *must* be introduced ; the tracheotomy has to be completed, even though the child be apparently dead upon the table, artificial respiration being then resorted to.

Statistics are of no avail in the **appreciation** of this operation ; each case is to be considered on its merits. If a child is suffering from dyspnœa, or is being exhausted by fruitless attempts to inflate the lungs, the trachea must be opened. The unhappy parents are greatly to be pitied in these circumstances. Suddenly overwhelmed with despair, they may be unable to consent to, and unwilling to forbid, a procedure which, after all, holds forth a somewhat slender prospect of recovery. It is then for the practitioner gently and persuasively to show that the child must not be allowed to die of sheer suffocation, and that the only chance of bringing him through even the immediate crisis is by admitting air into his windpipe below the obstruction :—and who can tell but that this individual child may be one of those happy cases which are rescued by operation ? The child is never so near death from the exhaustion of dyspnœa that it is not worth while to operate. I know of an instance in which an experienced surgeon was called into the country

to perform tracheotomy on a diphtheritic child, but he found him so desperately ill that he declined to operate. It was, as he said, past all hope; so no operation was done; the child recovered. Tracheotomy will always give a chance, and it may be the means of rescuing the child even when the hope has been well-nigh extinguished; perhaps one child in every three is saved by the operation—at any rate, in hospital practice—whilst the chances of the procedure hurrying on a fatal termination may be disregarded altogether. Tracheotomy is a delicate rather than a difficult or a dangerous operation. It is unfair to regard it as a last resource; it is an invaluable measure for tiding a child through a terrible crisis.

As soon, then, as the larynx is implicated, the instruments should be in readiness, though possibly they will not be required. The breathing must be carefully watched, and if the difficulty be increasing, if the child be losing colour, or getting restless, he should at once be afforded the relief which tracheotomy is so well able to give.

When is the operation needed?—The answer is simple: “When an insufficient amount of air is entering the lungs.” The signs of this are a sinking in of the supraclavicular, suprasternal, and epigastric regions during inspiration, and a harsh or noisy entrance of the air through the glottis. Too much attention must not be given to the partial collapse of the chest in a small, rickety child, for with even slight dyspnœa in such a case there is a considerable and unimportant depression in the root of the neck and in the epigastrium. Further evidence of serious obstruction is prolonged and noisy expiration. If there be a doubt as to whether the operation may be still further delayed, it will be better to **perform it forthwith**. When more exhausted, the child will be less likely to benefit from the introduction of the tube. Many a case is lost from tracheotomy having been delayed; operation will not unfavourably prejudice the child’s chance—that is quite certain.

As regards contraindications, Laurent truly says there are none. No child is too young for it. I have had a successful case in private in an infant whose second birthday occurred within a week of the operation. It is a bad omen for the success of the contemplated operation, however, if

the jugular and epigastric regions do not markedly fall in with inspiration; this shows that the lungs are already engorged, and that the energetic inspiratory effort is failing to produce a partial vacuum. Nevertheless, even if it is evident that the lungs are implicated, the surgeon should give the child the benefit of tracheotomy. Oxygen is a wonderful tonic, and its admission into the lungs—late though it be—may possibly save the child.

Anæsthetics.—Except in those rare and urgent cases where time does not permit of it, chloroform should always be administered. If the child be frightened, he may be “put to sleep” before being taken from the cot. The chloroform may be administered on a handkerchief, a few drops being sprinkled on it to begin with; only a small quantity will be required. If the child be unconscious, or moribund, one operates forthwith, possibly the only instruments at hand being a penknife and a swan-quill. I have never operated without chloroform, and I have never seen any harm whatever caused by the anæsthetic. Putting all sentiment aside—so far as I am able—I deem the advice to refuse its administration in these cases, to say the least, unkind. Of course, the chloroform must be used with care and discretion, as the child’s blood is already imperfectly aërated.

The **instruments and material required** are: Chloroform, sharp scalpel, two pairs of dissecting forceps, several pairs of pressure-forceps, steel director, scissors, sharp hook, simple dilator, various silver-plated tubes, a few ligatures, needle and suture, small sponges, feathers, gauze dressing, and tape. These should be obtainable at a moment’s notice. The instruments should be boiled in soda solution after being used, as at any time they may be needed for a non-diphtheritic patient. I strongly disapprove of their being kept in a velvet-lined case. Brandy, and a syringe for its subcutaneous injection, and vaseline, should also be at hand.

Operation.—The low chest of drawers or table on which the child is to be placed should be in the best light obtainable, against a window or under the gas. If the operation be done after daylight, it will be well to have a supply of lamps or candles placed about. In a small room, with a single gas-jet from the middle of the ceiling, it will be

advisable to have the neck of the patient almost under it, and to stick pieces of candle upon the mantelpiece, bookshelf, or elsewhere, by planting them upon a little of the melted tallow or composition. Excellent illumination may thus be secured; long candles being cut into several pieces. The trunk and limbs being wrapped around with a thin blanket, the child should be placed with his shoulders on a small, firm pillow, and the head thrown back, so as to draw up the trachea from behind the sternum. The surgeon stands at the child's right shoulder. The chloroformist is placed at the end of the table, so as to be able to hold the head straight in the middle line. Unskilled assistants are of little or no use at a tracheotomy; they are apt to be in the way.

The **landmarks** are the thyroid and cricoid cartilages, the trachea, and the episternal notch. In a small, fat-necked child it is not always easy to feel the trachea. It is, therefore, well to remember that the cricoid is the first projection encountered when the finger is drawn upwards in the middle line from the top of the sternum. It is very necessary to have the child's head kept straight, and the incision exactly in the median line; the chloroformist, therefore, charges himself with the former of these duties. The deep part of the incision should be as long as the skin wound; a tapering, conical wound leads to difficulties. The incision is about $1\frac{3}{4}$ in. long, and longer in a fat-necked child. A small incision is apt to cause difficulties during the operation, and subsequently to give rise to general emphysema. A very important point is to keep it high up, beginning it over the thyroid cartilage. If it be made farther down the neck, the trachea will be sought where it is deeply placed, and in a dangerous area. The trachea is opened in the highest rings, the cricoid cartilage being cut through, if expedient. If the wound made in the trachea be found of insufficient length, it must be enlarged upwards, not downwards.

Laryngo-tracheotomy is a very proper operation for children, whether the air-passage is to be opened for diphtheritic or œdematous obstruction or for a foreign body in the larynx, trachea or bronchus. The surgeon can subsequently enlarge the opening upwards or downwards as occasion may

direct. Certainly if an inexperienced tracheotomist would set out with the intention of dividing the child's cricoid, he would avoid the many difficulties of the lower operation. Even in young children the cricoid cartilage forms a prominent landmark, and the surgeon who aims for it is quite unlikely to go wrong. Below the level of the isthmus the veins are fuller. The surgeon need not fear the isthmus, but, tearing through the tissue with two pairs of forceps, the windpipe is at last exposed to the extent of the width of the top of the left index finger, which is being used as a guide. The isthmus is perchance divided. The subcutaneous and deeper tissues should, so far as is possible, be torn rather than cut, so that there may be the less bleeding. For this two pairs of dissecting forceps may be advantageously used. There must be no hurry during the operation, bleeding vessels being secured with self-holding forceps, and the trachea actually exposed before it is opened. If the trachea cannot be made clearly visible (as may happen if the wound be deep or there be much bleeding), at least it must feel bare to the tip of the finger. If an attempt be made to open it while it is still covered with muscle or aponeurosis, delay and danger will ensue. Swollen veins which are in the way may be caught with two pairs of self-holding forceps, and then severed. A few pairs of these forceps are of great help; with them the wound can effectually be kept dry without perpetual sponging, and any irregular or large vessel can be quickly secured by them. The welling-up of dark venous blood which occurs in the deeper part of the dissection must be disregarded. Though it may look terrible, it ceases immediately the trachea is opened, and the entrance of air has once more freed the pulmonary circulation.

When the windpipe is exposed, a sharp hook is thrust into it, to fix it at, or close below, the cricoid, and the point of the scalpel is then plunged in from below upwards. The edge of the blade is directed forward, and as many rings are divided as may seem necessary for the introduction of the tube. The surgeon should assure himself by the touch that the hook is firmly in the windpipe; of this there must be no doubt. The hook afterwards shows him exactly where he has to insert the tube. The importance of exposing the

trachea before opening it is due to the fact that there are strong fasciæ as well as flat muscles in front of it, and that it is very easy to slit the fascia instead of the trachea, and then to thrust down the tube between the fascia and the trachea, with the result of still further impeding the intake of air. It is not difficult to lose the trachea when it is flattened beneath the finger, or drawn aside by a clumsy assistant.

The blade of the thermo-cautery is not suited for the operation; it makes the wound so hot, and its edges so hard, that the finger cannot be used as a guide, and the resulting eschars may be cast off with serious hæmorrhage.

As soon as the trachea is opened, air rushes up through the blood, and the anxiety of the operator diminishes. Forthwith the dilator (Fig. 1) is passed into the wound; the



Fig. 1.—Tracheal Wound Dilator.

blades are separated; the child coughs out blood and mucus, and the tube is introduced between the blades of the dilator. The spasmodic respiration at once quiets down, air passes through the tube, and breathing is so peaceful (such a change after the late noisy respiration) that a stranger to the process might think that the quiet betokened death. Colour returns to the face. The pulse improves. Thick mucus is driven into the tube, and is removed by a feather or a camel-hair pencil, and shreds of false membrane are perhaps coughed out or extracted with forceps. If, when the tube has undoubtedly been inserted in the windpipe, air does not pass readily through it, even when artificial respiration is resorted to, the probability is that the end has slipped down between the tracheal wall and the mucous lining, or else beneath a cast of diphtheritic membrane. In such circumstances the tube must be withdrawn, the tracheal wound enlarged, and the mucous lining incised, or the false membrane extracted by forceps.

The **tube** which, in my opinion, best answers the various requisites is of metal, and consists of an outer and an inner

part. The outer part has two lateral limbs, and must be securely made. This outer tube is introduced by itself, the limbs being pressed together, so that the thin, flat end easily slips in between the blades of the dilator, even if the tracheal wound be small. A round-ended tube is apt to compress the trachea without entering it.

The tube must not be too large, nor too much curved forward, lest it impinge against the front of the trachea. With the latter fault, pressure might bear against the front of the trachea, with, possibly, fatal complications. The tube need not completely fill the trachea. A useful size and shape is that shown in Fig. 2; it is not so much curved that

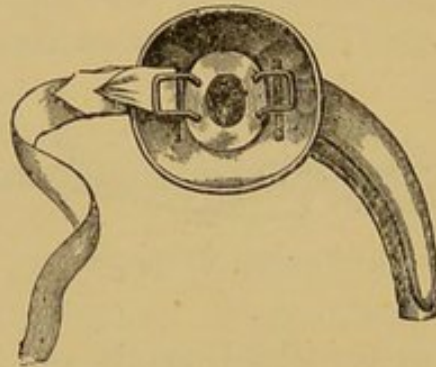


Fig. 2.—Ordinary Bi-valve Tube and Method of Securing it.

its end comes against the front of the trachea, and it is but slightly tapered. It is large enough when it admits the air without noise. For small children, the lumen of the outer tube, at the level of the plate, may be of about the size of an ordinary steel-pen holder, and, for larger children, of the size of a cedar-pencil. To the surgeon who is not in the habit of choosing tracheotomy-tubes this simple gauge, though laying no claim to accuracy, will be found not without value. It is well to keep several intermediate sizes in readiness. I prefer the old-fashioned bivalve tube, as figured herewith, to all others. It is easily introduced, free from valid objection, and perfectly trustworthy. In a day or two it will be replaced by soft tube, or removed altogether.

If the neck be swollen from diphtheritic inflammation, it will be necessary to have a long tube. Unless the inner tube be longer than the outer the end of the latter may

become blocked. A suture may be applied at the ends of the skin wound after the tube has been inserted. While fully recognising the disadvantages of a tube after opening the trachea, I do not yet see my way to dispensing with it. Without doubt, a handy and trustworthy substitute for the tube is much to be desired, but it is obviously not safe to stitch the tracheal wound to the skin and leave the child without any tube.

Tying in.—When the breathing has settled down, the tapes are adjusted, and tied in a double bow at the side of the neck. The tape should be narrow enough to run easily through the slit in the tube-plate, and, being pointed, is quickly threaded through the plate, as it rests upon the skin of the neck. Lawyer's red tape serves well. A slit about half an inch long should have been cut in the middle line of the tape, near the end to be threaded, and the running end afterwards drawn through it, as shown in Fig. 2. Until the tapes are securely fastened, a finger should be kept on the plate of the tube to prevent its being forced out of place by a cough. A scrap of gauze, appropriately notched, should be covered with vaseline and slid upwards between the shield of the tube and the skin. It may be changed every few hours, and another piece of gauze, dipped in a lotion of sanitas or carbolic acid, may be lightly placed across the opening of the tube and the front of the neck as an antiseptic respirator. Before leaving the nurse in charge of the case, the surgeon should see that she has sufficient skill and confidence to take out, cleanse, dry, lubricate, and re-insert the inner tube.

In the early days after the tracheotomy there is so much viscid mucus that the inner tube is of great convenience. But when matters have quieted down, and the passage into the trachea is lined with granulations, a single tube may be substituted. For this Baker's indiarubber tubes serve well. They are not so convenient for introduction at the time of operation as is the bivalve tube. Before insertion, the tube is soaked in hot water and lubricated with vaseline; oil should not be used. Its introduction may be facilitated by cutting the end obliquely, or by sending it down over a flexible catheter used as a guide; or it may be slipped in between the

blades of the dilator. It gives no trouble, and it can be cleaned with a feather; moreover, it is not apt to set up ulceration or necrosis of cartilage, or to cause secondary hæmorrhage. It has no opening on its upper surface, but one can easily be made with a pair of scissors. When changing the tube, a bivalve metal one must always be at hand, which may be slipped in should trouble arise; and the surgeon should never change a tube of any sort without having the dilator (Fig. 1) within reach.

No kind of tracheotomy-tube can be worn for an indefinite period without risk of deterioration; it should be examined from time to time. The soft tube is not trustworthy unless it is made on a foundation of canvas. Should part of a tube slip into the trachea, the case must be dealt with as directed in chap. xvii.

Clearing the wound of mucus and blood may be effected with pieces of torn sponge. If the trachea itself be blocked, the mucus may be forced up to the surface-wound by sudden and firm compressions of the chest walls, and can be then caught and wiped away. Or a ruffled feather may be gently pushed into the trachea, and, being twisted round, may entangle and draw out tenacious mucus, or cause it to be ejected through the wound by coughing. Shreds or tubular casts of false membrane may thus be fished up, and then caught at the wound by forceps. If the tube become choked, it must be taken out and a search made with forceps for a membranous cast of the trachea which, perchance, is blocking its orifice.

Caution.—In standing over the child the surgeon runs great risk of infection by the breath of the patient, or by the out-rush of air through the wound. This risk is run in the course of duty, and is scarcely heeded. Nevertheless, the exposure should be as little as possible. But if, after the trachea is opened, the air do not pass freely, it is not the surgeon's duty to put his lips to the wound and endeavour to suck the parts clear of obstruction. This proceeding is neither lawful nor expedient. Sucking can be of no practical advantage. It may cleanse the surface of the wound of blood and mucus, so that the bubbling noise is diminished; but this could be done as effectually by a piece

of sponge. It cannot clear the trachea, because suction can be effected only under the influence of atmospheric pressure, and the lungs are a shut sac. Air locked in the bronchial tubes can hardly be possessed of sufficient expansive force to help the expulsion of mucus or membrane, even when a powerful suction is at work at the wound. But the surgeon is apt to lose sight of these facts when he sees his little patient failing to gain the expected relief. The intense anxiety which at this juncture he feels for the patient, for those to whom the young life is dear, and, let it be added, for the success of the operation itself, is apt to impel him to put his mouth to the wound. I am fully convinced of the futility of the act. It is as unsurgical as it is dangerous, and has caused the unavailing sacrifice of many a heroic life.

It has been suggested that the trachea may be cleared by a catheter passed down the wound and fitted with an exhaust-ball. But even this scheme does not appear very practicable. Reliance should be placed rather upon the effect of firm pressure over the chest to drive up fluid or shreds. By turning the feather round in the trachea, or even in a bronchus, a more thorough, effectual clearing of the wind-pipe can be obtained than by any other method; but this must be resorted to only by the surgeon (not by the nurse), and then with equal gentleness and discretion. On no account should small pieces of cotton-wool or sponge be introduced into the trachea, or even into the wound in the neck; they are apt to be carried adrift and to plug a bronchial tube.

Artificial respiration should be resorted to on the conclusion of the operation if breathing be not established. It should be persevered in for half an hour, or even more. By this means life has been sometimes restored after all hope had been given up.

Fallacies in the operation.—The skin-wound may be too low and too short: the trachea may have been dragged aside, or not sufficiently incised, so that the tube (especially if it be a round-ended one) does not enter, but slips down in front of it. The trachea may have been missed if the dissection were not kept absolutely in the middle line. If the wound in the

trachea be made with a blunt scalpel, and without a little plunge, the mucous lining may escape transfixion, the tube passing down between it and the tracheal wall. If air do not pass through the tube, either naturally or on compressing the chest, the chances are that the tube has not been passed into the trachea. If air cannot be made to pass, the tube must be quickly taken out, the dilator introduced, and the trachea exposed and explored as already insisted upon. The tube may be blocked with mucus, or its aperture obstructed by false membrane. Search should then be made for a membranous cast of the trachea. For thorough exploration, the tracheal wound should be enlarged slightly upwards, and a pair of forceps introduced. The occasion is critical, and fortunately is rarely encountered. It is far more likely that the tube has been passed down amongst the ribbon muscles at the front of the trachea than that it is blocked by a membranous cast of the trachea.

I knew of a case in which, from the windpipe having been twisted from its position, the tube was found *post mortem* to have been introduced into the trachea through the œsophagus; and of another in which the tube had been dashed right through the trachea and into the œsophagus. Pugin Thornton has seen *post mortem* three cuts on the vertebral column, which had been made by a house-surgeon in fruitless attempts to open the trachea. Probably the unhappy operator first lost his landmarks, and then his head. He should have paused in the middle of the operation, sponged out the wound, secured bleeding vessels, and calmly felt with the tip of his left index finger for the trachea. There must be no hurry about a tracheotomy. To attempt to incise the windpipe before it is bared beneath the finger and secured by the hook is highly reckless. Nothing is gained by dash in the operation; steadiness is everything. The surgeon who has operated on a fat-necked infant will have more sympathy with him who scored those vertebræ than he who has had no experience in the operation.

Various ingenious instruments have been designed with the idea of simplifying tracheotomy. By the thrust of a double-bladed instrument the trachea was straightway to be opened! But the blade is apt to compress, or to slip from

off the movable trachea, or to go through both its walls, and into the œsophagus or vertebral column. Tracheotomes are very dangerous instruments; there is no royal road to tracheotomy.

The **prognosis**, when the operation is performed for laryngeal diphtheria, is highly unfavourable, the cause of death being exhaustion, the extension of the inflammatory process, broncho-pneumonia, or blood-poisoning. Or death may be due to paralysis of muscles of respiration, or of the heart. The operation itself does not kill the patient, or even shorten his life. Let that be clearly understood. The child dies in spite of the operation, not because of its performance. It usually happens that the child rallies after the operation, at any rate for a time, though, on the other hand, he may die before the surgeon has had time to finish it.

In my experience, children with laryngeal diphtheria in private practice do not show nearly so good a percentage of recoveries after tracheotomy as do those who, being at once taken to a hospital, are operated on at the first indications. In the Hospital for Sick Children, Great Ormond Street, there were, in a little less than five years, 66 cases of tracheotomy for laryngeal diphtheria, out of which number there occurred 25 recoveries — a percentage of about 38. And at St. Mary's Hospital during four years there were also 66 cases (almost entirely amongst children); of these, 20 recovered, or about 30 per cent. In the total of 132 cases there were 45 successful results, or a percentage of 34. I feel sure that if the results of an equal number of tracheotomies in children with laryngeal diphtheria in private practice could be collected (not selected, as statistics too often are), the percentage of recoveries would not show nearly so favourably, the explanation being that the surgeon is not so free to resort to operation in private as in hospital work. (These figures were taken just before the adoption of the antitoxin treatment.)

It is a bad sign when the introduction of the tube does not completely relieve the breathing, as, in that case, the false membrane has already reached the trachea or even the bronchi. It is a bad sign when the child is apathetic; when the tube remains dry, or is merely caked with gluey mucus; when

food escapes through the tube, as, the muscles of the larynx being then paralysed, food will probably enter the lungs and set up "deglutition-pneumonia." The prognosis in infants and young children is especially bad. It is bad also when the membrane comes away in thick flakes. During certain epidemics hardly any children recover, in spite of the most skilful tracheotomy and nursing. On the other hand, it has sometimes happened that half a dozen diphtheritic children in succession have recovered after tracheotomy—before the days of antitoxin.

The child may be expected to recover when he swallows food and stimulants abundantly and well; when his temperature keeps down—but not abnormally low—and the tube discharges clear mucus freely; when his colour holds good, and he takes increasing interest in his toys, or in what is going on around him. But he is not "out of the wood" until convalescence has so far advanced that he is beyond the risk of paralysis of the cardiac and respiratory muscles.

The **after-treatment**.—The strength must be kept up with milk, egg-flip, wine, and quinine. But if the muscles of the glottis be affected with diphtheritic paralysis, or their action hindered, so that fluid enters the larynx, the child should no longer be fed by the mouth. If fluid food go the wrong way, it comes up through the tracheotomy tube, mixed with frothy mucus. A very soft (Jaques) No. 8 male catheter should be gently passed along the floor of the nares, through the pharynx, and into the stomach; through this the food can be administered by a glass syringe or funnel. The juice of lemons, or of some other fresh fruit, should occasionally be given. The first drops of the fluid should be introduced slowly, so that the surgeon may assure himself that the instrument has passed the right way. Peptonised enemata must be freely used; one being injected before the child is replaced in bed after the operation. Quinine and iron must be persistently administered, and small pieces of ice may be put into the mouth to allay thirst. The food is to be given in small quantities, and at short intervals—say, of an hour and a half or two hours. The stomach should not be overloaded, lest vomiting supervene; the subject of diphtheria cannot be expected to have either

good appetite or power of digestion, and vomiting is a contingency to be dreaded. Wine should be given with great freedom; there is no drug or aliment of equal value to it. Instead of some of the food mentioned above, certain beef peptonoids may be employed which contain the nutritive elements of the meat, with the solid constituents of milk and gluten. The food is prepared as one mixes mustard, in a cup, and is then diluted with hot water. If used as an enema, it should be given in a glass syringe, as it chokes the india-rubber apparatus. Rectal feeding may prove of great advantage. Warmed pancreatic food may be given in milk; it is readily absorbed by even a weak stomach.

The nurse should see, before the household retires to rest, that she has enough coal, methylated spirits for the spray, antiseptics, stimulants, ice, and food to last through the night; also feathers and torn pieces of sponge for keeping the tube clear. It is unsafe to leave the child for a moment unattended, so she cannot desert her charge during the night to make good deficiencies. In private practice two skilled nurses are required, one for night and one for day; they should both be in the room when the tube has to be taken out, or the child has to be disturbed for any other important matter.

There is an art in *clearing the tube*. When the child coughs, the scrap of sponge should not be held over the hole, but the nurse should wait until the cough has brought the mucus up to the mouth of the tube, then she should snare it, and prevent its being drawn down again. Great responsibility rests with the nurses. They should be thoroughly instructed in the art of clearing and cleaning the tube, and should have confidence for the removal of the inner tube for washing.

Cellulitis.—The surface of the wound occasionally takes on a covering of diphtheritic membrane; the skin and cellular tissue may become swollen, so that the tape around the neck requires easing, and inflammation may end in suppuration or gangrene. It is likely, however, that the child will sink ere such change can ensue. The œdematous wound may be painted with glycerine and carbolic acid, and the neck coated over with flexible collodion, or with white lead paint.

General emphysema sometimes follows tracheotomy; and

if, as sometimes happens, the air finds its way into the pleural cavity, fatal collapse of the lung is likely to take place.

The **permanent removal of the tube** involves anxiety and patience. If the child do well, it may be taken out for an hour or two on the second, third, or fourth day; but if there be spasm or dyspnoea, it must be slipped in again. The dilator should be at hand in case of difficulty occurring in the re-introduction. Before removing the tube, and to ascertain the condition of the glottis, a small piece of wet oil-silk may be laid over the mouth of the tube (after the removal of the inner tube), so that air has to pass through the glottis and between the limbs of the outer tube. At each inspiration this film is sucked over the opening, and the entering air has to be drawn through the larynx. This frightens the child at first, but he soon gains confidence, and so prepares himself for breathing through the glottis. It may be some weeks, or even months, before the tube can be omitted by night as well as by day; the dyspnoea is always worse at night. If the child be very nervous, the tube may be removed and the glottis exercised under chloroform. Impediments to removal of the tube arise from apprehensiveness on the part of the child, diphtheritic paralysis of the muscles of the glottis, blocking of the larynx by granulation-tissue, or adhesion between the vocal cords.* Such cases are difficult to manage, and fortunately they are rare. Granulation-tissue and adhesions may be broken down by passing a probe through the glottis from below, or it may be necessary to perform thyrotomy (page 53), and so to clear a way the granulations. The tube would be left undisturbed in the trachea for a few days subsequently, or the communication through the glottis might be re-established by the use of O'Dwyer's tubes, which may prove of signal service in the treatment of these troublesome cases.

Papillomata of the larynx may not be visible on laryngoscopic inspection, but by a process of exclusion their presence may be diagnosed almost with certainty. They are small pedunculated and sessile outgrowths of the mucous lining, which may all but completely fill the cavity of the larynx. They may be congenital. The dyspnoea has no intervals of

* See paper by Thos. Smith: Trans. Med.-Chirg. Soc., vol. xlviii.

complete remission, as in laryngismus stridulus. Parker had a case of this nature in a child of four years, who had suffered for three-fourths of its life from laryngeal obstruction. There was insufficient voice for speech or cry; finally, urgent dyspnœa ensued; tracheotomy was performed, the thyroid cartilage was laid open from the front, and the crop of warts cleared away. Recovery was complete, and voice was gradually developed. All cases do not prove so satisfactory. It is an anxious operation, and a serious ordeal for the child, the risks from shock, hæmorrhage, pneumonia, and sepsis being great.

For **thyrotomy** a preliminary tracheotomy is performed, and an exact median incision made through the thyroid cartilage and the crico-thyroid membrane. In childhood the parts are so small that probably sufficient room will not be obtained unless the cricoid be also divided. The surgeon proceeds slowly, securing each bleeding point, and making due provision that no blood passes down by the side of the tracheotomy-tube. This may conveniently be done by packing the space with small pieces of sponge tied on silk. The vegetations are scraped, seared, or snipped from the region of the glottis, with as little damage to the mucous membrane as possible, and the surface is then touched with a saturated solution of chromic acid, to check oozing and to diminish the risk of the return of the growths. When the alæ of the thyroid cartilage have been readjusted, the tracheal tube may be removed and the air-way through the larynx tested. The child must be watched lest respiration become suddenly embarrassed, and the dilator and tracheotomy-tube must be handy.

The operation should be performed before the child has become exhausted by dyspnœa; and when the diagnosis has once been established the surgeon should not wait for a fresh paroxysmal attack before operating. In the very young child there may be some difficulty in finding the lumen of the larynx, especially when the growths are abundant.

Thyrotomy may also be needed when circumstantial evidence of there being a foreign body impacted in the larynx is strong (page 236). After the operation the tracheal tube should be left in, lest dyspnœa suddenly occur from traumatic œdema of the glottis.

CHAPTER IV.

HÆMOPHILIA—TUBERCULOSIS—RICKETS.

HÆMOPHILIA.

THE hæmorrhagic diathesis is an inherited defect ; several members of the family may be vitiated by it. A boy with a constitution thus impaired was under treatment for a small contused wound of the scalp ; only after a prolonged trial of styptics, and compression, did the bleeding cease. A brother of this boy had bled to death from a scratch of the finger. Hæmophilia is a desperate complication in operative surgery ; even such comparatively small matters as circumcision, the extraction of a tooth, the bite of a leech, or the division of the frænum linguæ, sometimes causing fatal hæmorrhage.

Hæmophilia is far more common in boys ; but the girls of a "bleeder" family, though rarely themselves the subject of persistent hæmorrhage, are very likely to beget hæmophilic male children ; indeed, they are more likely to beget bleeders than are the males themselves. If a girl be hæmophilic, she may be the subject of serious loss of blood at the oncoming of menstruation.

As a rule, it is not a first or a second bleeding which causes fatal exhaustion, but the constant repetition of the attack. A boy may lose a large quantity of blood at a hæmophilic crisis without a fatal result, and, after bleeding has ceased, he may even make rapid progress towards an uncertain recovery. The attack may be preceded by headache and malaise. Sometimes the blood flows from the nose, the rectum, or the bladder ; the gum is a frequent site for spontaneous hæmorrhage. Blood may form large collections in the subcutaneous tissue, the intermuscular spaces, or the articulations. Such hæmorrhages differ from those of acute rickets by their frequent recurrence as well as by their characteristic associations. Reference has been made to umbilical hæmorrhage on page 271. Blood may well up through apparently sound skin, and, unable to coagulate, may

flow away in a full stream. It is always from many capillaries, rather than from a large vessel, that the bleeding takes place, and it is persistent rather than energetic.

If a surgeon knew that a child comes of a "bleeder" family, or had suffered from spontaneous hæmorrhage, he should decline to operate, except in the case of extreme urgency. When a cutting operation is demanded, it may be expedient to perform it with the thermo-cautery; abscesses should be allowed to open spontaneously. Should the child grow up, the taint will probably render him ill-fitted for the struggle for existence.

A late house surgeon of mine, at St. Mary's Hospital, who has been worried from his childhood upwards by this diathesis, performed his duties constantly and efficiently, notwithstanding the occasional presence of a collection of blood in his knee-joint or elbow.

Of the *pathology* nothing definite is known; it may be a disease of blood, or of blood-vessels, or of both. All *treatment* is unsatisfactory. The bleeding child should be put to bed, and if the hæmorrhage be from an extremity, or into a joint, the limb should be fixed to a splint. Neither suture nor cautery should be used, as this would be followed by ulceration or sloughing. The spot may be dressed with dry cotton-wool secured with gentle pressure. Opium should be given in small and repeated doses, and the fact that "Ruspini's styptic" is a patent medicine need not preclude a trial being made of it. Iron and cod-liver oil may be given, and any drug or food which is likely to improve the general condition. Ergot and turpentine are highly spoken of also; but no drug has yet been found of specific influence. Even in extreme cases transfusion should not be resorted to, as the necessary incision may give rise to bleeding which may be equally unmanageable. Warm saline injections may be administered by the rectum, but alcoholic stimulants must be avoided. Fresh air, sunshine, cleanliness, and warmth, are of the utmost importance. If unusual vascular fulness give warning of an attack, the child may be treated by free purgation; indeed, it is a most important matter to see that the bowels never become confined. (Epistaxis, page 209.)

TUBERCULOSIS.

Tuberculosis is an "infective" disease—that is to say, the micro-organisms upon which it depends may multiply within the body and give rise to a general infection. The discovery of the specific bacilli is accepted as evidence of the tuberculous nature of the affection, but a failure to discover them in pathological fluids and tissues does not imply that they are absent. Indeed, my experience is that it is often extremely difficult, or even impossible, to find them in material which has been removed by surgical operation upon a child who is obviously tuberculous. The presence of the bacilli in the weakened tissue of an unhealthy child determines the growth of feeble granulation-tissue which is particularly apt to break down, or to undergo caseation. These masses are sometimes spoken of as "tuberculous gummata."

The adjectives "strumous" and "scrofulous," which were formerly used in connection with an inflammation of a lymphatic gland, a joint, or a conjunctiva, implied that the subject was of an unhealthy nature, either from inheritance or surroundings, and, further, that the attack was likely to run a lingering course, and possibly to end disastrously. The words had no accurate meaning, and they no longer find a place in pathological literature. Indeed, they are quite unworthy of it, being destitute of definite, scientific meaning. To the lay mind the word "strumous" was acceptable, in that it meant nothing more, perhaps, than a potential tuberculosis, which might be warded off by timely and judicious treatment. Thus it was considered to be far more suited for domestic use than the adjective "tuberculous," which, for pathological purposes, is the one which will be employed in this book. The adjective "tubercular" has an anatomical rather than a pathological signification. "Scrofula" is hopelessly out of date; what has the sow (*scrofa*) to do with tuberculosis?

Tuberculous inflammation is often unassociated with pain, the skin being pale, bluish, or marbled. A great feature is that the inflammation is liable to be started by insignificant causes. Thus, a tuberculous boy sprains his knee, and the

chronic, or subacute synovitis which follows ends in total destruction of the joint. Another child is rapped on the wrist with a stick or ruler, and chronic abscess is the result; a third child suffers from an intractable periostitis of the tibia after a fall on the shin; and, in a fourth, ulcer or abscess refuses to yield to treatment.

The usually accepted theory is that the bacilli, or their spores, enter the system by the lungs, the alimentary canal, or by a denuded integumentary surface. If the patient be predisposed to the reception and cultivation of the bacillary growth, either from hereditary tendency or an acquired condition, it will enter the blood, lodge at some part weakened by injury or by disease, and, developing after its kind, set up the peculiar form of chronic inflammation. These bacilli are, thus, harmless in the child with sound glands and joints; but when those tissues are below par (as after an attack of zymotic fever, or after a local injury) to breathe the germ-laden air may be the cause of disaster or death. If this theory be a true one, it behoves the medical staff and attendants at a children's hospital, where bacilli must needs abound, to be sound in every tissue *cap-à-pie*. If the bacilli be of that desperately malign nature with which they are discredited, how is it that so many children with tuberculous disease of spine and joint completely recover, as they most certainly do, under the simple treatment of rest and tonics? I think that Keetley is right when he says that tuberculosis tends to die a natural death, and that Time can kill local tuberculosis unassisted by the surgeon. The misfortune is that Time is so dilatory in the exercise of his healing powers, and that very often the patient or the joint, or both, are destroyed before the disease; but when vigorously helped by the surgeon, Time often wakes up, as it were.

Tuberculosis of bone.—Tuberculosis attacks by preference the small bones, which are rich in cancellated tissue—as, for instance, the bodies of the vertebræ (page 246), the carpus and tarsus and the diaphyseal ends. Usually the nutrition of the bone has been lowered by an injury, or by the child having just passed through some serious illness. So the bacilli tuberculosis get a foothold, and, undergoing successful cultivation, set up a very quiet and rarefying osteitis.

The result of this is that a growth of granulation-tissue takes the place of the cancellated tissue, leaving nothing but the compact shell. In due course this also gives way, and the granulation-tissue spreads into the adjacent synovial membrane (Fig. 3), cartilage, or bone, as the case may be. During all this time the affected bone does not increase in size, for tuberculous inflammation of bone is a rarefying, not an osteo-plastic process.



Fig. 3.—Tuberculous Abscess at Lower End of Femoral Diaphysis, opening into Knee-joint. (From Museum of St. Mary's Hospital.)

Tuberculous osteitis is not always a primary affection. It often happens, for instance, that a tuberculous synovitis determines the wreckage of the adjacent bone-tissue, granulations spreading as easily from synovial membrane into bone as in the opposite direction. Thus, when a knee is opened for intractable synovitis, the granulation-tissue may be seen creeping over the articular cartilage "like ivy on a wall," and working its way beneath it, and through the compact lamella into the interior of the bone. But, however much the articular end of the femur, or of any other long bone, may be involved, the bone is not sclerosed. When the knee-joint has been long the seat of tuberculous disease, the head of the tibia having

been displaced backwards and somewhat outwards, and the internal condyle of the femur has been left isolated and prominent, it is apt to be thought enlarged. But when the joint is opened for the purpose of performing a resection, it is at once seen that there is no bony enlargement whatever.

When tuberculous inflammation attacks the delicate new bone at the end of a diaphysis or of the interior of an epiphysis, it sometimes sets up a localised thrombosis which ends in necrosis. The sequestrum then lying in the midst of the bone causes so much irritation that chronic osteo-plastic inflammation ensues, and the end of the bone becomes

sclerosed and expanded. Such a case is apt to be taken for one of myeloid sarcoma (page 118). Without needless delay the enlarged bone should be cut down upon, trephined and explored, the object of search being a central sequestrum, or the opening up of a definite abscess cavity. Even if myeloid sarcoma has been diagnosed, a cut should be made into the mass, so that there may be no risk of a superfluous and calamitous amputation being resorted to.

When tuberculous inflammation attacks the lower end of the femur, it is apt to determine necrosis of that triangular piece of the bone which helps to form the floor of the popliteal space. As a rule, this is associated with the formation of a certain amount of pus; so that, as soon as abscess threatens, an incision should be made in the groove between the tendon of the biceps and the ilio-tibial band, and the popliteal surface of the femur should be explored with the finger. One is thus enabled to detect an opening into the diaphysis or epiphysis close to the junction-cartilage, and, on enlarging the opening, may have the good fortune to extract a central sequestrum. Many a joint has been lost because the surgeon has neglected to make an opening into a bone, the articular end of which was in a condition of tuberculous inflammation, or was irritated by the presence of a central sequestrum or abscess. Without help, a sequestrum is quite likely to escape into, or wreck, the joint.

In Fig. 4 is represented the vertical section of the lower end of a femoral diaphysis which has been enlarged by chronic irritation set up by the presence of a central tuberculous abscess. The enlargement is not caused by tuberculous osteitis (for that would be a rarefying inflammation); it is an osteo-plastic process. The area of bone in which the bacilli tuberculosis worked their destructive influence was limited to that of the abscess and sequestrum, which are well shown in the wood-cut.

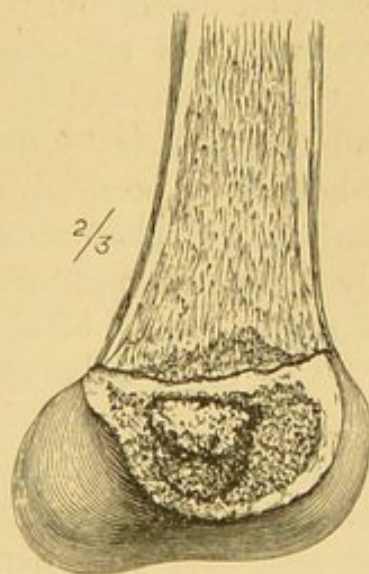


Fig. 4.—Central Necrosis the Result of Tuberculous Epiphysitis. (From Museum of St. Mary's Hospital.)

Sometimes it is difficult to say whether the necrosis was determined by a tuberculous or a septic osteitis. The discovery of staphylococci in the sequestrum is not a proof of the septic origin of the necrosis, for they may have found access to the region by an open sinus. Fortunately, the treatment is the same in each case, namely, to scrape out the cavity and to irrigate it with a lotion of zinc chloride (grs. 10 to ʒi).

Tuberculous inflammation specially attacks lymphatic glands, bone, skin (lupus), and synovial membrane. It may come on quietly and painlessly, dragging its weary course; it is little influenced by treatment, and is very prone to relapse. For months or years tuberculous deposits may remain quiescent, and then, under the influence of physical depression or local disturbance, may wake up and excite suppuration. In this way the so-called *residual abscesses* are produced. Caseation and subsequent drying up are a fortunate ending of the deposit.

Prognosis.—Often when tuberculous inflammation has liberated itself by setting up auspicious suppuration, and evacuation of the abscess has taken place spontaneously, or has been procured by art, rapid healing occurs. Tuberculous inflammation is by no means incurable. Even from general tuberculous peritonitis a child may recover on the surgeon performing abdominal section, although at the time of operation the peritoneum is seen to be dusted over with countless specks of tubercle.

The term **tuberculous abscess**, as applied to the fluid granulomatous collection of spinal caries, hip-disease, and so on, is more convenient than correct; it is no more an abscess than is an advancing gumma. *Abscess* implies the presence of pus, and pus demands the presence of certain septic micro-organisms. If these micro-organisms find entry into a tuberculous granuloma, true suppuration occurs, and greatly to the disadvantage of the child. Under appropriate treatment the child with tuberculous disease of the hip, spine, or other joint, may grow into a strong man or woman; experience is daily showing us that the intractability of tuberculous disease of joints has been exaggerated. Still, according to D'Arcy Power, "tuberculosis kills one-third of the children who annually die in hospitals." (*See Foot-note, page 252.*)

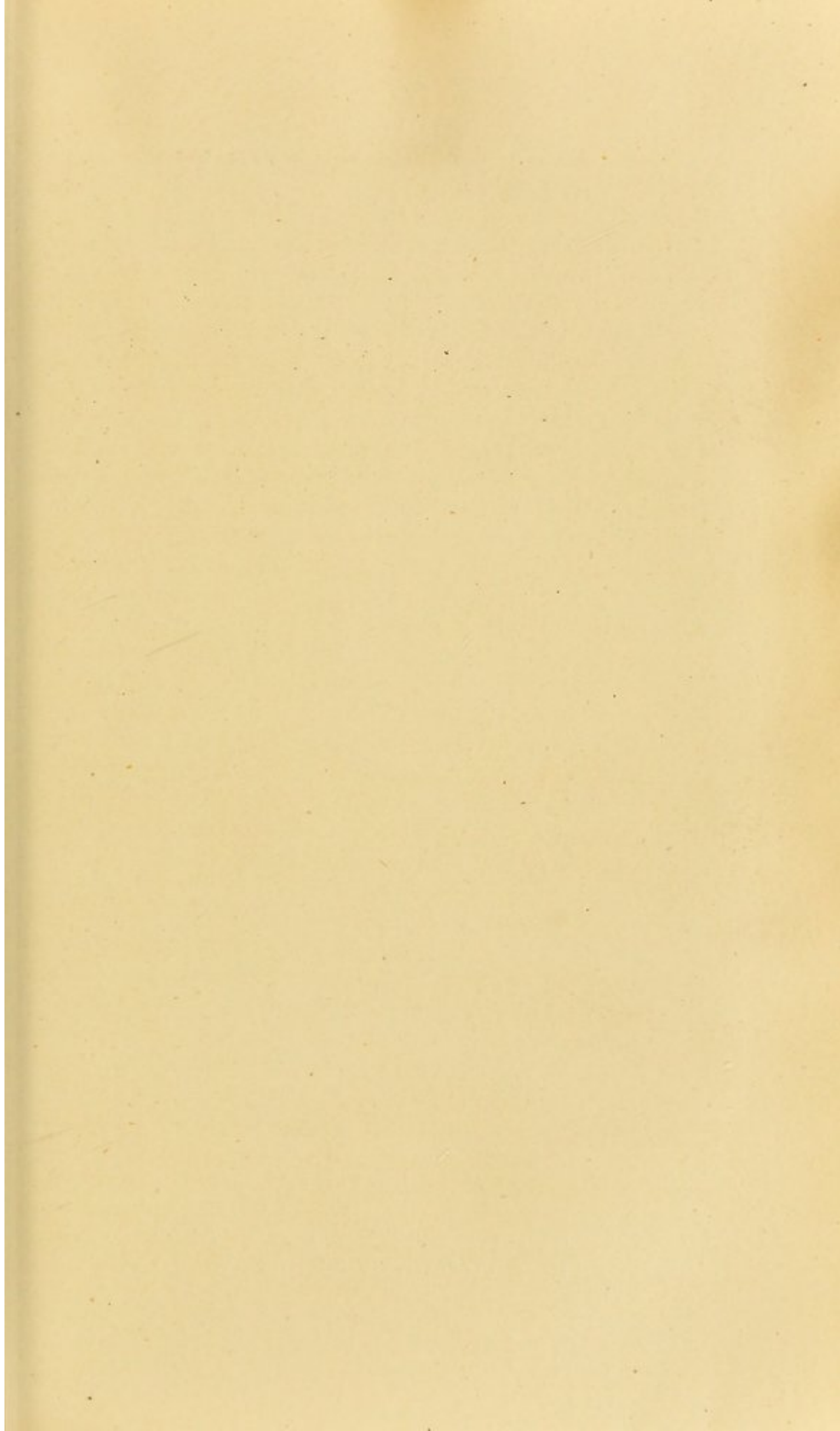




Fig 1.



Fig 2.

PLATE I.

FIG. 1.—TUBERCULOUS DACTYLITIS. (Page 61.)

FIG. 2.—ULCERATIVE STOMATITIS. (Page 192.)

The *treatment* demands fresh, dry, warm air; sunshine; flannel clothing; plenty of good wholesome food; rest; warm washings of the entire body; gentle exercise—mental and physical—and cheerful surroundings. But fresh, dry air and sunshine are “everything” to the tuberculous child. Cold bathing is prejudicial; the circulation is slow, and after exposure to cold the fingers become chilled and livid. Drugs to be tried are iron (in the form of tincture or iodide) and cod-liver oil (if the latter can be taken without nausea). Cod-liver oil may be given with sardines, but where it cannot be kept down, cream and bacon form excellent substitutes. The oil must not be administered in large quantities; half a teaspoonful twice a day after meals is a fair dose. Every now and then the oil may be left off for a few days or weeks, so that a dislike or disgust for it may pass away. Glycerine is not an equivalent for cod-liver oil. Oil may also be rubbed into the skin when the child cannot take it by the mouth, and its action is the more prompt when some camphor liniment is added. Wine is not essential; spirits are actually harmful. Occasional doses of rhubarb and soda may be required.

Such places as Rhyl, Broadstairs, and Margate are excellent for residence, especially in warm weather; but in winter Bournemouth, Ramsgate, and Eastbourne are preferable.

Prof. Lannelongue has advised the injection by a hypodermic syringe of a strong solution of chloride of zinc into the tissues infected with a growth of tuberculous granulation-tissue. In the case of a synovial membrane being affected, care must be taken that the solution does not enter the cavity of the joint. My own experience of this method of treatment is not sufficient for me to speak either for or against it, but one would think that the sclerosing action of this powerful salt cannot but be beneficial.

Tuberculous dactylitis is a rarefying ostitis of the phalanges, or metacarpal or metatarsal bones. It is often associated with other manifestations of tuberculosis. It may come on after a slight injury, but in many cases there is no history of the hand or foot having been damaged. The bone is considerably swollen, its shell of compact tissue being

occupied by a mass of feeble granulation-tissue and pus. The skin of the affected digit is dusky and œdematous, and after the abscess has discharged itself, a ring of flabby granulations may mark the opening of a sinus, through which a probe may be passed into the area of the tuberculous osteomyelitis. The affected bone is apparently enlarged, but, as a matter of fact, the original bone-tissue has disappeared under the growth of granulations, the expanded periosteum forming a new osseous shell from its deep layer. (Plate I., Fig. 1, shows a finger affected with tuberculous ostitis.)

Treatment.—If the hand or foot be very efficiently fixed on a splint, and kept in perfect rest, the case will probably do well. As the enlargement subsides, minute sequestra come away, the cloacæ disappear, and a useful though shortened digit results. But if the disease be more advanced, or prove unresponsive to gentle measures, the shell of bone should be laid open and thoroughly scraped out, the cavity being packed with mercuric gauze. Amputation is rarely needed.

Tuberculous gummata of the skull-cap, tuberculosis perforans, sometimes occur in children who are deeply under the influence of tuberculosis. They appear as flat, circular elevations beneath the scalp; they are rather tender, and at first are quite firm. But as they increase in size they become softer, on account of the breaking down of the granulation-tissue and inflammatory material of which they are composed. If left to take their own course, they become more elevated and still softer, and at last the scalp gives way over them, exposing a carious surface of the calvaria. The central part of the small area of diseased bone is then represented by a circular and somewhat pyramidal sequestrum, which has been loosened from the surrounding bone by an annular growth of granulation-tissue. In fact, the disease is a mixture of caries and necrosis (*caries necrotica*), and, as might be expected in the diathesis, the inflammation is unassociated with plastic deposit. The effect of tuberculous inflammation of compact bone, like the skull-cap, is different from that of a spongy bone—the body of a vertebra, for instance. In the latter case a rarefying ostitis results; but when hard, compact tissue is inflamed, necrosis is very apt to ensue. Sometimes several of

these puffy swellings may be found, and the deepest of them may extend through the entire thickness of the skull, the apex of the sequestrum resting on the dura mater. At other times only the outer table is involved. If the small puffy swelling, or swellings, be unassociated with other manifestations of tuberculosis, the surgeon may at first be in doubt as to whether the case may not be one of syphilitic gumma. This doubt is readily solved by administering a course of potassium iodide or of mercury. As I have implied elsewhere (page 100), there is a close anatomical resemblance between a tuberculous and a syphilitic gumma. But in the latter case, when the disease affects the bone, there is generally more or less osteo-plastic deposit, which is conspicuous by its absence from the tuberculous lesion.

The *treatment* involves the free use of the scalpel and sharp spoon.

Tuberculous nodules in the skin (*scrofulo-derma, strumous tubercle*).—A child is probably being treated for some chronic affection of glands, bone, or joint, when the mother remarks that he has "something like blind boils on his thigh." The tuberculous nodules are often seen in the child who is the subject of dactylitis, and a favourite site for them is the skin of the buttock. Sometimes there are tubercles in various stages of development in different parts of the body. The smallest of them feels like a fine shot-pellet in the skin; there is neither tenderness nor discoloration about it. A further stage shows the nodule larger, and nearer to the surface, and the skin around it hyperæmic or dusky. A deposit still more advanced may be as large as a bean or a dried raisin; the spot being soft and the skin brownish or purple. Soon after this the thin skin gives way, and the chronic "abscess," or unhealthy-looking ulcer which results slowly disappears, its situation being temporarily marked by a dusky staining. The best way to find the youngest of these tubercles is gently to pass the hand over the skin of the trunk and extremities. They consist of aggregations of leucocytes in a fluid, granular, or slightly fibrillated matrix. At first they are quite hard.

Treatment.—If the child be dealt with on the scheme laid down in this chapter, the nodules may probably disappear

spontaneously, either by the contents being absorbed or by escaping to the surface. Still, realising the fact that they are centres from which the bacilli may infect the system, the sooner that they are incised and thoroughly scraped out the better. So also with regard to the tuberculous ulcers which are apt to remain after the spontaneous evacuation of the nodules. The wounds thus made are conveniently dressed with dry boracic lint.

Lupus is a chronic, painless dermatitis often met with in tuberculous children. The surface of the skin is dusky red, and in its depths is a diffused mass of unhealthy granulation-tissue, which, breaking down, and destroying the superficial layer of the skin, causes a spreading ulceration. Though its favourite seat is the face—and especially the nose—it may occur on any part of the body, and give rise to unsightly devastations. Around the chief focus of the disease glazed papules may be found ready to merge into the original sore. Sometimes the granulation-tissue becomes slowly transformed into cicatricial tissue, without the occurrence of ulceration. The bacilli are difficult of discovery, and the disease never gives rise to general tuberculosis.

The *treatment* must be very thorough. The patches should be freely dissected away, or efficiently dealt with by means of the sharp spoon or thermo-cautery. Lupus cannot be cured by medicines, though cod-liver oil and iron are useful adjuncts to operative measures. When a large area of skin is implicated, it should be boldly and cleanly dissected off, and, the oozing from the raw surface having been checked by pressure, aseptic grafts of the superficial layer of the skin of the thigh should be applied, after the method of Thiersch.

Tuberculous ulceration is generally quiet and painless. Though sometimes surrounded by undermined and dusky edges, at other times the sores are covered with granulations, which, but for a want of energy, look fairly promising. Healing is not influenced by drugs, diet, or local applications. The sore may fill up for a while, and then break down again. Nothing short of a thorough scraping avails, the edges being at the same time shaved away. If the sore be upon an extremity, a splint must be applied to the limb to ensure perfect rest. (For Tuberculous Glands *see* page 103.)

Tuberculous meningitis is apt to supervene in the progress of a localised tuberculous disease, and even when everything promised well. The fact of such meningitis being of comparatively rare occurrence is evidence that the tuberculous disease of glands, bones, and joints is not, after all, generally infective. The meningitis is rarely a primary affection. It is due to the tuberculous material being carried to the pia mater—chiefly at the base of the brain—where it sets up an inflammation which almost invariably ends fatally. The deposits are actually “tubercular.”

The acute inflammation of the pia mater, and also of the choroid plexus, determines basic and intra-ventricular effusions of serum, so that the disease was often called *acute hydrocephalus*.

The **symptoms** may be at first, and for several days, quite obscure. The child cares less for food; he vomits occasionally or persistently, and even when he has not been taking food; he loses flesh, and is drowsy. He may ask to be put to bed two or three times a day, or to be taken upon his mother's knee. He complains of headache, and puts his hand up to his head; he is restless and apathetic, and his pale face is every now and then covered with a bright flush. He takes no interest in his toys or anything else; he is peevish, and he wishes to be left alone. By drawing the finger-nail in a slight scratch across the skin of the abdomen, a wide red streak appears (*tache cérébrale*). The abdominal wall is depressed, for the intestines are empty and contracted. The boy grinds his teeth during sleep, and wakes up with a scream. He dreads the light, and turns over in bed to avoid disturbance. The eyebrows are knit, and the expression is anxious; the head may be hot, and rigidly drawn backwards. The child utters a short, sharp cry, and may call, “My head! my head!” The fontanelle may be bulging. The pulse is quickened, and the temperature raised. He may temporarily rally. The pulse is irregular, weak, and flickering, and there is also irregularity of respiration; twitchings and localised paralyses may be often noticed. The pupils may be evenly contracted, or unequal, and often the child squints. Then drowsiness yields to delirium. At any period of the disease convulsions may set in, and as the end approaches, coma is

complete, the bladder and rectum being evacuated unconsciously. On ophthalmoscopic examination the retina is found congested, and tubercular deposits may be detected in the fundus.

Treatment and prognosis.—No treatment seems of avail when once the diagnosis of tuberculous meningitis definitely declares itself. Mercury, iodide and bromide of potassium, anodynes, purgatives, and leeches; cold to the head and blisters afford but temporary relief. If the child be constantly sick, it is useless to give medicines by the mouth. When milk cannot be kept down, nutrient enemata may be administered; but it is first expedient that the bowels be thoroughly cleared, either by a full dose of calomel and jalap, or by a simple enema. The room should be kept dark and quiet; lint soaked in iced water may be applied to the head. The bladder may require attention.

In the case of little children in which the acute effusion of meningitis is rendered obvious by the bulging of the fontanelles, temporary relief may be offered by trephining the skull, or by draining off the cerebro-spinal fluid through a puncture in the loin. At the best, I fear that this measure is only the treatment of a symptom of the disease; so far as we know, the withdrawal of the fluid does not influence the advance of the tubercular deposit in the pia mater, which is the cause of the disease. My own position as regards *lumbar puncture* is that, in that it relieves the great tension of the membranes and pressure upon the cerebral tissue, it "does something," but that, in the present state of our experience with it, I am not able to urge its adoption.

Multiple abscesses in infants at the breast.—A succession of abscesses in the subcutaneous connective tissue, and even in the intermuscular spaces, are occasionally met with in infants at the breast. It is by no means satisfactory to ascribe them, as Bouchat has done, to syphilis or tubercle. I am disposed to attach a close connection between them and a chronic form of blood-poisoning, the result, perhaps, of infection at the truncated umbilical cord. Roulland reports the case of an infant who was in a satisfactory condition as regards health and surroundings till he was weaned, when he was attacked with diarrhoea. The abscesses which then

appeared subsided with the diarrhœa. A second attack of diarrhœa, after an interval of three months, was followed by more abscesses. He believes that the child was inoculated by absorption of septic material from the bowels.

Escheric is of opinion that the abscesses are due to swarms of staphylococci, which abound in the liver of all sucklings, colonising in the connective tissues.

The treatment should comprise fresh air and cleanliness, and the prompt incision and washing under chloroform of each abscess as it forms. I have recently had an extremely bad case of this disease, evidently of a pyæmic nature; but the infant was enabled successfully to struggle through the attack. There was no suspicion of syphilis or tubercle, nor had the mother had any puerperal trouble.

RICKETS.

Rickets is a disease of nutrition, and usually appears in the first or second year. The disease abounds amongst the offspring of the London poor; practitioners from British colonies are astonished at the number of children affected with it—there were definite signs of rickets in about 30 per cent. of the children under my care in the out-patient department. Exposed to similar prejudicial influences, some infants become tuberculous, others rickety; probably an hereditary peculiarity determines the inclination to this or that disease. Tuberculous children are not often rickety. Hand-fed infants are much more liable to rickets than those who are suckled, especially if they have been reared on condensed milk or a farinaceous diet. The children of well-to-do parents are likely in these circumstances to show signs of rickets; the disease is not by any means limited to the children of the poor. Being constantly associated with errors of diet, rickets is probably due to the absorption from the alimentary canal of products of decomposition which have been derived from the undigested food. If this be the case, rickets is as much the result of a toxæmia as are hectic fever and albuminoid disease, with this difference, that in rickets the absorption is from the alimentary canal, and not from a large septic wound, as is usually the case in hectic fever and albuminoid disease.

One of the earliest **symptoms** is restlessness at night, and a habit of kicking off the bed-clothes. Many rickety children perspire freely during sleep, so that the pillow is wet. If a child kick off all the clothes, he becomes chilled, and then perspiration does not occur. The frequency of the occurrence of bronchitis and acute pneumonia in rickety children is partly accounted for by their lying naked and chilled in bed. It is not clear why rickety children kick off the clothes. It has been suggested that it is because the body is tender and cannot tolerate pressure; but the rickety child is not so tender as this would imply—unless, indeed, subperiosteal or other hæmorrhages have occurred. In the general run of cases there is no definite tenderness; the child is anæmic, feeble, helpless, and fretful, but not in pain. He is backward, and tumbles about, or crawls, when he ought to be able to walk securely. The muscles are flabby, and the normal curves of the bones are exaggerated.

The head is expanded, the forehead large, and the face puny. The borders of the parietal bones are swollen, so that the sagittal suture is thickened; but ossification is so delayed that the anterior fontanelle, which should be closed before the end of the second year, remains open long afterwards. The thickening of the parietal bones may produce a definite, though shallow furrow along the sagittal suture. The occiput may be flattened if it be constantly resting upon the pillow, or on the nurse's arm. And either from the pressure of the brain from within, from absorption, or from retarded ossification, a thinning of certain parts of the parietal and occipital bones is produced (**cranio-tabes**). (See also page 95.) The soft spots may be detected by pinching the postero-lateral parts of the head between the finger and thumb; it is as if the skull had been patched with a piece of parchment. The condition is found chiefly during cradle-life, and is thus an early manifestation of rickets.

When rickets appears in early infancy, the eruption of the incisor teeth may be delayed, and if the disease appear after the cutting of the incisors the eruption of the molars may be retarded. A case has been recorded in which a rickety child of nearly two years had cut but four teeth. The enamel is imperfect and the teeth readily decay. The alveolar process

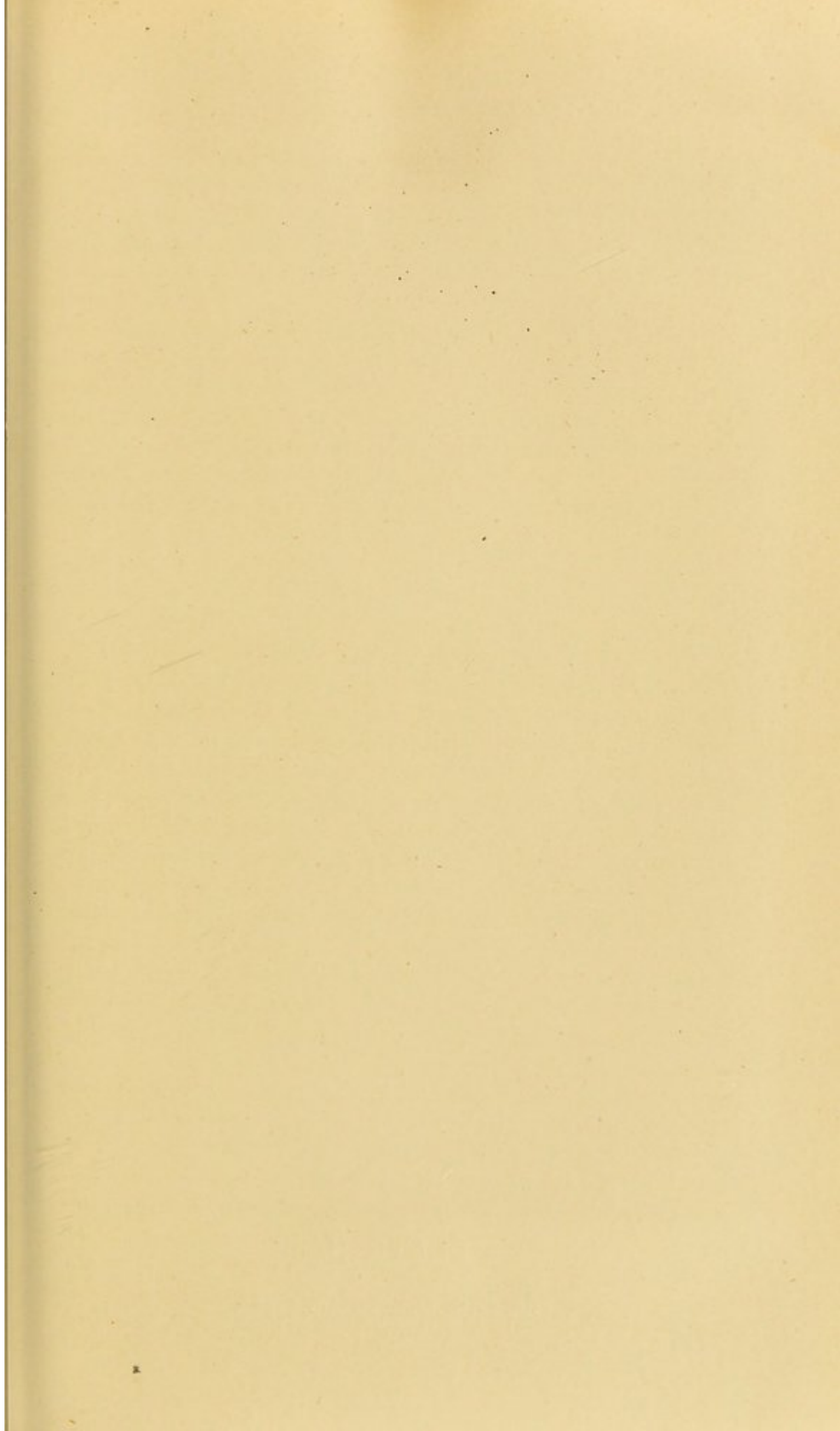




PLATE II.

EXTREME RICKETS. (Page 69.)

of the plastic lower jaw, under the influence of the pressure of the lips, is occasionally repressed so that the teeth slope backwards. The rickety infant is very apt to be the subject of laryngismus stridulus (page 36), and of convulsive nervous attacks.

The bones are deficient in earthy matter, and yield to superimposed pressure. The femur, tibia, and fibula bend, and if the child content himself with crawling, the bones of the arm and forearm may be deformed. Sometimes the mere elevation of the arm by the deltoid causes the humerus to yield. The spine bends in a hoop curve, and may be so weak that the head hangs down upon the chest. Want of nutrition affects the development of the bones, so that the rickety youth is generally stunted, as well as bandy or knock-kneed.

The ribs yielding under atmospheric pressure, the child becomes pigeon-breasted (*See* page 86). The anterior extremity of each rib and the adjoining piece of costal cartilage are expanded, so that a series of "beads" suggests the term "rickety rosary." But a child may be markedly rachitic without presenting this sign, the expansion of the end of the rib being then almost entirely on the pleural aspect.

The abdomen is prominent and widened, even up under the false ribs. This is not due to enlargement of the liver or mesenteric glands, but to distension of the intestines, for there is unusual resonance on percussion. The motions are irregular and offensive; and the gas evolved by fermentation of the food causes the alimentary canal to be inflated. The prominent abdomen, and the chest compressed from side to side, are characteristic of the disease; and they are well shown, together with the large head and the small face, in the adjacent Plate II.

An interesting feature in connection with the tumid abdomen is that the linea alba yields, becomes frayed out, and is represented by a wide median furrow. The straight muscles of the abdomen are then thrust from each other, under the constant pressure from within the cavity, till at last a wide gap is left between them, from pubes to sternum. Through this gap the intestines bulge when the abdominal muscles are thrown into action, as in the child's attempt to sit up.

The pelvic bones become crumpled, and especially so if the

weight received by them be increased by the weak spine being fitted with a steel "support." But the child may grow out of all these deformities, provided only that he be kept lying down until his skeleton is more strongly developed, due attention being paid to matters of general hygiene.

There is a disordered proliferation in the cartilage at the ends of the diaphyses, and in the periosteum, which are the sources of the normal growth of the bones in length and in thickness. The cells for the growing bone are formed in vast numbers; they are swollen, and heaped through the matrix without histological order, and, as ossification advances, clusters of cartilage cells become shut off and forgotten, as it were, remaining for a long while in the expanded bone, or growing out as bony spines and nodules (*v.* Exostoses, page 136). Thus the extremities of the long bones are expanded, especially the carpal ends of the radius and ulna, the tibia and fibula being affected in a less degree. The wrist may appear as if it possessed an articulation above the swelling as well as below it, and the child is then described by the mother as "double-jointed." The rickety child is sometimes unusually well developed, heavy and plump, but, on taking the end of the radius between the finger and thumb, the actual and unhealthy state of the child becomes manifested. This may be discovered in certain cases in which there has been a complete absence of dyspeptic symptoms. Unless the rickety diathesis be effaced at a tolerably early period, a definite trace of the enlargement of the end of the radius persists through adult life.

Treatment.—The child should be kept evenly dressed, and always warm, and it is absolutely necessary that the air and the food should be fresh. As regards the general hygiene, reference may be made to page 12, and with regard to drugs—which, however, is a far less important matter—reference may be made to page 61. The child must not be allowed to walk or sit until the bones and ligaments are strong enough to support his weight. He should be kept flat. The administration of phosphorus in minute doses has acquired considerable repute in the treatment of rickets and of the deformities resulting from it. The most convenient preparation of the drug is the oleum phosphoratum, in doses

of from one to six minims. Lime-water should be given with the milk.

The treatment of rickety deformities is given in the next chapter.

Fœtal rickets is a name given to a condition occasionally observed in the new-born infant. The body of the rickety fœtus is rounded, and laden with fat; the belly is tumid; the limbs are stunted, and marked with transverse folds. The shafts of the long bones are short, thick, and bent, and the ends of the ribs beaded by the development of a cap of bone around the costal cartilage; the head is large. These infants may be regarded as belonging to a pronounced fœtal type of cretinism. They probably perish at or soon after birth. (Cretinism, page 172.)

Although the disease is one of infancy, its appearance may be delayed until the child—usually a female—is approaching its teens, or even puberty. But in some cases of *late rickets* the disease is probably the recrudescence of an early and unnoticed attack, and is brought on by want of fresh food, fresh air, and exercise. The epiphyses become enlarged, and the bones bend.

Rickets in adolescents makes its appearance, or, more probably, its recrudescence, at about puberty. It is an association of weak ankles and flat feet, with albuminuria. Lucas attributes it to masturbation.

Hæmorrhagic, or "scurvy" rickets.—If an infant have been brought up chiefly on farinaceous food, or on condensed milk, or on the two combined, he is apt to become extremely anæmic, weak, and markedly rachitic.* A diet exclusively of bread and butter may induce the condition in an older child, but, as a rule, the subjects of so-called "scurvy" rickets are of about nine months. I have recently met with a case in which the infant had been reared on fresh cow's milk excessively diluted with barley-water. The ribs are beaded, the epiphyses are swollen, and the head is wet with perspiration; there is little or no elevation of temperature. The gums may be spongy and swollen, and bleed at the least touch, and hæmorrhages may take place into their substance, making them look as if

* Trans. Path. Soc., 1883, by Barlow and Page; "Year-Book of Treatment," 1884.

bruised. Hæmorrhages may also occur into the kidney or bladder; beneath the periosteum of the femur, tibia, or other bone; into the joints, the skin, the conjunctiva, or other mucous membrane, or amongst the muscles. I have seen an enormous extravasation between the gastrocnemius and soleus, and in the case of an infant of eleven months there were capillary ecchymoses beneath each lower eyelid and into the vaccination scar. But I have met with several cases in private practice in which, though there has been considerable swelling of a leg or thigh, the gums have been apparently healthy. The gums should always be examined.

The infant with sub-periosteal hæmorrhage lies moaning, and he cries out when the swollen limb, generally the leg or thigh, is handled; the disease being sometimes mistaken for rheumatism or periostitis. When a limb is peculiarly tender, and there is no history of the infant having met with an accident, and no other suggestive cause, the question of incipient "scurvy" rickets must be considered. The child looks extremely ill; the skin is conspicuously pale, and glazed from tension beneath, and the limb is too heavy and too painful for the child to move it. The swelling, which has come on suddenly, extends around the limb, and usually gives no sign of fluctuation. The skin of the foot may be glazed and œdematous, and the child dreads being disturbed. Sometimes the effusion—into the knee-joints, for instance—comes on after a fall or other hurt, and may thus be taken for sero-synovial fluid. But the absence of heat and redness over the joint should make the surgeon suspicious. I have known the disease taken for "rheumatism" in a case where both knees, in a boy of three and a half years, were distended. But the absence of a high temperature should have guarded one against this error in diagnosis.

Briefly, I would put the diagnostic points thus:—A glazed, swollen, motionless, and tender limb in a pale, rickety child, who has been brought up on patent foods and sterilised milk. The child is very likely to be the subject of gastric catarrh and chronic dyspepsia, and perhaps "everything" in the nature of advertised food has been ineffectively tried. The disease is a rare one, and its diagnosis is very likely to be overlooked.

The surgeon may wonder at first if the case is one of broken bone, of septic osteitis, or of cellulitis. Sometimes both legs are affected. In some instances the epiphysis is detached from the shaft. (A fine cannula and trochar thrust into the swelling would find the bone bare, and on withdrawal of the trocar a drop or two of dark blood would escape, but no pus.) As D'Arcy Power says, the chronic nature of this disease and the absence of the signs of septic infection distinguish it from osteo-myelitis (Chap. XXVI.). Ashby does not accept the theory of "scurvy" in this condition, but regards the sponginess of the gums and the hæmorrhages as expressions of the extreme anæmia of acute rickets. For my own part, I would by no means insist on the retention of the term "scurvy" rickets. I would be content with the adjective "hæmorrhagic." The association of the word "scurvy," however, is advantageous in that it at once suggests the appropriate line of treatment.

Treatment.—Recovery takes place under the influence of cleanliness, warmth, fresh air, new milk, cod-liver oil, sweetened orange juice, beef juice, and fresh vegetables. For the swollen limb, elevation, gentle massage, and dry compression are useful, with appropriate splinting. Small doses of quinine and iron may be administered; no active surgical treatment, or exploration, is required. Under the improved hygiene, the blood clot is steadily absorbed; the periosteum resumes its connection; detached epiphyses again adhere to the shaft; the swelling of the limb disappears, and the child completely recovers. The child should not be shut up in a dark, stuffy room, but should be got out into the fresh air as much as possible.

CHAPTER V.

RACHITIC DEFORMITIES.

Genu valgum, or **knock-knee**, is common amongst rickety children, and, unless attended to, it is apt to persist in a marked form in adult life; but considering the number of valgous children that we see, and being fully aware of the

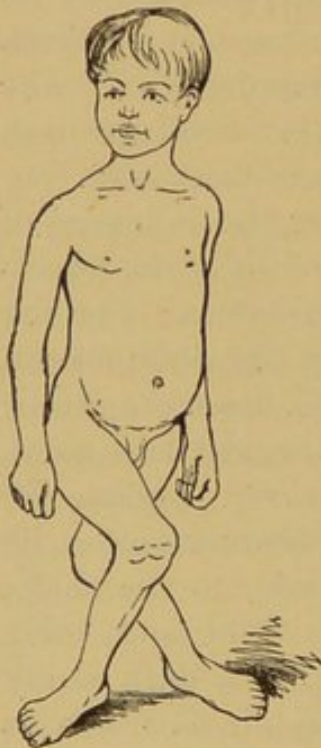


Fig. 5. — Extreme Genu valgum. (From a Photograph.)

imperfect way in which our instructions are usually carried out, it is surprising that the number of knock-kneed adults is not larger. The deduction is that some children grow out of their deformity; but to leave the disfigurement unattended to, and to promise that the child will grow out of it, is to court disappointment (Fig. 5).

Genu valgum is usually associated with, if not determined by, a relaxation of the muscles and ligaments of the foot, especially along the inner aspect of the arch; the knock-kneed child is generally flat-footed. The anatomy of knock-knee is more fully treated of elsewhere.* The tibia having lost much of its support at the inner side of the ankle, the upper surface of its head receives the weight unevenly from the femoral condyles, the outer tuberosity getting more than its due share. This extra pressure causes some arrest of growth at the outer condyle of the femur, whilst, under the diminished pressure, the end of the diaphysis above the inner condyle grows abnormally. This irregular growth of the diaphysis is associated with a convex inward curve of that part of the femur which still further lowers the internal condyle. In some instances it is at the internal tuberosity of the tibia

* *Journal of Anatomy and Physiology*, 1879.

that the extra growth of bone takes place, with considerable thickening at the inner side of the upper end of the tibial diaphysis. An outgrowth of bone is often found below the inner tuberosity of the tibia, caused, in all probability, by the strain on the fibres of the internal lateral ligament. This long-continued irritation sets up an increased blood-supply, and an overgrowth of bone results, the starting-point of the bony outgrowth being probably a nodule of cartilage which has been isolated at the end of a rickety diaphysis (page 136).

Valgous children have usually a heavy trunk, and a large head, which the weak-jointed feet and legs are unable properly to support. The ligaments yielding, the distribution of the articular pressure is disturbed; when once started, the deformity increases rapidly. Heredity has no direct influence on the condition, though parents of feeble constitutions, themselves valgous, are likely to beget weak-kneed children. Excessive standing, or the carrying of heavy weights, has a prejudicial influence. Weakly children should not be allowed to carry about small brothers or sisters, nor help in the heavier matters of housework. Stockings should not be suspended by an elastic band descending along the outer side of the knee if there is the least inclination to genu valgum.

Sometimes one leg is valgous, whilst the other is bandy. This is due to the mother carrying the child always on one arm, whilst she throws the other arm around the knees to make them fit into the hollow of her waist. Thus, if the feeble child be carried always upon the left arm, its right leg will probably be valgous, whilst the left will be bowed.

In order to estimate the amount of deformity, the leg should be fully extended, so that the lateral ligaments of the joints may be tightened, and the tibia rigidly locked upon the femur. The patella, which is apt to be displaced over the external condyle, must be made to look directly upwards. With but a little flexion of the joint, sufficient rotation and rocking of the head of the tibia are produced to efface all the valgous deformity. In most of these cases there is, at any rate at first, a considerable looseness of the joint. On the outside of the extended valgous knee, the thick fascial insertion of the tensor vaginae femoris and of

the great glutæus is very tight along the front of the biceps tendon; but the ilio-tibial band has no concern with the actual production of deformity.

To obtain a record of the amount of deformity, the child should be seated upon the table, with his legs fully extended, and the patellæ directed upwards. A sheet of paper, large enough to reach from the ankles to above the knees, is placed beneath them, and by a pencil, held upright, a tracing of the limbs is taken. The distance between the ankles may be noted in inches.

Even when deformity is but little marked, the child may complain of pain in the legs and knees, especially after much standing or exercise. Sometimes there is tenderness over the inner side of the knees. These pains are occasionally mistaken for chronic rheumatism; sometimes they are called "growing-pains." They are the result of strain of ligaments, and of irregular pressure upon delicate bone tissue.

Treatment.—The child must be taken absolutely and completely off his feet for a while, and his general health must be improved, as described under the head of "Rickets"



Fig. 6.—Simple Treatment of Double Knock-knee.

(page 70). Apparatus should be supplied with a view entirely to prevent, not to assist, the child walking (Fig. 6). A splint fastened along the leg of a child who is allowed to walk about is useless, and "irons" are as inappropriate for little children as they are expensive. For a time the child may fret at being taken off his feet, but he soon submits with resignation. If the limbs be but slightly valgous, a flat pillow may be fixed between the knees, and the ankles tied together by a handkerchief, or secured by a strap. This method should be carried on day and night, and to prevent any rotation of the tibiæ, a sand-bag may be kept across the knees as the child lies.

If these gentle means prove inadequate, a plain wooden splint, padded on one surface, should be applied along the outer side of the limb; it should be long enough to reach from the top of the thigh to six inches beyond the foot (Fig. 7).

The limb is then braced firmly against the padded side of the splint, by wide webbing straps and buckles, the strap which passes around the knee being drawn most tightly. The surfaces subjected to pressure should be carefully protected. The splint is applied to keep the child from putting his foot to the ground until the bones and ligaments are strong enough to support the weight, and, moreover, that a gentle and continuous pressure may be exerted against the lateral angle of the knee. It may be applied to the right and to the left limb on alternate days. Bandages of elastic webbing exert so much pressure that they might cause ulceration. Every night, and occasionally in the day, the apparatus should be removed, and the feet and legs rubbed; and by judicious, firm, and repeated efforts, the parent or nurse

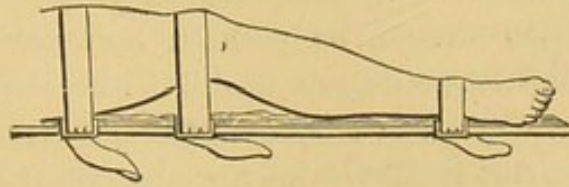


Fig. 7.—Simple Treatment of a Single Valgous Knee. (The splint should have been shown reaching farther below the foot.)

should endeavour to straighten the extended limb. From time to time also the surgeon should manipulate the limb, and should satisfy himself that the nurse understands, and efficiently carries out, instructions as to rubbing, kneading, and massage. (See also the treatment of bow-leg, page 83).

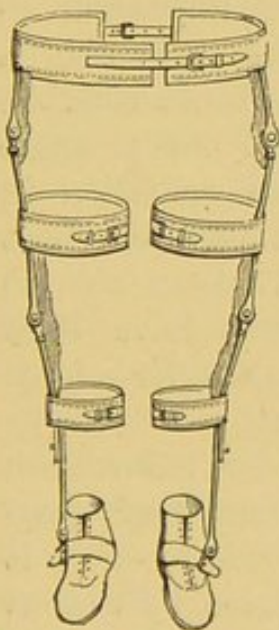


Fig. 8.—Apparatus for the Treatment of Double Knock-knee.

If the deformity be extreme, or the improvement unsatisfactory, more vigorous measures may be demanded. The child must still be kept entirely off his feet, and the limb secured in some form of trough splint, and submitted to greater straightening force by means of an arrangement of straps and buckles. Careful washing, rubbing, powdering and padding will be needed to prevent the effects of chafing or pressure. If only one knee be valgous, the child may be conveniently treated by a Thomas's knee splint.

Or the gradual straightening may be effected by an

outside iron splint, the rod of which is fixed to the boot; it has an antero-posterior hinge at the ankle, and a lateral one at the knee. This second hinge works with a rack and pinion. The strap which passes round the inner side of the knee should be padded and carefully adjusted, and on the slightest soreness it should be removed (Fig. 8).

Operative measures.—If the child be young, and money be not forthcoming for the splint with rack and pinion joints, or there be no one to look after the case, **forcible straightening** of the limb may be desirable. We are strongly assured that the younger the child the more satisfactory is the result of forcible straightening; but to this the rejoinder is, the younger the child the less the need for rough handling. Still, in suitable cases forcible straightening is an excellent measure. It is effected when the child is under chloroform. The surgeon holds the thigh in one hand, and the middle of the leg in the other, and with his knee placed near or against the prominent angle of the extended limb he straightens it gently yet firmly, as he would a bent stick. The limb is afterwards put up straight in splinting. It is impossible to say what happens during this manipulation—probably a condensation of tissue takes place about the inner condyle. But it is by no means necessary to efface the lateral angle of the knee at once. I have performed this operation in a large number of cases, and have never known the least trouble result from it, whilst, so far as I have been able to determine, its immediate and ultimate results have been entirely satisfactory. The method is not suitable for a large child with strong bones.

Osteoclasia, or the forcible fracture under chloroform of bent bones by mechanical means, is a method of treatment which, I confess, does not commend itself to me. It has been somewhat extensively adopted, however, by various discreet British surgeons, and the fact of their continuing to employ it is sufficient proof to me that it can be exercised with safety and precision; but I prefer to divide a bent bone through a clean incision with an ordinary key-hole saw, rather than by a mechanical bone-breaker.

Section of the biceps tendon, the ilio-tibial band, or the external lateral ligament, is an unscientific measure. Though

it leaves the knee straight, it renders it permanently weak, and would entail the patient wearing some apparatus for the rest of his life.

Ogston's operation.—By a narrow incision (Fig. 9), leading obliquely to the trochlear surface of the femur, a course is prepared for the blade of a key-hole saw, and the inner condyle is sliced off; the limb being then straightened, the loosened condyle is pushed up. This operation has now given place to Macewen's, which has the great advantage of not implicating the joint.

Macewen's operation.—A half-inch incision (Fig. 9) is made down to the femur, where a line, drawn transversely inwards at a finger's breadth above the top of the *external* condyle, joins a vertical one which is half an inch in front of the tendon of the adductor magnus. The osteotome is slipped down to the bone by the side of the scalpel, which is then withdrawn, and the edge of the osteotome is turned at right angles to the length of the femur. From time to time, during the use of the mallet, an attempt may be made to straighten the femur by force, either by bending or breaking through the bone-tissue which has not been divided; the knee is supported on a moistened sand pillow. The wound is covered with a pad of sterilised gauze and a bandage, and the limbs are secured in the straight position by lateral splints of gypsum, which reach from ankle to hip. A second dressing is rarely needed. A convenient apparatus for use after these operations consists of two long outside wooden splints, reaching from axilla to ankle, and firmly connected above by a hooped iron which arches over the front of the chest, and below by a short transverse bar of wood which is fixed to the posterior edges of the splints near their lower ends. The apparatus is, in fact, a simple variety of fracture-box.

A modification of Macewen's operation.—In those cases of knock-knee in which the bloodless measures either offer no prospect of success or have absolutely failed, osteotomy is, of course, the only alternative. But in performing this I have now entirely discarded the osteotome and mallet, preferring to

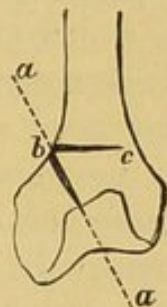


Fig. 9.—
Front of Left
Femur.

a a, Line of
Ogston's inci-
sion; *b c*, Line
of Macewen's.

make a partial section of the femur with a key-hole saw and completing the fracture by force. Having "cleansed" the area of operation, I make a transverse three-quarter-inch incision on the outer side of the thigh, through the deep fascia, a little above the condyle, clearing a passage for the narrow-bladed saw by a raspatory, with which also the periosteum is raised. Along this instrument the saw is slipped, the femur being then cut, as nearly as one can tell, through its anterior two-thirds. Sometimes, when the bone is very hard, the first attempt which is then made to break the femur fails, and the saw has again to be introduced. If both limbs require operation, the second is treated after the first has been temporarily dressed; they are then fixed straight in the apparatus described in the preceding paragraph or in lateral gypsum splints. Of the objection to the presence of bone-dust in the wound I know nothing in practice, though in theory it is sometimes raised. The long stalk-bladed saw, which has been specially designed for subcutaneous osteotomy, is by no means suited for section of the lower end of a child's femur, or of a tibia; a key-hole saw answers every requirement. In the educated hand, a Macewen's osteotome may be safe enough; but I have heard of very grave accidents in connection with its employment—accidents which could, I think, hardly happen with a saw which is being worked from the front of the bone, the movements of which even an inexperienced hand is able to appreciate and to guide.

Advice to the osteotomist.—Operation being demanded, the surgeon must assure himself that the child is in a proper state for the ordeal; that the urine is free from albumen, and that the temperature is not foretelling a coming storm; that the throat is not sore, and that there is no scarlet fever near. The instruments, the part to be operated on, and the hands of the surgeon and of his assistants, should be absolutely clean. The landmarks are to be carefully noted, and then, by a strong-bladed scalpel, a course is cleared down to the bone for saw or osteotome. If serious bleeding occur, the wound may require enlargement, so that the vessel may be secured. The progress of the osteotome is to be carefully watched, as there is some danger of the cutting edge being driven right through the limb.

The osteotome is introduced upon the flat of the knife blade; when the bone is reached, the scalpel is withdrawn, and the osteotome turned and steadily placed upon the spot selected. "Do this lightly, so as not to damage the periosteum. Hold handle of osteotome firmly in left hand, with ulnar border of that hand against the skin of the limb. When two-thirds of the bone is divided, the rest can usually be broken. Never use osteotome as a lever to break bone. When both limbs are osteotomised, the first wound can be compressed by an antiseptic sponge and gauze bandage, while the other is being operated on. Use no drainage-tube unless you expect danger of tension and suppuration."* If after operation the toes become dusky, if blood or other discharge soak through the dressings, or if the temperature rise to 101°, the wound should be inspected. In a rickety child new callus cannot be trustworthy at once: the operation improves only the local, not the general, condition. Retentive apparatus must, therefore, be worn, and the child entirely kept off his feet for some months. Lastly, it is quite possible that the operation may so disturb the growing end of the bone that the epiphysis fuses too early with the diaphysis, considerable arrest of development ensuing in consequence.

Osteotomy of the tibia may be needed as well as of the femur in extreme knock-knee, especially when there is hypertrophy below the inner tuberosity; and as the mere section of the bone may not suffice for straightening the limb, it may be necessary to remove a wedge either by saw or chisel. This necessity, however, rarely occurs, as simple oblique section usually suffices. In extreme *antero-posterior curvature* of the tibia, a wedge has occasionally to be removed, but even then the section need not extend right through the bone. If this operation be done with a small, delicate saw—which I prefer to use—a semilunar flap of integument and periosteum is raised from the antero-internal aspect of the shaft, and when the incisions in the bone have passed well back, the wedge may be broken out by strong forceps. To complete the operation the tibia must be bent or broken straight by the hands, and the tendon of Achilles divided. The leg is then dressed in sterilised wool gauze and gypsum splints. After the tibia has been

* Keetley, "Index of Surgery," p. 296 (1884).

divided, the fibula can be broken through so easily with a properly directed and sudden jerk that osteotomy of its shaft is unnecessary. But in breaking this or any other long bone, the existence of the epiphyseal cartilages must be remembered.

Although the operation for genu valgum is comparatively safe, still, it must not be lightly undertaken. In connection with a fatal case, Mr. Barker wrote,* "I have never observed such scrupulous care as in this operation"; and in conclusion he stated that the operation is dangerous. Fatal cases occur more frequently than they are reported in the journals. I once lost a miserable child on whom I had performed supra-condylar osteotomy; and occasionally one hears incidentally of similar mishaps. Death took place within forty-eight hours, probably either from fatty embolus or septicæmia. Hæmorrhage from the anastomotica magna, or some articular branch, or even from the popliteal artery itself, may cause anxiety and involve amputation, or even death. Suppuration may demand incision and drainage, and may be associated with wreckage of the joint, with pyæmia, or with necrosis.

Genu extrorsum (out-knee) is the common form of bandy leg, the thigh-bone and the leg-bones being bowed outwards, so that the knees are widely separated. The condition is frequently met with in heavy, rachitic children, in whom the bones happen to yield rather than the ligaments: when the ligaments are the first to give way, genu valgum results. On account of the strong support which is afforded to the outer side of the knee by the ilio-tibial band, the external lateral ligaments are competent to resist any strain which they may be called upon to bear. In most cases of genu extrorsum the outward thrust of the knee is not associated with any alteration in the shape of the femoral condyles, or of the end of the diaphysis, as is the case in genu valgum; there is an even bending throughout the entire length of the shaft. (See *Lancet*, 1889, p. 173.)

Treatment.—Many of the remarks made in connection with the subject of genu valgum apply to genu extrorsum. But as the knee is displaced outwards, without being itself affected, it would be incorrect to bandage the limb to a long

* *Transactions Clinical Society*, 1878.

inside splint; for the result of this would be merely to throw a useless strain upon the internal lateral ligament. Should this be done, and the internal lateral ligament yield under the continued force, the production of genu valgum would be employed to correct the outward bowing, and the improvement obtained in the limb would be apparent, not real. In any attempt at forcible straightening of the limb, the integrity of this ligament must be respected. Though forcible straightening may be of value in the treatment of these limbs in early childhood, it is frequently superfluous, for with careful supervision and adequate rest the young child outgrows the deformity. The heavy mechanical supports supplied by the makers of apparatus are of little or no service, whilst to allow a child with soft bones to walk about in "irons" is a violation of surgical principles. What is required is absolute rest. But when the bones are more solidly developed, as in approaching puberty, osteotomy of the femur and of tibia may possibly be demanded. I should think that osteoclasia might prove especially useful in these cases, as there would be no risk of damaging the epiphyses, the fracture being effected in the middle of the shaft.

Bow-leg is a simple curvature of the tibia and fibula; there is no bending of the femur, and the knees may be brought close together. When bow-leg is associated with curved femur, the knees are widely separated, and the condition is called genu extrorsum. Bow-leg may often be observed before ever the child's feet have been put to the ground; in this case the bend taken is but an exaggeration of the natural curve of the tibia. Frequently the deformity is the direct result of that peculiar habit which the rickety child possesses of folding its legs across each other, and sitting upon them tailor-wise.

The curvature of syphilitic osteitis (page 94) must not be taken for that of rickets. In rickets the ends of the bones are enlarged; in syphilis the thickening is in the diaphysis, the convexity of the bend is always forwards, and there is sure to be some other evidence of syphilis forthcoming.

Treatment should be begun as soon as the existence of the deformity is recognised. If the child be badly nourished, or rickety, he should be tended with special care. In order

to keep up an even circulation in the legs, warm stockings and woollen gaiters are advisable; for if, when the child is being carried or wheeled out in the open air, the legs become chilled, the nutrition of the bones suffers. Frictions in the direction of the venous and lymphatic return should be employed morning and evening, after the warm bath. If the patient be flabby, weakly, or ill-nourished, not only the legs, but the entire body should be rubbed over with cod-liver or olive oil. Very many children with bent legs have been

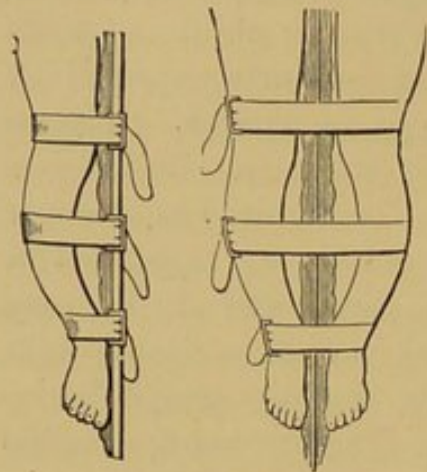


Fig. 10.—Simple Treatment of Bow-leg. (The splints should, of course, extend much farther downwards, so as to prevent the child from getting his feet to the ground.)

brought up on the bottle, and many of them on condensed milk or a farinaceous diet. Fresh milk, eggs, and meat should be given; but no tea, beer, or wine must be allowed. Bathing the legs in cold water is not advisable, except in the warmest weather, and not even then, unless the circulation be found sufficiently brisk to set the skin in a glow. Warm sea-water, natural or artificial, is a useful stimulant; but parents must be disabused of the widespread belief that allowing the weakly child to amuse himself with naked feet on

the sea-shore, and paddling in the shallow water, is particularly conducive to improvement. Indeed, as a rule, it is harmful, for it keeps the child's weight upon his limbs, and also chills them, driving the blood to the trunk, and so causing congestion of the brain, lungs, or bowels.

If the treatment thus briefly sketched out be adopted, and the child be taken entirely off his feet, a steady improvement will set in; but if the deformity be considerable, it will be well to adopt certain accessory measures. Thus, a light wooden splint, padded on each side, may be fixed between the limbs, and the legs strapped to it. The splint should be long enough to reach some inches below the level of the feet, so that the child may find himself unable to stand; for it is absolutely necessary that no weight be transmitted through the leg-bones (Fig. 10). To apply splints of wood or iron, and then allow

the child to walk, is wrong. Children do not fret when they understand that they *must* be kept off their feet, nor does health suffer from the enforced rest. The child should be taken out of doors as much as possible. The spinal column is probably as weak as are the tibiæ, so the less he is sitting up the better. If only one leg be bowed, it should be secured to a long inside splint, so as to ensure rest (Fig. 10); the improved condition of the bones is brought about more by rest, and the adoption of general measures, than by the mechanical effect. The author had under treatment a little girl with marked bowing of each leg; one leg he treated by forcible straightening under chloroform; the other he left alone. The child was taken totally off her feet, and at the end of a year the bandiness had almost entirely disappeared from both legs, and the child had greatly improved in health. The rest which was necessary for the leg which had been forcibly straightened had brought about an equal improvement in the other. With supervision, the deformity is sure to diminish, but frequent manipulation towards a straightening may be found of service. When force is being employed, care must be taken to grasp the limb so that there is no risk of the epiphyseal cartilages being detached. In extreme cases osteotomy may be performed, after the manner described on page 81.

Coxa vara.—The bones being soft, the weight of the body in the erect posture sometimes causes the head and neck of the femur to sink even below the level of the top of the great trochanter. The result is that the top of the trochanter rises above Nélaton's line, and the case, seen for the first time, may suggest congenital displacement of the bone (Chap. XXVIII.); the child has a peculiar waddle. The defect may exist upon one side or upon both sides. It may be recognised by the fact of the child being markedly rachitic, by the trochanter not descending when traction is made upon the leg (as would happen in displacement), and by the fact that, on inverting the thigh, the head of the femur cannot be felt beneath the gluteal muscles.

The child should be taken off his feet and treated on the lines laid down under the head of "Rickets." Massage will be helpful in improving the general condition.

Deformities in the upper extremity.—When a heavy, rachitic child, unable to walk, is allowed to crawl, the radius and ulna, as well as the humerus, may yield under his weight and become greatly deformed. Equable compression upon a well-padded splint, together with massage, usually suffices to get the bone straight again. But if the bending is considerable, and somewhat angular, it may be well to give the bone a forcible straightening under chloroform, fixing it subsequently on a splint. For the angular bending of the clavicles which is often met with in rachitic children no local treatment can be adopted. So prominent is the bend in some cases that the deformity looks like a green-stick fracture; but there is no effusion or tenderness about the part, as there would be with fracture.

Pigeon-breast is produced in the rickety or soft-boned child by the bending inwards of the anterior extremities of the ribs—probably under the influence of the energetic contraction of the diaphragm. Thus the chest is compressed from side to side, whilst the antero-posterior measurement is increased (Plate II.). This is caused by the imperfect expansion of the chest during inspiration, and may be secondary to post-nasal growths (page 206), or to chronic enlargement of the tonsils. Laryngismus stridulus, a common affection of rickety children, may also cause pigeon-breast. During inspiration a partial vacuum is produced in the interior of the thorax, and the atmospheric pressure upon the outside of the chest restores the balance by forcing inwards the most pliant part of the thoracic wall. Shaw reported an interesting example of this:—A little boy with enlarged tonsils suffered great difficulty in breathing; he was pigeon-breasted. An attack of extreme dyspnœa demanded the performance of tracheotomy; a few days later the tonsils were amputated, the chest filled itself with air during each inspiratory act, and the costal deformity vanished.

The general health must be improved by iron, cod-liver oil, quinine, and lime-water; the condition of the alimentary canal must be regulated, and obstructed entrance of air must be corrected. Compression by truss or bandage is not only unnecessary, but actually harmful. Often in the course of the day, the hand of the nurse or mother should, by firm and

gentle movements, help to correct the anterior bulging of the chest, the child being also encouraged to take slow and deep inspirations. Exercises with light dumb-bells and "chest-expanders" are desirable, as are also gymnastics generally, provided always that the strength and capabilities of the feeble child be not over-taxed thereby.

Bowing of the sternum may occur when air is greatly hindered in entering a soft-walled thorax. It is due to the lower end of the pliant breastbone being pulled backwards by the energetic but vain contractions of the diaphragm. In some rickety children the sternum is deeply indented, under the combined influence of muscular contraction and atmospheric pressure. Treatment should be directed towards securing a free entrance of air, and improving the general condition of the child (page 70).

CHAPTER VI.

SYPHILIS.

SYPHILIS in childhood may be congenital or acquired. I have had under treatment a boy, of nine years, who had a Hunterian sore upon the prepuce and condylomata at the anus; he had received contamination from a girl of the same age. When secondary symptoms appear in a precocious child, it will be well to make an examination of the lymphatic glands in the groins, and of the parts associated with them. Inoculation may be received from a syphilitic wet-nurse; by kissing a syphilitic child or other infected person; from an infected spoon or toy, or from careless vaccination. The primary induration may have attracted little or no attention until the secondary symptoms appear. The course taken by acquired disease is like that seen in the adult.

I have never met with a case of **vaccino-syphilis**. In England, where vaccination is performed with fair discretion, such cases very rarely occur; but should syphilis and cow-pox be inoculated together, the vaccine disease would have run its course, when the inoculation wounds become indurated and the axillary glands enlarged. Further confirmatory evidence of syphilitic infection is afforded after a few weeks, when roseola and other affections appear.

In the case of **hereditary disease**, the taint may have been received from either parent, or from both parents; in all cases, however, it is the same disease—the double inheritance does not intensify the symptoms. After the parental disease has reached the tertiary form, it is improbable that infection will be transmitted.

When suspicion is strong, but no direct confirmation is to be found in the child, it may be well to question the mother as regards premature confinements, miscarriages, or stillbirths; to examine the brothers and sisters of the patient, and, if necessary, to have a private interview with the father.

A syphilitic infant is, as a rule, apparently healthy for some weeks after birth; he is not born with syphilitic eruption out on him. The symptoms rarely appear before the fourth or sixth week, and are found in greatest intensity about the third or fourth month. If treatment be delayed, the infant may sink exhausted. A mother may give birth to a syphilitic child without having herself been infected. But such an infant should not be put to a wet-nurse, for though it cannot infect its mother, it can infect a healthy woman. Some children in a family may escape the hereditary infection, but, as Hutchinson truly remarks, the youngest may suffer as severely as the eldest.

Symptoms.—The subject of congenital syphilis is apt to be of premature birth, and he may, exceptionally, be very puny; but a syphilitic child is usually strong and plump at birth. Emaciation and anæmia are early and important suggestions of the disease, and may for a time afford the only evidence of syphilis. Indeed, persistent anæmia which does not improve by dieting or by ordinary treatment should suggest latent syphilis or tubercle. It must be remembered, however, that, though a child shows evidence of syphilis, he may be plump and well-looking. And, further, because the father was known or suspected to be the subject of syphilis, it is not to be assumed that a rash upon his child must needs be syphilitic. It must also be noted that the child may be several years old before he shows any signs of infection. The skin and the mucous membranes first show signs of disease, but even in the early weeks of infancy an obstinate sleeplessness and fretfulness may suggest the presence of the taint. The sleeplessness may be the result of osteal pains.

The *nasal mucous membrane* is in a condition of chronic inflammation and ulceration, so that there is constantly a thin or purulent discharge from the nostrils. The discharge may not be so abundant as that of a simple catarrh, and it is not associated with sneezing. It causes an impediment to the passage of air, and the infant is said to have "**snuffles**"; this may be the first sign to attract attention. But the presence of snuffles is not by itself proof of syphilis. When the nares are blocked, the infant can breathe only by the mouth; he cannot suck and breathe at the same time without snorting

or suffocating, so he refuses the breast, and wastes rapidly. If the ulceration continue, blood may be mixed with the mucus, and the development of the cartilage and of the nasal bones may be seriously and permanently affected; caries and necrosis are, however, not commonly met with.

Eruptions.—A moist roseola may be spread over the body, being best marked about the gluteal folds and the genitals; sometimes the skin is raw in patches. The syphilitic eruptions of early infancy may be papular, vesicular, pustular, or scaly. They are usually symmetrical and polymorphous. Their hue was likened by Fallopius to that of the lean of ham. They are not prone to appear before the infant is six weeks old; but even within a few days of birth a bullous eruption may break out and afford strong evidence of the disease; this infantile *pemphigus* involves a grave prognosis.

The epidermis is apt to be detached from the palms and soles either with or without the occurrence of vesicles or bullæ. This is almost pathognomonic of hereditary syphilis. Altogether, the skin of the infant has a dirty, muddy look, and falls in unwholesome wrinkles over the miserable trunk and limbs. The nails are ill-formed and friable, and pustular sores may be found upon the adjoining skin.

Dermatitis on the pelvic region of an infant is not necessarily of syphilitic origin, even when associated with a plentiful outbreak of papules and vesicles. Often it is due to the irritation of napkins that have been saturated with urine or fæces, or washed with soap or soda. An eczema which extends up the abdomen and down the lower parts of the thighs—that is, beyond the region enclosed in napkins—is likely to be of syphilitic origin; a non-syphilitic dermatitis seldom reaches below the middle of the thighs. The nates, thighs, and pudenda must be kept clean and dry, and napkins and towels should be soft, and should not be washed with soap or soda.

There may be bleeding fissures, ulcers, or condylomata at the angles of the mouth, which may heal with linear or general cicatrices (Fig. 39). These lines are highly characteristic, as are also cracks and sores between the fingers and toes. Pain and bleeding attend stretching, and sucking and defæcation cause much distress when the labial and anal mucous

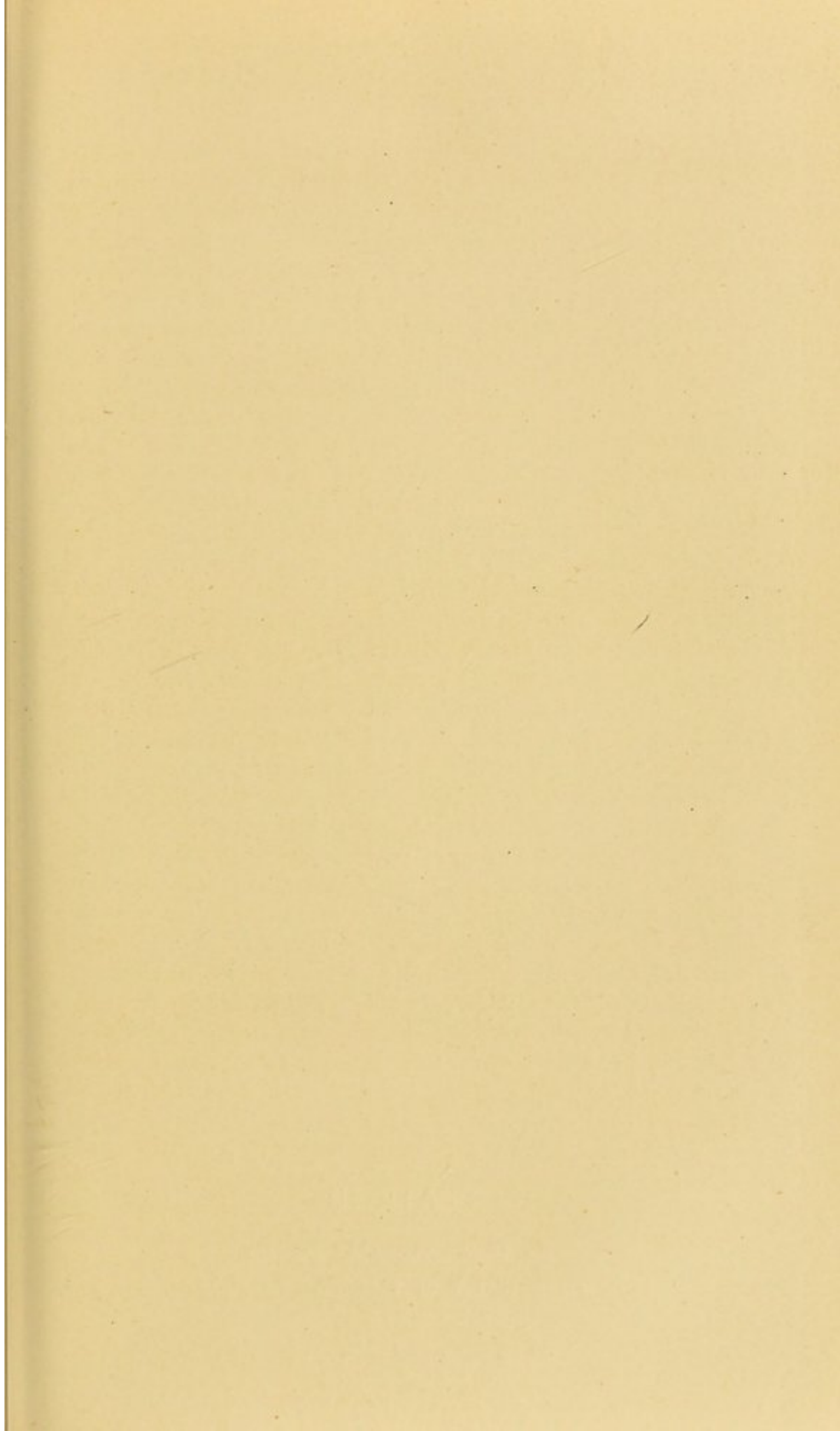




Fig 1.



Fig 2.

PLATE III.

FIG. 1.—CONDYLOMATA. (Page 91.)

FIG. 2.—HIATUS OF BLADDER. (Page 277.)

membrane is thus fissured. Small ulcers and **condylomata** may be found at the anus, and condylomata may appear about the scrotum and thighs; occasionally they are to be seen on the transverse dimples of the neck, thigh, or arm. Wherever condylomata appear, there also may be found raised "*mucous patches*"; their surface is moist, pearly-grey, slate-coloured, or dusk. They consist of clusters of small condylomata (Plate III. Fig. 1). Papules and patches may be found on the pharynx; and when ulceration has been followed by cicatrization adhesions may be detected between the soft palate and neighbouring mucous surfaces. The history and the appearance of the child suffice to distinguish these adhesions from those of tuberculous disease.

Epiphysitis and **periostitis** about the articular ends of the long bones may in some few cases afford the only evidence of hereditary disease. In cases of suspected syphilis, each epiphyseal region should be gently squeezed between the finger and thumb. On account of the periostitis near the epiphyses, the child keeps the limb almost or entirely motionless, and any attempt made fully to flex or extend the joint causes distress, as does also pressure over the slightly thickened area. Synovitis and inflammatory effusion occur in the neighbouring joint. The limb soon begins to waste, and the infant scarcely ever moves it. In one case the infant had a wide annular thickening around the upper, growing end of the humeral diaphysis (there being no other trace of disease), and the arm appeared paralysed. In another, the ends of all the diaphyses were enlarged, and, as distinguishing the condition from rickets, the swellings were extremely painful. There was no beading of the ribs or other sign of rickets; and the child's aspect denoted syphilis, not rickets. When only one epiphyseal region is affected, the diagnosis is simpler, as rachitic enlargements are symmetrical. The exact nature of the case is apt to escape recognition, the disease being mistaken, perhaps, for simple synovitis or periostitis, or infantile paralysis. Free movement, however, quickly returns under the influence of mercury. The affection is well named **pseudo-paralysis**. The limb should be secured by a well-padded splint.

Cases.—An infant was lately brought on account of some obscure trouble of the shoulder; she was restless, and seemed

unable to move the arm; the shoulder was swollen and tender. There was no history of injury; the mother had had four miscarriages, all at about the seventh month, and this child, though born at full time, had "snuffles." Syphilitic

inflammation was suspected, but, in the absence of more direct evidence, a tentative but futile treatment was adopted. On a course of mercury, the child improved, and the thickening and paralysis entirely disappeared.

Pseudo-paralysis must be carefully distinguished from infantile paralysis—a disease of somewhat later months, and one which is characterised by the suddenness of its onset. The neighbourhood of the joints is, however, sound in infantile paralysis, and the range of movements is not diminished. The way in which the trouble clears up under mercury renders the diagnosis absolute.

The actual condition is a growth of syphilitic granulation-tissue; a gumma, in fact, occupies the end of the diaphysis, and though no suppuration occurs, the granuloma may extend across the epiphyseal cartilage and produce a *separation of the epiphysis*. The epiphyses unite again on the child being put under mercurial treatment. In a fatal case, *post-mortem* examination showed the affected articulations to be full of pus,



Fig. 11. — Humerus of Infant that died of Hereditary Syphilis. Sub-periosteal gumma at lower end of diaphysis extended across line of epiphyseal cartilage, and caused enlargement near epiphysis. (From Museum of Royal College of Surgeons.)

the ill-organised syphilitic granuloma having invaded the joint and then broken down.

Fig. 11, from a specimen in the Hunterian Museum, shows the syphilitic granulation-tissue stretching across the lower end of a humeral diaphysis and stretching up beneath the periosteum in a ring around the shaft. It was, doubtless, associated with tenderness near the elbow. Had the gumma broken down, the epiphysis would have eventually been

detached; but if, on the other hand, the granulation-tissue had become organised, the end of the diaphysis would have been left permanently thickened.

Diffuse osteitis may cause hypertrophy and sclerosis of the bones. In one case the tibia was greatly *thickened*, and increased in length by one inch and a half, but, as a rule, both tibiae are more or less affected. Hypernutrition of the periosteum and bone determines the increase in circumference, and of the end of the diaphysis, the increase in length. Various bones may be affected at the same time, and subperiosteal gummatous abscesses may quietly form and break, exposing a denuded surface of bone, which, on account of the mildness of the local disturbance, is slow in exfoliating. The long bones are curved in syphilitic hypertrophy (Fig. 12), in a manner suggestive of the deformity of osteitis deformans in the adult, and they are often attacked with patches of caries necrotica. As Ashby and Wright remark, it is sometimes very difficult to differentiate between syphilitic and tuberculous disease of bone. Each begins quietly as an osteitis or periostitis, and each is apt to entail a growth of unhealthy granulation-tissue, which may invade the surrounding tissue, and may cause fracture of a bone. In each case the granulation-tissue would be apt to break down into a thin fluid, and, even at this stage it is often difficult to differentiate. Clinically there is little difference between a tuberculous gumma and a syphilitic gumma; but it may be taken as a good working rule that syphilis prefers the large and long bones, and tuberculosis the short ones. A highly important clinical feature in these cases is that the sharp anterior border of the tibia is blunted and widened. The excessive conveyance



Fig. 12.—Diffuse Syphilitic Inflammation of Ulna. (Museum of St. Mary's Hospital.)

of blood in diffuse osteitis causes general hypertrophy of the bone. The medullary canal is effaced, and the loose cancellated tissue is replaced by dense material—in other words, diffuse *osteo-sclerosis* is produced. The inflamed diaphysis is often bent; this is probably due to the fact that it is softened for a while by the chronic inflammation, and yields to the superimposed weight. It sometimes happens when only one bone, in the forearm or leg, is affected, that it bends around the bone which is not lengthened; in most cases the only bending is antero-posterior. Rickets does not thicken a bowed diaphysis, but hereditary syphilis does. And when the thickened bone receives an injury, an excess of inflammation is set up in a limited area, and, thrombosis readily occurring, a central necrosis takes place; the sequestrum adds to the disturbance, and thickening occurs at that part. It needs but a slight injury to cause necrosis in a bone when its vitality has been impaired by sclerosis.

Though, as a rule, chronic hypernutrition causes lengthening of the syphilitic bone, when it happens to be associated with a growth of granulation-tissue through the end of the diaphysis, it may actually destroy the junction-cartilage and determine an early fusion of shaft and epiphysis. So that, when we are examining a child for supplemental signs of hereditary syphilis, we may find some bones longer than they should be and some shorter, giving in either case unmistakable evidence of the disease.

When, as often happens, the fibula does not increase in length commensurately with the tibia, the foot becomes everted and a spurious talipes valgus is produced. On the other hand, if, as a result of syphilitic or tuberculous disease, the growth of the tibia is arrested, whilst that of the fibula is uninterfered with, the foot becomes inverted, a spurious talipes varus being produced.

Syphilitic inflammation at the extremity of the diaphysis is often associated with a quiet periostitis at the epiphysis, and if this occurs at the adjacent ends of the humerus and ulna, or of the femur and tibia, the elbow and knee assume an ovoid shape, which is apt to be mistaken for tuberculous disease. But the co-existence of other signs of syphilis, and

subsidence of the enlargement under specific treatment should make the case clear enough.

Dactylitis.—When periostitis occurs in a syphilitic child, the phalanges of the fingers and toes are apt to swell and break down under the disintegrating ostitis; but there is, as a rule, less discoloration of the skin in syphilitic than in tuberculous dactylitis (page 61). I agree with Mr. G. A. Wright in thinking that syphilitic dactylitis is more often described than met with. Personally, I know very little about syphilitic dactylitis, and I think that it is rare. Tuberculous dactylitis is not unlikely to occur in the subject of hereditary syphilis.

Nodes may be found upon the long bones as well as upon the skull. They vary in size with the general constitutional condition, and may undergo almost complete absorption. They are likely to be a late manifestation of the hereditary taint. Warmth and careful feeding, iodide of potassium, cod-liver oil and iron, together with an occasional course of mercurial inunction effect their disappearance.

Cranio-tabes has been alluded to in the chapter on rickets (page 68); but in connection with hereditary syphilis Elsässer, Barlow, and Lees have directed attention to an abnormal thinness of portions of the parietal and occipital bones, causing them to yield to moderate pressure, and to impart to the finger pressed upon them a sensation like that derived from stiff parchment, or from the surface of a dry bladder. These patches are probably the result of delayed ossification of the skull walls. Their existence is not proof of syphilis. They are often found in those who are neither syphilitic nor rickety, but simply ill-nourished. Nevertheless, a great proportion of infants with cranio-tabes are syphilitic. The thinning may be due to compression of the ossifying wall of the skull between the brain and the nurse's arm, or the pillow. It may occur only on the side upon which the infant is generally laid. It is when a



Fig. 13.—Frontal Bosses (Parrot's Nodes) in a Syphilitic Child. (See next page.)

syphilitic child is also rickety that the characteristic signs are most developed.

Cranial bosses (Fig. 13) have been described by M. Parrot as a proof of hereditary syphilis. They are flat, bony elevations of the frontal and parietal bones at the borders of the anterior fontanelle; their presence is detected, if not by the eye, by running the hand over the skull. In some cases the masses are very prominent, and appear as sudden upheavals of the

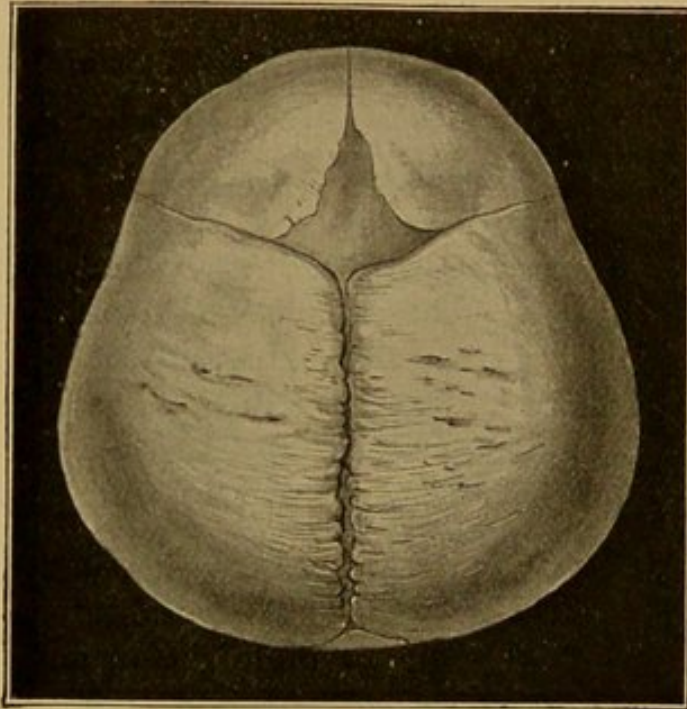


Fig. 14.—Thickening of Infantile Calvaria in Frontal and Parietal Regions, the Result of Syphilitic Ostitis and Periostitis (Parrot's Nodes). (*Museum, Royal College of Surgeons.*)

external table, so that the outline of the head is suggestive of a hot-cross bun; the head is often spoken of as *natiform* (Fig. 14), on account of a distant resemblance to the nates. These osteophytes appear between the sixth and twelfth months. They are not exaggerations of the frontal and parietal eminences, but are the result of chronic periostitis around the fontanelle.

Interstitial keratitis is apt to occur between the ages of five and fifteen years, either with or without iritis—more often without. A central haziness appears in the cornea, and it may gradually extend towards the periphery. Thus the cornea looks like ground glass, some parts of it being more flecked than others; one cornea is affected after the other, and

each may be studded over with fine, separate dots. The passage of blood-vessels through the inflamed cornea causes the appearance of pink streaks or "salmon-patches," which are nearly always associated with photophobia or lachrymation. Under mercurial treatment, the cloudiness quickly fades away, though frequently a slight opacity persists. Syphilitic keratitis is hardly ever followed by ulceration, and it differs from the keratitis of tuberculosis in being *interstitial* and not superficial.

Iritis is not a common symptom. It may occur at any time between early infancy and late childhood and, passing away, may leave the iris adherent and irregular. The symptoms are often so slight as not to attract attention.

Deafness, which is not a common symptom of hereditary syphilis, may be the result of an inflammatory thickening of the middle ear or Eustachian tube, or of cicatrisation of ulcerations at the aperture of the tube. Or it may be due to disease of the auditory nerve or its terminal filaments; such deafness is incurable. Deafness may come on with the keratitis,

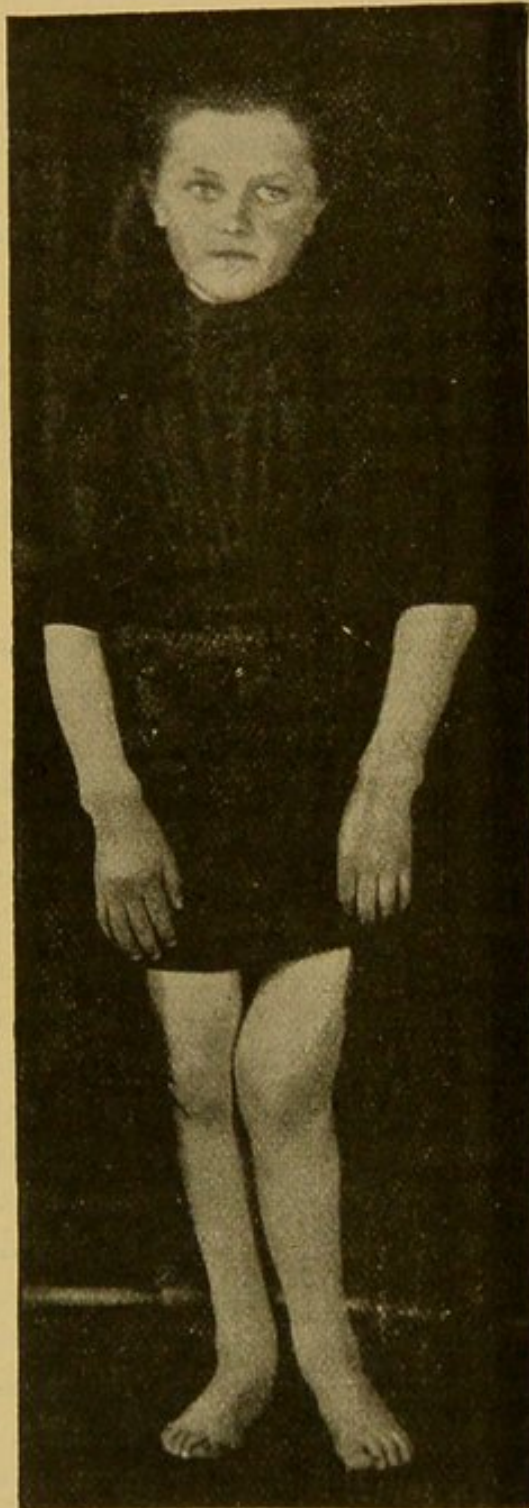


Fig. 15.—Synovitis of Wrists, Knees, and Ankles in a Subject of Hereditary Syphilis. (See next page.)

or may follow it at a long

distance.

The **voice** of a syphilitic infant may, from chronic laryngitis, be faint, or harsh and unmusical. The cry is very characteristic.

Syphilitic synovitis, as the result of hereditary disease, is a very quiet and chronic affection, and though its favourite seat is the knee, it may be met with in other joints, especially the elbow and wrist (Fig. 15). The age at which it usually occurs is from six years upwards. It is a diffuse, cellular infiltration of the synovial membrane. There is neither the thickening, nor the limitation of movement, which generally accompanies tuberculous synovitis, and there is neither heat of surface nor enlargement of bone. There is often, however, a considerable amount of fluid in the joint. If the knee is affected, the child is usually found limping, and, perhaps, complaining of pains at night, which are generally symmetrical, sooner or later. Not infrequently these cases escape diagnosis for a while, because of their rarity, but as soon as suspicion is aroused, and the cornea, the teeth, the skull, and the epiphyses are examined, and the family history is inquired into, the diagnosis becomes abundantly clear. The synovitis often runs concurrently with interstitial keratitis.

Treatment consists in mercurial inunction, or in the administration of grain-doses of grey powder, the joints being evenly compressed between lateral splints of gypsum. Massage and douchings should also be resorted to. The child's health must be improved to the utmost. The *prognosis* is good.

There is another form of syphilitic affection of the joints, in which a gummatous infiltration renders the synovial membrane thick and irregular. It is associated with disease of the epiphyses, and also of the diaphyses, and the extension of the syphilitic granulation-tissue through the end of the bone and through the articular cartilage, may entail destruction of the joint. As a rule, there are unmistakable evidences in the child of hereditary disease, and if the treatment sketched above do not suffice for the cure, small doses of iodide of potassium may be given.

Syphilitic inflammation of the vertebræ is not of common occurrence, and its diagnosis is apt to be overlooked unless attention be aroused by the recognition of osteal or synovial affections in the limbs, or of signs in the teeth or face.

The **teeth of the permanent set** may exhibit characteristic notches, especially the central incisors of the upper jaw; this pair Hutchinson calls the "test teeth" for hereditary syphilis (Fig. 16). They often "slant towards each other, are discoloured from defect of enamel, and each shows in its edge a broad notch." These, and the neighbouring teeth, may be dwarfed and unsymmetrical, with their corners rounded off. Sometimes the margin is occupied by small wart-like spines of dentine, which quickly wear away with use, leaving the notch conspicuous. The lower teeth may be peg-like, or studded with excrescences. Sometimes only a lateral incisor or a canine tooth is marked. These signs may be associated with keratitis. The imperfect and characteristic development of the teeth is due to stomatitis within a few months of birth; but as at that time the milk-teeth are already calcified, they cannot possibly possess characteristic markings. The milk-teeth are cut at the usual periods, but they are often shed early.



Fig. 16.—Syphilitic Central Incisor Teeth of Upper Jaw. (The "test-teeth" notched.)

"Bad" teeth are not evidence of syphilis, and even the permanent teeth of a child with undoubted hereditary syphilis need not bear evidence of the taint; the co-existence of notched central incisors and interstitial keratitis affords unmistakable evidence of hereditary syphilis.

Mercurial teeth.—If during the development of the teeth the child be brought so fully under the influence of mercury that stomatitis occurs, the enamel may be found "defective, pitted, and discoloured." This applies, of course, to the permanent set only, for, as already remarked, the milk-teeth were formed long before the stomatitis occurred.

Gummata are met with in the later months or years of the disease. They may be situated within and beneath the skin or mucous membranes, or may be in connection with periosteum, bone, or lymphatic gland. They may grow quietly, like a chronic abscess, and, being opened in error, or undergoing spontaneous evacuation, their situation is indicated by a deep excavation or dense cicatrix. I have met with such a gumma in the thigh of a girl, five years of age, who had at the same time a gummatous ulceration extending

through the soft palate, and deeply excavating the tonsil. She was deaf on both sides from syphilitic otitis. A gumma in the palate may quickly cause perforation, or lead to scarring about the velum. Therefore, in searching for evidence of congenital syphilis, in a doubtful case the mouth should always be examined. (*See* "Tuberculous Gummata," page 62.)

A gumma is simply a collection of unhealthy granulation-tissue which is undergoing quiet degeneration. When this takes place at the end of a diaphysis, the epiphysis is apt to be detached, and when it occurs in the substance of a bone it is apt to give rise to spontaneous fracture. In the former case, the junction cartilage is likely to be destroyed, and the solid bone is eventually found much shorter than its fellow.

Albuminoid degeneration in hereditary syphilis may affect the liver, spleen, or kidney. These organs become considerably enlarged, and albuminuria may result. The albuminoid disease is probably caused by the irritation of some toxic material which is circulating in the blood; though as to where or how it is generated no explanation is at present forthcoming.

Treatment.—The child should be equably and warmly dressed and carefully and regularly fed, and he must not be exposed to cold or wet. In fact, he should be kept in a warm, even temperature. Sunshine, fresh air, and warmth are of great therapeutic value. Mercury improves his condition as if by magic; whilst being brought under its influence he grows fat, wholesome, and contented. The drug is conveniently administered by the skin. A piece of blue ointment, of about the size of a bean, is placed upon a fold of flannel, and secured by a roller to the side of the child; the region for the inunction may be frequently changed. Fresh ointment is put on the flannel every day, and every day the child should be washed all over with soap and warm water; but the fold of flannel on which the ointment is spread should be used continuously, on account of its being saturated with the drug. This plan of treatment causes neither griping nor salivation. To treat the child by subcutaneous injections of mercury is highly undesirable, and to give medicine only to the mother, impracticable.

If it be expedient to conceal the nature of the treatment,

half a grain of grey powder may be administered in coloured sugar two or three times a day. For many emaciated children, the inunction of the blue ointment with cod-liver oil, persistently carried out, is of great value. The cod-liver oil inunction is especially useful when an infant cannot derive proper supplies of nourishment from the breast, on account of the "stiffness" in the nose. The treatment by inunction is continued for six or eight weeks, or longer if necessary; but an unduly prolonged treatment causes anæmia and wasting, and interferes with the development of the permanent teeth. I do not remember ever to have seen a child salivated whilst under this treatment; nevertheless, the gums should be frequently inspected. The periodical weighing of the child is advisable; the steady increase of weight under the influence of the mercury is remarkable.

Children are very frequently brought for further treatment on account of relapse, especially if instructions laid down on previous occasions have not been carried out; but with prolonged and careful supervision the disease can be brought into complete and permanent subjection.

Condylomata and mucous patches may be dusted over with starch and calomel, and kept clean and dry. This dusting-powder may be used for the moist surfaces like toilet-powder. If the condylomata be at the verge of the anus, in the fold of the buttocks, or between the thigh and scrotum, the opposed surfaces must be separated by cotton-wool, on which calomel has been dusted. (Plate III., Fig. 1.)

In later stages, especially if bones be involved, iodide of potassium in two-grain doses, taken in plenty of sweetened water, proves of the greatest service. Nasal discharges need frequent irrigation with warm solutions of salt or of sanitas, the head being allowed to hang forward during the process. Calomel may then be blown up the nostrils by an insufflator.

If the pain in diffuse ostitis be very severe, and be not greatly relieved by medicinal treatment, it will probably yield to linear incisions or borings deeply made by a Hey's saw or a gimlet.

Of the *infectiousness of congenital syphilis* there should be no doubt. Mr. Arthur Hall, of Sheffield, recently showed

a series of cases of syphilis which had been traced to infection from a congenitally syphilitic baby. (The mother of this child presented an old syphilitic ulcer of the leg.) The baby had ulcers at the mouth and anus. From this baby its brother had been infected, the primary sore being on the cheek; also a girl, aged three, the primary sore being on the mouth. This was probably due to sucking the baby's "dummy titty." The girl had secondary symptoms, and had infected her own mother, the primary sore being on the left nipple.

CHAPTER VII.

ENLARGEMENT OF LYMPHATIC GLANDS.

ENLARGEMENT of lymphatic glands may be due to local or constitutional causes. Usually it is determined by local irritation; and, in the case of a tuberculous or unhealthy child, a trifling irritation may give rise to a disturbance in the lymphatic gland which is serious out of all proportion to the local lesion. Thus, a tuberculous diathesis predisposes the child to suppuration on the occurrence of local irritation; but every glandular abscess in an unhealthy child is not necessarily tuberculous—many of them are septic.

A chain of glands (*glandulæ concatenatæ*) extends along the deep surface of the sterno-mastoid. Should one gland be infected, others may become involved, even though the primary source of irritation may long since have healed. When it is impossible to determine the exact cause of the disturbance, one is too apt to suppose that the glandular enlargement is a primary affection. It is likely that, the child being tuberculous, a slight lesion commenced the disease. A common cause is irritation of the pharyngeal mucous membrane by *sewer gas*, the fauces being found congested or inflamed; but all trace of irritation may have passed entirely away before advice is sought for the "lumps." In every case the throat should be inspected. On one occasion,* children from three different families in a district where a sewer had been emitting volumes of foul air were under treatment for cervical abscess. In one of these families the children were markedly tuberculous. Had not the existence of the neighbouring sewer-ventilation been known, we might have regarded the glandular enlargement as an independent manifestation of tuberculosis, no definite lesion about the pharynx or elsewhere being discoverable.

A follicular abscess, which has long since healed, may have set up glandular enlargement throughout the whole neck of

* *Lancet*, Aug. 3, 1878.

that child whose lymphatic tissues have been already prepared for destructive disease by a tuberculous taint or by a prejudicial environment.

The cervical glands are much exposed, and are connected with mucous membranes which contain abundant lymphoid material and are very prone to inflammation and ulceration. Particularly is this the case with glands in association with the tonsils, pharynx, mouth, and nares; and when one of these areas is attacked the glands are quickly enlarged. Amongst the local causes of enlargement are pediculi, scalp-wounds, eczema and impetigo, otorrhœa, carious teeth, sore throat, adenoids, and hypertrophied and inflamed tonsils, and, as already suggested, the poisonous exhalations from insanitary closets, foul drains, or dust-bins.

The chief constitutional causes are tuberculosis, and the debility after measles, scarlet fever, or influenza. In the former cases the enlargement may have been determined by the ulceration of the throat and tonsils.

Decayed teeth should be looked for; the importance of this examination can hardly be over-estimated. Children have such a dread of dental surgery that they often deny that a tooth has ever ached, lest the admission of the fact should entail extraction. A carious spot in a tooth of the first set, if the glands of the neck on that side be enlarged, demands immediate extraction of the tooth, even though it have never ached—for irritation may be set up in the alveolar lymphatics, sufficient to cause glandular enlargement and even abscess, although there may have been no actual pain with the tooth. In this and in similar cases the glandular trouble is started by the entrance of septic micro-organisms, the abscess not being, at any rate at first, of a tuberculous nature; the septic inflammation, however, prepares the tissue for the invasion of the bacilli, so that the inflammation readily becomes tuberculous. A child prone to glandular enlargement should not be allowed to run the risk of a lymphatic irritation, which may at any time be started by the presence of a tooth of questionable integrity. A tooth of the permanent set which may be irritating the peripheral lymphatics must be dealt with according to circumstances, but it is inexpedient to temporise with a serious offender.

Widespread disease may follow the stopping of carious milk-teeth; and in connection with these remarks, I would urge the importance of all children being examined by the dental surgeon at regular intervals—say, of six months—in order that anatomical and pathological irregularities of the teeth and mouth may be prevented or arrested.*

The irritation caused by the presence of *pediculi capitis* is a common cause of enlargement, and even of suppuration of cervical glands. If the child be of an unhealthy nature, the suppuration may be extensive. The child is pale and miserable, and there is a peculiar, dry look about the hair. Very often this dry hair has been carefully plastered down by the mother before the child is brought for advice. It is advisable in every case of enlarged cervical glands to inspect the scalp; it were an insult to ask a mother if the head is "clean." A good plan of procedure, when the presence of pediculi is suspected, is to take off attention by asking if there has ever been a sore place on the head, and then, without heeding the answer, to make a thorough examination of the scalp. If pediculi be there, they will most likely be found under the hair behind the ear. On quietly showing a pediculus (but hardly else, for adherent ova may not carry conviction), the mother feigns surprise, and engages to cut the hair quite short, or, better still, to have the head shaved. (The hair should be burnt.) The head should then be washed with soap and water, sore places covered with simple ointment, and a skull cap tied on by strings beneath the chin. If removal of the hair cannot be obtained, it must be frequently combed with turpentine, or with a weak lotion of corrosive sublimate.

There is an important gland at the elbow, just in front of the internal intermuscular septum, which is often inflamed after injury, or disease of the hand or fore-arm. The axillary glands are sometimes implicated after vaccination, and especially if the child were unhealthy at the time of the operation. If a glandular enlargement be near the saphenous opening, the child's trousers and sock should be taken off, and search made for sores about the toes, foot, leg, and thigh; the child's word should not be taken as evidence of there having been no "sore place" upon the leg or foot. Common

* See Trans. Odont. Soc., No. 8, 1894.

causes of trouble are chilblains, ingrowing toe-nail, the chafing of the heel by a badly fitting boot, a scratch, a bruise on the knee, and scabies. Possibly the bruise or abrasion which started the enlargement may have healed some time since. With the on-coming of the fresh trouble in the groin, the initial lesion is likely to be forgotten. The pink scar of a sore which has healed may sometimes be found. If the enlargement be along the line of Poupart's ligament, careful inspection must be made of the buttock, perinæum, scrotum, and penis, the prepuce being thoroughly retracted. If rest in bed, and attendance to the sore do not cause the enlargement to subside, the gland had better be dissected out without further delay.

Enlarged glands may, with the greatest advantage, be removed from the depths of the iliac fossa, or even from behind the peritoneum. From one tuberculous child I removed a long cluster from the front of the lumbar vertebræ, and, though I was unable to clear them all away, rapid and permanent recovery was secured thereby, the others probably undergoing spontaneous absorption.

A popliteal gland may be the seat of enlargement, and of abscess, either on account, or independently of a sore upon the outer side of the foot, the heel, or the calf. Such abscess should be opened, as a rule, through the interval between the ilio-tibial band and the tendon of the biceps. The evacuation of the abscess is often followed by an intractable sinus, which may need scraping. The knee must be kept straight, and in perfect rest.

Leeches, lotions, and counter-irritants are of no value, and they may do harm by exciting the circulation, and determining wreckage. Poultices are worse than useless. Tincture of iodine, painted over the skin, is occasionally applied, more for the sake of "doing something" than for any real belief in the therapeutic efficacy of the measure. Probably it is partly through the influence of the iodine in the air that a stay at the sea-side gives help. Bryant iodises the air of the sitting- and bed-room of the patient by putting on a shelf some solid iodine in a perforated box.

In my experience, valuable time is often wasted in sending the child to the sea-side as a forlorn hope. Far better is it to

clear away the local irritation and the suppurating glands, and *then* to send the child to the coast. Sea-breezes cannot determine the absorption of the septic or tuberculous pus in a gland. Yet the advice is sometimes given in an off-hand way that children with suppuration be taken to the sea. This usually ends in disappointment.

If the child's health be poor, and no improvement be effected by treatment; if the masses be large, and few in number; if they be numerous and increasing rather than diminishing, and apparently disturbing the well-being of the patient; or if they threaten suppuration, they should be removed without further delay, whatever their situation. It is inexpedient to leave collections of matter in the tissues; it is impossible to say where they may eventually find exit, and, discharging spontaneously, they may become septic.

Excision of tuberculous glands.—Too often the operating surgeon sees the case only when suppuration has far advanced, the skin being undermined, and a considerable series of glands being matted together, or on the point of forming a diffuse abscess. Provided only that treatment be not too long delayed, the cases are very manageable; and, instead of the child being permanently marked with scars, a thin white line is all that ultimately remains as evidence of the disease and its treatment.

It may be that a gland the central part of which has broken down has, in a few rare instances, undergone complete resolution and absorption; but the chance of this occurring in any individual case is so unlikely that for all practical purposes it must be disregarded.

With respect to the radical treatment of enlarged glands in the neck, it is of little use advising operation on a case unless the surgeon is determined to deal effectually with every implicated gland and sinus, root and branch, and he must be prepared to encounter considerable difficulties during the procedure. He will, therefore, feel much more at his ease if he has, in addition to a skilled anæsthetist, a trustworthy assistant, and I am sure that, whenever practicable, the services of a special anæsthetist should be engaged. The child should not be kept too deeply under the anæsthetic during the operation. I have never met with any instance

in which a child has died from the administration of chloroform; but the occasions in which I have seen this calamity most nearly approached were in operations for the removal of tuberculous glands from the neck. In more than one case I thought that the child was dead—in spite of treatment by hanging it up by the feet so as to stimulate the anæmic brain, and at the same time resorting to slow and rhythmic compression of the chest by way of artificial respiration. In two of these cases chloroform was being somewhat freely administered, without regard to the pulse, only respiration being watched. I am sure of this, that the pulse is terribly apt to fail before the respiration; and I regret the teaching of the Hyderabad Commission—that only the respiration need be watched.

After extensive operations upon the necks of children whose glands are involved in advanced decay, a vigorous clearance and erosion acts like the pouring of oil on stormy waters. This much the surgeon can safely promise, that his operation, which will be associated with no serious risk, may be trusted to effect a very great improvement, and that, if it unfortunately have to be partially repeated, the second operation will probably be successful. The parents must not regard the operation as of a speculative nature, and the alternative should have due weight when the operation is being urged: if nothing be done, the case must take its own tedious and perilous course.

Operation.—The hair should be cut short and the side of the neck thoroughly cleansed. Chloroform having been administered, a sufficiently free incision is made over the tumour—most likely along one of the borders of the sterno-mastoid. The incision should in every case be parallel with the glandular chain—that is, in the *length* of the neck, not across it—so that, as the surgeon proceeds, he has merely to lengthen his incision, if more room is needed. Sometimes, indeed, it happens that the surgeon has to weed out enlarged glands all down the chain, from the front of the transverse process of the atlas even to behind the clavicle. It is an error to keep the incision too small, for a good deal may have to be done through it—much more, perhaps, than the operator had anticipated. A great deal of room may be secured for

working in the cavity by inserting the tips of the two index-fingers into the skin-wound and pulling them asunder; but it must not be forgotten that a large amount of work cannot be effectually carried out through a very small incision.

Having made this incision through the skin, platysma and deep fascia, I use the scalpel as little as possible, and expose the glands by working with a steel director and forceps. Vessels entering the gland I tear through with two pairs of forceps, so as to avoid needless bleeding. In all probability the neighbouring glands are also enlarged, and they are, therefore, weeded out along with the chief offenders. If there be much bleeding—and, as a rule, there is not—it is easily checked by the temporary use of catch-forceps. The cavity is then dried by swabs of aseptic gauze.

Having prepared some horsehair by soaking it in the warm antiseptic lotion, sutures of that material are then inserted with a fine needle, introduced close to the edges of the wound. But if a considerable amount of diseased skin has had to be cut away, or if a friable tuberculous cicatrix has required removal by the sharp spoon, no attempt need be made to close the wound absolutely. A clear course having been made by the sharp spoon to the depths of the diseased area, drainage will take place without special provision being made for it.

But if suppuration has entailed severe scraping, it is better to leave in a drainage-tube or a strand of horsehair for twenty-four hours. There is sure to be a good deal of exudation following the scraping, and unless the fluid can escape freely into the absorbent dressings, it is apt to cause tension, and disappointment. I do not say that the drainage-tube is always necessary; but it is, I think, safer to leave one in for a few hours, as a scraping operation is very different from a clean incision through healthy tissues. A bulky sterilised dressing is bound on by a bandage encircling the neck.

The child being put back in his cot, an ordinary pillow is not allowed, but a small junk is placed beneath the occiput, and the head is steadied between a couple of sand-bags as large as quartern loaves. From this position the child is not allowed to stir, either for feeding or for any other purpose

whatever. To prevent the dressings from becoming soiled when the child is being fed, it is well to have them covered by a handkerchief or a piece of waterproof jaconet, which the nurse can change at her pleasure.

Next day the dressings are removed without disturbing the child, and the drainage material is withdrawn. After this, there will be no need for inspecting the wound for several days.

There should be no hurry about getting the child up again; by means of brightly coloured pictures of contingent happiness he whiles away the time, a contented and expectant lotos-eater. But when he is allowed to get up, his neck should still be kept at rest by means of a stock of stiff buckram covered with linen, which is wide enough to reach from his chest to his chin, and from his shoulders to his ears. If it be probable that the case will run a prolonged course, it is better, before operating, to prepare a collar on the principle of that advised in the treatment of cervical caries (page 258). This must be worn whilst the child is up and about, and even for some weeks after the wounds have soundly healed, the sand-pillows being still employed at night.

Unfortunately, it often happens that as soon as the skin is incised pus escapes, and, proceeding further, the surgeon finds that he has to deal with a suppurating cavity which encloses and communicates with several broken-down glands. The best that can then be done is to lay open, scrape out, and irrigate the cavity and the sinuses communicating therewith, taking away, or thoroughly scraping out with a sharp spoon, the wreckage of the broken-down glands, enucleating each of the enlarged glands, and making provision for temporary drainage. Whenever a piece of a capsule, or a gland, has to be *dissected* away, the scalpel must be made to "hug" the gland, lest troublesome hæmorrhage, or something worse, result.

It is highly advantageous to convert an undermining and unhealthy sore, and a possible source of general infection, into an open, clean, and granulating surface. If it be right to remove one degenerating gland, it must be right to remove all compromised glands, as, sooner or later, they are likely to be the seat of abscess. Every enlarged gland, therefore, should be weeded out; and through a single incision glands

which lie at a considerable distance may usually be reached. Thus the finger and forceps may work beneath the sternomastoid from the base of the skull to the submaxillary, to the thyroid, and even to the clavicular regions. On only one occasion have I had to divide the sternomastoid in order that I might effectually deal with enlarged glands beneath it; this is rarely needed, as it can usually be raised and drawn aside. Sometimes it is better to make several incisions rather than to attempt too much through the one wound.

The internal jugular vein is the chief structure which causes anxiety. Indeed, after dislodging a gland, a considerable extent of the dusky and bulging vessel is often exposed, and might by chance be mistaken for a gland. In a considerable number of cases wounding of the vein is inevitable. The hæmorrhage must be provisionally controlled by prompt and firm pressure in the wound itself, and also beneath the mastoid process, and then the vessel must be thoroughly exposed. It is highly expedient, therefore, that the surgeon be not without competent assistance during the operation.

In children the internal jugular vein appears large out of all proportion, and if, when the surgeon is removing a tuberculous mass from its neighbourhood, the vein is wounded, the rush of blood may be truly alarming. It has occurred in my own practice on several occasions, and twice when I was operating in private houses and was "short-handed." Given the case of a small child, with a large rent in a swollen jugular vein, an untried anæsthetist, and a strange or an unhandy assistant, and I know of no surgical position more embarrassing. In thus calling attention to a complication which may arise in these operations, I would like to offer a word of caution to practitioners who, not being in the habit of operating, lightly undertake the clearing away of a mass of glands from a child's neck. For although there is nothing of the nature of "specialism" in the operation, and, although it may prove a perfectly simple affair, and produce the most satisfactory result, it may, on the other hand, involve the surgeon in an exceedingly unwelcome and alarming predicament.

When the operator is dragging up and dissecting around an enlarged gland, the vein may be so much raised that the adjacent part becomes kinked and flat, and may then be readily cut. It is well, therefore, during the progress of the dissection, to pause, from time to time and allow the gland to drop back, and to see if the vein fills up and becomes evident. When the surgeon knows the exact position of the vein, he is less likely to wound it. But, having cut it, I deem it unsafe to close the wound in its wall by a superficial, lateral ligature, or by fine suturing. The right thing to do is to clear the vein, to tie it above and below the wound, and to divide it. I have had to do this many a time, and I have never known any trouble follow.

In one of my cases, with a mass of tuberculous glands which stretched from occiput to collar-bone, the internal jugular vein was wounded so near to the base of the skull that it was found to be impossible to apply a ligature. The vein had, therefore, to be seized with a pair of pressure-forceps at the posterior lacerated foramen; these were left on for forty-eight hours. The result proved entirely satisfactory.

For the first day or two the temperature may rise a degree or more above 99° , but it soon comes down to, and tracks along, the normal line. Sometimes the operation is followed by a little local œdema, but this also quickly passes away. A great feature of the case is that, as a rule, the general condition of the child is greatly improved by the local clearance—an improvement such as is often noted on clearing out a tuberculous mass from the knee-joint by arthrectomy.

Primary union cannot be secured in all cases; everything depends upon the condition of the overlying or surrounding skin. If this be dusky and implicated, or be represented by unhealthy, "rotten" scar-tissue which has inevitably to be scraped away, sutures would be out of place. It is better, then, that the wound be allowed to granulate up from its depths. But if, as too seldom happens, the case has come early under operation whilst the tuberculous process is confined within the limits of the gland-capsule, and the skin is perfectly sound, the result is extremely satisfactory. Indeed, it is in every respect a most excellent operation. In many cases its success proves greater than could have been

expected; but in others, as already remarked, it proves, on the first attempt, a little disappointing. Occasionally some inflammatory exudation into the sterno-mastoid follows the operation, but this clears up in due course, especially if the neck be kept perfectly quiet. In cases in which a small piece of the wound has been left open, or for some other reason no drainage-tube has been inserted, the dressing need not be disturbed for a week; and at the end of that time, when the stitches are removed, the wound is found soundly healed. I regard the operation for the removal of diseased glands as one of the great advances of modern surgery. For its introduction we are chiefly indebted to Mr. Teale.

The treatment of enlarged glands by the electrolytic cautery, by thermo-puncture, and by injection has, in my opinion, nothing to recommend it.

Lymphomata are tumours resulting from simple overgrowth of lymphatic glands, independently of local irritation, tuberculosis, or sarcoma; they are merely hypertrophied glands. The process is an innocent and slow one; the glands cluster, but they rarely fuse together, and they never suppurate. They are most often seen in the neck, where they may form enormous, lobulated masses, along the whole length of the sterno-mastoid. Lying beneath that muscle, they cause it to be pushed aside, flattened, and thinned. They may be handled without pain ensuing, and they will be found so freely movable that the surgeon is invited to shell them out. They generally have a capsule, from which they may be readily dislodged.

For the *operation*, there should be plenty of time and light at the disposal of the surgeon, for the procedure may be long and tedious. One of the chief points to be attended to is the prevention of hæmorrhage. Every bleeding point should be secured, either by pressure-forceps, or by a fine ligature. If the surgeon enucleate the glands by using director and forceps, rather than scalpel or scissors, he will have little to fear from bleeding. The after-treatment will be just that which has been described in connection with the removal of tuberculous glands (page 109). The surgeon must be prepared to find a second or a third operation needed, even though he may have removed, so far as he could tell, every

enlarged gland on the first occasion. The result of removal of multiple lymphomata is very satisfactory.

The constitutional treatment demands fresh air; a liberal diet; cod-liver oil, and liq. arsenicalis or iodide of iron. But the drug is not yet discovered which can prevent the recurrence of the glandular enlargement or determine its subsidence.

In **Hodgkin's disease**, or **lymphadenoma**, the glands are enlarged in various parts of the body; they are smooth and movable, and vary in size from a pea to a hen's egg—the disease is, in fact, a *general lymphadenomatosis*. Compared with simple lymphoma, it is, fortunately, a rare disease, and, microscopically, it differs from it by the great excess of cell-growth. This general disease may, apparently, begin in a group of glands as the result of injury. At the onset, only one group may be affected; as, for instance, the glands of the neck. In due course those of the corresponding axilla, the groin, or the mesentery, are implicated. They increase rapidly in size, but they are not tender; they do not fuse together or with the surrounding tissues, as sarcomatous glands would do, and they do not suppurate. They form large tumours, which are of a soft and brain-like consistence. The lymphatic elements of the tonsils, liver, spleen, and kidney are affected with a similar hyperplasia, and the spleen may be enlarged to ten or twenty times its usual size. This disease resembles leucocythæmia, with the exception that the multiplication of white corpuscles is wanting. It is not dependent upon tubercle.

The child has irregular attacks of high fever, grows weak and anæmic, and eventually dies exhausted. Sometimes death is due to pressure on important parts, with resulting dyspnœa or dropsy. The course of the disease is apparently uninfluenced by constitutional remedies, and the enlargement of the glands being but local expression of a general dyscrasia, surgery can give but slight help; sometimes it runs an acute course. To recognise the existence of this malignant disease is to admit the advisability of avoiding active surgical interference in the early months of glandular enlargements generally. It would be a misfortune to attack indolent glandulæ concatenatæ by operation, and then to find that the cervical enlargements were but the foreshadowing of this

serious constitutional malady. And unfortunately the diagnosis of simple from malignant lymphoma is, in the early stage of the disease, impracticable. Iron and arsenic in small and oft-repeated doses may be given.

Operation may be required if the gland-masses cause dyspnoea, either from pressure against the side of the larynx or tracheæ, or from pressure directly upon the front of it. The child is liable to sudden spasm, which may prove fatal. Tracheotomy may be demanded. The operation may be long and difficult; it should be performed cautiously, and an unusually long tracheotomy-tube will be needed. If it be thought inexpedient to undertake a tracheotomy for the dyspnoea, some temporary relief to pressure may be afforded by division of the deep cervical fascia. Inasmuch as the glands are diseased in various parts of the body, enucleation of the cervical masses is not to be thought of.

Primary sarcoma of glands.—Fig. 17 represents a lympho-sarcomatous tumour. It reached from the ear to the clavicle and the episternal notch, and, laterally, from the median line of the neck to the border of the trapezius. It had a semi-solid feel; it did not implicate the skin, and it was freely movable. It was situated beneath the sterno-mastoid, taking there its origin in the lymphatic glands. Its great size and rapidity of growth betokened its malignant nature, and suggested prompt removal. Accordingly, it was exposed by a free incision, and enucleated. The common carotid artery and the pneumogastric nerve were found to occupy a deep groove in its substance, whilst the internal jugular vein was stretched over its surface a little farther back. The vein had to be sacrificed, and it was accordingly tied above and below. The operation being completed, the wound was closed with a continuous suture, and the infant was put back in his cot with his head between sand-bags. Sections of the



Fig. 17.—Sarcoma of Lymphatic Glands, successfully removed by operation.

tumour unmistakably demonstrated its sarcomatous nature. After the operation, the child's pulse for three days ran at 180, but the temperature only once reached 100°; the wound healed completely, and the infant was taken home in a good state of health a month later. In cases like this no treatment short of extensive operation can possibly avail, and though the shock attending it may end fatally, still, as the inevitable alternative to operation is death, the most serious risk should be unhesitatingly accepted and the operation undertaken.

Permanently satisfactory results after operation in these cases are quite exceptional; still, operation offers the only chance of relief. The disease is recognised for certainty only by the microscope.

For the **obliteration of depressed cicatrices** Adams recommended the subcutaneous division of adhesions by a tenotomy knife, introduced beyond the margin of the cicatrix and carried down to its base. The cicatrix is then elevated, and kept in position by fine hare-lip pins. On the second day the pins are removed, and the scar tissue is allowed to find its level. It will probably remain for a while somewhat raised. But I agree with Ashby and Wright that a far better result may generally be obtained by dissecting out the puckered scar and replacing it by a linear cicatrix.

CHAPTER VIII.

TUMOURS.

As might have been anticipated, growths upon the type of embryonic connective tissue, **sarcomata**, are common in childhood—they are more likely to occur in tissues which are passing through the developmental stages than in those which are permanently differentiated. Like the embryonic tissues upon the type of which they are founded, sarcomata are met with of several varieties. The round-celled sarcoma is the representative of the lowest form of development, but of the highest malignancy. The giant-celled, or myeloid sarcoma is the representative of the medulla of embryonic bone; it is the least malignant form, and the usual variety of a *central* sarcoma of bone. *Periosteal* sarcoma generally consists of spindle-cells, which enter the blood-vessels far more readily than the giant cells, and, therefore, more quickly infect the viscera, especially the lungs.

Sarcomata differ from the tissues on the type of which they are formed, in that they show no desire for the higher development. Were it otherwise, they might grow into fibrous tissue or muscle, and so become harmless elements in the parts which they infest. The sarcomatous cells actually form the thin-walled vessels of the tumour, and, readily entering the blood-stream, they become quickly disseminated—especially the small round and the spindle-celled varieties. Inasmuch as the cellular elements of the tumour are carried away by the veins, the secondary visceral deposits are almost certainly in the lungs. They have a much less direct association with the lymphatic vessels; nevertheless, it is by no means unusual for them to implicate the glands, and in sarcoma of the testicle such an implication is almost invariable. Sarcomata are painless, though, if they be growing quickly, there may be discomfort from tension of sensory nerves. Sometimes the growths are hard, sometimes soft, but they are generally smooth and rounded. They are

apt to grow after injury to a bone, simulating periostitis, or ostitis with a central necrosis, and errors of diagnosis in connection with them are of common occurrence (page 120).

Case.—A girl of seven years was admitted to the Children's Hospital for a painful and "throbbing" enlargement in the head of the tibia; seven months previously she had fallen, and had cut her stocking in the fall in the exact place of the tibial enlargement. The skin was hot over the tumour, and there was a feeling of boggiess in the parts beneath. As all her trouble dated from the fall, it seemed more than probable that the swelling was inflammatory, but the diagnosis was withheld until an incision was made, when the bone-tissue was found to be replaced by a soft, succulent growth. She made a rapid recovery after amputation in the lower third of the thigh.

Myeloid sarcoma is generally found in the jaws, and in the ends of the diaphyses. It may, however, cause a central swelling in any part of a diaphysis. It is on the type of foetal red marrow. It grows slowly, and on account of the great size of its elements (giant cells) it is less disseminated by the blood-stream. The large cells are mixed with small round and spindle cells. When once a growth of this sort has been completely removed, recurrence is unlikely. A common form is **epulis** (ἐπι, upon; οὔλον, gum). It is of a reddish-brown or maroon colour. Sometimes it is necessary to extract one or more of the teeth before the growth can be entirely removed. The epulis is apt to be, especially in its deeper parts, osteo-sarcoma. In a child recently under treatment (Plate IV., Fig. 1), the epulis had grown quickly and extensively; for its complete removal it was necessary to resect the inferior maxilla, from the front of the masseter to considerably beyond the symphysis. (See also page 190.) On making an exploratory puncture into it, the bleeding had been extremely fierce. When a myeloid sarcoma springs from the medulla, or cancellated tissue of a long bone, a smooth, ovoid expansion may take place, pulsation and "egg-shell crackling" being distinguishable in it. The egg-shell crackling is not of common occurrence. Let it be clearly understood that the egg-shell crackling over a central sarcoma is not due to the bone being actually expanded by the growth.



Fig 1.

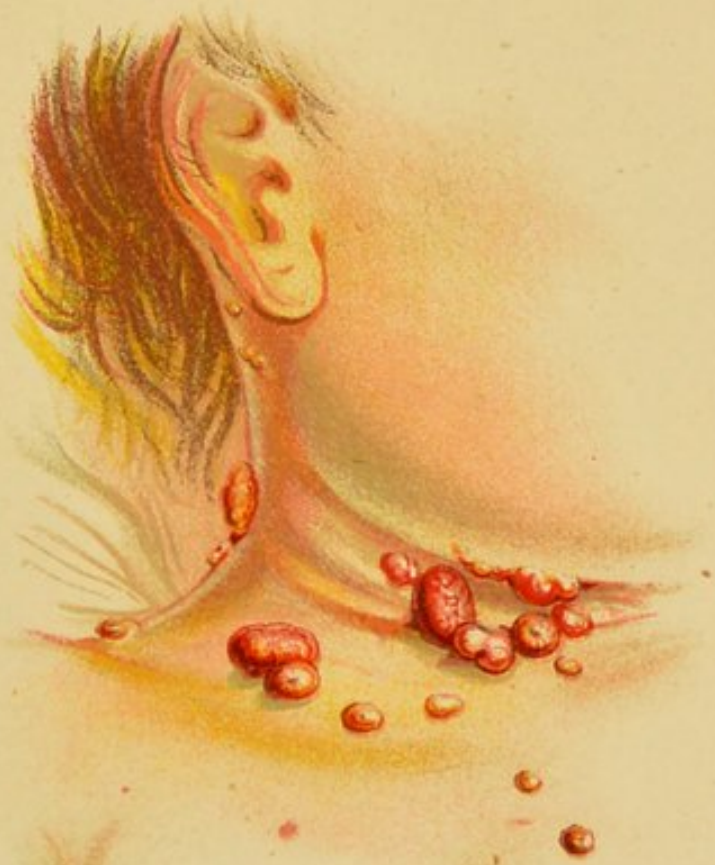
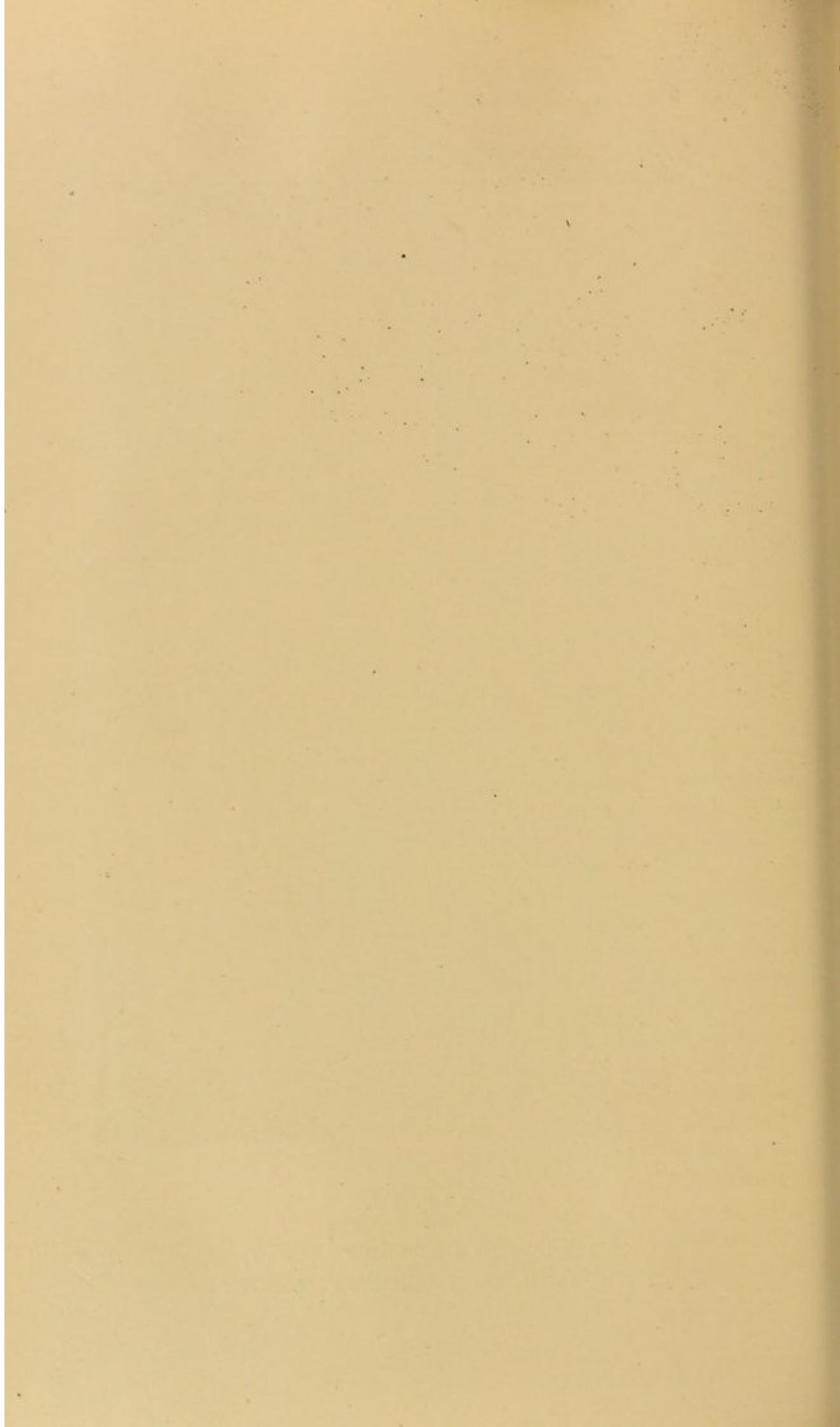


Fig 2.

PLATE IV.

FIG. 1.—EPULIS OF LOWER JAW. (Page 118.)

FIG. 2.—MOLLUSCUM CONTAGIOSUM. (Page 145.)



A sarcoma does not act in that manner, but rather by replacing the bone in its centrifugal growth until only the periosteum is left. The periosteum is expanded over the sarcoma, but as it is not invaded by the sarcoma it continues to form in its deeper part a thin layer of bone, which is eventually spread somewhat unevenly over the surface of the growth.

Sometimes the pulsating tumour is highly suggestive of aneurysm, especially when, as in the case of the lower end of the femur, the expansion of the bone is near to an artery. On compression of the main trunk in either case, the tumour would diminish in size, but on remitting pressure an aneurysmal sac would at once fill up, whilst a vascular tumour might need two or three beats of the heart for its complete distension. Central sarcoma of the end of a bone very rarely invades a joint. It pushes off the articular cartilage, however, and, causing disturbance of, and effusion into, the joint, may lead the surgeon to regard the case as one of arthritis. When, therefore, thickening occurs about the lower end of the femur soon after an injury, and effusion takes place into the knee-joint, the surgeon may have great difficulty for a while in diagnosing myeloid sarcoma from traumatic arthritis. In two conspicuous instances I failed in this respect; in each case amputation was eventually performed. In one of the children the disturbance of the knee-joint was so vigorous, and the pain and tenderness were so great, that several surgeons besides myself took the case to be one of acute traumatic arthritis, for which we urged immediate amputation. After the operation we found a myeloid sarcoma springing from the end of the femoral diaphysis and bursting through the epiphysis into the joint. The boy eventually died of recurrence in the other femur and in the sacrum.

I have ventured to place under the heading of "myeloid sarcoma" the drawing of a specimen of tuberculous abscess of the end of a diaphysis, in order that it may be seen how easily the case might have been mistaken for one of central new growth. It may also act as a reminder that in the case of obscure enlargement at the end of a diaphysis, incision should be made into the mass, and a thorough exploration, before the limb is condemned for amputation. (Fig. 18.)

The X rays do not at present give material assistance in the elucidation of obscure cases of sarcoma of bone.

Periosteal sarcoma is very much more malignant than central (myeloid), for it consists of small round or spindle

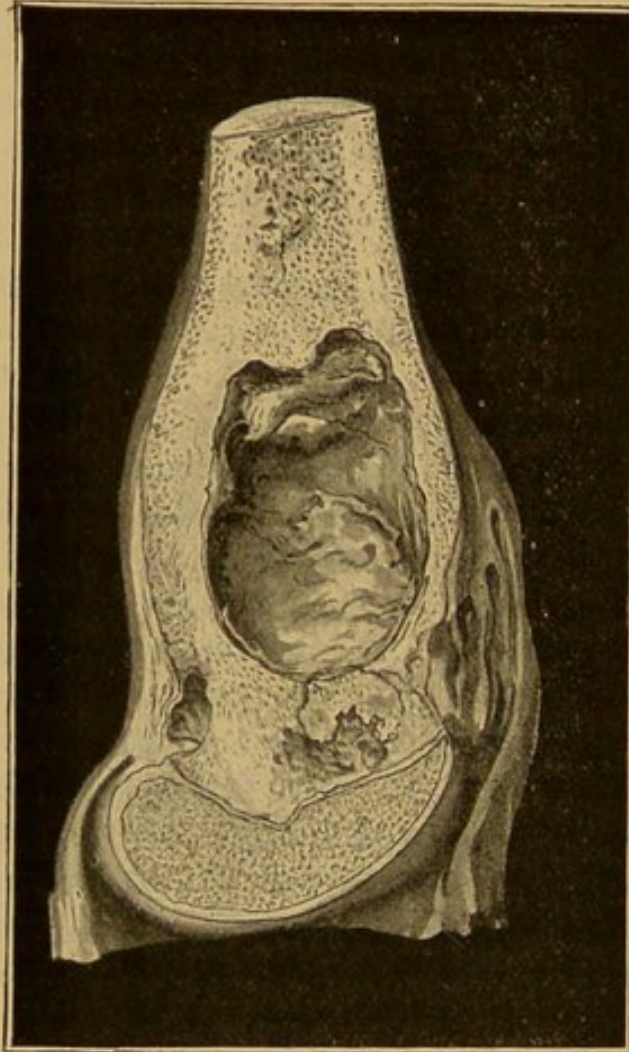


Fig. 18.—Tuberculous Abscess Cavity in Lower End of Femoral Diaphysis, causing Enlargement of Bone, highly suggestive of Myeloid Sarcoma. In adjacent part an irregular sequestrum is seen, the result of tuberculous osteitis; granulation tissue ("pyogenic membrane") lines abscess cavity. (*Museum, Royal College of Surgeons.*) (See last paragraph on page 119.)

cells which easily find their way into the blood-stream, to become disseminated in the lungs or elsewhere. Moreover, the periosteal growths are apt to extend along the attachments of the muscles and into the intermuscular spaces. The bones most often attacked by this kind of sarcoma are the femur, tibia, and humerus, and, more rarely, the scapula, fibula, and the bones of the fore-arm. When the end of a diaphysis—the favourite situation of the growth—is involved,

the bulging is at first more localised than in the case of the central growth; but, spreading along the periosteum, it may quickly surround the bone. When the sarcoma attacks the diaphysis at a distance from its ends, it soon spreads round the shaft and develops into an even, fusiform swelling. Like the myeloid sarcoma, the periosteal growth is often started by injury, and not infrequently it leads the surgeon into the mistaken diagnosis of abscess; exploration with a cannula and trocar, or, better still, with a scalpel, is the surest way of forming a correct diagnosis and of preventing regrettable loss of time. Early amputation high above the growth is the only treatment available.

The only available **treatment** of sarcoma is by operation, and it should be both prompt and thorough. The removal should be effected through healthy tissue, and at a considerable distance from the limit of the disease. Enucleation of the growth should be resorted to only when the tumour is a central myeloid sarcoma, early recognised and promptly dealt with. Resection of the piece of bone invaded is far preferable to scraping; but if there is any doubt as to the sarcoma being diffuse, amputation should unhesitatingly be resorted to. I greatly fear lest a too general adoption of limited operations in sarcomata of bone should be followed by an enhanced proportion of recurrence of the disease. That effort of the surgeon which may be commendable for its conservatism in operations for injury, or for innocent growths, is usually out of place when the interference is for malignant disease, even in the case of the mildest form of sarcoma, the myeloid.

The more rapid the growth of a tumour the greater the need for removal; early infancy does not preclude operation. An exploratory incision should be made. No time should be lost; high amputation may offer the only chance of success. Amputation, even at the hip, for sarcoma of the femur in childhood is not so desperate, if done early in the course of the disease.

Prognosis.—If surgical interference have long been delayed, the child may sooner fall a victim to deposits in the lung, the liver, or in the lymphatic glands or viscera; and this is particularly the case with disease affecting the testis.

In other instances, death may be caused by the exhaustion attendant on ulceration, suppuration, or hæmorrhage.

Sarcoma of the kidney is not an uncommon disease in infancy and childhood; I have performed nephrectomy in four such cases, but with only one successful result. As a rule, the diagnosis of malignant disease is not made until the growth has assumed considerable size, and by this time dissemination may have taken place in the lungs or elsewhere. By this time, also, the child may have become thin and miserable, and unlikely to survive the ordeal of nephrectomy. The prominent feature of renal sarcoma is its painlessness. It grows to an enormous size, pushing the liver or diaphragm upward, and impeding respiration. It strips up the peritoneum also from the flank, thrusts the intestines across to the opposite side of the abdomen, and bulges as a rounded tumour from the costal cartilages to Poupart's ligament, causing also a fulness between the lowest ribs and the back of the iliac crest. It may even bulge across the median line. The whole region of the tumour is dull on percussion. The tumour may seem to fluctuate. The stretched and shining skin is generally marked with dilated veins.

Diagnosis.—At first there may be uncertainty as to whether the tumour may not be a hydronephrosis (page 297), or a large abscess. This is cleared up by the introduction of a hollow needle from the loin, only a few drops of blood escaping. There is not necessarily hæmaturia.

Treatment.—An incision should be made through the linea semilunaris and the parietal peritoneum, and, the intestines having been drawn aside, the peritoneum should be again incised to the outer side of the colon—so as to avoid the colic artery. Then the renal capsule should be incised, and the growth extracted from within. If the capsule has already been traversed by the growth, a rapid and vigorous attempt should be made to clear away all the outlying malignant tissue; and so also with regard to neighbouring enlarged lymphatic glands. Every precaution should be taken against shock, and the operation should be performed as quickly as possible, as well as at as early a date as possible. The prognosis is desperately bad, but thorough operation affords the only prospect of recovery.

Abdominal sarcoma is not infrequently met with. The child makes no complaints of pain, but he grows pale and thin, and his abdomen begins to swell. The pressure of the sarcomatous infiltration upon the veins of the omentum or mesentery causes effusion of ascitic fluid, upon which the inflated intestine may be floated. As the abdominal walls become thinner, hard and painless, brick-like masses of growth can be easily made out; and if, as is often the case, they are in the omentum, they can be examined with still greater facility when the child is on its hands and knees.

Inasmuch as the surgeon cannot always be absolutely certain of his diagnosis of abdominal tumours, it may sometimes be well for him to make an exploratory incision, in case, by chance, the disease should be tuberculous peritonitis with a matted and hard omentum (page 272). Having introduced his finger and found general sarcomatous infiltration, his diagnosis is confirmed, he has assured himself that no radical treatment can be undertaken, and the parents have the melancholy satisfaction of knowing that nothing has been left undone which might possibly have saved the child.

Congenital tumours are the subject of a valuable lecture by Mr. Hardie, in the *Lancet* of 1885; Mr. Sutton also has recently published an original work upon this subject; and to both of these authors I would here express my indebtedness.

Included foetation, attached foetus, is the result of a fusion of two embryonic areas which have been accidentally formed in the blastodermic vesicle. The attachment may be so slight as to tempt the surgeon to sever the connecting band and so set two individuals free, or so complete that one of the germs may be surrounded by the advancing development of the other, and its growth compromised. A portion only of the parasitic foetus may attain full development, monstrosities of various kinds being thus produced. Projection of one or more limbs of the parasite from the body of the host is an ordinary example of such a monstrosity. The predominant partner is termed the *autosite*, and the one of secondary importance the *parasite*. The inclusion may be complete at the time of birth, the parasitic members sprouting later. The growing portion of the included parasite is

particularly apt to be associated with the sacrum, ovary, or testis; and any cystic formation may contain bone, hair, or tooth. According to Mr. Lowne, these cases of heterologous union are the result of a second embryo becoming wedged in between the visceral arches or laminae of another before they unite, the development of the second being arrested.

Congenital hypertrophy, or atrophy, may affect an entire limb or part of a limb, or any individual organ or part of it. The error of development must be ascribed to some obscure disturbance of nutrition. It is by no means rare to find a limb shorter than its fellow, and when the thigh and leg are implicated the case may at first appear as a clinical puzzle. The great trochanters are practically on the same level; and when the child is laid flat on its back, and its thighs are flexed to a right angle, one femur is found short; again, when the knees are placed on the same level, the leg-bones on the one side are short and the foot is small. There is nothing wrong with the joints. In such a case, all that one can do is to add an appropriate thickening to the heel and sole of the boot. In some cases the arrest of development seems to be the direct result of the umbilical cord having been twisted around the limb.

Congenital sacro-coccygeal tumours.—Tumours about the sacral or coccygeal region may be connected with the front of the sacrum, the spinal canal, or even with pelvic viscera. Exploration through the rectum may afford evidence of complicated attachments. These tumours often originate as abnormal dilatations of the post-anal gut, a part of the alimentary canal which, for a certain period of embryonic life, exists posterior to the anus. The minute structure of this variety of teratoma agrees, in every particular, with the histological details of the section of the gut.

Some of these tumours are of such enormous size as apparently to be incompatible with life; they may be sarcomatous in their nature and some may spring from Luschka's gland. The skin over the tumour may undergo ulceration, and fatal exhaustion may supervene. If a coccygeal tumour be found deeply connected with the interior of the pelvis, it had better not be interfered with.

A sacro-coccygeal tumour grows most easily in a downward direction, and it may quickly form a soft mass pendulous from the pelvic outlet. Sometimes the growth becomes pedunculated in appearance. Fig. 19 is drawn from a

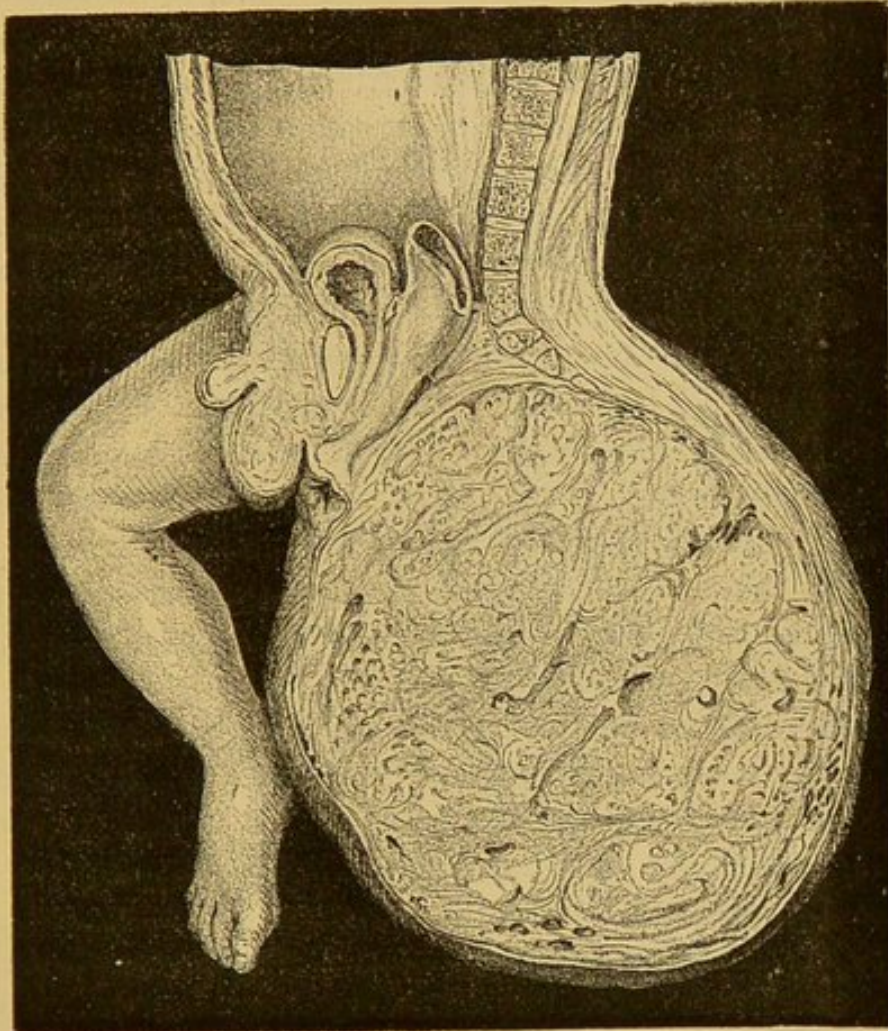


Fig. 19.—Congenital Tumour probably Springing from Luschka's Gland. (*Museum, Royal College of Surgeons.*)

preparation in the Hunterian Museum; the tumour in this case apparently started from Luschka's gland. The infant was six weeks old.

Treatment.—Inasmuch as the tumour is certain to keep on growing, to block the rectum, and ultimately to destroy the infant's life, a determined attempt should be made to remove it by dissection. If, however, the intra-pelvic attachments be very extensive, removal may be impossible, in which case the surgeon must temporise, performing an inguinal colotomy as soon as the rectum is blocked. The shock caused by

removal, or attempted removal, would be serious, while the extent of the wound would entail an exhausting drain.

Of a *tumour in the middle line of the back* the surgeon must always be suspicious, for though it may be capable of some movement over the subjacent bone, it is very likely to be connected with the spinal canal. If it is associated with "weakness" of the bowel or bladder, there can be little doubt as to the importance of its connections. Though such a tumour may look like a simple fibro-fatty growth, it is apt to be the remains of a spinal meningocele which has happily undergone spontaneous or artificial cure. Its base may be associated with some part of the cauda equina.

Treatment.—If operation be determined upon, a careful dissection should be made down to the base of the tumour, with all needful precautions. If it be found unconnected with the spinal canal, it should be removed. If connected by a slender pedicle, this must be ligated and the tumour then detached. But if the communication with the canal prove considerable, the wound should be closed and the tumour eventually dealt with as a spina bifida.

Other varieties of tumour in the neighbourhood of the sacrum and coccyx are **dermoid cysts**. These may contain hair, sebaceous matter, or rudimentary teeth. Tumours consisting of foetal remains of bone or cartilage, or the vestiges of limbs, are occasionally met with.

Dissociated blastoderm, dermoid cysts, arise from germinal cutaneous cells of the epiblast which have wandered to an abnormal site, and there have, at a later stage, developed after their kind. They are often found over the anterior fontanelle, and in the median line of the forehead and nose, being there, as Lannelongue has shown, portions of the dorsal groove which have been carried forward with the growth of the front of the head and of the face.

Dermoids may often be found embedded beneath skin or mucous membrane, either in the median ventral, or dorsal line of the union of the lateral halves of the body, or in some other line of fusion, especially about the neck or face. Fig. 20 shows that dermoids are apt to be embedded at the inner and outer angles of the orbit, the upper eyelid, in the naso-facial sulcus, the cheek, or slightly posterior to the angle of the

mouth. They also occur in the middle line of the chin, and on the nose. At the root of the nose the dermoid has to be diagnosed from meningocele (page 174). The only satisfactory way of treating dermoids is by dissection.

Dermoid cysts of the ovary are of congenital origin, but at any time after puberty they may begin to grow. Sometimes their development takes place much earlier. Thus, Dr.

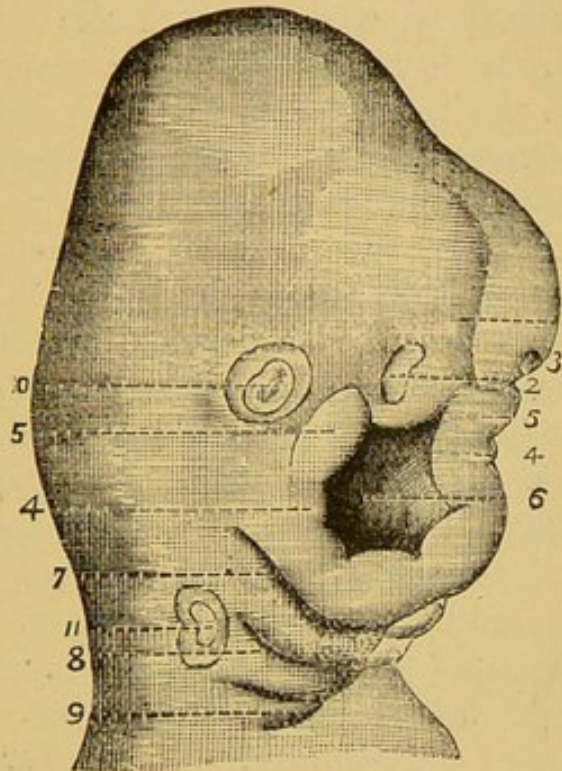


Fig. 20.—Face of an Embryo of 25 to 28 days, showing the Branchial and other Clefts where Epiblastic Inclusion is apt to occur. 1, Frontal prominence; 2 and 3, Olfactory fossæ; 4, Mandibular arch; 5, Maxillary tubercles; 6, Oro-nasal cavity; 7, 8, and 9, Branchial arches, with clefts intervening; 10 and 11, Ocular and auditory vesicles. (*From Gray's "Anatomy."*)

Roemer successfully removed a dermoid ovarian cyst, of the size of a child's head, from an infant of twenty months; in several instances dermoid cysts have been removed from children two or three years old.

Cysts about the orbit are often very firm. They are usually dermoid, and are caused by a piece of epiblast being detached, belated, and locked in the depths of a closing developmental fissure—like a fly in a piece of amber. They preserve their vitality, and proliferate epidermal scales which degenerate into a pultaceous mass. In the neighbourhood of the orbit they lie beneath the orbicularis, and, on being

dissected out, may be found to have occupied a distinct fossa in the bone.

Thus, dermoid cysts are often met with in the regions of the orbit, forehead, and scalp; sometimes they attain considerable size. Their epiblastic origin has been already alluded to. They differ from the sebaceous cysts of the adult in that they are generally hard, and are deeply seated—beneath the orbicularis, for instance. They are not in the substance of the skin; they may be quite beneath the occipito-frontalis. They are often in connection with the periosteum, or embedded even in the bone itself. The skin moves freely over them, and sometimes they move over the bone; but they may so retard the ossification of the subjacent wall as to entail its perforation. They contain a cheesy, sebaceous matter, epidermal tissue, or thin serous fluid; fine hairs may grow in them. Dr. Ogle described a dermoid cyst which had gone astray to the inner surface of the dura mater at the torcular Herophili—actually pushing aside the venous sinus. Within the cyst a lock of hair had curled itself up in a bed of sebaceous matter and epithelial cells. I had a case in which

a small occipital dermoid extended into the cerebellum, where it spontaneously set up fatal suppuration. The cyst contained hair.



Fig. 21.—A Meningocele: distinguished from a dermoid cyst by the fact that some of its contents could be squeezed back into the skull.

Diagnosis.—When near the angle of the orbit, a dermoid must be distinguished from a meningocele. (Fig. 21.) A dermoid is smaller than a meningocele, and of more definite outline, and it may not have been noticed at birth, as a meningocele would be. None of its contents can be squeezed back into the cranial cavity; there is no increase in size on crying, and compression applied to it does not disturb

the brain. A small cyst which is partly embedded within the frontal or parietal bone, and immovably connected with it, may possibly be mistaken for an exostosis, so hard is it. A needle introduced establishes the diagnosis.

From a nævus it may be distinguished by its hard and regular outline, the absence of discoloration of skin and

its unvarying size, the tumour neither increasing when the child cries nor diminishing under pressure. If the tumour were a meningocele it would either grow larger or smaller. If smaller, no treatment would be necessary, for it would in time completely shrivel up; if larger, its nature would be obvious, and active treatment shown to be impracticable. The dermoid cyst would, in all probability, grow larger by slow degrees; it would remain firm and rounded; and, unless embedded in the bone, it would be more or less movable; then the sooner that it is dissected out the better. Still, it is sometimes extremely difficult to say for certain whether a tumour over a fontanelle is a meningocele or a dermoid, and in all these cases the surgeon must proceed with the utmost caution.

Mr. Sutton gives an excellent account of these cysts, and of their occurrence in the region of the anterior fontanelle, reminding us that early in embryonic life the dura mater and scalp are in contact, and that though the growth of the skull soon causes a separation of these layers, the scalp and fibrous covering of the brain remain in actual contact along the sinuses for a year or more after birth, and especially so at the anterior fontanelle and at the region of the torcular. "Should the skin be imperfectly separated, or, indeed, a portion remain persistently adherent to the dura, it would act precisely as a tumour-germ, and give rise to a dermoid cyst. Such a piece of skin may retain its old attachment to the dura, and its pedicle becoming surrounded by bone, the cyst resulting from it would lie outside the bone, but be lodged in a depression on its surface with an aperture transmitting its pedicle."

Operation for its removal is not always easy. The incision should pass right into the substance of the tumour, the cyst-wall being then dissected out. None of the cyst should be left behind, lest healing be delayed and the operation prove but partially successful. If the cyst be embedded in the bone, the neighbouring dura mater must not be injured during extraction. The edges of the wound should be drawn together with cross-strapping, rather than with sutures. If redness or inflammation follow, it may be treated by water-dressing under oil-silk. When a tumour has to be

taken away, it should be thoroughly done by scalpel and forceps; not a particle should be left behind. In these days of aseptic surgery it will not greatly matter if, in drawing out the deepest part of the tumour, an attachment with even the dura mater have to be severed. When about to attack a dermoid cyst in the median line of the head—where it is especially likely to be found—it must be remembered that the bones are thin and that the venous sinus is not far off.

Tissue hypertrophy.—Congenital tumours of this nature may be fibrous, cystic, or fatty, or any combination of these varieties; they may be pendulous or sessile. The most important of them are next described.

Cystic lymphangioma, hygroma, is composed of a series of cysts which are closely or irregularly spread through fibrous tissue. The cysts are dilated lymph spaces; they vary in size, and when distended they are spheroid. Some of them may be as large as an orange, or even larger, whilst others in the same growth may be the size of a marble or pea, or just visible to the naked eye. The cysts may be in communication with each other; they are sometimes surrounded with semi-fluid Whartonian jelly. The periphery of the growth fades away into normal connective tissue. In removal by dissection, the cysts collapse; and, when separated, the growth is something like a piece of torn sponge, but with vacuolations less definite. The larger and more solitary growths, when in the neck, may be described as "hydrocele." Some of them are of enormous size, and on their contents being drawn off, the cyst-wall and the integument shrivel up. When large and pendulous, the cysts may appear bluish through the thin and translucent integument. Occasionally they form diffuse tumours upon the trunk.

Cystic lymphangioma sometimes grows with alarming rapidity. In one child, a lymphangioma at the root of the neck pushed aside all the movable structures; deglutition and respiration were thus impeded, and so great was the compression upon the large veins that the eye-lids, hands, and arms, became œdematous. Death was caused by obstruction of the trachea. (See also page 179.) Lymphangioma of the neck may extend around the carotid sheath, and even reach into the mouth and implicate the tonsil. Though cystic lymphangiomata

are usually found in the neighbourhood of the face, neck, and arm-pit, they may also occur upon the trunk, or even upon the extremities. In 1882, I showed a child before a meeting of the Medical Society of London, with the remains of a hygroma upon the arm; the tumour had been for three years under observation. I had been content to watch it without offering to interfere, and the tumour dwindled into a diffuse mass, which resembled a lipoma, the fluid part having undergone spontaneous absorption. I have also seen these growths undergoing spontaneous cure upon the thigh, and upon the back. And I have recently seen a child with a hygroma of the size of the long half of a hen's egg upon the inner side of the the arm. The lump had attracted attention at birth, being then of the size of a large walnut.

In the case which is illustrated (Fig. 22) the lymphangioma which had been noticed at birth had begun to grow six months later. It extended across the front of the neck, reached upwards behind the pinna, and invaded the lobule. This last was a very important clinical feature; there is no other form of cervical growth which trespasses upon the pinna without causing a discoloration of the surface, as a *nævus* would do, or without producing local and general signs of malignancy, as would a sarcoma.

Hygroma is altogether different from another variety of "hydrocele of the neck," in which one of the branchial clefts fails to be obliterated in its deeper part, and, being closed in externally, gradually becomes distended with degenerate epithelium and with the secretion of the included epiblast. A dermoid-cyst-hydrocele resembles a hygroma in that it probably first shows itself in early childhood, that it bulges upon the surface, and extends deeply amongst the tissues of the neck, even to the pharynx or *œsophagus*, that it has a feel of fluctuation, and that it is painless. But it differs from a hygroma in that it has a definite and



Fig. 22.—Cystic Lymphangioma invading Pinna.

rounded contour, and that it consists of a solitary cyst which, being evacuated, leaves the neck of normal appearance. Such a hydrocele sends no offshoots towards tongue or axilla, and though it may recur after tapping, it will be cured by incision and drainage (page 126).

The adjoining wood-cut (Fig. 23) is taken from an infant with a rapidly-growing cystic lymphangioma of the right subclavian region, which seemed to be composed of six or eight large cysts. The tapping of one cyst did not empty the others; but, on the collapse of one, the others came into



Fig. 23.—Lymphangioma or Cystic Hygroma, forming one variety of Hydrocele of neck.

prominence and were emptied in turn. From each of the larger of the cysts about an ounce of pale serum was withdrawn. After puncture the tumours entirely disappeared, but as a rule many tapplings are needed before such a growth is permanently effaced.

In another case the mother had noticed a swelling under the right side of the tongue a few days after birth. On its being shown to the doctor, it was called a "ranula." It grew across the floor of the mouth, and amongst the muscles, until a tumour appeared beneath the jaw. The child was losing appetite and becoming thin. Had anyone examined her then, for the first time, he might have deemed the growth malignant. Later, the tumour became welded into a solid mass, as if a large abscess were about to declare itself. The inflammation was associated with pain and constitutional disturbance, but on its subsidence, and without the occurrence of suppuration, the growth steadily diminished, and at last was represented by a trifling fulness. A hygroma appeared upon the other side of the neck; it grew rapidly, but, like the other (with which it had no apparent connection), it underwent spontaneous inflammation and obliteration. The low vitality of these growths renders them specially liable to inflammation. (The diagnosis from ranula is completed on puncture; for further remarks *see* page 187.)

The growth for which cystic lymphangioma is most likely to be mistaken is lipoma:—Both are apt to possess an

indefinite border and an obscure sense of fluctuation; they are painless, and are covered by apparently healthy skin, which shows a characteristic dimpling or puckering on being gently pinched up between the finger and thumb. But in the case of a fatty tumour the dimpling skin can always be raised in places and isolated from the surface of the subjacent mass, whereas with a cystic lymphangioma it cannot be so raised, for the simple reason that the dilated lymph spaces of the tumour spread into and blend with dilatations in the skin itself. Moreover, the surgeon can, unless the cysts are very tense, feel subjacent structures—such as the ribs—through a lymphangioma; he could not do this in the case of a lipoma.

The diagnosis from *nævi* is sometimes difficult. In each case the tumour consists of dilated vascular spaces filled with fluid, and when deeply placed the exact nature can be revealed only by puncture or incision. But I have met with cases in which dilated lymph spaces were mingled with cavernous blood-vessels, and others in which the contents of lymphatic cysts were stained by leakage from the neighbouring blood-vessels. The *nævoid* mass may generally be made smaller by steady pressure, and the integument over it usually shows some dilated blood-vessels. (Fig. 24.)

Treatment.—Like a *nævus*, a cystic lymphangioma may cease to get larger, or it may even quietly disappear without apparent cause. Cysts may be tapped one after another at intervals; in the meanwhile, the skin shrinks over the diminished mass, and the other cysts can be reached with exactitude. This simple and harmless method of treatment should be patiently and systematically carried out in practically every case; it greatly helps towards permanent effacement of the mass. I see no reason for limiting either the number of times that puncture should be performed or the period of months or years through which it may be employed.



Fig. 24.—Lymphangioma associated with *Nævoid* Discoloration of the Surface.

The natural desire of parents that some more prompt and radical treatment should be adopted ought not to induce the surgeon to desert multiple punctures for some speculative measure which he may be quite unable to complete. For puncture, an anæsthetic is scarcely wanted.

The surgeon must be prepared for a cystic lymphangioma becoming suddenly and spontaneously increased in size, hot, and tender, and he welcomes the attack of inflammation, provided that it is not extreme, for he expects that, on its subsidence, the tumour will, in due course, become effaced. But it is not essential that obliteration be preceded by inflammation, for the serum may undergo a quiet absorption, just as fluid in the tunica vaginalis in little children may do.

It is a suggestive fact, and a strong argument against rash interference with these diffuse lymphangiomata, that, common as they are in children, one never meets with them in adults, though occasionally a grown person may present an ill-defined fulness which marks the site of a congenital hygroma. But my experience of them is that they gradually become effaced, especially under the puncture treatment. Of electrolytic treatment, I cannot speak very favourably. For large cysts the injection of Morton's fluid may be tried, and, if this fail, incision and drainage may be resorted to.

On all sides the growth is continuous with connective tissue; it possesses no capsule, and the skin may be incorporated with it; outgrowths may also extend between muscles, nerves, and blood-vessels, and may actually traverse muscles and fasciæ. If the growth be apparently limited—if the fingers can be got all around it, and it can be more or less lifted from the deeper structures in the neck—it may be attacked by dissection. D'Arcy Power has shown some good results of this treatment. And if the tumour be fairly defined upon the trunk or upon a limb it may be dissected off; but the large diffuse swelling which one so often sees in the neck had far better be left untouched by the scalpel. For though the surgeon may be able to free it from the skin and from the carotid sheath, he cannot dissect it out also from beneath the trapezius and the clavicle, for instance. After so prolonged and tedious a dissection the child would

be likely to suffer from profound collapse, and probably the operation would have to be given up long before removal was completed.

Fatty tumours. — A soft, lobulated, movable tumour in the neighbourhood of the thigh, buttock, or shoulder, is probably a lipoma. The differential diagnosis is chiefly from chronic abscess, nævus, and malignant disease. Any doubt as to the nature of the growth could be cleared up at the time of the ablation, and it is sometimes expedient to withhold till then a positive opinion as to the nature of the tumour. A lobulated swelling in the middle line of the back must be regarded with suspicion. (Spina bifida, page 241.)

Fibromata may occur in the skin, or in the connective tissue of any region. They are of a benign nature. Strange *fibrous nodules* from the size of a shot-corn to a bean, and even larger, are sometimes found just beneath the skin in children with acute rheumatism. They often lie over the bony prominences of the knee, elbow, shoulder, occiput, and ankle. They can be slipped about beneath the skin without causing discomfort, and in due course they may quietly disappear.

Chondromata occur upon the metacarpal bones, the phalanges, and at the joint-ends of the longer bones, especially the femur, tibia, and humerus. In these situations chondroma is an innocent growth. It probably springs from an unconverted island of cartilage in the midst of bone-tissue, or from an epiphyseal cartilage. Treatment need not be precipitate, as the tumour may undergo calcification and cease to grow. If in the way, it may be scraped out, or a phalanx removed. Amputation should not be resorted

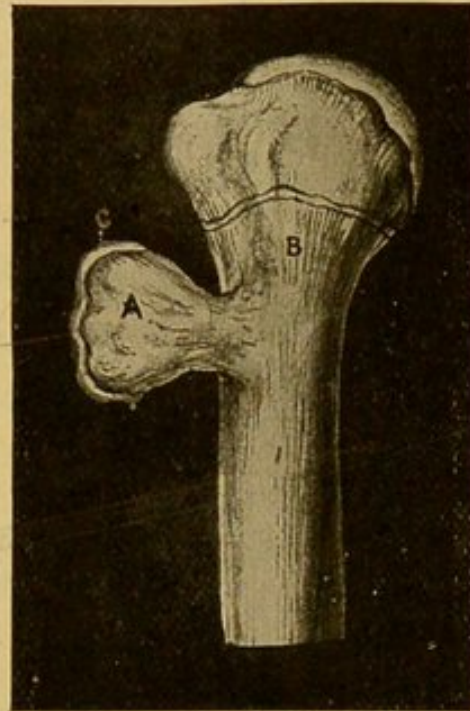


Fig. 25.—A, Exostosis of Humerus being carried away from End of Diaphysis by B, Additions of New Bone. C, Incrustation of Temporary Cartilage. (See p. 136.)

to, even in the case of there being many chondromata, until scraping has been found ineffectual.

Exostoses are of common occurrence in children. They are of cancellated tissue, and are due to the erratic development of cartilage cells at the end of the diaphysis. They



Fig. 26.—Multiple exostoses of Tibia and Fibula. (*Museum of St. Mary's Hospital.*)

are specially apt to occur in rickety children, growing from islets of temporary cartilage which have been belated and shut off on account of the irregularity of the ossification. As the nodule grows, the base is converted into bone whilst its incrustation of temporary cartilage continues to advance. At last, when the epiphysis is ossified on to the shaft, and the length of the bone is completed, the incrustation also ossifies and the growth of the exostosis is ended. Such being their history, exostoses might be looked for at those diaphyseal ends where developmental activity is greatest. Thus, they are most often found at the knee-ends of the femur, tibia, and fibula (Fig. 26), and at the upper end of the humerus. As the diaphysis increases in length by deposits of bone at its epiphyseal end, the growing exostosis is gradually carried farther and farther away from the joint. Often the exostoses are pedunculated, and a very large number may be found in the same child. There is frequently a strong history of heredity with them. In some

cases the growth of the exostosis seems to check the normal growth of the diaphysis. (*See Fig. 25.*)

Treatment.—Anxious parents may be assured that the growths are quite innocent, and that their period of increase is strictly limited. If, however, they are “in the way,” or interfere with joint, muscle, or nerve, a clean incision should be made down upon them and their bases cut smoothly off with a chisel or sharp pliers.

Sub-ungual exostoses are found upon the great toe, causing the nail to grow irregularly, and keeping up constant annoyance. I have known the condition mistaken for ingrowing toe-nail. This spongy growth of bone may easily be removed by sharp pliers or gouge.

CHAPTER IX.

NÆVI, WARTS, BOILS, KELOID, ETC.

NÆVUS is a dilatation of blood-vessels, capillary or venous; it is not necessarily noticed directly after birth. (Arterial nævi have been described, but I, personally, have never met with one in a child.) A nævus may be situated in or beneath the skin, mucous membrane, or muco-cutaneous tissue, and a great number of nævi may exist in different parts of the child. Superficial nævi may be merely flat patches, as in "port-wine mark," without any thickening. They may be associated with much pigmentary staining, or with abnormal growth of hair—*nævi pilosi*. When but thinly covered, they are apt to cause troublesome or even serious hæmorrhage.

The arteries supplying a venous nævus are generally small, though sometimes pulsation can be made out in them near the base of the tumour. The veins are dilated, and form blood sinuses such as those found in ordinary erectile tissue. This expansion of the veins produces absorption of the fibrous tissue of the framework of the nævus, so that the tumour may often be squeezed flat and empty. This fact helps in diagnosing them from dermoid and other cysts.

When beneath skin or mucous membrane, and not implicating the surface, the diagnosis may be uncertain; but sooner or later the superjacent vessels are implicated, and the nature of the growth is revealed. If increase in size be rapid, the resemblance to malignant disease may become very close. A subcutaneous nævus is likely to feel knotted or spongy, the skin over it showing a bluish tint, from the presence of dilated vessels beneath; but when deeply beneath the skin a nævus may grow to a considerable size before it shows any superficial staining. A nævus may remain quiescent for a long while after birth, and then assume active growth. When upon the face or head, it is apt to become turgid when the child cries; its ceasing to do so is suggestive of consolidation,

and of approaching subsidence. (For the diagnosis from meningocele see page 128.)

Capillary nævi may be flat or raised, or heaped up into a bright mass like a currant or strawberry. Sometimes the mother sees in them a close resemblance to a mouse or a lobster, and straightway endeavours to harmonise their causation with some fright or longing which impressed her during pregnancy. An inoffensive nævus which is out of sight may be left without treatment; if it do not fade away, at any rate it will probably cease to grow. I have seen a large, diffuse capillary nævus which was conspicuous upon the forehead of an infant grow fainter and smaller week by week, till ultimately it passed completely away. Superficial nævi not infrequently subside after spontaneous and quiet ulceration. Being composed of unstable elements, they are very apt to undergo degeneration, and especially atrophy or ulceration. Spontaneous sloughing rarely occurs. Though we should not make a needless fuss about a nævus, we should regard it with suspicion, and deal with it promptly and effectually. It is too much the custom to allow a nævus to guide the surgeon. Far better would it be, in the general run of cases, if the surgeon governed the nævus. Sometimes a nævus which has been inconspicuous in early childhood suddenly and rapidly takes on growth.

Treatment.—An unsightly nævus, or one which has begun to grow rapidly, evidently demands treatment. Dr. Laurent, of Brussels, urges that a nævus should be attacked as soon as it is recognised, irrespective of the age of the child. Though there are exceptions to this rule, it would be for the good of patients, parents, and practitioners if the soundness of the principle were generally admitted.

Pressure is a method of treatment occasionally employed with success, especially when the growth is situated over a surface against which compression may be kept up, as over a cranial bone. It may be exerted by means of a coin wrapped in a fold of lint, and secured by strapping, or by an elastic band which encircles the head, or takes its bearings from a closely fitting skull-cap. If the nævus be large, or if pulsating vessels be entering it, the treatment by pressure is almost certain to disappoint.

Stellate and small nævi may shrivel up by the single

application of *collodion*; or by two or three applications at intervals of a few days. The contraction of the collodion squeezes out the blood and prevents its subsequent return. If 30 per cent. of corrosive sublimate be added to the collodion, the application proves more vigorous; it is not suited, however, for painting over a mucous surface.

If collodion fail, *ethylate of sodium* may be tried. This sodium-alcohol robs the skin of the elements of water, and the caustic soda which is then left against the tissue quietly destroys it; however, it is of no great value in the surgery of nævi. If *nitric acid* be used, it can be conveniently applied on the end of a lucifer match or by a fine glass brush, the healthy skin surrounding the nævus being smeared with vaseline as a protection against the spreading of the acid. Occasionally hideous scars are seen which have been caused by the careless application of the acid. In one case I saw a cicatricial furrow extending down the cheek from the scar of a nævus near the malar bone, the nitric acid having trickled over healthy skin! The bottle containing the acid should be kept well out of the reach of the child's arms and legs.

A nævus over the anterior fontanelle (a favourite seat), on the eyelid, or in the tongue, mouth, or rectum, cannot be treated in any of the ways just mentioned.

Electrolysis.—The decomposition of the nævoid tissue by the continuous current is a satisfactory method of treatment, but if the mass be large and deeply seated, electrolysis is unsatisfactory. A convenient battery is one of zinc and platinum. The positive pole is connected with a wet sponge, placed upon the skin, while the needle, or needles, in connection with the negative pole, are introduced into the midst, and into the periphery, of the nævoid tissue. A slight blackening or scorching of skin in contact with the needles, and a crackling of the hydrogen disengaged within, are signs that all is going well.

The battery and needles should be previously tested in a little water, to see that the combination of elements is in working order; decomposition of the water demonstrates efficiency. The needles should be made to penetrate every part of the tissue, which quickly becomes hardened from the coagulation; they should be gradually and slowly withdrawn,

so that not a drop of blood is spilled. Thus the resulting scar is as small as it can be. The operation is prolonged and painful, and demands the administration of an anæsthetic.

Electrolysis causes a very limited destruction, the sloughs are gradually absorbed, and with slight risk either of ulceration of the skin or of sepsis. If, in his anxiety to hurry on the cure, the surgeon is too vigorous with his treatment, sloughing may ensue.

For *igni-puncture*, the large blade of the thermo-cautery is made to penetrate the mass in every direction, one skin-wound often sufficing for the purpose. At once it becomes hard and it soon begins to shrivel; the eschars are detached in due course, and a healthy, granulating surface remains. For small nævi the needle-blade of a thermo-cautery answers extremely well, each vessel seen entering at the periphery being obliterated by the red-hot point. For a large nævus, electrolysis lacks the vigour and certainty possessed by the cautery, and several sittings, at intervals of a week or more, might be needed ere the growth is destroyed.

Excision.—Subcutaneous nævi are usually encapsuled, and may be excised by the scalpel without much bleeding. As the mass is being turned out, the bleeding vessels must be caught by the self-holding forceps. *The incisions should be made through unaffected skin*; and the vascular tumour having been torn out, and the bleeding points secured, the wound may be closed by sutures. In this way I have dealt with enormous nævi which involved the entire thickness of the lips or cheek.

Until the surgeon has himself excised a large nævus he can scarcely understand how safe and satisfactory the operation is (Fig. 27). The great point is to keep the scalpel well beyond the dilated vessels, and, attending to this, he can often enucleate the encapsuled, spongy mass with but a trivial loss of blood, though the bleeding would have been furious should the blade traverse the vessels of the cavernous tissue.

Unfortunately, nævi have not always a capsule, but even when they are comparatively diffuse, excision proves an excellent method of treatment. The bleeding is not nearly so troublesome as might have been expected, and with plenty of catch-forceps at hand, the different vessels are readily secured.

Healing is usually prompt, and the scar is comparatively

inconspicuous. Sometimes when the mass is being dissected out, it is seen to be incorporated with a large amount of pinkish, nodular fat. This tumour—for which nothing short of excision would serve—constitutes a *naevo-lipoma*. It often grows very rapidly.

Excision is specially suited for the deep nævus in which the skin is but slightly affected. All skin, however, which is



Fig. 27.—Extensive and Rapidly-growing Nævus which was Removed by Dissection.

affected must be removed. There is, as a rule, no sloughing or suppuration (such as must occur with the thermo-cautery), and the obliteration is thoroughly effected at the one operation — which could not be done by electrolysis.

The *subcutaneous ligature* I have long abandoned; it is a painful procedure. The effect is produced with sloughing and suppuration. Parts of

the strangled mass escape obliteration and have to be attacked afresh, and much constitutional depression attends the discharge. Strangling by ligatures around hare-lip pins is also to be condemned. Excision is far better.

Injection of perchloride of iron or other irritant is dangerous. I have seen a case in which the ala of the nose sloughed after a subcutaneous injection of tannin, and a fatal result has followed the entrance of injected fluid, or of a loose coagulum, into the general circulation. *Vaccination* as a means of removing nævi is more speculative than practical. Hideous scars may be caused by it, and yet the nævus may have escaped obliteration.

I have met with two instances in which a large cavernous nævus involved the mamma. In both cases there was no alternative but to remove the mamma.

Appreciation of the various methods.—When a large nævus is brought for treatment, no thought should be given to sodic ethylate, vaccination, or ligature, reliance being placed

on the knife, cautery, or electrolysis. And if it be on the face or eyelid—in which case it is more important to leave the smallest amount of scar, rather than to adopt the most prompt method of obliteration—electrolysis may be tried. But if it be upon the trunk, or upon a limb, it may be thoroughly obliterated by the thermo-cautery, or enucleated by the aid of scalpel and forceps, and of these methods, after considerable experience, I strongly recommend the latter. Small *nævi* may be dissected from the face so as to leave but an insignificant scar.

Concerning the line of procedure for small *nævi*, anxious parents may be advised as follows: Except so far as a small *nævus* causes disfigurement, it is generally harmless, and interference may be indefinitely delayed, perhaps never required; it may fade away; and not a few *nævi*, by the pressure or chafing of the clothes, or without external irritation, undergo an attack of inflammation which cures them.

But seeing how quickly speck-like *nævi* may grow into large and unsightly patches, it is advisable to treat every suspicious or threatening spot upon the face or neck before much increase is possible. For this purpose there is nothing better than the fine point of the thermo-cautery at a bright-red heat. The pain is momentary, the destruction of the growth certain, and the ultimate disfigurement slight.

A *nævus* must be watched, and its size compared from time to time with an outline drawing previously made; if it be spreading, it must be attacked. If a *nævus* be pedunculated, it may be ligated by a strong waxed thread. If it involve the whole thickness of the lip, it should be attacked from the dental aspect. *Nævi* of the tongue, of the inside of the cheek, or the rectum are best treated by the thermo-cautery.

Hairy mole.—A child has recently been under treatment whose left malar and frontal region were deeply pigmented, and thickly covered with black hair. The appearance was as of a mole's skin, except that the hairs were long and black. There was also a thick growth of hair on that side of the head. With the hairy scalp itself no interference was undertaken, but the disfigurement of cheek and forehead was treated by repeated operations at considerable intervals with the thermo-cautery. With the red-hot blade, fine parallel

lines were scored through the layers of the epidermis, and just into the true skin. The cauterisation was still further increased by cross lines where the pigmentation and hair were blackest. The crops of hair which grew after operation became lighter and lighter, and the disfigurement faded in the most marked degree. No puckering of the skin, or retraction of the eyelid ensued. There is no reason why a small hairy mole should not be removed by the scalpel, if its presence cause disfigurement; but probably the better line of treatment is with the thermo-cautery. The treatment must, in any case, be effectual, and should never degenerate into mere irritation or excoriation. Moles may, later in life, become the starting point of epithelioma or of melanotic sarcoma. Of this I have met with characteristic examples. Growing moles should be promptly excised.

Port-wine stains of the skin may be dealt with in a manner similar to that detailed above, or patiently treated by electrolysis. Oft-repeated puncture with the needles of the negative pole (page 140) could hardly fail to render the discoloration paler, even if it did not entirely efface it; but for rapidity and thoroughness of treatment, the benzoline cautery is to be preferred. The finest point, raised to a white heat, is to be lightly stabbed just into the true skin in a deliberate and regular manner. No bleeding occurs.

Lymphatic nævus is similar in its nature to the various blood vascular tumours just considered. It may be observed at birth, or may take on growth subsequently. It is apt to occur upon the tongue in the form of a small, pale nodule, or as nodules, which may be snipped off with scissors.

Should the dilated lymphatics infiltrate the skin of a limb, great hypertrophy may result. As extensively affecting the tongue (macroglossia) and lip (macrocheilia) the disease is considered on pages 197 and 198.

When a **limb** is **hypertrophied** by general lymphatic dilatation, carefully regulated compression by Esmarch's band may effect a cure.

Aneurysms are of very rare occurrence in children. Their presence would most likely be due to the arterial wall having been softened and stretched owing to inflammation set up by

direct injury or by the lodgment of a septic embolus. As this book is going through the press, I am seeing with Dr. Lees an infant with what we take to be a fusiform aneurysm of the common femoral artery; there is, however, no history of the infant having been hurt, nor is there any suspicion of his having been the subject of septic endocarditis. (See article by R. W. Parker, "Med.-Chir. Trans.," vol. lxvii.)

Warts (verrucae) may be solitary or in clusters. Though often due to local irritation, sometimes there is no apparent cause for them. They consist of enlarged, branched papillae, on which epidermal scales are closely packed. They should be thickly and continuously covered with diluted red mercurial ointment, or by glycerine saturated with salicylic acid. Sulphate of magnesia should be given so as to keep up a gentle purgation.

A pedunculated wart may be made to slough by strangling its base with a waxed thread. Warts upon the fingers, due to the irritation caused by the frequent contact with sub-preputial discharge, disappear after circumcision has been performed. Onanism is said to be occasionally the cause of warts on girls' fingers. In any case, warts usually disappear at, or soon after, puberty.

Molluscum contagiosum.—The tumours vary in size from a minute speck to a pea; they may be still larger; often they are clustered. They are most frequently met with on the infant's face; and as tumours of an exactly similar nature may be found, at the same time, upon the breast or face of the mother, or on the face of some other member of the household, the disease is apparently contagious. In the centre of the growth a dark spot is visible (Plate IV. Fig. 2).

The treatment consists in squeezing the little tumours between the thumb-nails; or they may be snipped off by a pair of fine scissors. It is unnecessary to touch with caustic the small wounds thus made.

Boils (furunculi) are caused by acute inflammation about a sebaceous gland or a hair follicle, the result of inoculation of septic micrococci; death quickly follows in the minute piece of tissue thus implicated, and eventually the small gangrenous shred, "the core," is cast off. Until the boil breaks, or the

inflammatory tension is relieved by puncture, the child may suffer much. The usual seats for boils are the back of the neck, the knee, buttock, and arm-pit; in fact, wherever by friction the micrococci are likely to be worked into the skin. In the eyelid the inflammation begins in connection with a ciliary follicle, the disease being then called a **stye**. Boils may generally be taken as evidence of the child being out of health. The boy who is home from school, and eats, drinks, and sleeps more than he has been accustomed to do is apt to break out in boils; so also is he whose diet is insufficient, and whose general tone is depressed. The explanation is that if his tissues were perfectly healthy the micrococci would not have been able to obtain a foothold in them. Weakness predisposes to boils.

Treatment.—An overfed subject should be supplied with less food, and the poor-looking and underfed one put on a liberal diet of meat and fresh vegetables. Iron and quinine tonics, or the laxative iron tonic, may be prescribed, but no internal remedy is of special value, the disease being a localised septic disease. Change of air may be of great efficacy. The condition of the urine should be inquired into, and the bowels kept well open.

The acutely inflamed and tense tissues may be relieved by puncture with a lancet, the wound being then dressed with a scrap of lint dipped in a solution of carbolic acid or corrosive sublimate, and covered with a piece of oil-silk. Poulticing is apt to set up irritation, and by helping inoculation to determine the outbreak of smaller boils. The adjoining tissue should be thoroughly washed with mercuric lotion, and then smeared with vaseline, to prevent inoculation of the adjacent hair-follicles by the micro-organisms. It is well to touch each inflamed spot with a strong solution of carbolic acid (1 in 4) on a pointed match.

Keloid is a pinkish outgrowth of fibrous tissue, starting from a recent cicatrix; but as its blood-vessels are gradually obliterated by the inevitable contraction of the scar tissue of which it is composed, it becomes white. It frequently follows scalds, burns, scraping operations for lupus, vaccinia, and varicella, and I have known it started by the application of a poultice to the chest of a weak child; though it may be

unsightly, it is innocent and harmless. If dissected out, it will probably be replaced by a similar growth ; if left uninterfered with, its tissue is almost sure to undergo contraction in due course. I have never known anything but disappointment follow operative treatment.

Sometimes keloid growths apparently occur independently of previous injury, but the probability is that even so they started from a scar of a trivial or of an unnoticed lesion. In any case, the presence of keloid is strongly suggestive of tuberculosis.

CHAPTER X.

HYDRO-THORAX AND EMPYEMA.

Hydro-thorax.—As a result of inflammation, serous effusion may take place into the cavity of the pleura. It is only when the amount of effusion is excessive that surgical interference is called for. Then, the earlier the fluid is drawn off, the greater the chance of the lung tissue recovering its function.

When the pleura is full of fluid, the lung, emptied of air, is compressed against the vertebral column. There is, therefore, a complete absence of breath sounds over the basal, anterior, and lateral regions of that side of the chest. The percussion note is absolutely dull; and when the hand is laid flat upon the ribs, and the child coughs, cries, or speaks, no vocal vibration can be detected, the sound-waves being cut off by the intervening fluid. On listening between the scapulæ, air may be heard entering the bronchial tubes. The heart may be considerably displaced, especially if the collection be upon the left side, the apex beating far from its normal situation—which is just below and to the inner side of the nipple. The side of the chest appears abnormally full, and the lower intercostal furrows may possibly—but not probably—be effaced. That side of the chest does not move with the other, and as the one lung has to do the work of two, the respiration is hurried, especially as the child changes his position in bed. He naturally lies upon the water-logged side.

Differential diagnosis.—The signs are not always as clearly marked as above recorded. From consolidation of the lung, the diagnosis will be made by the history of the case; by there being in the case of consolidation some increased vocal fremitus and tubular breathing; by the absence of fulness of that side of the chest, and by persistence of the intercostal furrows. Notice also should be taken of the character of the sputum. From malignant disease the

diagnosis is not always easy. In some cases it can be effected only by an exploratory puncture with a trustworthy hypodermic syringe, or a special exploring syringe.

Paracentesis thoracis.—The apparatus used will be a fine, sterilised cannula and trochar, or an aspirator; the point of the instrument must be sharp, so that it is certain to pass through the thickened and tough parietal pleura. The side of the chest and the instrument must be perfectly clean; and if the aspirator be employed, the operation had better be previously rehearsed with hot water, for the piston may be too tight, or require more "packing"; taps may be stiff, or their working not perfectly understood, the needle may be stuck in the cannula, the indiarubber tube may be leaking, or some joint may not be air-tight. The complete aspirator of Dieulafoy may be used; but the simpler one, which is extemporised out of an ordinary wine-bottle, is quite as serviceable, and it is less likely to get out of order. Porritt recommends a piece of indiarubber tubing, of $\frac{3}{16}$ in. bore, and long enough to reach from the patient's chest to the floor. The lower end is weighted with a piece of lead, so that it may remain beneath some carbolic solution in the vessel in which the fluid is to be received. The other end is secured to one of Dieulafoy's open cannulas, not less than three inches long. The trochar is made to enter the cannula by being thrust into the tubing close to the cannula. As soon as the trochar is withdrawn, the puncture in the wall of the tubing is obliterated, no air is admitted, and the paracentesis is conducted with perfect asepticity. Unless the child be very apprehensive, chloroform need not be administered. If given, it should be with great care and watchfulness, the child being laid on the water-logged side of the chest.

The **site of puncture** should be just in front of the inferior angle of the scapula, so that the diaphragm may be out of reach of the end of the needle. The pleural cavity will not be completely emptied by the one aspiration or puncture, but very likely after the chief part of the fluid has thus been withdrawn the rest will be quickly absorbed. Brandy or ether should be at hand, for subcutaneous injection, in case of faintness supervening. The skin having been blanched by ice and salt, the sharp

instrument is to be thrust into the chest close over the upper border of the lower rib. It must be sent in with a short, sharp plunge. If the end of the index finger be fixed on the instrument at about an inch and a half from the point, it is unlikely that the lung will be wounded. If the flow *suddenly* stops, in all probability there is something blocking the end of the tube, and a little judicious movement may re-start the full stream. As the serum gradually ceases to flow, the tube is withdrawn; if a simple cannula be used, the end should first be blocked with the finger, so as to keep air out of the cavity. If the aspirator be used, the vacuum must not be very thorough, lest the expanding lung be sucked over the tube and its surface capillaries ruptured. The cannula must be withdrawn when the flow begins to get irregular. A cough which is apt to occur as the fluid escapes shows that the lung has not lost its power of re-expansion. The cough tears through adhesions, and is, therefore, beneficial "within reasonable limits," but if the child continue to cough, or if blood appear in the fluid, the cannula should be withdrawn. In rare instances air leaks into the wound, and, being pumped onwards by the respiratory movements, emphysema is a temporary result.

Even if no air have entered the cavity, suppuration may follow the operation; rarely in childhood does the fluid remain clear and limpid. Occasionally, after the tapping, the lung expands forthwith, and the thoracic troubles entirely disappear. In other cases the favourable result follows after repeated punctures.

If it be uncertain whether there be fluid in the pleural cavity, or whether the fluid be serous or purulent, an exploratory puncture should be resorted to without hesitation, but care must be taken lest a sudden movement of the child cause the needle to break off short. It is far safer to use a special exploring syringe than a hypodermic needle.

Fallacies.—Although the chest may contain much fluid, the aspirator is occasionally unable, even in childhood, to effect its withdrawal. This may be due to the fact that the lung is solidly compressed against the spinal column, and unable to expand; that the diaphragm fails to rise,

or the chest wall to fall in; and in varying proportions all these conditions may obtain at the same time. The end of the needle may be manifestly free in a large collection of fluid, and the aspirator may be in perfect working order, yet no fluid escape on setting the apparatus in train. In the case of consolidation or tumour of the lung there may be a little serum in the pleura, as the hypodermic syringe may evince, but not enough to serve the large aspirator. Care must be taken that every joint of the instrument is air-tight. Sometimes, as is demonstrated by the subsequent introduction of the finger, the cause of the dry tapping is a tough veil of organised lymph, hung as a lining to the pleura, which the trochar, failing to traverse, pushes before it into the fluid. Therefore the instrument should be sharp, and it should always be sent in with a short, sharp thrust.

Empyema.—A simple hydro-thorax is likely to become purulent; the first and second aspirations may give clear serum, but after this the fluid is apt to be sero-purulent. Suppuration is probably determined by the inoculation of pneumococci or staphylococci, with the bacteria of tuberculosis on the pleural surface. These germs may have found their way thither from a tonsillitis or other septic focus. Symptoms may have already made the medical attendant suspicious of the nature of the fluid—such, for instance, as shiverings, or even convulsions, with elevation of temperature, vomiting, sweats, and increasing distress. As a tentative measure, aspiration may be tried, for the removal of a certain amount of pus is in rare instances followed by absorption of the rest. Even in the case of a large pleural abscess a single tapping occasionally suffices to establish convalescence. But if the child show little or no real improvement after the tapping, the pleural abscess must be treated on the principles which guide us in dealing with a collection of pus in any other cavity. The longer the delay in evacuating it, the greater the risk of the lung being rendered permanently useless, and of purulent extravasations, of pyæmia, of hectic, and of albuminoid disease. If the collection of pus remain uninterfered with, it may discharge itself spontaneously through an intercostal space or a bronchial tube; or it may burst through the diaphragm and give rise

to fatal peritonitis. A spontaneous external opening is usually in the fourth or fifth space, outside the anterior middle line.

Caution.—When the pus has been collecting under great tension, as is shown by the critical appearance of the child, the water-logged condition of the chest or the extreme displacement of the apex-beat, it is inadvisable to evacuate the abscess all at once, lest the sudden alteration of the position of the heart cause fatal syncope. In such cases it is far better to withdraw by aspiration a considerable amount of the pus some hours before cutting into the abscess. I know of an instance in which neglect of this precaution entailed death of a child under operation. Suddenly to open the pleural abscess of a child who is very ill is almost to invite serious collapse. In an extreme case the surgeon must content himself with preliminary aspiration. Similarly, if empyema exists on both sides, one only should be dealt with at a time, as further explained below.

The **site for the operation** varies in the case of an encysted empyema with the situation of the abscess, the primary exploration being made, of course, in the area of greatest dulness. But in the case of a general pleural abscess, the seat of election is just in front of the angle of the scapula, the arm being by the side. It is unnecessary to count the ribs to find out which intercostal space is about to be traversed; it will most likely be the sixth. It is not advisable to make the opening lower than this, for, as the abscess-cavity contracts upwards rather than downwards, there would be a risk of the ascending diaphragm obstructing the end of the tube. The evacuation of the cavity is not accomplished merely under the influence of gravitation; were it so, the tube should, of course, be introduced at the very lowest part; the pus is got rid of by the expansion of the lung and the ascent of the diaphragm, and partly by absorption.

Before operating, the skin should be thoroughly cleansed. Chloroform should be very cautiously administered, the breathing being carefully watched, for respiration is carried on entirely by one lung. The child must not be turned upon the sound side, but may lie upon his back if he seems to

prefer that position, or he may be laid upon the affected side and brought well over the edge of the bed, so that the abscess may be opened without further change of his position.

It is advisable to resect about an inch of one of the ribs at that situation. This is best done by making a two-inch incision along the middle line of a rib and detaching the periosteum by an elevator, at the same time isolating the rib from the intercostal vessels. The bone is then cut through in two places with a pair of strong scissors or pliers, and the resected fragment is picked out. If the bone have first been isolated, as above described, there is practically no risk of bleeding. A blunt director is then thrust into the abscess, and when pus appears along the groove the opening is enlarged with dressing-forceps.

I make it a practice in every operation for empyema to resect a piece of rib. It does not increase the risk of the operation, and it ensures free and effectual drainage. In the majority of cases incision and drainage might be sufficient. But there is a small proportion of cases in which resection is absolutely needed; and because one cannot tell at the time of operating which cases are likely to require it, I would urge that each case have the benefit of the resection. Everyone who has had much to do with empyema in children has met with those unhappy cases which have "hung fire" because drainage could not be effectually secured through the simple incision. And he has probably seen the case quickly clearing up after a second operation with resection. Why submit a child with empyema to the risk of long-continued discharge and of having a second operation performed upon it? Resection is a simple matter; let it be resorted to in every case. When the empyema is cured, the rib is quickly restored by the formation of new bone from the periosteum. It must be clearly understood that the piece of rib is removed merely in order that drainage may be perfectly free. The resection has nothing whatever to do with Estlander's operation, which is described a little further on.

The first indication is to have an opening through which even large flakes of lymph can escape, and one

which admits of the subsequent removal and re-introduction of the tube without alarming or hurting the child. The thorough drainage prevents retention and decomposition, and the free entrance of air into the pleural cavity is advantageous, in that it affords support to the lung tissue, and shields it from consecutive engorgement.

Having made the opening, the surgeon introduces his finger, exploring as far as he can reach, breaking down adhesions, and perhaps scraping away masses or shreds of coagulated lymph.

If an ordinary rubber drainage-tube is used, it should invariably be fixed to a piece of string tied round the chest. Nothing is easier than for an untethered tube to slip into the chest, and nothing is more difficult than in certain cases to extract it. The surgeon is not always informed of the slipping in of the tube, however, and it may be left for a "pathologist" to make the tardy discovery. A useful "anchor-drain" may be made by taking a couple of inches of a stiff indiarubber tube, of about the circumference of a cedar pencil, splitting the last quarter of an inch into four equal segments, and passing the split end through a hole in a piece of mackintosh sheeting about an inch and a half square; the four segments are then stitched flat upon the mackintosh. The tube thus arranged cannot drop into the pleura, its outer end remains wide open, and the absorbent pad placed over it keeps it from slipping out.

As the discharge diminishes, the tube is made more slender and shorter, and even before the discharge has absolutely ceased it may be left off. If, after the surgeon has finally removed the tube, the temperature ascend, and there should be other evidence that pus is locked up, he must break through the track and re-introduce the tube. Harm is just as likely to arise from a tube being left in too long as from its being taken out too soon: the latter fault is easily corrected. Indeed, it is not unlikely that as the surgeon learns to distinguish the various forms of empyema by immediate microscopic examination of the pus, or by other bacteriological methods, he will find a class of cases which may advantageously be dealt with by immediate closure of the wound. But in the present state of our knowledge

it is safer to advise the use of the drainage-tube in all cases, but for the shortest possible time. The sooner that the tube is out the better.

The layers of the pleura, bathed with pus, behave like the surface of an ordinary ulcer, covering themselves with granulation tissue which may eventually be converted into fibrous tissue. Coming into mutual contact, the two layers may adhere. A thickened and rigid pleura helps to prevent expansion of the lung in those cases in which the opening of the abscess has been delayed.

The dressings should consist of bulky pads of sublimate wood-wool in gauze bags, kept in position by a binder.

When a case is "hanging fire" or draining badly, or septic intoxication threatens, it may be advisable to enlarge the opening, excising a second piece of rib, and introducing the finger with a view of breaking down adhesions and searching for localised abscesses, and of clearing out masses of ill-organised lymph. After this, flushings with hot sanitas water may effect a clearance of the cavity.

Irrigation of the cavity should not be resorted to as a routine practice, but may be advantageously adopted when the discharge, though sweet, is extremely profuse, or when, though, perhaps, moderate in quantity, it has become putrid. For this purpose, neither corrosive sublimate nor carbolic acid in solution is safe, on account of its toxic effects when absorbed. Warm iodine-water decolourised by a little carbolic acid lotion, or sanitas solution answers well. The fluid may be injected by a soft catheter fixed to the india-rubber tube of an irrigator.

Having determined the presence of pus in the thorax, the surgeon must make it his business thoroughly to evacuate the abscess. In the case of a child of about three years on whom I was operating for a supposed empyema (pus having been found by the exploring syringe), we discovered no fluid in the pleural cavity after opening it at the spot where we had resected a piece of rib. Deep in the substance of the lung, however, we found and drained an extensive abscess, leaving in a flanged tube. No attempt was made to shut out the pleural cavity. The child made a rapid and complete recovery.

Empyema of both sides is sometimes met with in children, and it is, of course, a very serious condition. If both pleural abscesses were opened upon the same occasion, the child would be unlikely to survive. The operative treatment must therefore be approached cautiously, and, if time and circumstances permit, aspiration should be performed before incision is done, in order that the area of useful lung-tissue may be increased. Then one side is to be opened, after which the lung will in all probability begin to expand. Some days later a piece of rib upon the other side may be resected, and by this time it is to be hoped that the lung first set free is well up to its work.

Tube loose in chest.—Occasionally the surgeon is called to extract a tube from the pleural cavity. On slightly enlarging the wound, wedging the ribs asunder, and searching with the finger, the tube may generally be found, and extracted. A speculative search with forceps alone is apt to be unsuccessful and harmful. Flushing the cavity with a warm antiseptic solution might bring the tube to the opening; but neither probe nor forceps can disclose the whereabouts of an indiarubber tube.

Resection of portion of many ribs (Estlander's operation) has to be adopted when the lung remains collapsed and bound to the spine, and the pleural discharge fails to diminish. The operation is resorted to in order that the chest-wall may fall in and permanently obliterate the cavity. In young children, a natural obliteration of the cavity must duly take place by the falling in of the chest-wall, the occurrence of a certain amount of lateral curvature, the elevation of the diaphragm, and the expansion of the opposite lung. Unless the evacuation of the empyema have been long delayed, and the lung be irretrievably damaged, the division of a series of ribs is not likely to be needed. That the expansion of the lung should begin before the opening in the chest-wall is closed would seem a physiological impossibility. It does so, however, and to a great extent through the influence of the expansive force of the pulmonary air in coughing.

There must not be too hurried a resort to Estlander's operation; possibly with change of air the cavity will be obliterated or dwindle down into a mere sinus, which will

heal after scraping and after the resection of a piece of the adjacent rib. The operation having been decided upon, the child is laid on a hot-water mattress and chloroform is discreetly administered. The finger is introduced through the existing wound, and the cavity is explored with a view to seeing how many of the ribs over it will need resection. It is not unlikely that they will be the third, fourth, fifth, and sixth—two, four, or even six inches of each, according to the size of the cavity. There is, probably, less shock to the child if each rib is dealt with by a separate incision, as described above (page 153), rather than after the making of a long vertical incision, or the raising of a large flap. After the operation the child must be kept very quiet, and, if necessary, treated by stimulation and warmth.

In the treatment of empyema, careful attention must be paid to diet, and wine should be liberally administered. If necessary, extra food may be introduced into the stomach by the œsophageal tube (page 50). The drugs required will be quinine and iron, and, perhaps, small doses of opium. As soon after the operation as possible, the child should be got out of bed and into the fresh air. Gentle exercise helps the lung to expand, and it is permissible even before the discharge ceases. It is an error to confine the child to the sick-room, or even to the house, simply because he has an unhealed pleural abscess.

Prognosis is for a time uncertain. The abscess cavity may quickly contract, especially if the evacuation have not been long postponed. But exhaustion, pyæmia, spinal caries, tuberculosis, or albuminoid disease may intervene and prove fatal.

CHAPTER XI.

BURNS AND SCALDS.

BURNS and scalds are very serious injuries in childhood. They may cause death by shock, exhaustion, tetanus, lung disease, or blood-poisoning.

Children are sometimes badly scalded by being incautiously plunged into a hot bath when in convulsions; by the application of over-hot poultices, or even by the upsetting of a tea-cup. Serious injury and shock may result from a child being made to sit over a chamber-vessel containing hot water, for the relief of chronic constipation. From this cause I have known extensive ulceration to occur on each buttock.

Prognosis is most unfavourable when the burn is about the pelvis, abdomen, or thorax; this may be on account of the close proximity of the sympathetic plexuses. When as much as one-third of the surface of the body is burnt, recovery is highly improbable. Prognosis thus depends upon the extent of skin injured as well as on the area affected. Even though there be apparently but slight shock, soon after the occurrence of the burn, prognosis must be guarded.

(For burn of glottis *see* page 239.)

Treatment.—If a child's clothes were ablaze, and he have been wrapped in a table-cloth, coat, or rug, he had better not be disturbed until chloroform has been administered. The clothes should be cautiously removed, and each burned and scalded part dressed. After this, the less the child is disturbed the better. To diminish the effects of shock, hot bottles wrapped in flannel may be placed in the bed, and warm drinks given. No one should be allowed at the bedside but the nurse on duty, for quiet is of vital importance. Wine should be given at short intervals, with milk or egg, and when reaction is established morphia should be administered in small, repeated doses. Bromide of potassium may be indicated if convulsions supervene, but even then confidence may be placed rather in the morphia; castor oil may be

required. The intense thirst may be partially allayed by fresh lemon juice, with sugar and ice. Children are especially fond of fresh fruit when they are feverish, and it is generally good for them.

Each dressing should be carried out so as to cause the least exposure to the air. Air is a great irritant; the surface should be exposed to it as little as possible. One part should be covered up before another wrapping is undone. Warm carbolic acid solution (1 in 60) keeps the wound aseptic and deadens the sensibility of the nerves. Linen soaked in it may be applied under oil-silk, so that evaporation cannot take place or the dressings become adherent. Additional lotion can be introduced by a syringe, but watch must be kept against carbolic acid poisoning (page 9). Lint thickly spread with vaseline and eucalyptus oil may be laid on a scorched surface, and over this a padding of cotton-wool bandaged. Blebs should be opened up and dusted with boracic powder. If the child suffer, chloroform may be administered for the dressings. I have not experienced much benefit from the use of the saturated solutions of carbonate of soda, which have been recommended as lotions.

Dusting the denuded surface with flour from a kitchen dredger forms a thin protective cake over the exposed nerve filaments, and shields them from the air. As serum oozes up and loosens the crusts, fresh flour may be dusted on. If the burns be very severe, the child may be kept constantly lying in a warm bath. The more thorough the rest, the more rapid the healing; the neck should be steadied between large sand-bags; a limb should be fixed by a splint or a weight.

Even if a limb be deeply charred, it is inadvisable to resort to prompt amputation, as the superadded shock might prove fatal. Erysipelas, meningitis, broncho-pneumonia, suppuration, exhaustion, or coma may supervene. Traumatic fever must be anticipated, and combated with stimulants or, if necessary, opium. Should erysipelas supervene, it may be treated by common white-lead paint, or by the liniment of lactate of lead.

Déformities follow the healing of extensive burns. It is often said that the cicatrix after a burn contracts more than any other kind of scar; probably the true explanation is that

this cicatrix is usually more extensive than that left after any other injury, the contraction being proportionately great. The contraction of a scar at the front of the neck drags the inferior maxilla down to the chest, and prevents its development; the lip is effaced, the teeth come through irregularly, and the saliva dribbles. Attempts to improve the disfigurement are likely to be disappointing, as the adjacent skin is unsound and intolerant of interference. If the burn be at the back of the knee, the leg must be kept extended by a stirrup and weight, provided that the skin of the leg be sound enough for the attachment of strapping. For a raw surface down the front of the neck, cicatrisation may be quickened and deformity checked by the collar shown in Fig. 63.

If the burn be limited to the front of the knee, the leg should be kept flexed, so that when the scar is contracted to the utmost full flexion may still be permitted. If the burn be in the groin, the child may be placed upon a Thomas's hip splint. If at the front of the elbow, the limb should be kept extended; whilst if on the salient angle, the fore-arm had better be flexed. Like principles guide the surgeon in dealing with a burn about the shoulder, arm-pit, wrist, or finger. The opposed and granulating surfaces of fingers or toes should be separated by strips of lint, smeared with vaseline and eucalyptus oil. If the nose be burnt, a short piece of drainage-tube should be fixed in the nares during the cicatrisation.

When an arm is bound to the side by cicatricial bands, or an elbow or other joint is permanently flexed, a plastic operation may afford some improvement, but subsequent contraction of the new scar-tissue is certain to follow. The tissues in the neighbourhood of a cicatrix are rarely available for plastic operations, whilst flaps transplanted from distant parts often fail to take root in the scar-tissue prepared for their reception. The result of interference with contracted cicatrices is generally disappointing. Fingers or toes which are rigidly curled round may need removal; and a hand, foot, arm, or leg which is greatly deformed, seriously in the way, or covered by an extensive and intractable ulceration, may demand amputation. Constant exercises of the limb, with gentle frictions and shampoings of the tender tissue,

ensure the greatest amount of suppleness for the scar; but care must be taken lest the frail scar-tissue give way. The healing of healthy ulcers may be accelerated by skin grafting; for this purpose minute chips of healthy skin which has just been removed at a circumcision may be made available (Lucas).

For Thiersch's method of grafting, the granulating wound is made aseptic and healthy; the superficial granulations are scraped away, and bleeding is arrested by firm pressure applied over a layer of "protective." The front of the thigh having been made aseptic, broad strips are shaved from it through about half the thickness of the skin. These strips are then spread close to each other over the surface of the sore, and, covered with protective, are firmly surrounded with sterilised dressings. They should not be examined for about a week.

Keloid growths are apt to form in the cicatrix after a burn. (See page 146.)

CHAPTER XII.

INFANTILE PARALYSIS—PSEUDO-HYPERTROPHIC PARALYSIS—
TETANY—SPASTIC PARALYSIS—NEURO-MIMESIS—SPORADIC
CRETINISM, ETC.

Infantile paralysis. *Pathology.*—The nerves that govern the nutrition, and regulate the movements of the muscles of the trunk and extremities, are associated with multi-polar cells in the anterior horn of the grey matter of the spinal cord. When acute inflammation (*anterior polio-myelitis* *πολιός*, “grey”; *μυελός*, “marrow”) attacks this grey tissue, or hæmorrhage occurs into it, the associated muscles are thrown out of working order. When serious extravasations take place, the destruction of the cells, and of the delicate fibres connected with them, may be irremediable, the paralysed muscles becoming quickly and permanently wasted. This form of paralysis is not confined to infancy, or even to childhood, but by far the greatest number of cases occur before the fourth year.

The paralysis may come on without warning, and in a typically healthy child, or it may be preceded by a short feverish attack, or by convulsions; it may be accompanied with pain and tenderness in the limbs. Sometimes the attack is associated with vomiting. If, as often happens, the child be cutting a tooth at the time, the premonitory symptoms may be attributed to “dentition.” And, there being absolutely nothing to draw attention to the actual seat of mischief, the disease is not diagnosed. The medical attendant may find himself blamed when, later, as the child begins to crawl about again, paralysis is for the first time discovered. The practitioner who is ever prepared for polio-myelitis, is least likely to be taken by surprise. As a rule, more muscles are at first affected than are ultimately left paralysed. This is due to the disturbance of outlying cells being only temporary. In one case, all four extremities were paralysed; gradually the arms recovered, but both thighs

and legs have remained permanently useless. When only one group of muscles in a limb is left paralysed, deformity is produced. Thus, on the inner tibial muscles being affected, spurious talipes valgus may ensue; or, *contractures* occurring in the affected muscles, the deformity of equino-varus may result. Even after more or less recovery from leg-paralysis talipes equinus often persists and demands section of the Achilles tendon.

Certain groups of muscles in a limb may be paralysed whilst others may be but partially affected, or may entirely escape. Favourite groups for permanent paralysis are those of the extensors of the toes and flexors of the ankle. In no case is sensation diminished; sometimes, indeed, it is exalted. Infantile paralysis affects the lower extremity more often than the upper, though a "wasted arm," or deltoid, is of no infrequent occurrence. When the shoulder is flattened and the head of the humerus lowered, the case looks somewhat like one of luxation, but the movements are all free. Atrophy quickly supervenes, not simply from want of exercise, but from damage to the nerves which govern nutrition. The upper extremity being affected, the withered arm hangs useless by the side. The hand and fingers are flexed, and the elbow is extended, but not rigid. The trophic nerves being damaged, the bones and joints, as well as the muscles, fail to be developed, and the limb becomes flail-like. The excitatory loop being broken, on account of the damage to the ganglionic cells, the reflexes are abolished, and the affected muscles cease to respond to the interrupted current, though, for a time at least, they give an excessive response to the continuous current. Intractable ulcers are apt to occur from slight pressure on the wasted limb, especially in cold weather, and the skin appears blue and ill-nourished.

Prognosis.—After the explosion in the grey matter, the alarm is often great; the case is, however, almost sure to improve up to a certain extent. The transient paralysis is explained by the attack of myelitis having been arrested before serious damage had been caused.

As regards the prospect of ultimate recovery, information may be obtained by noting the gradual return of contraction under the interrupted current. If, under stimulus, the

contraction can be excited, even though the atrophy be extreme, recovery may be looked for. For some days, or even weeks, it is better not to express any definite opinion regarding future restoration, but merely to look forward with hope for improvement. In the case of paralysis in the thigh and leg, it is an excellent augury when patellar tendon-reflex persists, as this shows that the bi-polar cells in a very important region of the cord have escaped wreckage. The impairment of nutrition with which the central lesion affects the limbs renders the long bones liable to fracture; but even then union occurs in due course, provided the limb be kept absolutely quiet.

The **differential diagnosis** is not always easy, and in the earliest hours it may be quite impossible to give a positive opinion. In the obscure illnesses of children the practitioner must always speak with caution, and, while taking care not to give unnecessary alarm, he must hold himself prepared for contingencies. Certainly, he should not rest content with the suggestion that the illness may be merely a passing effect of "teething." The tenderness which lingers about the limb is apt to mislead:—An infant of fifteen months was brought for treatment on account of "hip-joint disease." Some months previously she had had an attack of "bilious fever," evidently with pains in the head. She did not move the left lower limb, and cried when it was even gently handled. On carefully rotating the thigh, so as gently to rub the head of the femur in the acetabulum, no signs of distress were evinced. There was no fulness in the fold of the groin, nor was there any flexion of the limb. (Chap. XXIX.) Infantile paralysis was therefore diagnosed, and after a few weeks she was able to walk a little, though she still dragged the limb. (With hip-joint disease the limb would have been advanced, not dragged.) A younger brother of this child subsequently came under my care for infantile paralysis; and in another instance two children in a family have been under my treatment for this disease. (For "Reaction of degeneration," see preceding page.)

Treatment.—The gums may be inspected, and the bowels cleared by a dose of rhubarb and soda, or grey powder. The fretful child must be nursed, watched, and kept warm; it may not be expedient to confine him to bed. Small doses of

bromide of potassium may allay irritability. Leeches, a mustard poultice, or a stronger irritant, may be placed over the cervical or lumbar enlargement of the cord, as the case may be. But until tenderness has disappeared from the limb, or the general disquietude has passed away, and until it has become evident which muscles are affected, electrical treatment should not be resorted to. Nor is it advisable to alarm and worry the child with electricity for the purpose of diagnosis until his health is re-established and apprehension has passed away.

The circulation and development being slow, the limb should be enclosed in a thick stocking or sleeve, the interior of which is lined with lamb's wool. Frictions, in the direction of the venous return, should be performed in front of the fire at frequent intervals during the day. The mother or nurse may be instructed in the principles of massage, and more faith may be placed in this than in the employment of electricity. The treatment must be persisted in, if necessary, for months or years. As Holmes suggests, much good may result from putting the child in a "go-cart," when, in order to move about, the affected muscles must be called upon to act. If the child possess sufficient intelligence, he must be induced to try to set the feeble muscles in action by force of will, and his games and toys should be arranged with regard to this matter.

The continuous current will serve to assist nutrition until the central damage has been repaired. Later, the interrupted current may be used, the strength being just sufficient to produce a visible effect; but electricity cannot restore connection between nerve fibre and cell, nor create fresh elements in the damaged grey crescent. Improvement, excepting in those muscles which have already shown signs of amendment, can scarcely be hoped for after the lapse of eight or ten months from the commencement of the disease. Iron and strychnia may be prescribed, and the limb should be rubbed with oil.

In paralysis of the flexors of the ankle, the foot must not be allowed to become extended to more than a right angle, or the toes will be in the way during progression. Frictions and manipulations may do much towards preventing such deformity; but a stiff boot, or Achilles-tenotomy may be

necessary. As the child lies in bed, the weight of the clothes should be removed from the toes by a cradle, so as to prevent over-extension.

Arthrodesis (*ἄρθρον*, "joint"; *δέω*, "to fix").—When the muscles of one part of a limb are left functionless, whilst those of another part are serviceable, great advantage may be derived from removal of the cartilages of the intervening joint and securing its solid ankylosis. Thus, a withered and deformed leg may be brought under the control of the muscles of the thigh and rendered useful for progression. Both knees may be straightened and so fixed at the same time, and elbows, ankles, and tarsal joints may be similarly dealt with, as circumstances direct.



Fig. 28. — Pseudo-hypertrophic Paralysis; enlargement of deltoids, buttocks, and calves.

Pseudo-hypertrophic muscular paralysis.—The adjoining figure (Fig. 28), taken from a patient at the Children's Hospital, shows some of the characteristic features of this disease. The calves and buttocks are enlarged, the hypertrophy is symmetrical, and there is an arching of the loins.

Microscopic examination proves that the increased size of the muscles is due to a general development of connective tissue between the fibres, the muscular elements themselves being diminished. The boy (the subjects are generally boys) is perpetually falling about. He steps along like a bare-footed bather descending a shingly beach, and endeavours to preserve his balance by keeping the legs wide apart, and by throwing out the arms (Duchenne). The heels being drawn up, he walks much on his toes, and cannot stand firm. The shoulders are thrown back, in order to render the equilibrium more stable. Thus, arching of the loins is produced, but it disappears when he lies down. The weakness of the gluteal muscles renders the act of getting up from the floor

somewhat difficult. The strange gait, with weakness and unsteadiness, should direct attention to the muscles, even before hypertrophy has appeared.

The diagnosis from double congenital dislocation at the hips (Chap. XXVIII.) is established by the fact that the condition was not congenital, and that it has been coming on gradually and increasingly; that the femoral heads cannot be made out in the gluteal regions, and that the great trochanters occupy their proper position as regards Nélaton's line; that the muscles of the calves and shoulders are enlarged, and that probably the feet cannot be freely flexed.

Whether the muscular degeneration be the primary condition is not certainly known, but treatment should be directed to the muscles themselves, and should consist in massage, stretchings, and galvanism. Possibly, in the early stage of the disease, these measures may be attended with some success. Elevation of the heel, which is apt to occur in the later stage of the disease, may demand tenotomy.

Prognosis is unfavourable. The degenerative process extends to the arms, and even to the chest and abdomen, and during this final stage there is a rapid decrease in the size of the hypertrophied muscles, the child becoming too weak to stand. Death occurs before adult age from sheer prostration, or from some intercurrent affection of the respiratory organs.

Tetany.—The chief feature is painful, reflex muscular spasm. It is usually in close association with rickets, and is probably due to the absorption from the alimentary canal of poisonous material resulting from decomposition of food which has been lying in a dilated stomach or unhealthy bowel. Only a very little central irritation is needed in the case of an infant to upset the balance of the feebly-organised nervous system, and so to cause reflex spasms. A few years ago many of these nervous phenomena were ascribed to dentition, but there is nothing to show that tetany is dependent on the eruption of the milk-teeth, though it is apt to occur when they are being erupted. It seems to me not improbable that as the diseases of malnutrition are more studied in the laboratory, ptomaines will be obtained from the alimentary canal of infantile dyspeptics which, being injected into the lower animals, will be able to produce rickets,

laryngismus stridulus, and tetany. The child with tetany usually suffers from diarrhœa, which is a strong suggestion of there being something in the alimentary canal which is of an irritative, toxic nature, and had best be got rid of. I entirely accept the suggestion of Oddo, that tetany is, like rickets, a disease of malnutrition.

The hands and feet alone may be affected. The first joints of the thumb and fingers being flexed, the other joints being extended; in the slightest form of the disease the thumb alone is affected. The rigidity persists during sleep. The brain itself is not implicated. The child does not lose consciousness. Both hands or both feet are involved at the same time; there is no elevation of temperature.

The feet being affected, the ankles are extended, the sole is arched, and the toes are curled up. This is highly suggestive of the presence in the blood of an irritant poison.

Laryngismus stridulus (page 36) is a constant symptom of tetany, as is also irritability of the facial nerve; passing the finger over the nerve trunk sufficing to cause contraction of the sphincters of lips or eyelids.

Any severe disturbance, such as that arising from wet or cold, or the irritation set up by improper food, may cause the carpo-pedal contractions in an unhealthy infant.

Treatment.—Attention must be paid to diet; the rickets must be treated (page 70); diarrhœa must be checked (perhaps by rhubarb and soda or castor oil), and tonics of oil and iron must be prescribed in due course. Bromide of potassium or chloral may be needed. Fresh air and warm clothing are of the utmost value.

Spastic paralysis, or tetanoid paraplegia, is the result of sclerosis of, or pressure upon, the antero-lateral columns of the cord; thus it is not infrequently met with in caries of the spine (page 266). Sometimes it is secondary to injury to the motor area during the passage of the head through a narrow pelvis, or to injury by the blade of forceps used to help delivery. There is no loss of sensation, for the sensory part of the cord remains sound. All the reflexes are exaggerated, for though the reflex loop is entire, the cerebral control is no longer able to descend through the diseased motor track of the cord. The reflexes may be so greatly in excess that, on

examining the child, the limbs may become rigidly flexed, or drawn together with spasmodic violence. Often there is intertrigo near the genitals. If the child attempts to walk, the limbs stiffen and the heels are drawn up (because the muscles, free from control, overact their part), the toes being made to scrape along the floor.

There is no wasting of the muscles at first, unless the anterior cornua of the grey matter be also implicated; but in due course the muscles become stiff and contracted, the feet are deformed, as shown in Fig. 29, the fingers "clawed," and the child is a hopeless cripple. Surgery cannot do much for these cases; massage gives little result, and tenotomy is usually disappointing. Nevertheless, a careful search should be made for peripheral irritation, especially about the genitals. A long prepuce should at once be removed, and all adhesions thoroughly broken down.



Fig. 29.—Spastic Paralysis. The child could not sit or stand.

The disease is often associated with fits, or with imbecility. In the early stages of the disease division of the Achilles tendons may prove helpful for a while.

Cerebral paralysis.—I have at present under my care a child of about eight years, who is mentally and physically imbecile, or, as its parents euphemistically term it, "backward." Its lower extremities, and the muscles of one side of the body, are feeble and rigid, and on that side there is talipes equinus; the reflexes are exaggerated. On that side also there is adductor spasm. The association of the mental

with the physical defect shows that the condition of the extremities is not the result of lesion in the spinal cord. The cause of the general imbecility is, probably, cerebral hæmorrhage in early childhood. It comes on suddenly, often with convulsions, and it is likely to leave the child hemiplegic. Sometimes the paralysis partly clears up, but it generally leaves the child feeble. Sometimes, when the area of the cerebral hæmorrhage has been extensive, one side of the face is paralysed. All that can be done for the child is comprised in the words galvanism, tenotomy, exercises, and massage.

Obstetric paralysis of infants.—The violence inseparable from the expulsion or extraction of the fœtus is apt to cause paralysis. The facial nerve is not infrequently implicated; but the lesion here referred to is that which follows forcible elevation of the arm, as after version or breech-presentation. It is a variety of Erb's paralysis, and is due to injury to the fifth and sixth cervical nerves, which largely form the outer and posterior cords of the brachial plexus. The paralysis is, thus, of the deltoid, supra-spinatus, infra-spinatus, triceps, coraco-brachialis, biceps, brachialis anticus, and supinator longus. The arm and forearm hang useless, with the hands slightly pronated and the fingers bent. The treatment recommended by Duchenne is localised faradisation. (*See* "Bull. de la Soc. Méd.," 1891.)

Careful examination for co-existent dislocation of the humerus should be made; if this lesion were overlooked, subsequent resection of the head of the bone might be rendered necessary.

Trismus nascentium is a rare disease in Great Britain. It generally comes on from the fifth to the tenth day after birth, and is popularly called "nine-day fits." It is likely that the tetanus is the result of the inoculation of the specific bacillus by scissors or dressings. Castor oil, opium in the most minute doses, chloral hydrate, and bromide of potassium may be tried; chloroform might be needed if the tetanic convulsions were severe. An account of the way in which this disease has been prevented in the island of St. Kilda (where it had long been known as "the scourge"), by the adoption of energetic antiseptic precautions, is found in the *Brit. Med. Journ.* of Oct. 24th, 1896.

Neuro-mimetic, or **hysterical**, affection of the spine, hip, or other joint or tissue, is met with even in early childhood, and in either sex. Some of the signs of joint disease are closely imitated, but, as a rule, there is no wasting of the muscles of the limb—an early sign of joint disease. The child believes that she cannot move the limb, and she usually keeps the joints partially flexed. There is no redness or heat of the surface, nor any swelling. Sometimes it is difficult to say whether there is incipient disease or not; but it is then advisable to keep the child at rest, and the part under close supervision.

Diagnosis.—If the child's attention be directed to the "painful" part, and the skin be even lightly touched, she will complain; but if her attention be drawn away, as in the earnest examination of a distant part (of the chest wall, for instance), the fingers of the other hand may be thrust into the tissues which were previously so "tender" without the least discomfort. Neuro-mimesis invariably overacts its part. *Generally, the tenderness is located in the skin.* Sometimes the child affords evidence of nervous weakness. Educational over-pressure is apt to be the cause of this hysterical condition.

Neuralgic pains in the mammæ are apt to occur with approaching puberty. They should excite no alarm, being almost physiological. They may be relieved by belladonna liniment, or by gentle friction with oil. Laxative iron mixture may be prescribed, or some other tonic. **Mastitis** sometimes occurs in boys as well as in girls as puberty comes on.

Mastitis neonatorum.—A few days after birth, both in boys and girls, a little milky fluid is apt to ooze from the slightly swollen breasts, and if the infant be weakly, or the nurse meddlesome, the rudimentary breast may be involved in acute inflammation, or even in suppuration. The treatment consists in the use of mild carbolic fomentation, and incision and scraping should abscess form.

Sporadic cretinism is the myxœdema of childhood. Here is the report of a case which was recently under my care:—The child, five and a half years, but looking four years younger, had been born in Hampstead of healthy parents. She had been weaned at three years, but was still fed from the bottle. Amongst the chief clinical features were the large mouth and protruding tongue, the *absence of all trace of*

thyroid gland, and the presence of diffuse tumours over the subclavian triangles. The child could not walk or stand; nor could she speak. The characteristic deposits in the neck, as also those that shrouded the muscles of the thickened limbs, were the result of mucoid infiltration; they were not fatty.

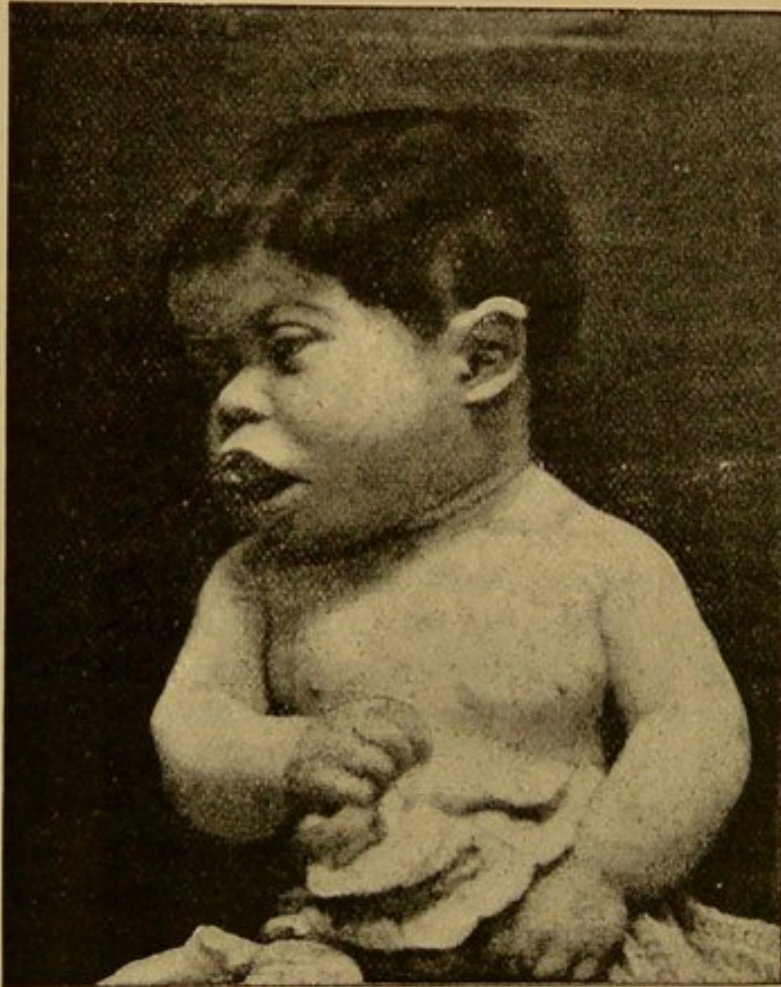


Fig. 30.—Sporadic Cretinism, showing Diffuse Swelling at Root of Neck. This patient was 16 years old when the photograph was taken.

Another child (whose portrait is given in Fig. 30), though sixteen years of age, looked about twelve years younger.

When the circulation is unusually slow, the skin may be a good deal mottled. Mr. Horsley's experiments upon monkeys show that the removal of the thyroid gland is followed by myxœdema.

These children used to be considered as hopeless idiots, incapable alike of intellectual and physical improvement; but now, under treatment by thyroid extract, they may undergo great physical and mental improvement.

CHAPTER XIII.

CERTAIN MALFORMATIONS IN HEAD AND NECK.

Chronic hydrocephalus is a collection of fluid within the cerebral ventricles, the brain substance being greatly expanded; the bones also are thin, and, with a strong light behind, the head may be actually translucent. The fluid may increase so as to cause separation of the cranial bones, and to leave wide, membranous sutures, the brain substance being represented by a cyst-like layer of nerve-tissue spread inside the capacious cranium. The excess of fluid may be the result of a slow inflammation of the arachnoid, and of the lining of the lateral ventricles which may have existed during foetal life, or of a blocking of the cerebro-spinal opening. The face is small and old-looking, and the forehead and head are excessively large (Fig. 31). The child has no physical or intellectual vigour, and probably falls an early victim to convulsions or to pulmonary disease. The *acquired* variety is generally the result of obstruction to the venous return from the skull; it may be caused by the pressure of a cerebral tumour on the veins of Galen, or by obstruction of the foramen of Majendie.

Treatment.—Drainage of the cerebral ventricles, with the view of warding off compression due to intra-ventricular hydrocephalus, is a rational procedure, though most of the children so operated on have succumbed; but according to Dr. Keen the probable explanation of the failure has been the too rapid escape of the fluid. Broca advises Keen's method of thrusting in a trochar $1\frac{1}{4}$ inch above and behind the external auditory meatus, and in the direction of the opposite external meatus. Then, with a continuous aseptic drainage, there is a chance, provided the skull-wall is still soft, that improvement may ensue; but the chance is necessarily a very poor one.



Fig. 31. — Chronic Hydrocephalus. (From Life.)

Compression by elastic bands or strapping is of no value. In one case the ethmoid bone was disarticulated by the pressure, and death supervened. The intracranial pressure which is ordinarily associated with hydrocephalus is likely to determine cranio-tabes (pages 68 and 95), or even general fenestration of the skull. On the chance of the trouble being due to syphilis, mercurial treatment may be tried.

Acute hydrocephalus is the result of tuberculous inflammation of the membranes of the brain (page 65). The surgeon meets with it chiefly as a final complication of tuberculous disease of bones or joints. The *prognosis* is always desperately bad. Possibly it may eventually be rendered less unfavourable by trephining the skull, washing out the sub-arachnoid space with hot boracic lotion, and draining it, and, may be, the lateral ventricles as well. But this heroic treatment has not yet availed much.

A simpler—and I fear that I must say an equally ineffective—method of treatment of tuberculous meningitis is that known as *lumbar puncture* of the sheath of the cauda equina with a fine cannula and trochar. For this purpose the laminae



Fig. 32.—Large Anterior Meningocele.

of the third and fourth lumbar vertebrae are separated as far as possible by flexing the child's trunk, and the instrument is thrust boldly but discreetly into the distended sub-arachnoid space, and a certain amount of the cerebro-spinal fluid is withdrawn. Most of those who first used this method have admitted that it is now useful only to estimate the amount of tension in the sheath and the nature of the fluid producing it.

Meningocele is the protrusion of some part of the membranes of the brain through a gap in the skull, the result of imperfect development. It may possibly be caused by hydrocephalus during intra-uterine life. The tumour is found at the occiput, the root of the nose (Fig. 32), the inner angle of the orbit, or the parietal region—that is, over a suture or at the meeting of sutures. If the deficiency existed at the sphenoid-ethmoidal region, there might be a prolapse into the pharynx or nasal fossa. As the result of the dragging of the

tumour during the progress of ossification, the interior of an ethmoidal meningocele may become at last completely cut off from the cavity of the cranium. It may give rise to symptoms resembling those of naso-pharyngeal tumour.

Encephalocele is a meningocele with the addition of some of the encephalon. If fluid intervene between the protruding brain substance and the membranes, the condition is termed hydro-encephalo-meningocele. A favourite situation of the protrusion is the occipital region, where the gap may allow of the escape of much of the cerebral hemispheres. The condition is generally associated with internal hydrocephalus, and

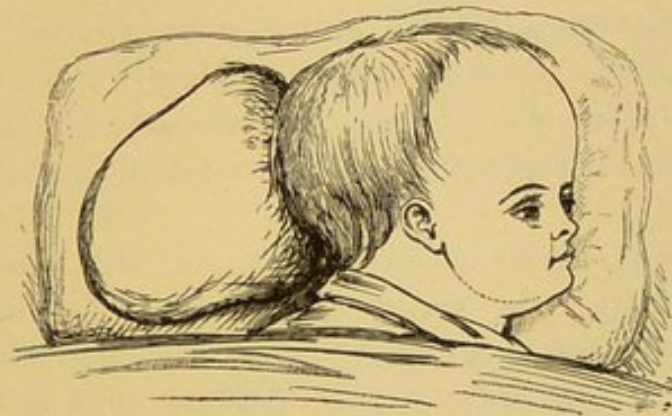


Fig. 33.—Large Occipital Encephalocele.

some portion of the lateral ventricles, distended with fluid, may be extruded in the cerebral substance. If the tumour be translucent, it probably consists of dura mater with cerebro-spinal fluid only. If it be opaque, and if it pulsate, it is probably an encephalocele (Fig. 33), but brain-tissue expanded by internal hydrocephalic may be translucent, as remarked above.

The surgeon should pause before interfering with a tumour of suspicious nature over or near to a cranial suture. A meningocele at the root of the nose might be mistaken for a dermoid cyst or a deeply-seated nævus. The situation of the tumour *over a suture*, the wide and deep connections of its base, the history, the strange appearance, and the absence of skin-staining, help in the differentiation. Nevertheless, the diagnosis from nævus is not always easy, and time may be required to make it absolute; exploratory puncture should not be adopted. The meningocele is a congenital growth, and must occupy a definite site; it has not the spongy feel of

nævus, though, like a nævus, it may swell when the child cries.

The diagnosis from a blood-tumour of the scalp is helped by the situation of the swelling; the cephalhæmatoma (Chap. XXVII.) is usually over the middle of the parietal bone, where a meningocele would be unlikely to be found. The gentle squeezing of a blood-tumour would not give rise to cerebral disturbance; meningocele is congenital, and some of its fluid can be squeezed into the cranium. Hydrocephalus suggests that the tumour has intra-cranial connections. I have known of a meningocele which, instead of protruding at the fronto-nasal region, had escaped through the suture between the orbital plate of the frontal bone and the cribriform plate of the ethmoid, where its appearance so closely resembled that of a nasal polypus, that its removal was attempted with a pair of forceps—a proceeding which entailed a fatal attack of meningitis.

The tumour may steadily decrease, and ossification may then block up the abnormal opening. If the growth be pedunculated, the weight may cause a gradual elongation and narrowing of the pedicle and ultimate separation from the cranial cavity. In some cases the tumour, continuing to grow, at last gives way, either from a sloughing of the thin integument, or from accidental violence. Fatal convulsions may result, but in rare cases obliteration of the tumour has thus been happily established. On the other hand, if the tumour escape injury, there is nothing in the deformity to prevent the child from growing up a useful, though perhaps a somewhat disfigured, member of society.

The mere withdrawal of a little of the fluid may give rise to convulsions and death. If the tumour were translucent, unassociated with hydrocephalus, and in communication with the interior of the skull by a seemingly small gap, it might be expedient to treat it after the manner of a simple spina bifida. If its pedicle were slender and appeared solid, it might possibly be removed by the knife or ligature. But active interference must needs be attended with considerable risk.

Microcephalus.—Though the smallness of the head of certain idiotic children is not a surgical affection, it must just be mentioned, in order that something may be written

concerning a cutting operation which has recently been devised with a view to establishing improved cerebral development. The operation is termed **craniectomy**, and it consists in making linear incisions through the roof of the skull, on the theory that the brain has been arrested in its growth by a too early ossification of the fontanelles and sutures. But, as Dr. Sutherland truly says, experience does not sustain the sanguine expectations of early operators. As microcephalus is not, as a rule, dependent on premature synostosis, but on original faulty brain-development, the operation cannot be a promising one; and though it has been contended that in some cases improved brain-pulsations were produced by it, the after-histories of cases operated on have not shown more mental improvement than would probably have occurred independently of the operations. Bourneville has even demonstrated that such operations diminished the cranial capacity, as exuberant bone-growth was apt to take place where bone had been excised. And, as Sir G. M. Humphry asserted, there is nothing in the skulls of microcephalic idiots to suggest that the deficiency in the development of the skull is the leading feature in the deformity. The brain growth is the determining factor, and the skull grows upon and accommodates itself to the brain, whether the latter be large or small.

Craniectomy as an operation for the improvement of microcephalic idiots is dead. Its life was short and meteoric; and, to those who expected great things from it, it must have been sadly disappointing.

Malformations of the external ear.—The pinna is not an important part of the organ of hearing, and in certain instances both it and the external meatus fail to be developed; or the pinna may be present and the meatus absent. The meatus may be completely or partially blocked by a septum of false membrane. Sometimes the pinna is curled upon itself or crumpled over the proper site of the meatus. It is doubtful if an attempt to open up a meatus by dissection is likely to be successful, as the existence of a meatus beneath a rudimentary pinna is quite unlikely. Occasionally the pinna remains elongated and pointed in an extremely suggestive manner.

If the **pinna** be **prominent** and unsightly, it may be flattened against the side of the head by a fold of soft wool and a bandage or strapping. But if this do not suffice, an elliptical

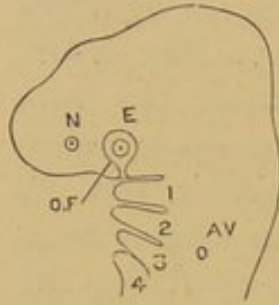


Fig. 34.—1 to 4, Clefts and arches; AV, Auditory Vesicle; N, Nasal Pit; E, Optic Vesicle; OF, Orbital Fissure.

piece of skin may be dissected off the back of the concha, close against the scalp, the edges of the wound being then approximated by fine sutures. In exceptional cases it may be necessary to excise also a piece of cartilage for the cure of this deformity; but it is thus easily and completely remedied.

Supernumerary auricles and **pendulous growths** are occasionally seen in the neighbourhood of the ear (Fig. 35). They should be removed during infancy.

Occasionally they are found along the front of the neck; they are due to redundancy of tissue left after the closure of the visceral clefts. (See *Lancet*, February 18th, 1888.)

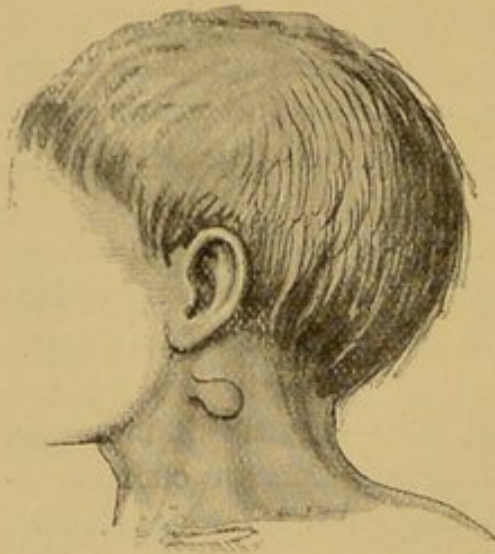


Fig. 35.—Auricular Appendage, the Result of Irregular Closure of a Branchial Fissure. (See also Fig. 40.)

Development.—The lower part of the face and the upper part of the neck are originally mapped out in five processes, the visceral arches (Fig. 34). From the uppermost of these the lower jaw is built up. Clefts are placed between the arches; they extend through into the pharynx (Fig. 36). From the highest of them the Eustachian tube and the tympanum are developed; the lower clefts (which represent the branchial apertures of

aquatic animals) eventually undergo obliteration.

But small congenital apertures may be met with, extending towards the pharynx or œsophagus, from one or both sides. Often they are just above the sterno-clavicular articulation or along the front of the sterno-mastoid. They are called *branchial fistulæ*. Clear mucus may exude from them. They are,

thus, remnants of the visceral clefts, and may be effaced by a caustic needle, or by dissection.

Branchial cysts are due to imperfect obliteration of the visceral clefts in their deeper parts, though their cutaneous portions have been duly effaced. They are round, ovoid, and smooth, and may contain mucus, atheromatous material, or blood. Should such a cyst become distended with a fluid which, when drawn off by aspiration, is found pale or amber-coloured, the condition might be called *hydrocele of the neck*. (See also "Congenital cystic hygroma," page 130.) In the young child the cyst may not attract notice, but at any period its epithelial lining may become active. These *cervical dermoids* are sometimes mistaken for inflammatory or other swellings; their situation in the line of the clefts, their softness, and their freedom from inflammation and tenderness, and, perhaps, their chronicity, are important points in their diagnosis.

A cystic swelling in the exact middle line of the neck, or the fistula which results from its having burst or having been opened, is likely to be associated with the duct of His.

Treatment.—If aspiration and the injection of tincture of iodine fail, and if the cyst continue to grow, drainage with antiseptic precautions may be adopted, or, better still, an attempt may be made to remove it by dissection. But in proposing this, the possibility of the existence of deep and important connections must be borne in mind. Sometimes the dermoid communicates with the pharynx. (For "Thyro-glossal cyst" see page 199.)

Tracheocele.—From imperfect development of the trachea, hernial protrusions of its lining membrane may extend laterally into the neck. The tumours thus arising contain air and are resonant on percussion. They do not readily lend themselves to active treatment.

Coloboma of eyelid.—After the eyeball is formed, two horizontal folds of integument approach each other, and meet at about the twelfth week. They are united by the epidermis



Fig. 36.—Embryo at 6th week, showing: 1, Mandibular Arch; and 1, 1st Pharyngeal Cleft and Auditory Vesicle. The 2nd Cleft is still visible, but the 3rd and 4th Clefts are effaced. (Quain.)

growing across the fissure, whilst, more deeply, the edges are glued together by the secretion of the Meibomian glands. In kittens the eyelids adhere for a week or so after birth, but in the human subject the lids separate before the end of intra-uterine life. Occasionally the child is born with the lids still joined together. In certain cases the upper lid is formed from two integumental processes instead of one; and if the



Fig. 37.—Coloboma of Eyelid.

two buds fail to unite in the vertical line, coloboma is produced, after the manner of hare-lip.

In the operation upon the child shown in Fig. 37, the edges of the cleft were pared and then adjusted by horse-hair sutures, some of which passed through the tarsal cartilage. Primary union occurred. The child was a patient of Dr. Keser's.

Wry neck.—The cause may be an awkward position of the fœtus in utero; a partial tearing of the sterno-mastoid

during labour; irritation set up by spinal caries (page 252); inflammation of cervical vertebræ from wet or cold; glandular inflammation or suppuration; central irritation of the brain or spinal cord, and contraction of the cicatrix after a burn.

During the birth of the fœtus, either from the force of the expulsive efforts, or from the traction exerted upon the feet by the medical attendant or midwife, the sterno-mastoid is partially ruptured within its sheath, blood being extravasated between the torn ends. But the swelling in the sterno-mastoid may be met with in infants whose entrance into the world has been so easy that neither nurse nor midwife had the opportunity of assisting. The rupture of the muscle probably occurs from a twist of the neck, rather than from over-extension. In the fat-necked infant, the tumour may pass unnoticed for days or weeks; as the neck grows, the swelling attracts attention. It may exist in the sternal or the clavicular

part of the muscle, or above the junction of the two parts. The lump is tender for a while, because of the associated myositis, but as it becomes consolidated the infant suffers no pain on its being fingered. It may be of the size and shape of an almond, filbert, or small walnut, its long axis being in the line of the muscle. In order to keep the swelling free from pressure, the infant holds his head persistently towards that shoulder, and subsequent contraction of the cicatrix produces the permanent deviation.

Having long been of opinion that these tumours were the common cause of wry neck, I at last met with a youth whose birth had been "crosswise," in whose neck a tumour had been noticed directly after birth, and who, it was stated, had all his life kept his head drawn down to the shoulder of the side on which the lump had existed during childhood. I have observed so many cases of wry neck in which a cervical tumour had been noticed shortly after birth, that I conclude that so-called congenital wry neck is, with but few exceptions, the result of partial or complete rupture of the sterno-mastoid during parturition. In the case of a child with wry neck, close-questioning of the mother generally brings forth evidence of there having been something wrong with the neck in early infancy, though it may not have been until a much later date that the child carried his head markedly awry.

These sterno-mastoid tumours were formerly taken as a manifestation of constitutional syphilis. Dr. Frederick Taylor, examining one of them *post mortem* (the child happened to be the subject of the congenital taint), found in it fibrous tissue and striated muscle, the former being probably organised blood clot, the latter being shreds of sterno-mastoid (Trans. Path. Soc., vol. xxvi.)

The appearance of the child with wry neck is characteristic:—The occiput is drawn towards the acromion process, and the chin and face are directed towards the opposite shoulder. The shoulder of the affected side is raised, and that side of the neck is short and concave, the hollow being bridged across by the prominent muscle. From the constant dragging upon that side of the face, the commissures of the lips and eyelids are drawn down; and the bones, especially the inferior maxilla, are unequally developed.

The *treatment* varies with the age of the patient. In an infant, as soon as the tenderness has passed away, frictions may be made along the muscle, and, the shoulder being depressed, the head may be encouraged towards the straight line, and even beyond it. This is the prophylactic treatment of wry neck, and, if carried out with patience, it usually suffices for removing all deformity. No special treatment is required for the tumour, but frictions will expedite its disappearance; no apparatus is needed.

Tenotomy.—If the child be older, and mild treatment prove insufficient, it will be advisable to divide one head or both heads of the sterno-mastoid above the clavicle, where the band or bands can be clearly felt beneath the skin. The child should be anæsthetised; the side of the neck should be cleansed, and the muscle made more definite by drawing up the head. An incision is made parallel with, and about half an inch above the upper border of the clavicle, across the origins of the two heads of the sterno-mastoid, through the skin and fasciæ, thus completely laying bare the muscle. The tendinous head of origin is then cut through from before backwards, and the clavicular piece is dealt with in the same manner. The neck being straightened, the cut ends go asunder, leaving a wide and deep gap. In the bottom of this gap the thin-coated internal jugular vein, of comparatively enormous size, may be plainly seen, and perhaps the anterior jugular. I have entirely given up subcutaneous tenotomy—the method of operating in the dark, as it were—and since I have adopted the alternative plan of dividing the muscle through an open wound, I have found the cases doing equally well as regards results, whilst the comfort and satisfaction which are experienced at seeing exactly what is being cut can hardly be overrated. The edges of the skin-wound having been approximated by fine sutures, a pad of dry lint is secured over it, the head being left for a few days in the old position, so that the wound may be healed before massage is begun.

Although on dragging upon the head previous to operating, it sometimes appears that only the sternal origin of the muscle is in fault, it is generally found that when this has been divided the clavicular part has also to be cut.

The operation of subcutaneous tenotomy of the sternomastoid is not without risk. One danger is from the blade transfixing some large tributary of the subclavian vein at the root of the neck, though such veins may generally be avoided by keeping the knife close under the tendon. If, notwithstanding this precaution (in the subcutaneous method), much blood well up through the skin-wound, the operation should be desisted from, and a pad of lint firmly pressed over the wound, with many turns of a soft roller passed round by the armpits. After an interval of a week or so the operation may be completed, this time through a different skin-wound, or, far better, the open method may be adopted. Another danger is that of air passing into the venous circulation through a wounded vein; if air be carried into the right side of the heart, and churned up with the blood, alarming syncope may occur. The veins are close to the skin on the one side, and to the large subclavian trunk on the other, and the accidental wound is stretched widely open by the strained position necessary for section of the muscle. The accident once happened in my own practice; fortunately the collapse did not end fatally, as firm pressure arrested further entrance of air and escape of blood. But having had considerable experience of both the subcutaneous and the open method of dividing the muscle, I strongly advocate the latter. It is a straightforward procedure, and, as it enables the surgeon to see exactly what he is doing, it must needs be the safer operation.

After-treatment. — When the skin-wound has soundly healed, gentle massage must be begun, and fibrous bands, which now assert themselves, must be worked at with the thumb until they yield; they will not require division. The child should be made to sit on a footstool, whilst the surgeon fixes the shoulders between his knees, and gently, but firmly, works at the neck. This he should do regularly every day, and the nurse should be taught to practise the same manipulations. At frequent intervals during the day the child should be made to walk with a weight hanging down in the hand of the affected side, whilst at the same time the head is inclined towards the opposite side. At night he should lie with the affected side of the head resting upon a firm pillow of a proper

thickness, so as to keep up a constant though slight strain upon all shortened bands. No mechanical apparatus is needed for the cure. The hands of the surgeon and the nurse, and the voluntary exercises of the patient, can accomplish all that screws and straps can do, and, moreover, with greater satisfaction and comfort.

Caries of the cervical vertebræ may cause wry neck. The diagnosis often escapes recognition in the earlier days, the disease for which it is taken being generally rheumatism. (See page 256.) The first symptoms are neuralgia in the area of distribution of the occipital nerves, in the neck, front of chest, shoulders, or arms. The scalp-pains the child is apt to call "headache." Children are not clever at describing pain, but they may be trusted when they affirm that a part "aches," or is "sore." When wry neck is associated with obscure pains in the regions indicated above, which are increased by steady pressure upon the head; when the child sits with his chin supported on his hands, and, on being told to turn his head, wheels his whole body round, and refuses to shake or nod his head, there can be no doubt about the deformity being caused by vertebral disease. And for this condition absolute rest in the horizontal position is, of course, required, as described on page 257.

In one case the wry neck was the result of cervical periostitis, which had been brought on by the child wearing a hat which was sopping wet. Probably the inflammation was greater in the tissues on one side of the neck than on the other, as a single sterno-mastoid was contracted. The acuteness of the symptoms, and the suddenness with which they came on, showed that the torticollis was not the result of caries. After four days in bed, the head being steadied between sand-bags, and with the use of fomentations, the child became convalescent. Stiff neck from cold is often of this nature, though in a less marked degree. It is best treated by rest and warmth.

When a lymphatic gland is acutely inflamed beneath the deep fascia, the pressure is taken off from it by persistent contraction of the sterno-mastoid of that side, the torticollis disappearing on the subsidence of the inflammation. So also with deep cervical abscess.

Stiff neck may persist after convalescence from mumps. These cases are best treated by massage and education, as suggested on page 183, and by iron tonics. I have met with wry neck in a boy in whom the deviation was the result merely of habit. Under judicious supervision he was soon cured.

Wry neck is said to be sometimes caused by the irritation of intestinal worms or teething; I never met with such a case, however. Sometimes the deformity is due to inequality in the two eyes.

In *hysterical torticollis* complaints of pain and suffering will probably be described in exaggerated terms, certain symptoms being but imperfectly imitated. The patient would most likely experience great distress on the *skin* of the neck being gently pinched! (See also page 171.)

Congenital asymmetry may affect the head and face, as it may the trunk or limbs. The disparity of the two sides is likely to be diminished in the subsequent growth of the child. The disfigurement is not capable of improvement by surgical interference.

CHAPTER XIV.

THE MOUTH, PHARYNX, NOSE, AND EAR.

Development.—The first that is seen of the buccal cavity is a wide cleft beneath the fronto-nasal process; laterally it is bounded by the maxillary processes, and below it the mandibular plates are advancing towards the middle line. The fronto-nasal and the maxillary processes are at this time separated by a fissure which extends from either side of the mouth into the orbit (Fig. 38).

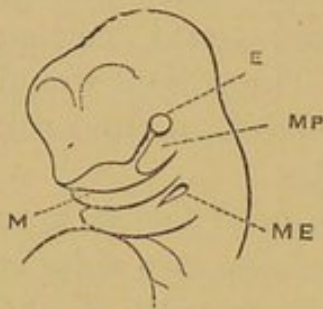


Fig. 38.—Development of Face.

E, Orbit; MP, Maxillary Process; M, Mandibular Plate; ME, Cleft for External Auditory Meatus.

Atresia oris.—At birth the mouth has in rare instances been found completely closed. Cooper Forster described a case in which the mouth was found so small as only to admit a full-sized bougie. To this deformity the term

microstoma congenitum is given, the fusion between the maxillary and mandibular processes having been overdone. The treatment is to bring a flap of the mucous membrane over the freshly cut lip surface, and there fix it by fine sutures.

To diminish the risk of closure by cicatrisation after operation, the mucous membrane should be drawn over the raw surface and sutured to the skin—edge to edge. Constant dilatation may be required to maintain the size of the opening.



Fig. 39.—Cicatricial Contraction of Mouth.

The small mouth is not necessarily a congenital defect; it may be caused by the puckering and contraction which follow syphilitic ulcerations (Fig. 39) or

burns. The child being in a good state of health, a plastic operation on the principle described above may be undertaken, but the outlook is not favourable.

Macrostoma congenitum is the opposite condition to that last mentioned, the corners of the mouth being extended through the cheek, and towards the angle of the jaw. The defect may be traced to arrest of union between the maxillary process and the mandibular arch (Fig. 40); it is likely to be associated with imperfect growth of the lower jaw, or even of the brain. Macrostoma must be treated by paring and suturing.

Errors of development in connection with the branchial arches are said to be more frequently met with in girls than in boys; hare-lip, on the other hand, is more often seen in boys.

Orbital fissure and dermoids.—The figure on page 186 shows that between the lateral frontal plate from which the ala of the nose is developed, and the superior maxillary plate, from which the lateral part of the lip is formed, a fissure runs upwards and outwards towards the eye—the orbital cleft. It is effaced by the blending of the frontal and maxillary plates. In rare instances this cleft fails to be obliterated. Enclosure within the cleft of a fragment of epiblast is apt to produce one form of orbital dermoid. It may produce epidermal scales, which, locked within the juicy tissues, remain succulent, or, undergoing fatty degeneration, produce a pultaceous mass. Sometimes the isolated scrap expends its energy in growing hair, which it carefully coils up in its interior.

Ranula is a cystic tumour in the sublingual region. It causes a bluish and translucent bulging of the mucous membrane; it is quite soft. It has ordinarily no association with the salivary duct; it is a collection of mucus in one of the follicular glands. The glairy fluid which escapes on puncture of the cyst is mucus, not saliva. In fact, ranula is a simple retention-cyst, perhaps in the Blandin-Nuhn gland.

Simple puncture of the cyst rarely suffices for its permanent obliteration. Nor does it always answer to snip out a piece of the cyst wall; for, the cyst being emptied, the



Fig. 40. — Large Mouth. Pendulous growths near ear.*

* After J. H. Morgan; Trans. Med.-Chir. Soc., vol. xlv.

edges of the wound fall together and adhere, and before the fluid again begins to distend the sac, the cicatrix is strong enough to bear the strain of the increasing contents. It may be necessary in dealing with this often troublesome affection to daub the inside of the cyst with a strong carbolic lotion, or even to dissect out the cyst.

Dermoid cysts also occur in this region. They are ovoid, and bulge not only into the floor of the mouth, but also into the submaxillary region of the neck. Sometimes they are very large. They are the result of epiblastic inclusion during development, and they are best removed by dissection (if practicable) through the mouth.

Dermoid cysts bulging into the floor of the mouth are often mistaken for ranula. They are caused by distension of an unobliterated part of a branchial cleft with the secretion of its epithelial lining; this will be mucus if from the pharyngeal part, and sebaceous material if from the dermal part of the cleft.

Cystic lymphangioma in the floor of the mouth may be mistaken for ranula; indeed, it is often impossible to make at once a diagnosis. (A further account is given on page 130.) The sublingual region is often invaded by the cystic growth, which may find its way amongst the muscles until it bulges in the submaxillary region. The mass is painless, lobulated, and evidently composed of cysts of different sizes.

In one case the growth extended with great rapidity, the tongue being pushed up until mastication and deglutition were seriously impeded; saliva ran continuously from the mouth, and the child grew thin. The submaxillary and upper cervical region became invaded, and the condition looked desperate. Then the growth underwent spontaneous inflammation, subsiding without suppuration, until nothing remained of it but a local thickening. As is generally the case with large lymphangiomata, operative treatment for its removal was out of the question—moreover, it was superfluous. Prominent cysts should be punctured from time to time.

Epulis may be simple hypertrophy, or an outgrowth of granulation tissue caused by a decayed tooth. It may be scraped off with a sharp spoon. Myelo-sarcomatous growth

from the gum is of somewhat common occurrence, especially on the lower jaw. It is of a maroon colour, and is very apt to bleed. The use of the gouge may effect its complete removal. If necessary, a tooth may be extracted, or even a wedge-shaped piece of the alveolar process may have to be removed. (See page 118.)

Congenital hypertrophy of the gum.—Physiological activity may be so great that by the fifth week after birth many teeth may have appeared, a pink mass of gum-tissue protruding between the lips; subsequent exposure may render its surface skin-like. Repeated partial operations may be required to remove the disfigurement, and portions of the alveolar process may have to be resected, bleeding being checked by cauterisation. Though the hypertrophy is called *congenital*, it may not appear until the first teeth are being cut. It may be associated with intellectual deficiency, and with physical deformities of various kinds.

Nævus may affect the lips or the mouth as a flat or rounded mass. If bruised by food or by the teeth, it is apt to bleed; sometimes bleeding is spontaneous. It had better be attacked by the thermo-cautery, the adjacent tissues being protected by a fold of wet lint. A nævus in the mouth must certainly not be allowed to grow uninterfered with, or it may assume alarming proportions. I have recently operated upon a lady who, from her childhood, had been the subject of such a condition. The nævus was occupying the thickness of her cheek and lip, and protruded in a dangerous manner against her teeth. Its removal entailed a formidable operation, involving a splitting of the cheek, and the sacrifice of the buccinator, the facial nerve, and a considerable portion of each lip. The surgeons, who at various times had inspected it, had advised postponement of the inevitable operation. The nævus has now been completely removed, but the operation has been followed by very serious contractions.

Dentigerous cysts, follicular odontomes, may be associated with error in the development of a tooth. The tooth is properly formed, but remains imprisoned in the depths of its closed follicle. The cysts are rarely connected with the milk teeth, but in the case of a cyst containing a tooth of the

permanent set, the corresponding milk tooth lingers long in its place. If, then, there be a fluid swelling in the jaw, and a milk tooth be found long after the time at which it is usual for it to be shed, considerable help is obtained for the diagnosis; a certain tooth, moreover, is conspicuously absent from the permanent set. The cyst may be of the size of a marble, or even of a small egg; it may grow into the antrum, and take its place, as it were. The bone is expanded, and occasionally the swelling is painful. The fingers readily perceive that the tumour is a central expansion of bone, and that it contains fluid; the bony walls yield to pressure, and then return to shape with crepitation, like the doubling of stiff parchment. On puncture, thick fluid may be drawn off, and on a probe being introduced the missing tooth may be discovered. (*See page 118.*)

Treatment.—A portion of the cyst must be excised, and the tooth extracted, obliteration being accelerated by scraping and compression.

Lancing the gums is resorted to less frequently now that the diagnosis and treatment of children's diseases are better understood. Though speculative incision into the tooth-bearing gum of an infant who suffers from fretfulness, diarrhœa, or convulsions, is still occasionally employed, it is illogical to argue that, because the child improves after the operation, the lancet has afforded the relief. Infants habitually recover from these conditions without the gum being lanced, and dentition is a physiological process. These infantile troubles generally appear when weaning is taking place, and are often due to irritation by unsuitable food. (*See pp. 36 and 167.*)

A proper dietary, the administration of rhubarb and soda, castor oil, or bromide of potassium, will often do away with the supposed need for the lancet. Probably, in not a few cases in which the use of the lancet has been followed by immediate relief, the wound has been soundly healed again long before the suspected tooth has appeared.

But if speculative incisions be made into the gums of a child who is fretful because he is ill, rather than because the eruption of the teeth is obstructed, serious trouble may follow. If the child be weakly, the loss of blood may suffice to extinguish his chance of existence; whilst if the blood-vessels

be of impaired construction, or the blood thin and uncoagulable (hæmophilia), the bleeding may be arrested only after much anxiety and trouble. The wounds in the gum may be slow to heal, or may be involved in suppuration, or the infant may suck them, and so keep up exhausting hæmorrhage.

Bleeding after tooth extraction, which may be dependent on the hæmorrhagic diathesis (page 54), may best be treated by plugging the alveolar cavity with a morsel of dry lint. If the bleeding have been serious, the child should be constantly watched, lest oozing entail a fatal exhaustion. The thermo-cautery may, possibly, prove useful in checking the bleeding, but it should be used with discretion.

Thrush.—Small curd-like patches are found upon the buccal membrane in early infancy; they are due to the presence in the epithelium of a fungus, the *oidium albicans*. At first the fungus is easily detached, but when it has implicated the deep layers of the epithelium it is not so manageable. Beneath the flaky patch is an ulceration of the mucous membrane, and close around it is a hyperæmic ring. The flakes are of about the size of a pin's head; they may be scattered or confluent. Fresh crops or patches may occur throughout a series of days or weeks. The infant is restless and disinclined to suck, and he may suffer from sickness and diarrhœa.

Treatment.—The mouth should be swabbed out after each meal with boracic acid and glycerine lotion. Borax with honey forms an agreeable and useful application to the patches. An occasional dose of rhubarb and soda will be required. Attention must be given to the infant's diet, and greater care paid, in the way of cleanliness, to the feeding-bottle (page 11), spoon, or cup.

Follicular and aphthous stomatitis appear in the weakly child, especially after measles. Either condition may attack several children in a family at once, and it is often associated with swollen tonsils or "sore throat." Attention should be directed to the condition of the milk- and the water-supplies, and to the ventilation and drainage. The treatment just described will answer well.

Among school-children in France superficial sores and

fissures occur at the angles of the mouth, caused by parasites conveyed by unclean drinking vessels. The disease is called *perlèche*, and is best treated by alum washes.

Ulcerative stomatitis occurs in tuberculous children, and in those who have been badly fed and ill-cared-for; it is apt to follow measles, enteric or scarlet fever. The mucous membrane is swollen, spongy, and dusky. The inflammation may run on to ulceration or gangrene. The lining of the lips and cheek may be affected, the teeth being dirty and the breath offensive. The gums being destroyed, the fangs are laid bare, and the teeth may fall out or require extraction, and the alveolar process may necrose. The disease is rarely dependent upon the abuse of mercury; but formerly, when that drug was given very freely, ulcerative stomatitis, shedding of teeth, and maxillary necrosis, were often caused by it. Sometimes an attack of ulcerative stomatitis is the prelude to *cancrum oris*. (*See Plate I. Fig. 2.*) The inflammation is due to the presence of septic micro-organisms. (The subject of spongy gums is also alluded to on page 71.) Occasionally stomatitis is met with in children who have been brought up on an improper diet, but who manifest no other direct evidence of scurvy; and I have recently seen the disease in a marked form in a child who has been allowed constantly to suck an indiarubber teat. Ulcerations may also be the result of syphilis, when other evidence of congenital taint will be obtainable (page 89).

Treatment.—The mouth must be frequently swabbed out with a mild lotion of carbolic acid or with a saturated solution of boracic acid. Sloughs should be picked out, incrustations removed, and all carious teeth extracted. A dose of rhubarb and soda should be given, and afterwards quinine, iron, or cod-liver oil. Fresh milk, vegetables, fruit, and meat are required, but sweetstuff should be forbidden. Wine may possibly be needed.

Maxillary abscess and necrosis result from acute dental periostitis and alveolar abscess. The cheek grows swollen and red, tender and hard. The jaw is fixed by inflammatory deposit, a red line appearing in the œdematous gum around a discoloured or hollow tooth; sometimes, on gently pressing the cheek, ill-smelling pus wells up between tooth and gum.

The child suffers intensely, and may neither eat nor sleep. If the disease be allowed to run its course, an abscess opens by the angle of the jaw, or on the cheek or chin. Later, a sequestrum may be discovered, especially when, as usually happens, the lower jaw is implicated. Necrosis of the superior maxilla is rare, because its tissue is less dense than that of the lower jaw, and, therefore, better able to endure the effects of acute inflammation.

Treatment.—The diseased tooth must be extracted. Yet it sometimes happens that a dental surgeon refuses to extract a condemned tooth because of the acuteness of the local disturbance. He injudiciously advises delay until the inflammation has quieted down. The tooth ought straightway to be extracted; otherwise necrosis may extend, and suffering be needlessly prolonged. Fomentations and poulticings are out of place, but an elevator working from the outer side of the tooth affords prompt relief. If abscess have formed beneath the gum, and no individual tooth appear to be the cause of it, it will be well to incise the boggy tissue, and to wait before extracting a tooth. Any attempt to open the abscess should not degenerate into mere scarification, but the lancet should be thrust boldly down into the suspicious area, the child being under chloroform.

In the removal of sequestra, the less the wounding of the skin, and the less the disturbance of the young teeth, the better. Whether a sequestrum be removed through the mouth, or by way of a sinus which opens near the angle of the jaw, must be determined by the nature of the case.

Both in the upper and lower jaw extensive necrosis may be caused by the local effects of the septic micro-organisms which flourish in the wake of exanthematous fevers. While the process of exfoliation is taking place, strength must be kept up by tonics. Sanitas wash and spray must be used to correct the fœtor of the breath, and sequestra must be removed as soon as possible.

Cancrum oris is an acute inflammatory affection of the cheek and lips, or even of the jaws, which rapidly runs on to gangrene. It is not a common or a painful disease. It selects victims from wretched children, generally under six years of age, who have received but little attention in the

most important matters relating to hygiene. It is specially apt to affect the child whose physical condition has been exhausted by measles or some such ailment, and is due to a local cultivation in the tissues of septic micro-organisms which leads to thrombosis of the vessels.

The disease may begin as an innocent-looking swelling of the cheek or lip, the mucous membrane being the seat of a superficial ulceration; occasionally it follows ulcerative stomatitis (page 192); the mucous membrane may be grey and sloughing, and covered with a foul exudation. The swollen tissues are œdematous and hard, and the skin is at first reddish. The breath is fœtid, and there is profuse ptyalism. When the cheek is brawny and thick, the interior of the mouth cannot be inspected without causing distress. The ulceration extends rapidly; the gums become gangrenous, and the adjacent teeth loosen. Extensive necrosis may result, and the mouth and pharynx may be laid open through the cheek.

The phagedænic ulceration spreads beneath the skin, so that between the floor of the ulcer and the skin there is a groove in which the destructive process is advancing most rapidly. The margin of the overhanging skin may be blue and gangrenous. In a recent case the noma had begun (after measles) in the parotid region, and had invaded the pinna of the ear and the cheek. In the floor of the ulcer the ramifications of the facial nerve were exposed.

The first indication for alarm may be a dusky or black spot, due to septic coagulation of blood in the distended capillaries, and to the escape of coloured corpuscles. Though the child may be unable to eat, or to drink even fluids, "it is not a rare thing to find patients in whom gangrene has committed the most frightful ravages, who neither suffer pain nor have suffered it, who maintain a good appetite, and continue cheerful" (Dr. Bristowe).

The **prognosis** is highly unfavourable. The child may succumb to rapid exhaustion, or, lingering awhile, may sink from diarrhœa, septic pneumonia, or general blood-poisoning. And though he may struggle through the attack, he cannot escape disfigurement. The greater the sloughing, the greater,

of course, the cicatrisation and contraction, the jaw, perhaps, being permanently fixed.

Treatment.—The *local remedies* comprise the free application of strong nitric or carbolic acid, care being taken that the tissues be first made clean and dry, and that the gangrenous material is first cut away. The harmful bacilli are beyond this gangrenous mass, and they cannot be reached by the acid until the knife has been efficiently used. The operation should be performed under chloroform. The foul ulcer may be surrounded with a thick layer of vaseline, and its surface covered with carbolic acid crystals, the caustic fluid being carefully dried up as the acid deliquesces. The crystals may also be packed beneath the overhanging margin of the sore. Or the infected tissues may be effectually and precisely destroyed by the thermo-cautery at a white heat. This procedure is, I think, generally preferable to that of excising the gangrenous tissue with the scalpel.

Food should be administered at short and regular intervals, and if the child cannot swallow, he should be fed by a flexible catheter introduced into the stomach through a nostril (*See page 50.*) Nutrient enemata may be administered. Peptonised beef, milk, eggs, and beef-tea, with a liberal allowance of brandy, are needed. Quinine, iron, and mineral acids are useful medicines, and opium in small and repeated doses is also of much service.

No attempt should be made to improve the disfigurement after the sloughing until the child has acquired vigorous health, and the tissues are perfectly sound.

Wandering rash.—The dorsal aspect of the tongue of a little child is liable to a slight inflammatory affection of the mucous membrane, of which the worst symptom is usually a slight itching. It is not of syphilitic origin; and it differs from a mucous patch in being flat and red—not grey. It “wanders” in circular patches with whitened borders, quickly changing its situation and its shape. Its pathology is as obscure as its treatment is obstinate, and fortunately it passes away in due course as quietly as it came on, and it apparently leaves the tongue none the worse for its visit. Though it resembles a “ringworm,” careful microscopic examination has failed to detect a fungus in it.

Tongue-tie.—Sometimes the pale fibro-membranous band beneath the tongue is tight enough only to check extreme protrusion, whilst at others the attachment is so complete that the tip of the tongue can hardly be protruded beyond the incisor teeth. In the latter case there may be impediment to sucking.

The *operation* is very simple and almost painless. The infant's body and arms are steadied between the nurse's knees, the surgeon hooks the tips of the first and second fingers of the left hand under the tongue, one on either side of the frænum, and with a pair of scissors just snips the edge of the little cord; he tears through the rest of the frænum, and all is done. No anæsthetic is required, and there is no after-treatment. There is no hæmorrhage of importance, for the ranine artery, as it runs along the under surface of the tongue, is held up out of harm's way by the fingers. The snip in the frænum should be just enough to start the subsequent tearing. If the incision be made too freely, or the tongue torn up from the floor of the mouth with unnecessary vigour, it may be so much loosened that the infant can suck it backwards, and even bring it within the grasp of the constrictors. The monthly nurse—however high her qualification—should never presume to operate upon a short frænum linguæ.

Tongue-swallowing is a troublesome condition; it may be necessary to have the child constantly watched, lest suffocation ensue. Tracheotomy may even be demanded as a precautionary measure, as the condition is apt to cause fatal dyspnœa. For the purpose of keeping the tongue in place, a plastic operation on the floor of the mouth, with the view of establishing sublingual adhesions, may be advisable—in fact, producing an artificial tongue-tie. The condition is the result of a congenitally long frænum, or of operation for a tight one having been too vigorously performed. Children have sometimes died from swallowing the tongue shortly after division of the frænum. If after operation suffocation be threatened, the nurse should promptly thrust her finger into the pharynx and hook up the tongue.

Thumb-sucking is a habit of which a child should be broken as quickly as possible, or else it may be persisted in

for years. In early childhood the jaws are soft and pliable, and if the thumb be constantly pressed at the back of the intermaxillary bone, and, what is more, forcibly thrust against it in long-continued and energetic sucking, the alveolar process and the incisor teeth will be driven forwards, the palatine arch rendered high and narrow, and the inferior maxilla repressed. Equally harmful is use of the so-called "comforter," which so many infants are allowed constantly to suck—a large india-rubber teat with a bone flange to prevent its being swallowed. I condemn it altogether. It is a septic thing, and I have known it cause ulceration of the gum.

Painting the thumb with aloes or other nauseous drugs, and even tying up the hands in thick gloves, may fail to prevent the child from putting the thumb into the mouth; but a straight tubular arm-splint, applied around the elbow, will afford an effectual mechanical hindrance.

Hypertrophy of the tongue; macroglossia, is a congenital and rare disease, the result, not of muscular hypertrophy, but of dilatation of the lymph-spaces of the mucous membrane. The tongue is too large for the mouth, and hangs out between the lips or over the chin, causing irregular growth of the teeth and of the lower jaw (Fig. 41). The mouth being thus kept open, saliva constantly trickles down, though the tongue itself is dried by the exposure. Where its surface comes in contact with the teeth, ulceration occurs. Macroglossia is often found in the cretin, and may be associated with hypertrophy of the connective tissue lymph-spaces in other parts of the body, especially the root of the neck, as referred to in connection with "sporadic cretinism" (p. 172). Barker, in an excellent account of macroglossia, gives numerous references. Out of one hundred and thirteen cases the enlargement was congenital in at least sixty. The tongue, being large, is constantly in the way of the teeth; the hypertrophy might first be detected on the tongue being bitten; its enlargement might then be ascribed to injury.

Treatment.—If the tongue be so large as to protrude permanently from between the lips, compression by adhesive rubber plaster may be tried. If more heroic measures be required, a V-shaped piece might be removed from its

central part, the raw surfaces being brought together by wire sutures, passed so as to include bleeding vessels. If this failed, it might be necessary to excise the tongue; thus local irritation would be removed, and due development of the maxilla and the eruption of teeth ensured.

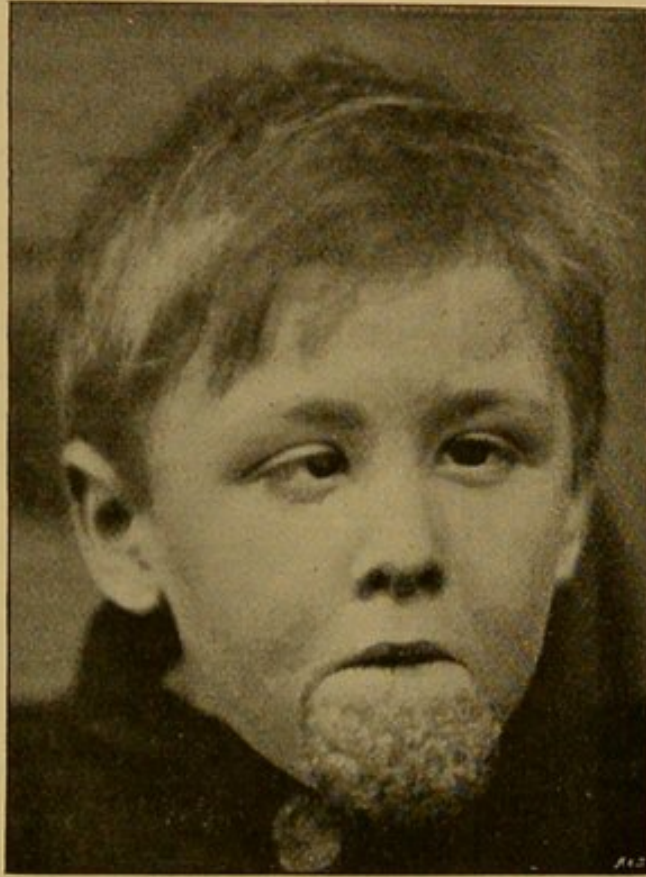


Fig. 41.—Macroglossia. (From a Photograph lent by Dr. Leah of Plymouth.)

Macrocheilia is an unsightly hypertrophy of the lips due to dilatation of the lymph spaces; the adjacent parts of the cheeks may also be affected, and the veins may be enlarged after the manner of a *nævus*.

Acute glossitis causes the tongue rapidly to swell; the impressions of the teeth are found around its sides and tip. If the condition be associated with extreme dyspnoea, incisions may be required along the dorsal aspect. Possibly, even, tracheotomy may be demanded, especially if the swelling be accompanied with œdema of the mucous membrane about the epiglottis and larynx. The child needs constant watching. An astringent mouth-wash, and free purgation are required.

Ulceration of the tongue may be found near the frænum, from the tongue coming in frequent and violent contact with the sharp edge of the lower central incisor teeth, during an attack of whooping cough. It is more apt to occur in little children, in whom the edge of these teeth is still serrated. The treatment should be directed chiefly to the relief of the spasmodic cough, jagged teeth being attended to.

Cysts in the tongue, if superficial, are easily diagnosed, and, if deeply placed, puncture establishes their identity. Cysts may also occur in the substance of the lip. They may be incised and scraped, or, if need be, dissected out.

Dermoid cysts occurring between the genio-hyo-glossi are caused by distension of the unobliterated *duct of His*, which is a passage in the embryo—the *thyro-glossal duct*—descending in the middle line from the pharynx, and traversing the base of the tongue from the foramen cæcum to the thyroid isthmus (Fig. 42). Subsequently the developing hyoid bone cuts it into two pieces. The upper piece is called the lingual duct, and from the lower piece—the thyroid duct—the thyroid body is developed. The accumulation of epithelium and sebaceous matter in the unobliterated upper or lower piece of the thyro-glossal duct constitutes a lingual, or a thyroid dermoid. Tumours formed upon the type of thyroid gland tissue are apt to grow from the glossal as well as from the thyroid part of the duct, and they may attain a great size. When at the side, they are probably

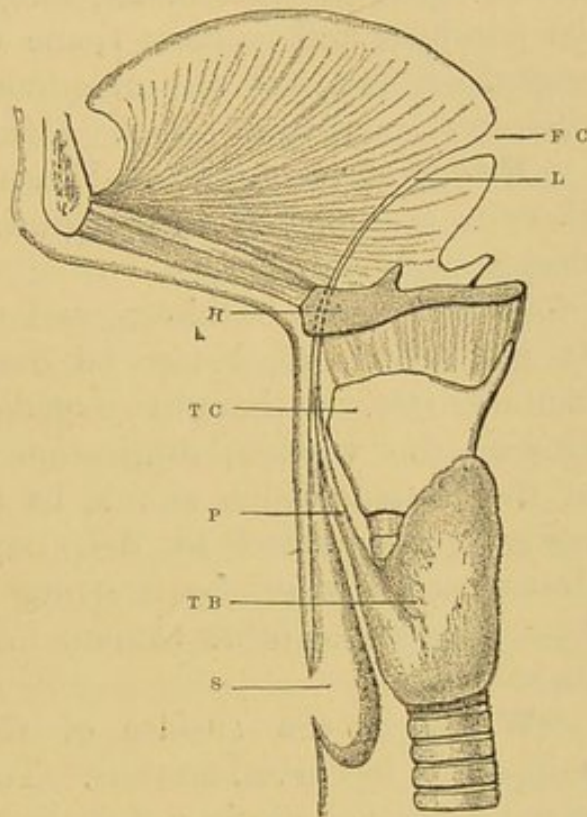


Fig. 42.—H, Hyoid bone; L, Lingual part of duct of His; P, Pyramidal lobe; F C, Foramen cæcum; S, Thyroid part of duct of His, dilated into a sinus and opening on to median surface of neck; T B, Thyroid body; T C, Thyroid cartilage. (After C. F. Marshall.)

the result of imperfect closure of the branchial cleft of the mouth or cheek. Some time since, a lingual dermoid which was discharging serum in the submental region of a boy was at first treated by me as a broken-down gland. Eventually I found that on introducing a fine probe into the opening, it ran up to the root of the tongue, and, all around it, could be felt firm and painless tissue which was evidently a well-organised, and not an inflammatory tissue. Ultimately I dissected it out from below. (*Med. Press*, April, 1891.)

Nævus of the tongue.—When it affects the tongue alone, there is no difficulty in recognising its nature, unless it is deeply situated.

If the nævus be bitten, serious bleeding is apt to occur. It had, therefore, better be dealt with promptly by the cautery. Or, if thought expedient, a V-shaped piece including the vascular infiltration may be excised, the edges of the wound, which should be made clear of the growth, being approximated by deep sutures. If the tongue be drawn well forward by a strong suture passed through its base, a nævus or other tumour may readily be dissected from its substance.

Warts on the surface of the tongue had better be snipped off by curved scissors. The application of escharotics is not a satisfactory way of dealing with them (page 144).

Bite of tongue.—If the bite be superficial and without hæmorrhage, it may be left alone; but if it be deep, or be associated with hæmorrhage, it should be closed by sutures.

Relaxed throat may be an association of chronic pharyngitis and tonsillitis, the result of cold or of imperfect sanitation. It is apt to be caused by a leakage of coal-gas. If chronic ulceration of fauces persist after the breaking of follicular abscess, the sore may be touched with lunar caustic, or with the point of the thermo-cautery. Every case of follicular inflammation must for a time be regarded with suspicion. Little spots sometimes run together to form false membrane, follicular pharyngitis being thus the precursor of diphtheria. (*See pp. 18 and 31.*)

Tonsillitis in relation to febrile attacks.—A child is suffering from febrile disturbance with no distinctive symptoms; he complains, perhaps, of headache, and he is

obviously out of sorts. Unless an inspection of the throat be made, the probability is that the *malaise* may be called "febricula" (whatever that is), or it may be ascribed to teething. In every case of obscure illness the tonsils should be examined as a routine practice. They may be found red and swollen, although no complaints have been made of the throat. The attack may be associated with languor and loss of appetite, with vomiting or even convulsions. The differential diagnosis is from diphtheria (page 31); judgment for a time may be held in suspense. Purgation and tonics may suffice, in the course of a day or two, to establish convalescence. If the tonsils be enlarged, it may be expedient to amputate them ere the child be again similarly attacked, for tonsillitis is a recurrent disease. The fact of their being inflamed is no bar to their being amputated.

Acute tonsillitis comes on suddenly, often as the result of exposure to wet or cold, or it may occur in an epidemic form, or in isolated cases, without such exposure. On inspection, the tonsils are found red and swollen, the child complaining of pains in the neck and pain on swallowing. The temperature runs up several degrees, and the child may have convulsions, shiverings, or even delirium. The thick, pasty mucus which adheres to the tonsils differs from the membrane of diphtheria in that it can be swabbed off; moreover, the redness is not in patches. Still, in some cases the diagnosis from diphtheria cannot be promptly made. The absence of redness of the palate and pharynx, and of the red spots upon the tongue, and the absence of rash upon the surface of the body, may distinguish this catarrhal tonsillitis from the throat of scarlet fever, but in not a few instances such differentiation is for a while impossible, and the child should certainly be isolated.

Treatment.—The child should be kept in bed and fed on slops. The bowels should be cleared by a dose of calomel, grey powder, or rhubarb and soda. Salicylate of soda should be given in small and frequently repeated doses, and the neck should be surrounded by hot, wet compresses. The disease is due to the presence of septic germs, and may be greatly relieved by swabbing with chlorine water. Suspecting supuration, the surgeon should make exploratory punctures

of the tonsils, under chloroform if need be. It is dangerous to leave a tonsillar abscess to spontaneous evacuation. (See page 262.)

Hypertrophied tonsils are suggestive of tuberculosis, but the condition is often met with in children who neither by heredity nor acquisition have the least trace of that disease. The tonsil is, indeed, a collection of lymphoid tissue, and, like the lymphatic glands generally, is a favourable seat for tuberculosis. The child with enlarged tonsils wears a vacant and characteristic expression. The mouth is constantly open (on account of the air being unable to enter the lungs through the obstructed naso-pharyngeal cavity), and thus the face becomes elongated; from want of use also, the nostrils may fail to be developed. The enlargement is due to hyperplasia of the lymphoid tissue in the gland, and may be associated with growths of a similar nature in the pharynx and also with enlarged cervical glands. Enlarged tonsils are not at all times equally conspicuous. A casual inspection of the throat may have shown them to be greatly hypertrophied, and subsequently, when the surgeon is looking at them with a view to operation, they may be scarcely visible. The explanation of this is that the child has probably become alarmed, and that spasmodic contraction of the stylo-pharyngei is drawing the tonsils outwards, and hiding them behind the anterior pillars of the fauces.

Breathing is harsh and noisy, and the voice thick and peculiar, the pharyngeal cavity no longer acting as a sounding-board. Deglutition is impeded, and when both tonsils are enlarged, only fluid food can pass the isthmus. An attack of catarrhal inflammation of the mucous membrane brings the masses into actual contact, and renders immediate amputation necessary.

Deafness is often associated with tonsillar hypertrophy, not from an actual blocking of the opening of the Eustachian tube, but rather from a chronic thickening of the lining membrane which is continuous with that of the tonsil. The hearing does not always improve immediately after the removal of the tonsillar masses. Chronic enlargement of the tonsils is very often associated with post-nasal growths (page 206), the presence or absence of which can be easily

settled by gently passing the tip of the finger round the back of the soft palate. It often gives rise to pigeon-breast, and to enlargement of the cervical lymphatic glands.

The *treatment* consists in the administration of cod-liver oil and iron; at the same time astringent gargles should be used, or the tonsils brushed with glycerine and alum three times a day. This palliative treatment should be given a fair trial; it sometimes succeeds, but too much must not be expected from it.

The child should be put on a wholesome diet, and, if practicable, sent to a place where the air is fresh. He should be warmly dressed, but the neck should not be encircled with a woollen comforter.

Though the angle of the jaw marks the situation of the tonsil within, there is such a mass of intervening tissues that the application to the skin of tincture of iodine, or any other drug, is useless. If left to itself, the enlargement may diminish as puberty approaches, though it may not entirely disappear. But if the hypertrophy be considerable, the medical attendant must not await the chance of an ultimate, though distant, subsidence.

Operation should be undertaken if, after fair trial of general measures, no equivalent improvement be manifest. If, when the child is first seen, the mass be hard and painless, little improvement can be anticipated. In the case of sickly children, the operation may sometimes be delayed until the health has been improved by medicine and diet; but, generally, the sooner amputation is performed the better.

There is a widespread superstition against amputation of enlarged tonsils; parents are apprehensive lest the voice should be spoiled thereby, or the sexual function impaired. The fear is absolutely groundless.

Amputation of the tonsil is not a very painful operation, but a timid child should not be submitted to it except under the influence of an anæsthetic. He should be laid supine with his head hanging back over the end of the table, or else sitting in a chair opposite a good light, his arms and chest secured with a towel. When he is under the influence of the anæsthetic, the assistant who has been administering it can

take charge of the gag and the tongue-depressor. The masses may be removed by either the guillotine, or by the straight blunt-ended bistoury and vulsellum. If the guillotine be used, it should be the simple one here figured (Fig. 43). I prefer the straight, blunt-ended bistoury and vulsellum, amputating first the right tonsil with my left hand, and then the left with my right hand. There should be a vulsellum for each tonsil, for trouble and delay may be experienced in disengaging the teeth of the forceps from the amputated mass. Too little may be removed unless the operator pull the tonsil towards the middle of the fauces during the section. The internal carotid artery is in no danger. If the boy be plucky,



Fig. 43.—Tonsil Guillotine. (*The handle is not shown.*)

the operation may be done after giving the tonsils a painting with a five per cent. solution of cocaine, and after three minutes a second painting. When, three minutes later, the tonsils are amputated, he will not feel much. He should be sitting or standing in front of a good light. An assistant should help with a tongue-depressor, but a gag is not needed.

Directly after the operation, the child should be laid flat upon the side, with the face turned downwards, so that the oozing blood may escape by the mouth. If the half-conscious patient be allowed to occupy a sitting or a supine position, the blood may possibly find its way into the larynx. After the return of consciousness the patient may suck ice, and be fed on an unirritating fluid diet. He should be kept indoors for a day or two, a boracic acid spray being used every few hours.

If serious hæmorrhage complicate the operation, a piece of lint dipped in powdered alum should be pressed against the bleeding surface, and, if necessary, the bleeding surface may be touched with the point of the forceps, which has been heated in the fire, or by some handy cautery. For amputation of the tonsil, neither the electric nor the Paquelin cautery is a suitable instrument. Of enucleation of the entire tonsil I

have no experience. Enlargement of the tonsil after efficient amputation rarely happens. But if too small a slice of the mass be taken away, a second and more thorough operation will probably be demanded.

If the *uvula be long or œdematous*, it is advisable to remove a portion of it at the time the tonsils are operated upon. A long uvula may, by keeping up a constant tickling about the back of the tongue, be the cause of spasmodic cough and of vomiting.

The uvula should always be examined when a child suffers from a cough which is unassociated with thoracic symptoms. Such a cough may come on after drinking anything warm, or may be at its worst when the child lies down. Painting the throat with alum lotion may check the cough for a time, but the best treatment is amputation of the uvula by long toothed forceps and scissors. The scissors may have a crescentic notch in each cutting edge, so that the uvula cannot escape section. The uvula should be pulled well forwards before being cut.

Post-pharyngeal abscess is considered in connection with spinal caries (page 261), to which condition it is frequently due. It may also be the result of inflammation in one of the lymphatic glands, or in the connective tissue at the front of the cervical vertebræ, and especially so after the occurrence of scarlet fever or diphtheria. When an infant or young child refuses food and shows signs of dyspnœa, the attendant must not content himself with the mere inspection of the throat, but must make a careful exploration of the post-pharyngeal region by the finger, as the abscess is sometimes situated below the level of the tongue. It not infrequently happens that the child has suffered much ere the cause has been detected.

Tuberculous disease of the naso-pharyngeal cavity is usually associated with other manifestations of the diathesis (page 56). The disease begins with swelling and suppuration in the follicular glands; abscesses burst, and the mucous discharge becomes purulent and stained with blood. Ulcerations being formed, the surface of the membrane becomes honeycombed or excavated. The ulcers may have a steep or undermined margin, and a greyish or bleeding floor. Healing

is associated with cicatrisation and contraction ; thus the soft palate and other mucous folds may be dragged from their normal position and permanently fixed. The tonsils may also be implicated in the inflammatory process.

If the ulcers be not hopelessly beyond the reach of practical surgery, they may be scraped clean, and subjected to insufflation of boracic powder. The prognosis is extremely unfavourable.

Adenoid vegetations in the naso-pharyngeal cavity are very often associated with enlargement of the tonsils. They are the result of hypertrophy of the adenoid tissue which abounds in that neighbourhood, and especially of the so-called pharyngeal tonsil, which is situated between the Eustachian tubes. When the adenoids are abundant, a granular appearance is noticeable on the pharyngeal wall, the result of overgrowth of lymphoid tissue. The affection may be detected even in infancy, and should always be examined for, if an infant be the subject of constant snuffing or chronic nasal catarrh. Thus, "snuffles" are not always caused by hereditary syphilis. The child has frequent naso-pharyngeal catarrh, with running from the nose. He is pale and poor-looking ; he cannot breathe freely through the naso-pharynx, so his mouth remains open, and his nostrils are small and flat. Like the subject of enlarged tonsils, he has a vacant expression, and he generally snores at night. His voice is "dead," or "nasal," and, on account of the blocking, or catarrh of the Eustachian tube, he is dull of hearing ; sometimes he is quite deaf or stupid. If the vegetations have long existed, there may be obvious deformity of the chest. And in a considerable proportion of children with serious nasal obstruction inguinal hernia is co-existent. Sometimes the growths are associated with elongation of the uvula, and with attacks of asthmatic breathing and serious dyspnoea. By hooking the end of the index-finger round the soft palate the obstruction of the posterior nares by soft, friable tissue is easily made out. No mirror is needed ; the finger tells everything, and that unmistakably. (For drawing of adenoids, *see* Frontispiece.)

Though this is comparatively a newly discovered disease, it has probably existed as long as tuberculosis itself. In the unenlightened days many children must have got well

without operation. Even at the present time it by no means follows that because a child has "vegetations" he must forthwith be operated on. The case is very similar to one of enlarged tonsils, where, we know, time, patience, and attention to general measures often obviate the necessity of operation. When, however, the obstruction is serious, the sooner that it is effectually dealt with the better; for it is of supreme importance that the air-way be free. Meyer gave it as an axiom that a deafish child who breathes through the mouth, and has a thin, compressed nose, is affected with vegetations. Experience confirms this statement. If the passage is found greatly choked, the sooner that it is cleared out the better.

Speaking from considerable experience of this disease, I must acknowledge Meyer's discovery of it as an extremely important one.

It is best to operate with the child placed upon a dressing-table, or upon a low chest of drawers. The head should be securely covered by a towel, arranged *à la Turque*, or by a waterproof bathing-cap, so as to prevent the blood clotting in the hair. The arms and chest should be enshrouded in a bath-towel, and the floor should be covered with a dust-sheet, or with one or two newspapers opened out. Lastly, a basin should be placed upon the newspapers just beneath the end of the table. A toilet-pail is still better, as the blood falling into it does not splash over. For preventing the child from closing his teeth upon the operator's finger, a small Mason's gag answers well. A capable anæsthetist takes charge of the gag, but one of less skill will have as much as he can manage to do in looking after the proper administration of the chloroform. In that case an assistant will be wanted.

The position of the child during operation must be such that the blood, and the fragments detached from the lacerated growths, cannot fall into the larynx. I prefer to have the child lying supine, with the shoulders raised over a firm pillow, and with the head thrown well back and hanging over the end of the table. This is the position in which I have for some years been accustomed to place children when operating for cleft-palate. It answers admirably for both operations, as the blood thus falls down

into the pharyngeal dome and wells up through the anterior nares, leaving the lower air-way free and open. Whilst the vegetations are being scraped away with the nail of the left fore-finger, and with a slender Meyer's ring-knife (Fig. 44), which is passed along the nasal floor, the head is steadied and supported by the assistant. I do not think that this lowered position of the head adds materially to the amount of bleeding.

Every patient upon whom I have operated has been under the influence of chloroform. However pluckily a child may screw up his courage to the sticking-point, it is more than apt to give way, if not at the first scrape, at any rate at the feeling of suffocation, or at the sight of the blood, and then the operation would have to be either cruelly or imperfectly done. The child should not be too deeply narcotised. For when the laryngeal reflex is abolished, no effort can be



Fig. 44.—Meyer's Ring-knife for the Removal of Adenoids.

made by the child to ward off impending suffocation. In these cases it is far better to give a slightly insufficient amount of chloroform than to have the child "fully under." All that is needed is to know that the child is feeling no pain, and yet is sufficiently quiet for the surgeon. To go farther than this with the narcosis is to court danger.

As soon as the operation is completed, the child should be placed comfortably on the table, in the semi-prone position, with the head resting on a pillow, and with a soap-dish kept beneath the mouth and nose to catch the blood and saliva which drain down into it. Heed should be given lest, in the hurry to get the child into a favourable position, the head is twisted round independently of the trunk. Neither sponging nor syringing is needed. The bleeding, which during the operation is very free, quickly ceases. As the child becomes sensible, he may be got to clear his nares of blood and his lungs of chloroform by vigorously blowing his nose. In a few days' time he should be taught to breathe through his nose. Frequently the good effects of the operation are not noticed for some weeks afterwards.

Should alarming hæmorrhage occur, it will be best treated by squeezing dry a large piece of sponge, seizing it in a holder or forceps, and thrusting it up into the naso-pharynx.

Deviation of the septum nasi to one side may be so marked as to cause serious obstruction of the nostril. By the use of a small pair of sequestrum forceps (the blades of which are enclosed in pieces of drainage-tube), the septum must be deflected to the middle line, and even beyond it; and it should be bent over again from time to time as may be necessary. The nostril should be kept open by a piece of stiff drainage-tube. If the septum were too large, a narrow, triangular piece might be cut out of it by a tenotomy knife, the muco-perichondrium having been first raised from it. Deviation must not be mistaken for abscess of the septum; a probe passed up reveals a corresponding depression on the opposite side of the septum. If the triangular cartilage protrude below the level of the fleshy septum, having been denuded of muco-perichondrium, it may be cut off with the scissors, and the tissues adjusted by fine sutures.

Epistaxis.—Bleeding from the nose is often a sign of constitutional weakness, and a child who has suffered from it once is liable to recurrence of the trouble. Sometimes it is the ruddy child who is attacked, in which case the bleeding might possibly come as a relief to over-filled vessels in the head and neck. The hæmorrhage may occur after excitement in play, or without apparent cause, and, passing off, may leave the subject but little the worse. Often it is the result of injury. When the bleeding is associated with the hæmorrhagic diathesis (page 54), the effect may be very serious, if not fatal. The bleeding may be secondary to malignant polypus; to tuberculous or syphilitic ulceration, to whooping cough, or to disease of the heart, lung, or liver.

Treatment.—The child must be kept sitting or standing; if he become faint, the head should still be slightly above the level of the rest of the body; it is said that the arms should be raised above the head. He must not be allowed to disturb the formation of a coagulum by blowing the nose; and for a while he should not be allowed even to breathe through the nose, the nostrils being firmly compressed by the finger

and thumb. Long-continued pressure in this way may have an excellent effect, especially when, as is apt to be the case, the bleeding is from an ulcerated spot upon the septum.

The vaso-motor nerves may be stimulated by holding a cold stone, or large door-key, or a piece of ice, to the nape of the neck, and cold water may be applied to the forehead and nose. The nostril may be irrigated with water as hot as can be borne, and after this, ice-cold water may be used. If the hæmorrhage be continuous and alarming, the posterior and anterior nares must be plugged with a piece of sponge which has been dipped in tincture of iron, and squeezed dry, or, better still, by strips of amadou. The plugging may be effected by the aid of a piece of bent wire. As a matter of fact, however, I have never met with a case requiring this operation.

Foreign bodies in the nostril.—Children are apt to push a button, bean, fruit-stone, or similar object, into the anterior nares. Subsequently, in an attempt to extract it, it may be thrust far up. If it cannot be seen, the boy's statement of his exploit is apt to be disregarded; but if a nostril have become suddenly blocked, there would be evidence of the statement being correct. After a time the nose becomes tender, the nostril swells, and a muco-purulent discharge appears; unilateral ozæna is unlikely to be of constitutional origin.

Possibly a thorough inspection of the nostril can be obtained only on the administration of chloroform, and after preliminary syringing. On the introduction of a speculum, the object may be seen and extracted. If the mucous membrane be much swollen, or the object cannot be seen, its presence may be determined by the use of the probe. Removal may be effected by a pair of slender-bladed forceps, or by a curette extemporised out of a hair-pin slightly bent at its closed end. Its continued presence would give rise to ulceration, and perhaps to necrosis. But if it were wedged high in the nostril and resisted every attempt at extraction, it might be advisable to push it backwards into the pharynx. If, after this interference, the child can blow down that nostril, the obstruction has evidently been displaced. Dr. Slaton's simple method of dislodging the body

is by spreading a handkerchief over the child's face, compressing with the finger the unaffected nostril, placing the mouth over the child's mouth, and giving a few strong puffs.

Ozæna (ὄζειν, to smell).—An ill-smelling discharge from the nostrils may be the result of traumatic, syphilitic (p. 89), or chronic tuberculous ulceration; or it may be caused by the irritation of a foreign body. In every case a complete examination should be made with speculum and probe, and, before using the former, the nostrils should be cleansed with irrigations of warm sanitas-water. The fluid thrown up one nostril should flow out by the other, the child breathing by the open mouth, the palato-pharyngei and the soft palate excluding the fluid from the gullet and mouth. In one instance, obstinate ozæna and enlarged cervical glands were due to the irritation of sewer-gas. Four children in the family were affected. The source of the foul air was a wide opening in the main drain close by. As soon as any of the ailing children were sent into another part of the country, all symptoms disappeared, whilst a relapse occurred on the return home; this happened on several occasions (p. 103).

Sometimes an apparently innocent nasal discharge is of a diphtheritic nature, and is followed by paralysis. (See Chap. II.)

Sarcoma of the nasal fossa is of rare occurrence. A case has recently been under supervision in which the new growth proceeded from the ethmoid bone, encroaching upwards upon the base of the brain, and extending downwards into the nasal fossæ. The growth was associated with frequent attacks of bleeding. It is only in the early days of the disease that operation can be expected to afford relief. (For meningocele of nasal fossa, see page 174.)

Mucous polypi—which are rare in childhood—should be treated by insufflation of finely-powdered alum and tannin, and, if necessary, by evulsion. Thickening of the mucous membrane over the inferior turbinated bone may be mistaken for polypus. But in the former condition the tumour is fixed, non-pedunculated, and usually of a bright red colour. A mucous polypus is grey, stalked, movable, and perhaps seen with difficulty. The projection from the turbinated bone may require removal by scissors. Bernard

Pitts tells of a case in which a nasal meningocele in a child was unfortunately taken for, and treated as, a simple polypus.

Impacted food.—Food which is being “bolted” may become impacted in the pharynx; the child chokes and probably the food is ejected. But if it be so tightly wedged as not to be so expelled, a person of sense would thrust in the fingers and try to dislodge it. If, though the laryngeal aperture were not completely plugged, the accident were associated with extreme dyspnœa, and the fingers passed beyond the epiglottis could not detect an impacted mass, a probang should be passed, as it is probable that the trachea is being compressed by the mass impacted in the œsophagus.

Foreign bodies swallowed.—Parents are apt to conclude that because a small object with which a child had been recently playing is lost to sight, it must have been swallowed. If a careful and thorough search be made of dress, bed, or carpet, anxiety may often be allayed by the discovery of the missing object. I was once called to a child who, as I was assured, had swallowed a large jet earring with a tassel fringe. He showed no symptoms, and the earring was eventually discovered hanging to the mother’s dress. In the case of a foreign body swallowed or impacted, emetics had better not be used. The Röntgen rays will in certain cases clear up doubt.

Foreign body in œsophagus.—If it be supposed that a foreign body is lodged in the œsophagus, that admirable instrument known as the chimney-sweep’s brush should be used. It may be oiled and passed gently down to the stomach; then, by a little manipulation of the handle, a disk-like network of stiff bristles is made to stand out horizontally. In its ascent it closely sweeps the mucous membrane, and it is almost certain to thrust down or withdraw anything lodged in the canal. Being very flexible, it is not likely to make a false passage. Cooper Forster tells of the end of a probang having been found in the posterior mediastinum! All instruments should be carefully inspected and tested before being used. The abrasion made by a piece of bone in its descent may give rise to the sensation that the obstruction persists; the withdrawal of the open brush

gives assurance to the contrary. Experience with œsophageal forceps and coin-catchers is not generally so satisfactory as that with the chimney-sweep's brush. A thorough examination should be made under chloroform, one finger being thrust down the gullet whilst the fingers of the other hand explore along the neck. In certain cases the X rays may prove useful. If an *angular body* were tightly jammed in the œsophagus, prompt *œsophagotomy* should be done.

For a **foreign body in the stomach**, porridge, pea-soup, or bread-and-milk should be given, after which an emetic may be administered, the surgeon being ready to perform tracheotomy. If it does not appear with the vomit, the hope then would be that it might pass *per anum*. In the meanwhile the diet should be such as is calculated to form a full, pultaceous mass, in which the object might safely descend. Purgatives should not be given; it might even be advisable to delay the action of the bowel by small quantities of opium. The gastric juice has no solvent action upon coins and such-like bodies.

It is surprising how easily, in this way, comparatively large objects may pass through the ileo-cæcal valve and the anus of a child. I have known a small button-hook, which was fortunately closed at the time, pass *per anum* without the least discomfort. The fæces should be carefully searched by breaking them up in a vessel with quantities of water, and then gently pouring off the fluid part. Sooner or later the object will be discovered in the sediment at the bottom of the vessel. The child need not know of the continuance of the search, or of the anxiety.

Mumps is an infectious inflammation of the parotid gland; it is often epidemic, and one attack usually insures immunity for the future. The submaxillary and sublingual glands may be affected as well as the parotid. The infective material is probably conveyed by the breath, and contagion may be spread even before the swelling of the gland has been manifested, and for an indefinite number of days, possibly for some weeks, after its disappearance. If an outbreak occur in a school, many children may be attacked, notwithstanding the prompt adoption of precautionary isolation. Infants are rarely affected, even in a severe outbreak. The period

of *incubation* is about three weeks, and the duration of the disease about two weeks more. After that, the patient should be kept for at least two weeks out of the reach of those liable to be infected. Suppuration rarely occurs, and the serous exudation is in time completely absorbed. Hardness, however, may linger after all other signs have cleared away.

The *premonitory symptoms* are generally *malaise*, restlessness, headache, chilliness, and even vomiting; after two or three days the swelling occurs. The swelling is attended with stiffness rather than pain; the head and neck cannot be turned, mastication and deglutition are difficult, and the child does not care even to talk. The swelling, which is hard and elastic, begins in the hollow between the ramus of the jaw and the mastoid process. In the case of enlargement of a cervical lymphatic gland, the swelling is lower down, the præ-mastoid hollow not being effaced. The other parotid gland may also be attacked, the face being then strangely broadened. The axillary temperature may be raised four or five degrees. The *prognosis* is favourable.

Inflammation of the testicle, which is very rarely met with before puberty, is most likely to take place on the disappearance of the enlargement of the parotid, and in rare cases the cessation of the orchitis may be the sign for recurrence of the parotid trouble. In females the mamma or ovary may be similarly affected, or œdema of the vulva may appear. These complications are probably caused by the unrecognised germs which started the parotitis.

Treatment.—On the earliest suspicion of infection the child should be isolated, and if the constitutional disturbance be severe, he had better be kept in bed; certainly he should not be allowed to run about the house or to go out of doors. The diet should consist of milk and slops; ice may be given to suck. A dose of grey powder or castor oil may be desirable; an ointment of belladonna may be smeared over the painful area, under a pad of cotton-wool secured by means of a soft handkerchief. Leeches should be applied only when the inflammation is excessive. The attack having passed off, change of air, and a course of iron and cod-liver oil, or of other tonic, may be desirable.

(For malformations of the ear, see page 177.)

A foreign body in the ear may generally be removed by a pair of fine forceps, provided that it have not passed right down the meatus. But if it be round and smooth, like a pea, and do not offer a hold for the forceps, it is better to place the child at once under the influence of chloroform, and to get the blade of a curette, or a bent wire, actually behind the foreign body before attempting extraction, even at the expense of wounding the integument of the meatus. It is injudicious to struggle with the child, and so to run the risk of pushing the body farther down, or to try to get it out by syringing unless the stream can be introduced behind it. Much damage may be done by an unskilled person attempting extraction; thus the body is almost sure to be forced through the narrow part of the meatus. If the syringe be used, the auricle should at the same time be pulled upwards and backwards, so as to facilitate the escape, and the nozzle of the syringe should be applied to the roof of the meatus.

If much swelling and inflammation of the meatus have been caused by the foreign body, or by unsuccessful attempts at its removal, leeches should be applied in front of the tragus. After the inflammation has subsided, the syringe may easily remove the foreign body; but one should not attempt extraction so long as the slightest tumefaction is present.* A foreign body which has passed through the narrow part of the meatus may lie loose at the bottom of it without creating disturbance, whilst clumsy attempts at removal may destroy the tympanic membrane, and possibly give rise to a fatal otitis and meningitis.

When *insects crawl into the ear*, they are readily killed by a few drops of olive oil.

Suppurative otitis is apt to follow scarlet fever and diphtheria, or it may be the result of a simple acute or chronic otitis, especially in the tuberculous subject. The membrana tympani having been destroyed, the meatus fills with offensive pus, and the discharge may continue year after year, without apparently much distress of any kind—but always with risk. Occasionally, blood is mixed with the pus, and the ossicles may be detached and discharged. Granu-

* Field, "Diseases of the Ear," page 40. 2nd edit.

lation-tissue may bulge up from the tympanum, hiding the remains of the membrane, and partially filling the meatus.

Before an abscess bursts, the acute inflammation of the tympanum causes great constitutional disturbance; the face may be flushed, and the head thrown back between the shoulders, and the child may likely be seized with severe convulsions. If old enough, the child will complain of "headache," or pain in the ear. The ear does not receive the attention which it deserves in urgent and obscure nervous conditions of childhood. In some of these cases the child is desperately ill, and even unconscious, with, perhaps, a temperature of 104° ; possibly, also, he is attacked with convulsions. He cries constantly, and can neither eat nor sleep, and his pupils may be of unequal size.

If the urgency increase, and the case be threatening, it will be advisable to put four leeches behind the ear, and to cover the pinna with a warm bread poultice; a little warm oil, mildly carbolised, may be dropped down the meatus. If the membrane be reddened and bulging, a sharp-pointed, slender knife may be passed down to and through the membrane; if pus escape, the symptoms will at once abate. Though puncture of the membrane is not a desperate procedure, it should not be adopted as a mere speculative measure.

Amongst the general measures for otorrhœa must be reckoned warm clothing, healthy surroundings, an occasional change of air, iron, cod-liver oil, quinine, and good wholesome food. The local measures include frequent syringing of the ear with a warm and very mild solution of Condyl's fluid, sanitas or carbolic acid. The irrigation should be carried out with patience and persistence, and without the expectation of immediate result, for a few weeks, or even months, of the treatment may show but little improvement. The syringe should not be used every now and then, but with perfect regularity, as, for instance, after every meal. The meatus should then be dried, and boracic powder blown into it from a quill or insufflator.

Prognosis.—With a general supervision, children outgrow the otorrhœa; but as regards the persistence of hearing on the affected side, nothing definite can be predicated; very

often, after severe and long-standing otorrhœa, the sense is but little affected, whilst in other cases, or after a short attack, total deafness results. This is particularly likely to follow the loss of the ossicles, though if the stapes remain to block up the opening into the vestibule, hearing may be but little affected. The loss of the malleus and incus alone may not entail serious result. Then, as regards life—on account of the close proximity of the tympanum to the cranial cavity, there is a grave chance of inflammation extending through the thin osseous plate which separates the middle ear from the dura mater, and of meningitis and encephalitis ensuing. Inflammation extending to the neighbouring lateral sinus determines there a septic thrombosis, and the clotting may extend from the sinus down the internal jugular vein, and even to the heart.

The diseased area may be a centre from which purulent absorption may take place, death resulting from pyæmia, after the occurrence of convulsions and rigors. In the case of an infant who was recently admitted into hospital for suppurative arthritis of each elbow-joint, *post-mortem* examination showed that the pyæmic infection which caused death was secondary to a chronic inflammation of the middle ear, with suppurative disease of the temporal bone. Pyæmia and metastatic abscesses are a somewhat common result of otorrhœa. Sometimes death occurs rapidly from suppurative otitis; at others the child grows slowly weaker, and sinks from exhaustion.

Post-auricular abscess.—Inflammation may extend backwards from the tympanum in the masto-petrous bone, and, partially destroying that tissue, show itself as a sub-periosteal mastoid abscess. A softish tumour covered with dusky skin then appears: it raises the pinna, and thrusts it forward. There may be much pain, headache, and constitutional disturbance.

Treatment.—The swelling should be incised forthwith, even if fluctuation be not evidenced, and provision should be made for drainage. If the mastoid region appear carious, the bone should be scraped with a sharp spoon, or gouged away until the mastoid antrum is opened up. The small cavity should then be washed clean, and the antiseptic lotion in-

jected into it should, if possible, be made to flow out through the meatus. Sometimes it is advisable to divide the posterior part of the tympanic ring, and to convert the meatus, the antrum, and the middle ear into one cavity.

The *opening up of the mastoid antrum* in children is a simple operation, and the results are generally satisfactory. In certain cases, though there is neither redness nor swelling of the skin in the mastoid region, clinical signs render the surgeon anxious to explore the antrum. To do this he makes a free, vertical incision upon the mastoid process, a finger's breadth behind the attachment of the pinna, and then with a sharp gouge he works inwards and forwards behind the meatus.

Occasionally sequestra of the temporal bone are cast off, and the entire masto-petrous bone may be detached as a sequestrum, and yet the child may recover. A child was recently in hospital in whom, months previously, such necrosis had taken place; total deafness of that side and facial paralysis had of course resulted. (*See also Proc. of Med. Soc. Lond., vol. viii. p. 162.*)

Intra-cranial suppuration, temporo-sphenoidal abscess, is a frequent result of chronic otitis media. The symptoms are not always definite, but there are generally complaints of severe headache and tenderness, with vomitings, shiverings, and convulsions. Though the temperature may be high, it sometimes remains persistently low, and the pulse may not be accelerated. At first the child is restless; later he becomes dull and drowsy, and he may be hemiplegic or unconscious. Optic neuritis of that side and squinting may occur.

Treatment.—Though the discharge from the meatus may have ceased, the passage should be thoroughly cleansed and explored, and that side of the head should be shaved and rendered aseptic. A large crescentic flap, having been turned down, the skull should be opened by a $\frac{1}{2}$ -inch trephine, the pin of which is planted an inch above and an inch behind (Jacobson) the external auditory meatus. If pus is not found, the dura mater should be incised, and, if need be, the temporo-sphenoidal lobe must be explored with a tubular needle in a direction forwards, inwards, and a little downwards. A soft drainage-tube is then to be inserted, and the wound closed

and dressed with wood-wool; but if no pus be found the wound must be entirely closed.

Cerebellar abscess cannot always be differentiated from suppuration in the temporo-sphenoidal lobe, though in the former case there is usually a marked and persistent retraction of the head, and the headache and tenderness are more likely to be referred to the occipital region. When cerebellar abscess is suspected, a trephine opening should be made with its centre about an inch behind the external auditory meatus and a quarter of an inch below Reid's base line. This will avoid all risk of opening up the lateral sinus, which, let it be borne in mind, winds from the region of the external occipital protuberance down the hinder part of the mastoid process.

Thrombosis of the lateral sinus is another result of chronic septic otitis, and it is apt to be the beginning of a fatal pyæmia. Ballance says that the condition may be recognised by an oscillating temperature, with repeated vomitings and rigors. There is also tenderness about the mastoid and occipital regions, and possibly a hardness along the upper part of the internal jugular vein. There is likely to be optic neuritis.

The best chance for the child will consist in gouging away the mastoid process, exploring the lateral sinus (which lies to the posterior part of the process), tying the internal jugular in the middle of the neck, and washing through the upper part and the sinus with syringefuls of carbolic or mercuric lotion.

CHAPTER XV.

HARE-LIP.

THE median part of the upper lip is formed by a process which descends from the front of the cranium in connection with the fronto-nasal plate; the lateral parts are developed from the coverings of the maxillary processes, which, extending inwards, are eventually fused with the descending flap at a short distance from the median line (Fig. 45). Thus, the fissure of the imperfectly developed lip is at some distance from the middle line, namely, where the median process should blend with the lateral fold. In certain rare instances, the gap is exactly in the middle of the lip; but a median cleft would not extend into a nostril—such an error

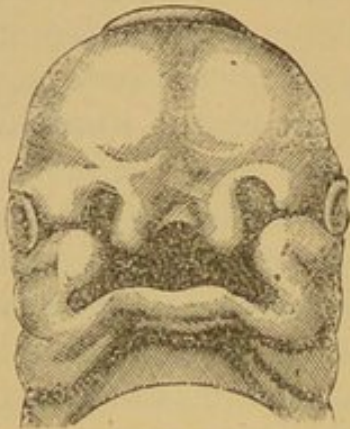


Fig. 45.—Notch in process, which descends to form median part of lip; a deepening of this notch gives median hare-lip.

would be developmentally impossible; but it might reach almost to the septum of the nose, as in Fig. 46. If a unilateral

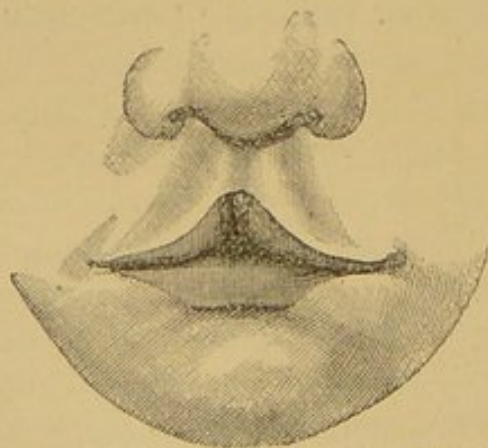


Fig. 46.—Median Hare-lip (Mr. Pitts's case).

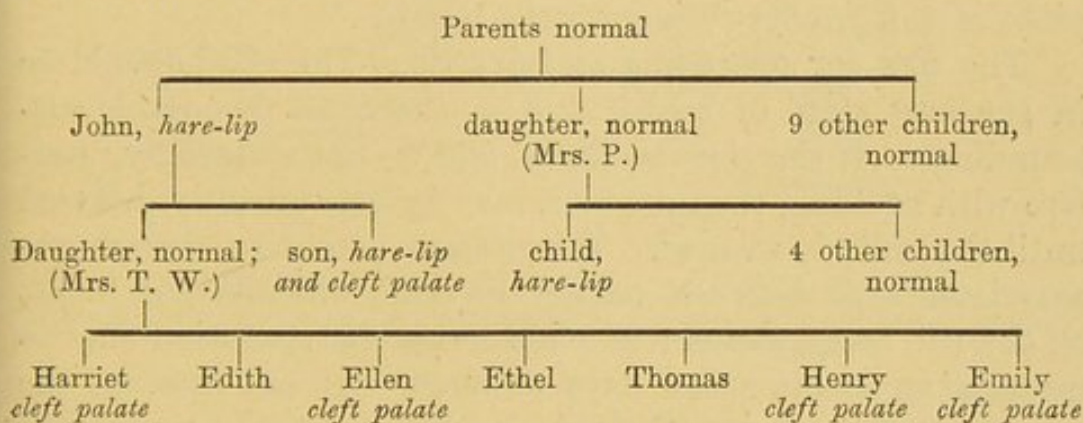
arrest of development takes place, a single hare-lip (Fig. 47) results; if the arrest be symmetrical, the cleft is double (Fig. 48). The central part of the lip is developed from the bifid fronto-nasal process, and if the interval between the two lateral tubercles fails to be effaced, a median cleft results. Some day a child may be forthcoming who has lateral hare-lip associated with a median cleft.

In Mr. Pitts's case Nature had confined her forgetfulness to the integumental part of the fronto-nasal process, the præ-

maxilla, the vertical plate of the ethmoid and the vomer being duly developed. There was only a slight groove between the intermaxillary bones.

Though we are at present unable to explain why development should so frequently miss the mark in connection with the formation of the lip and palate, I apprehend that we are now all agreed that maternal impressions have nothing whatever to do with it. As a rule, the "fright" comes long after the lips and features are formed. The lips are completely formed by the ninth week. Fig. 45 is at about the fifth week.

Heredity, however, has a powerful influence. Here is a family tree prepared by Dr. Guthrie Caley, in connection with a child under my care for hare-lip:—



A lateral cleft may extend into the nostril; or may be represented merely by a slight notch or depression at the border of the lip. Sometimes a small triangular gap is found

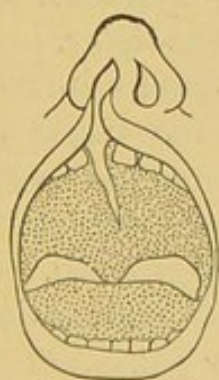


Fig. 47.—Single Hare-lip, with Cleft of Hard Palate. (After Mason.)

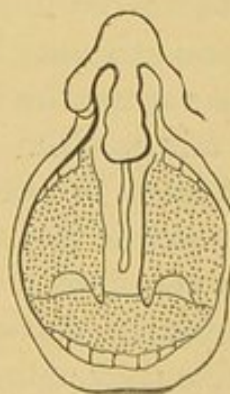


Fig. 48.—Double Hare-lip, with complete Palatine Fissure.

continuous by its apex with a vertical linear cicatrix, as if Nature herself had attempted a plastic operation with partial

success. Hare-lip is often associated with cleft palate, and the median piece of the lip may, with the intermaxillary bone, be attached to the projecting nasal septum (Figs. 49, 50).

When the child cannot suck, the mother's milk should be drawn by a breast-pump, and administered in a warm spoon. But if this cannot be done, fresh cow's milk and water (page 11) must be substituted. For feeding, the infant should be held upright, so that the fluid may run easily into the pharynx, the slipper-bottle being provided with a very large indiarubber teat with a hole below the end, through which the milk may be drawn or poured. Or the milk may be gently injected into the pharynx by a glass syringe, with a piece of soft rubber tubing on the nozzle.

The age for operating on hare-lip.—The child should be in the best state of health, and in the most favourable surroundings. If the cleft be slight, and do not materially interfere with sucking, the operation may be conveniently deferred until the child is weaned. When more extensive, though unassociated with defective palate, the child will take the breast on the rift being closed; in such cases the operation may be undertaken within a few days of birth. At any rate, for the sake both of mother and child, the defect should be remedied within the first few weeks, if the general condition appear satisfactory. If, however, a defective palate coexist, the operation may be deferred for weeks or months, as the power of sucking could not be improved by any operation upon the lip only; and strength may be gained by the delay.

Before operating, the surgeon must assure himself that the child is in fair health. Because of the labial fissure, the infant was unable to take the breast; his earliest days were, therefore, passed, if not in absolute want, at least in a state which is far removed from hygienic perfection. Many such children perish in the early weeks of their existence, and chiefly because they cannot be properly fed.

Operation for hare-lip.—The upper part of the infant's body should be surrounded with a towel, so that the arms may be secured. In private houses a low chest of drawers forms an excellent operating-table, which should be brought up to the window.

In a severe case, the first question which the surgeon asks himself is, Can the intermaxillary bone be eventually used for filling the front of the palatine cleft? For if so, the subsequent operation upon the palatine fissure will be simplified. There are, however, two fallacies in connection with the thrusting back of the intermaxillary bone: unless it be pushed well home, it may exert a pressure against the line of operation in the new lip, and so obstruct union. Secondly,



Fig. 49.



Fig. 50.

Double Hare-lip and Cleft Palate. Intermaxillary bone (or part of it) and prolabium attached to tip of nose. (*From a Photograph.*)

when thrust into the cleft, it may fail to take up a secure attachment, and may prevent that narrowing of the palatine fissure which a successful operation on the lip may be hoped in some slight degree to effect.

If double hare-lip be uncomplicated with intermaxillary prominence, the mucous membrane must be dissected from the entire circumference of the median flap as well as from the opposed borders of the lip; but from one side, or even from both sides of the lip, thick, useful flaps must be borrowed for deflection across the middle line. This is an important economy of tissue, only that which is found superfluous on adjusting the vivified surfaces being cut away, so that the natural fulness of the lip is preserved.

If the bone be pushed back the central incisors will grow irregularly; and if the dentist cannot then improve their position, he may extract them. Sometimes the sides of the process need trimming before it can be pushed into the cleft, in which case the margins of the cleft should also be pared.

If the piece of bone be taken away the central incisor teeth are sacrificed, the mouth is made small, the new upper lip hangs flat and depressed, and a mass of tissue, which might be very serviceable in the subsequent closure of the cleft palate, is lost. When the intermaxillary bone is growing from the tip of the nose, it must be sacrificed.

The rule should certainly be to try to save the intermaxillary bone. If it be not very prominent the lip may be operated upon without heed of the bone; constant pressure of the lip will cause its gradual recession. When the bone is attached on one side it may be pushed back by the thumb, or twisted back by sequestrum forceps, with the blades wrapped round with lint, so as to diminish the bruising. If the bone be free on each side, but firmly attached to the septum, it may be forced into its proper position after the removal of a wedge-shaped piece from the bony septum by means of scissors or cutting forceps. If hæmorrhage follow, it is certainly advisable that the rest of the operation be not undertaken until after some days, by which time there will have been recovery from the shock. The cautery at a dull heat may arrest the bleeding.

Chloroform should invariably be given, either on a piece of lint or by means of a Junker apparatus. After dividing the labio-maxillary folds by the tip of the scalpel, the attachments should be thoroughly torn up by the finger or by the handle of the scalpel. Blood can easily be kept out of the mouth by laying a torn piece of sponge safely beneath the lip, and by seizing the coronary artery and any other bleeding point by pressure-forceps; the forceps, hanging over the face, keep the lip everted, and prevent oozing into the mouth.

In the subject of Figs. 49, 50 it was impossible to gain any advantage by preserving the intermaxillary bone; so it was removed, and with it a considerable amount of the advanced nasal septum; the sides of the prolabium were then trimmed off, so that the median strip might be laid down the front of the septum to form an integumental column between the nostrils.

Unless the maxillary portions of the lip be very thoroughly freed from the subjacent bone, it is impossible to get the vivified edges approximated without leaving so much tension

upon the sutures as to spoil the chance of primary union. In some cases the muco-periosteal covering of the bone may be left though the bone is taken away.

When the labial flaps have been thus freely detached, the incisions are planned for obtaining the raw edges. By the old method, this was effected by dissecting away the mucous membrane from each side of the gap. But this plan wastes valuable tissue; and, when the raw surfaces are drawn together, a triangular notch remains permanently at the margin of the lip.

By the method of operating which I recommend, the mucous membrane is economically yet sufficiently removed from one side of the cleft and from along a good deal of the free border of the same side of the lip, whilst from the other side a very bold flap is cut, tapering off to the top of the cleft; this is then brought across and laid along the denuded border of the lip upon the other side. Thus its thickest part forms a prolabium, whilst that which was previously the red, mucous border of the vertical cleft, becomes the free, horizontal border at the bottom of the obliterated fissure as well as of the opposite margin of the lip. The piece thus brought across is not to be a mere paring: it is a thick, wedge-shaped flap which is boldly tilted down, so as to leave a firm gap into which the opposite side of the lip, which has already been denuded in its vertical and horizontal borders, may be dovetailed. Thus the scar, being deflected outwards, may escape attention—at any rate it will be less conspicuous as it tails off towards the corner of the mouth.

If the sides of the lip be well compressed, very little blood is lost; but if the assistant cannot be relied upon for compression, the ends of the coronary artery may be caught, and held by means of pressure-forceps. During the progress of the operation blood is kept from flowing into the mouth by the use of torn sponge. The pieces should not get adrift into the mouth; they must be secured in catch-forceps.

In Fig. 51, the left side of the lip being the more suitable for supplying the prolabial flap, the incision would be made downwards and outwards in its substance, beginning right up in the nostrils, as shown by the line A B.

The right side of the lip having had its mucous membrane

pared off, the lateral halves of the lip are brought forwards to the middle line; this could not be done, however, unless their connections with the superior maxillæ had been thoroughly torn through. When the left half of the lip is thus brought inwards, the incision, A B, which has been made obliquely into the lip, becomes vertical; the thick flap, which was previously

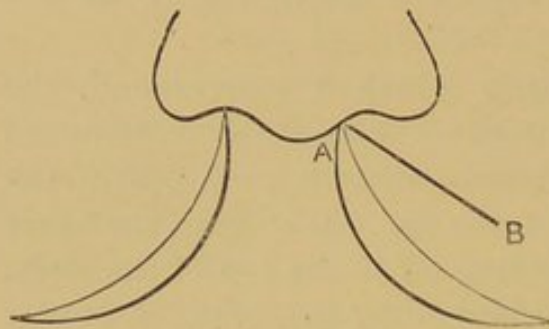


Fig. 51.—Double Hare-lip, the prolabium and incisive bone having been removed.

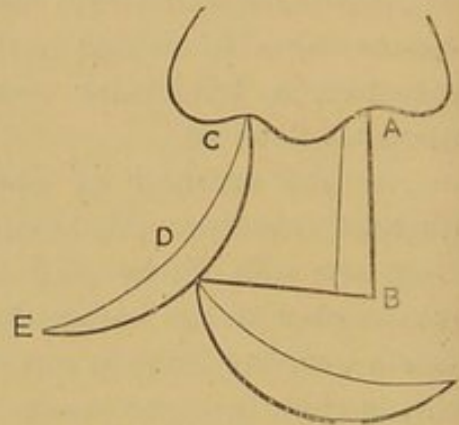


Fig. 52.—The left side of the lip drawn inwards until A B becomes vertical. C, D, E, Right side of labial cleft, is not yet denuded of mucous membrane.

vertical, becoming horizontal, so as to form the prolabium and the mucous border of the restored lip, as depicted in Fig. 52.

The right side of the lip being drawn inwards, some of its freshened border, C D, lies vertically in the middle line, whilst the rest of it, D E, forms a horizontal edge to which the deflected flap from the left half of the lip is then adjusted, the middle part being so arranged as to fit into the retiring angle on the left side, as is shown at B, in Figs. 53, 54.

As a rule, the flap is long enough to reach quite up to the commissure towards which it is reflected, so that it saves time if the operator thinly peels off the mucous surface in the short horizontal part of the lip as well as in the vertical part. The pink membrane must be entirely removed, for if any of it be left, primary union at that spot is impossible. Not a particle of skin, however, should be sacrificed.

The diagrams by which I have endeavoured to represent the scheme of the operation fail to show a puckering which often occurs, at B, when the vertical flap is brought across in the horizontal plane, which can be remedied by continuing the end of the incision, A B, a little outwards through the

thickness of the lip. They fail also to show how conveniently the flap may be stretched outwards towards the angle of the mouth, as at E, in Fig. 54.

The raw tip of the new columna nasi may be implanted at the upper end of the interval between the approximated labial folds, and there sutured. Stitches must be applied not only down the front of the lip, but also on the dental aspect, so as to prevent the child putting his tongue into the wound, and to protect the raw edges from irritation by food. In a case in which this posterior set of stitches was omitted, I have seen the uniting medium between the halves of the lip of the mere thickness of the skin.

Certain strong sutures, both at the front and back, should be inserted more deeply than the rest, so as effectually to prevent the halves of the orbicularis, and the associated muscles, dragging upon the wound. Prepared horse-hair may be used for adjusting the edges of the skin; horse-hair is very

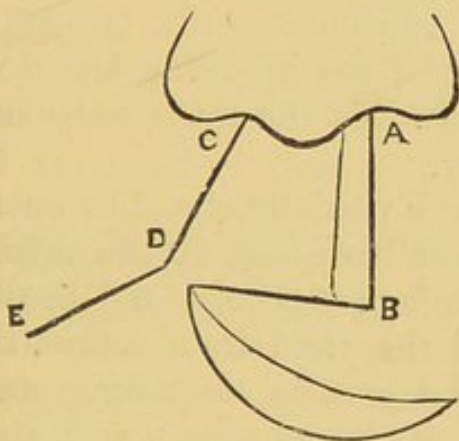


Fig. 53.—A, B, As before; C, D, E, Right side of labial cleft denuded of mucous membrane as far as angle of mouth.

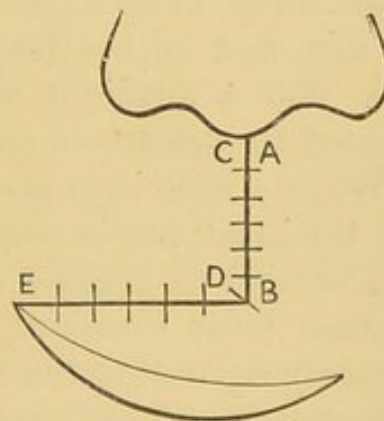


Fig. 54.—The two sides of the lip drawn together and secured by horse-hair sutures.

useful also for securing the transplanted flap along the opposite half of the lip. The sutures at the front and back of the lip render the use of steel pins quite superfluous. Indeed, I have long since given up the use of pins in the treatment of all forms of hare-lip.

When the operation is completed, the new lip may look small, and the lower lip prominent; these conditions are inseparable from the operation upon a wide cleft. To remedy this, a wedge-shaped piece may be excised from the middle of

the lower lip, the raw surfaces being carefully adjusted by sutures upon both the dermal and the mucous aspects.

After the suturing, a scrap of dry lint, but without collodion, is laid upon the wounds, and all the slack tissue of the cheeks is to be gathered up towards the middle line, and there fixed by strips of strapping extending diagonally from the malar bone to the angle of the jaw, and crossing the middle of the lip.

On the morrow, chloroform may be administered, if necessary, and the cheeks, having been well brought forward, and steadied by the finger and thumb of a nurse, the strapping is to be removed, and the sutures which are farthest from the borders of the lips are to be taken out, the wounds being cleaned, and dressed again as before. Next day a few more of the sutures may be taken out from the front of the lip, lest, remaining too long, they should set up ulceration of the skin, and cause disfigurement; those sutures, however, which are upon the dental aspect may be allowed to find their own way out. Thus within five days all the visible sutures are got away, those of horse-hair which are at the tail-end of the flap, and at the free border of the lip, being last dealt with. For a fortnight or so after this the lip is to be kept adjusted by waterproof strapping.

When a wide oro-nasal fissure is partially closed by operation, the breathing is necessarily embarrassed, for the child is then obliged to breathe only through the nose and mouth. A nurse must constantly guard the child from suffocation, by gently separating the lips and depressing the tongue, until he is accustomed to the change. By introducing a stiff piece of drainage-tube into each nostril, or by fixing down the lower lip by collodion, the difficulty may be got over.

When after a hare-lip operation the surgeon finds that all has broken down, and that there is no chance of obtaining primary union, he should still hope for a good result by granulation; and this he will be likely to obtain by adjusting and securing the loose flaps of the lip with strapping. In one case of this nature a first-class result thus attended an operation which, at any time during the first week, threatened a complete and hopeless breakdown.

CHAPTER XVI.

CLEFT PALATE.

THE roof of the mouth is formed by the fusion of the palatine processes with each other (and with the descending nasal process) in the middle line. The cleft of the soft and of the back of the hard palate is in the exact median line; but at the front it passes outwards through the midst of that half of the intermaxillary bone (Fig. 55). The inner part of each incisive bone, with the socket for the central incisor, is

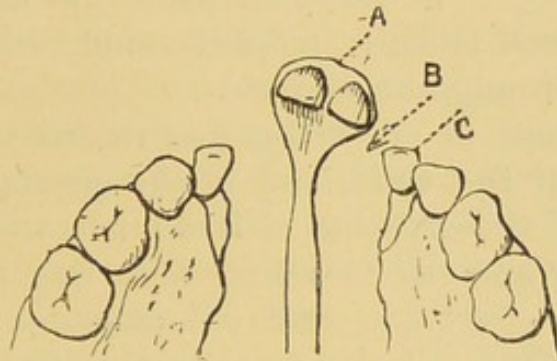


Fig. 55.—Albrecht's scheme, showing a cleft palate and double hare-lip, with the palatine cleft, B, passing forwards on each side between the central, A, and lateral incisor teeth, C. The median pieces of intermaxillary bones are advanced upon the nasal septum towards the tip of the nose, as shown in Fig. 49.

developed from the fronto-nasal process; the outer part, with the lateral incisor, is developed from the back of the nasal plate. Thus, according to Albrecht (Fig. 55), when the palatine cleft extends into the lip, it passes between the segment of the intermaxillary bone which contains the central incisor and the segment containing the lateral incisor. This explains the fact that in double hare-lip the isolated bony nodule behind the prolabium contains but two teeth, namely, the central incisors, the lateral incisors (if they have not been absolutely lost) being connected with the lateral maxillary process. Sometimes the uvula alone is fissured, or the defect may extend forward from it into the soft palate, or into the back of the hard palate, as is shown in Fig. 56. With a single or double hare-lip the cleft

may be confined to one half of the intermaxillary bone, as in Fig. 57.

An infant may be brought for advice because, although it takes to the breast greedily, it is growing daily thinner.

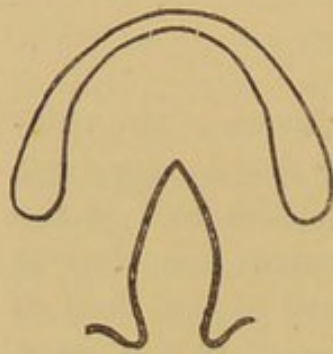


Fig. 56.—Cleft of soft and back of hard palate.

On examining the back of the mouth a cleft may be discovered implicating the soft palate and uvula. At first much of the fluid passes out through the nose; but if attention be paid to the position given during the feeding (page 222), and if a giant teat be used, the muscles of deglutition soon grow accustomed to the defect, and improvement takes place.

The voice is peculiar and unpleasant; if the child grow up with the defect unrelieved, speech is only partially intelligible, the letter *S* being altogether unpronounceable.

With reference to operating, due regard should be paid to the aspect of the child, and to the general health. For if the edges of the palatine cleft do not adhere from the first, the tongue and the food find their way between them,

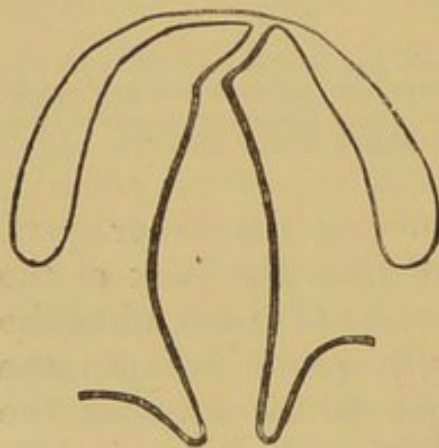


Fig. 57.—Complete palatine cleft extending forwards through the left intermaxillary bone, complicated with a double hare-lip.

and inflammation and suppuration ensue. The stitches cut their way out, and the mouth is left in a worse state than it was before, because the borders of the cleft are represented by scar-tissue. Failure to secure primary union is more serious than it is, for example, in the treatment of a hare-lip. For a cleft-palate operation, the child must be in the very pink of condition. It is well to have him placed in the charge of the trained

nurses for a few days before being operated on. Some children learn their first lessons in obedience in these circumstances.

Mr. Plimmer, who kindly examined some muco-pus after an unsuccessful operation for cleft palate, reported that the

streptococcus pyogenes was present in considerable numbers, and was probably the cause of the non-healing. It would have been interesting to know if these harmful bacilli had been lurking in the mouth before the operation. At any rate, the operator should take care not to introduce them with his instruments or sutures; he should have everything sterilised before operating, and although the region does not allow of his using the customary carbolic lotion, yet at least he should do his utmost to have the child's mouth and his own fingers aseptic. Enlarged tonsils and adenoids should be got rid of, and carious teeth extracted, some weeks beforehand. And if just before the day has arrived the tongue be found coated or the breath foul, or if the child be vomiting, purged, or coughing, or the temperature be raised, the operation must be postponed.

The age for operation.—Formerly it was considered advisable to postpone interference until puberty, so that the patient might assist the surgeon by clearing the throat of blood and mucus; but with the systematic use of chloroform this is altered. I am getting much earlier with my cleft-palate operations; one of a series of successful results was in a child just two years old when I operated on her complete cleft. When her father wrote to me a few days before the operation he said: "She is now two years old, and as far as we can judge her speech will be affected by the cleft." He was quite right; if the speech is to be improved to the utmost the mouth must be roofed in at the very earliest moment. For a soft palate, the child being in good health, the time for operating is somewhere in the first six months, I think. For a hard and soft palate together, it is, I think, in the second year. The spring and summer are the best time for operating. East winds, fogs, catarrhs, coughs, and colds have then passed away, and, moreover, a good natural light can almost be depended on. The more highly arched the palate the better for the operation, for the greater is the amount of available muco-periosteum; sometimes even raw surfaces of flap, rather than edges, can be obtained.

The operation.—The chloroformist stands at the head of the patient, using a Junker apparatus. The chief assistant stands on the left of the patient, opposite the operator, and a

nurse makes herself responsible for clean sponges—which should be fresh for every operation. Bleeding can generally be controlled by the firm pressure of a well-squeezed sponge. The instruments are on a table at the operator's right hand. In private houses a low chest of drawers serves well for table; it should be brought to a good light. The child's head should hang back, so that the blood may escape into the nares rather than into the pharynx. The mouth is kept open, and the tongue depressed by a Smith's gag. A tubular needle, with a continuous supply of wire upon a reel at the end of the handle, is very convenient. But, as a rule, I employ a considerable proportion of aseptic horse-hair sutures introduced by a slender rectangular needle. The twist in the wire sutures should invariably be from left to right, so that if the surgeon subsequently wishes to tighten one up with torsion forceps he will know which way to turn it.

The operation is begun by paring a slender strip of mucous membrane from each side of the gap from the tip of the uvula to the very front of the cleft; I like to get it all away in a single piece. A free incision is then made along the alveolar aspect of the palate, close against the teeth, and the strips of muco-periosteum included between these alveolar incisions and the borders of the cleft are carefully detached by raspatories from beneath the palatine arch and shifted to the middle line. The tension is then relieved by severing the aponeurotic attachment of the soft palate to the posterior border of the hard palate. For this purpose I use a pair of scissors curved almost to a right angle on the flat, introducing one blade between the muco-periosteum and the hard palate, and the other through the cleft and over the back of the velum. Thus, there are between the blades the aponeurosis of the soft palate, and the thin mucous membrane coming from posterior nares. On cutting these through the soft palate hangs low and perfectly loose. I then extend the alveolar incision a little backwards through the entire thickness of the soft palate. By this last means the elevators and tensors of the palate and the palato-pharyngei are entirely deprived of influence upon the line of suture.

Though the chief cause of failure of union is the incubation of septic micro-organisms, still the risk of the line of

suture giving way on account of the child vomiting, crying, or coughing must be reckoned with; but I have had so many cases in which vomiting and crying occurred without doing harm that I am not much alarmed at their occurrence. If the sutures are soundly inserted they ought to hold. That woman would hardly be worthy of the name of "nurse" who allowed the child after operation to stick his finger into the mouth, but no one can prevent the child from sucking at the wound or thrusting the tongue into the line of suture.

The Frontispiece shows one of the worst clefts that I ever attempted to close. It extended through the hard and soft palate, the widest part of the cleft being seven-eighths of an inch. One of the students of St. Mary's Hospital, Mr. Sanders, made a water-colour drawing of the mouth, showing through the cleft the pharyngeal tonsil (*see* Frontispiece).

The staphylorrhaphy was a tedious affair, and though we succeeded in getting the edges of the cleft together, in a few days the whole thing had broken down. Moreover, the palate and naso-pharynx were covered with foul and tenacious mucus. Not a stitch held, and the cleft appeared as wide as ever, with an unhealthy gap along the inner border of either alveolar process where the lateral incisions were made. There was no sloughing. When the wounds had cleaned up I placed the child again under chloroform, and, passing in some strong sutures, brought the flaps together once more in the hope that they might unite by granulation. This hope was partly realised; the hard palate is now entirely closed, but a very wide gap in the velum still remains to be dealt with. The pharyngeal tonsil has been depicted through the wide cleft. It consists of a dark, central aperture surrounded by an irregular granular mass of lymphoid material like that surrounding the apertures in the faucial tonsils. It is the enlargement of this lymphoid tissue which constitutes the disease known as post-nasal growths, or adenoids (p. 206). The faucial tonsils of this girl were enlarged, and these, with the adenoids, I removed before the palate was touched.

The central opening of the pharyngeal tonsil leads upwards into a small cavity which is often spoken of as the "pharyngeal bursa." Early in foetal life this cavity is continued

upwards towards the third cerebral ventricle, by a duct known as the cranio-pharyngeal canal, where it apparently ends in the anterior part of the pituitary body.

When there is difficulty in detaching the muco-periosteum from behind the incisor teeth, a very small angular knife and a well-curved raspatory are of great service; and whilst the friable edges are being stitched together, the double hook may be conveniently used instead of the forceps (Fig. 58).

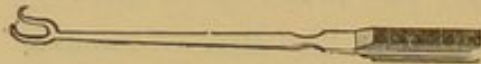


Fig. 58.—The Double Hook.

Sometimes the success of the operation is partial; a common site for the failure of union being at the junction of the hard and soft palate, but this generally fills up by granulation. One girl was operated on four times, with only a partial success on each occasion; but her wide palatine cleft was ultimately closed by chiselling through the palatine arch and by working the pieces in towards the middle line. This operation of cutting the bone should be resorted to only in those cases in which the coverings are unusually thin or their edges far asunder. Flaps of bone and membrane may be steadied together by passing a large wire suture around them by means of an aneurysm needle.

I am strongly opposed to the plan of operating on the cleft of the soft and of the hard palate on separate occasions, for, as a rule, one operation suffices for them both.

After-treatment.—Night and day for a time the child must be watched, or his hands tied, lest he get his fingers or toys into his mouth. If his arms be run through a stiff tubular splint, so as to prevent his getting up his hands, he will not need such constant supervision; but he must be thoroughly amused when awake, in order to keep him from crying or screaming. On no account must he be allowed to talk; every wish, so far as is possible, must be anticipated. If old enough, he can make his wants known on a slate. Toys and picture-books while away the time, and if the child be good, and the weather fine, he need not be kept in bed or indoors for more than a day. It is, I am sure, advisable to get him into the fresh air as early as possible. The less he is disturbed the better. It is inadvisable to frighten him by giving him food through the nares by a soft tube. If he continues to

vomit from the effects of the chloroform, the introduction of food into the stomach may be harmful. The best thing is to darken the room and let him sleep off the effects of the operation. If he makes signs that he wants drink, a teaspoonful of water may be given. Probably, in this way twenty-four hours may be passed over. After this, small quantities of beef-jelly may be given in a teaspoon; it slips down easily, and is a clean sort of food. It is preferable to milk; it does not form curds in the stomach, as milk does, and it is, I think, more easily absorbed. If, when the feeding is begun, the child will allow the nurse gently to spray or syringe out the mouth into a basin, so much the better. But it is a mistake to irrigate if it frightens the child. As regards the fluid for irrigation, sanitas and water, or a very mild solution of carbolic acid or of Condy's fluid, does well. In the course of a day or two a little sweetened orange-juice, chicken or meat which has been run through a fine sieve, bread and milk, or a soft custard pudding may be given. The stitches need not be removed unless they should be scratching the tongue; they will find their own way out.

After operation, improvement in the voice is but gradual; it may be hurried on, however, by patient and methodical instruction, and, for further improvement, Fitzgerald, of Melbourne, advises massage of the palate and its muscles. The child should be shown the exact movement of the lips and tongue of the teacher when the difficult words are being pronounced, and he should be made to imitate these movements with care and diligence over and over again. A person accustomed to teaching deaf mutes would give very helpful instruction.*

If the operation be performed late in childhood, the intonation is but slowly and partially improved; it is, therefore, advisable to operate at as early a date as possible in every case.

* See Haward's paper in *Lancet*, January, 1887.

CHAPTER XVII.

FOREIGN BODY IN WIND-PIPE—SCALD OF FAUCES.

By a natural instinct, little children put everything up to or into the mouth. In the latter case a small body, such as a bead, button, coin, or seed, may be carried with the inspired air, and "go the wrong way." Or, from careless feeding, small bones or fruit-stones may enter the larynx. The substance may be lodged in the larynx, or it may pass into the trachea or one of the bronchi, more likely the right, as it is the larger.

If it be lodged *in the larynx*, spasmodic coughing is at once set up, and this may have the effect of causing its expulsion. If the body remain, the coughing and dyspnoea continue, and, inflammation attacking the mucous membrane, respiration becomes insufficient. There may be evident tenderness at the thyroid region. The dyspnoea is paroxysmal, and the child clutches at his throat or stuffs his fingers into his mouth. The voice is altered, and the face becomes red and dusky; the veins swell up, perspiration is profuse, and exhaustion advances.

The laryngoscope seldom affords practical information (but in certain cases the Röntgen rays might give valuable help). The child resists the introduction of the mirror, and if, with the help of chloroform, an inspection be made, nothing, probably, is seen but swollen tissues and frothy mucus. The history of the case and the suddenness of the attack suffice for the diagnosis; and possibly the child shows by signs what has happened, or states clearly that he has swallowed something with which he was playing just before the attack came on.

Treatment.—A thorough digital exploration of the upper opening of the larynx is made; and, this failing, the administration of an emetic (sulphate of zinc) may procure the liberation and ejection of the body. If this also fail, the child must be inverted and roughly shaken, and slapped between the shoulders whilst he is held in the inverted position. In

case of the glottis becoming blocked during these examinations, tracheotomy would be demanded, so that the instruments must be all ready.

If the rough shakings do not avail anything, the child must not be allowed to remain in danger of a fatal attack of dyspnœa. Tracheotomy or laryngo-tracheotomy (*see* p. 41) must therefore be performed as a precautionary measure. After the operation the larynx may be probed from below, the tube (if one have been temporarily introduced) being removed for the purpose; or a wire and bristle pipe-stem cleaner, or a large feather, may be passed up between the vocal cords under the pilotage of a filiform catheter. If necessary, the inversion and shakings are again to be gone through, the larynx being also explored from below.

If the conviction be strong that the foreign substance remains in the larynx, the incision must be continued in the median line through the cricoid and thyroid cartilages, the *alæ* of the thyroid being held asunder, and the interior examined. The fact of the tracheotomy greatly relieving the dyspnœa is presumptive evidence of the body being still lodged in the larynx. (*See* p. 53.)

If a foreign body be loose in the trachea or bronchus it will probably be driven up to the glottis from time to time, with expiration, causing spasmodic respiration and coughing. The child may be sensible of the body moving in the trachea; and with the stethoscope its movements may be detected by the surgeon. A metallic body might be demonstrated by the X rays. The voice will not be altered, as would be the case if the body were impacted in the larynx. If the bronchus or one of its divisions be plugged, the corresponding lung-tissue becomes collapsed or œdematous; at any rate, the stethoscope placed over it may convey no murmur of the tidal air; or the air may pass the obstruction with a peculiar whistle. When a child is suspected of having swallowed a foreign body, and an area of the lung is found tideless, there is little room for doubt—even though temperature be normal and there be no other sign of disturbance. If the bronchus were plugged during inspiration, the lung-tissue which is implicated would be full of air (at any rate, for a time), but it would give no breath-sounds; afterwards pul-

monary œdema, with dulness on percussion would supervene. The earlier the operation is performed, the greater the prospect of a successful issue. Whatever the position of the foreign body, whether in larynx or trachea, high tracheotomy, or laryngo-tracheotomy, is the operation advised. Low operations upon the trachea are difficult and dangerous, and they offer no real advantage over the high and simple one. After operation, artificial respiration may be required. This is best accomplished by slow and rhythmical compression of the elastic chest-walls. (For operation, *see* Chap. III.)

The edges of the tracheal wound should be held apart by looped sutures, or, better still, they may be stitched to the skin. The child should be laid prone, with the head hanging over the head of the table, sudden pressure being made over the back of the chest synchronous with expiration. Possibly, if the opening in the trachea is ample, the substance will be expelled with blood and mucus in a violent fit of coughing; but if not, attempts to extract it must be deliberately and gently made by slender curved forceps passed down the bronchus in the direction of the tideless lung. Durham's flexible forceps, which work in a spiral wire, are excellent for the purpose.

If this fail, a loop of stiffish wire, bent near the closed end, should be passed down, in the hope of snaring and withdrawing the substance, or of setting it free, either by actual disturbance or by coughing. If every attempt fail, the tracheal wound must be kept permanently open, the child being encouraged to lie prone; on subsequent occasions renewed efforts may be undertaken. A tube must not be worn, or the substance would have little chance of escaping. But if, by good fortune, it have been extracted, the wound should be at once closed by fine sutures. I entirely agree with Mr. Page, that the right thing in all such instances is to persevere day by day until the body is dislodged, for the manipulations of the operator are a source of far less danger than the continued lodgment of the foreign body. The records of cases show that it is only a question of time when purulent pneumonia, bronchiectasis, or phthisis will occur. The foreign body must somehow be got out; and towards this end a free opening in the trachea, and the stitching of its edges to the skin, give the

surgeon great additional facilities in his efforts at extraction. Mr. Godlee also says that the inconvenience of an early tracheotomy and persistent searching are not for a moment to be weighed against the serious injury which may be caused by even a few weeks' residence of a foreign body in a bronchus.

But if, in spite of attempts at extraction, the body remain obstructing the bronchus, the tracheal wound must be allowed to close. Mucus, blood, or pus, may be expectorated; and possibly after days, months, or years, the substance may be expelled through the larynx in a fit of coughing. Its presence might likely cause abscess in a part of the lung, or give rise to phthisis, hæmorrhage, or septicæmia. An attack of pleuro-pneumonia being associated with localised abscess, the substance might even then happily escape through an intercostal space.

If bronchiectasis occur, resection of a rib and direct exploration of the injured part of the lung must be resorted to.

If the impaction of a foreign body in the lung were demonstrated by the X rays, I should deem it to be the surgeon's duty to remove it by operation. For this purpose he might make a trap-door in the side of the chest, and, either in one stage or in two stages, work his way inwards.

Scald of fauces.—A common childish trick is to put the mouth to the spout of a teapot, or of a kettle upon the fire, and suck. If the mouthful of fluid thus drawn up be very hot, acute inflammation and œdema, with pain and dyspnœa, at once come on. The œdema may similarly be due to the child inhaling flame when its clothes catch fire; it extends to the level of the vocal cords, but not below them.

Treatment.—The hot sponge, or leeches, may be applied, and two grains of calomel given every hour, or two minims of antimony wine with half a minim of tincture of aconite, every fifteen or twenty minutes, until a definite effect is produced. Small doses of a mixture of cod-liver oil and lime-water may be frequently swallowed as a soothing application to the inflamed membranes.

Intubation of the larynx (*see* p. 26) may be found efficient treatment, for the œdema is local and transient, and

the pressure of the tube against the swollen tissue will hurry on the absorption of the infiltration. In the case of great urgency an ordinary soft catheter might, under chloroform, be passed along the floor of the nares, and the point, guided by the fingers in the mouth, gently introduced through the swollen glottis.

There must not be too hurried a recourse to tracheotomy, as much of the dyspnœa may be due to simple reflex irritation which may be allayed by treatment. When, however, the dyspnœa is extreme, it is unsafe to leave the child without having made provision for the passage of tidal air. Too much reliance should not be placed on scarification of membrane; indeed, how could one be sure of scarifying the swelling over the rima without at the same time doing serious damage to the cords?

Prognosis is favourable unless the burn has been extensive. The most likely causes of death are shock, and secondary complications of the lungs—putting on one side the obvious risk of fatal dyspnœa.

CHAPTER XVIII.

SPINA BIFIDA.

A VERTEBRA has three primary centres of ossification, two for the laminæ, one for the body. The laminæ are fused in the root of the spinous process. If development be arrested, the spinal canal remains unclosed posteriorly (*spina bifida*), the membranes with the cerebro-spinal fluid protruding as a soft tumour—*meningocele*. It is a mesoblastic deficiency, and is found most often in the lower lumbar and sacral region, for there the laminæ are last solidified. It is possibly caused by an increase in the amount of cerebro-spinal (subarachnoid) fluid within the spinal canal, whereby development is prevented; thus it is often associated with hydrocephalus. But whether the collection of serous fluid be the cause or the result of the spina bifida has not yet been determined.

A dorsal dermoid cyst, from its exact median position (page 126), is sometimes mistaken for a meningocele, but it is more superficial and is not associated with the deficiency in the neural arches of the vertebræ. The coexistence of dorsal dermoid and spina bifida is occasionally met with.

The most characteristic feature of the tumour is its exact median situation, and its firm attachment to the deep parts; it is rounded, but if a number of neural arches be undeveloped, the base is elongated in the axis of the column. When not over-distended, stunted ridges of bone may be felt on either side of its root. The tumour may be so large at birth as to mislead the obstetrician as to the true nature of the presentation.

When the child screams, some of the cerebral fluid is displaced from the interior of the skull into the spinal canal and the tumour becomes more tense; by gentle compression of the tumour some of the fluid can be squeezed into the cerebro-spinal canal, with the effect of causing irregular muscular movements or convulsions, and of making the fontanelle bulge. When the communication with the cord is absent or

very slender, and the cyst-wall is thick and non-translucent, the diagnosis is sometimes difficult; but the fact of the tumour being congenital and in the median line, should at least make the surgeon suspicious and careful.

Though the membranes are fused with the skin, the wall of the tumour may be thin, translucent, and threatening rupture. Sometimes it yields spontaneously, the subarachnoid fluid escaping; or the wall may be but a thin, epiblastic membrane, through which the fluid oozes or escapes by ulceration. The wound may then close and the sac may refill and burst again, each escape of fluid being associated with convulsions. Such a case may end in spontaneous cure, but far more probably in death from septic meningitis.

At other times the skin is thick, leathery, and wrinkled, translucence and fluctuation being absent. Often the deformity is associated with imperfect innervation of pelvic viscera, arrested development of the lower extremities, paraplegia, or club-foot.

The sac may contain no nerve cords or branches—*meningocele*. In most cases the cord or the nerves are spread over its inner surface—*meningo-myelocele*. In rare instances the sac is lined by the substance of the cord itself, the serous fluid being contained in the immensely dilated central canal of the cord—*syringo-myelocele*. This is likely to be associated with internal hydrocephalus. If the cord or the large nerves of the cauda equina be in the sac—and in most of the cases it is so—they occupy the median part, and a median dimpling of the skin indicates such an adhesion.

The *prognosis* is extremely unfavourable. Very few of the subjects of spina bifida reach puberty. In many instances the child gradually sinks without any active treatment having been undertaken. In others, pressure or injury causes sloughing, when, the fluid escaping, death quickly supervenes, after septic myelitis and convulsions; or spinal meningitis, myelitis, and softening may complete the history. The same contingency frequently follows an aspiration, puncture, ligation, or excision. On the obliteration of a spina bifida, hydrocephalus may ensue. I have seen several cases in which a gradual obliteration of the sac has taken place spontaneously. As a rule, however, the sac becomes so tense and thin that a fatal

yielding occurs in early childhood. Even though the tumour persists, the child may grow up and be a useful member of society—but this is quite exceptional; nearly every child with spina bifida and meningo-myelocele dies.

The cases most amenable to *treatment*, or likely to undergo spontaneous obliteration, are those in which only a narrow communication exists with the spinal canal—the more slender the pedicle, the less the probability of the sac containing nerve elements. The first step towards obliteration, either by nature or art, is the closure of the neck of the sac.

If the base of the tumour be large (and the communication with the spinal canal probably free), and the covering thin; or if a tumour be associated with hydrocephalus, talipes, paralysis, arrest of development, or other congenital malformation, it is best left alone. If, as often happens, the child be thin and ill-nourished, no active measure should be adopted. Heroic treatment would bring discredit and disappointment. For the first few weeks no active treatment need be suggested; an opportunity should be given for the tumour to undergo spontaneous cure. But if the tumour undergo no change for the better, if the pedicle be small, and there be no association with other deformity, treatment may be undertaken, but with a full appreciation of the grave risks attending it. If no operation be contemplated, protection should be afforded to the cyst by a moulded cap of gutta-percha or leather.

Morton's method consists in the injection into the sac of a drachm of a preparation of ten grains of iodine, and thirty of iodide of potassium, in an ounce of glycerine. About a drachm of the fluid of the sac is first withdrawn, so that the tension may not be increased by the injection; being heavier than the spinal fluid, the injected fluid is not diffused along the spinal canal, but sinks to the bottom of the sac, and there quietly, or with local excitement, produces a change in the tissues. The communication with the spinal canal should be shut off during the administration of the injection, if that be practicable, and during and after injection the child should be kept in a supine position.

A hypodermic syringe may be used, the puncture being made through healthy skin, obliquely and towards the side, so

as to diminish the risk of wounding the cord or the large nerves. The injection may have to be repeated several times. Morton advises that injection be undertaken when the infant is from three to six weeks old.

If only it were known that the sac contained neither cord nor nerve (unfortunately this information can rarely be obtained), and if the child were a few years old, and his general condition favourable, a plastic operation might be attempted, the cut edges of the sac being adjusted with fine suture. Mr. Mayo Robson and other surgeons have described cases in which the tumours have thus been excised and the cutaneous and meningeal flaps approximated by sutures. In a few cases excellent results have been obtained. In all probability various methods of excision have been resorted to at different times, and, the results having been unsatisfactory, no publication of them has been made; the subjects of speculative and unsuccessful operations usually have quiet, unostentatious sepulture.

By *false spina bifida* is meant a tumour which, taking its root within the spinal canal, escaping through the unclosed laminae, and appearing above the line of the spinous process, does not contain either spinal nerves or cerebro-spinal fluid. The nature of such tumours varies; perhaps the most common example is the shrivelled cyst-wall of a meningocele which has undergone obliteration. (See also page 124.) In one instance the tumour was associated with deficient innervation of the bladder; the mass had the appearance of a simple fibro-fatty growth, and almost invited surgical interference. Probably the laminae were deficient, but this could not be ascertained; the association with "weakness" of the bladder suggested a deep attachment. In proposing operation, the surgeon should assure himself, as far as possible, that the connections with the spinal canal and the pelvis are not such as to preclude complete ablation; exploration by the rectum should be practised.

Spina bifida occulta is that variety in which the defective neural arches are not associated with a bulging of spinal membranes; the adjacent skin is likely to be marked by a thick growth of hairs. Club-foot, feeble lower extremities, and incontinence of urine or faeces should suggest search

being made for imperfect development of the lumbar spine. Later in life, the defect is not infrequently associated with perforating ulcer of the foot.

Sacral dimple.—Where the fusion of the lateral halves of the body has been imperfect, a dimple may persist in the skin of the middle line of the sacral or coccygeal region. Such a dimple is often associated with spina bifida. Should the depression extend still more deeply, it might in time become separated from the skin and remain as a closed sac beneath it; then, collecting epithelial elements in its interior, it would constitute a *dermoid cyst*. Dermoid cysts are often met with in this neighbourhood. Sometimes the dimple persists as a *coccygeal fistula*, discharging sebaceous matter or fluid.

CHAPTER XIX.

SPINAL CARIES.

It is incorrect to speak of spinal curvature as a *separate* disease; it is but a *symptom* of disease, and may be due to general softness of the vertebræ, so that the column yields under the superimposed weight. It is also met with in rickets, and in the case of the girl who has outgrown her strength. In its most marked degree, however, it is generally the result of vertebral caries. (The differential diagnosis will be found on page 252.)

Vertebral caries, or *Pott's disease*, is a tuberculous ostitis, beginning in, and sometimes confined to, the body of a single vertebra, but more often spreading to the adjoining fibro-cartilages, and into a long series of vertebræ. Its starting-point is usually in the area of greatest physiological activity, between the body of the vertebra and its epiphyseal plate; the intervertebral discs, which are only secondarily invaded, may be eventually absorbed. Sometimes vertebræ in distant regions of the column are affected whilst the intervening bodies are apparently sound. Thus, in the same subject, the upper cervical and the lower dorsal, or the cervical and lumbar regions, may be diseased. The caries may co-exist with tuberculous disease of a joint, of lymphatic glands, or of the hand or foot, or of a long bone. It often follows scarlet fever or whooping cough, or some other exhausting disease. No child is too young to be the subject of vertebral caries.

Vertebral caries is generally traceable to injury, such as a fall downstairs, from the bed, the perambulator, or the nurse's arms. The traumatic disturbance of the part lowers its vitality, and thus renders it liable to attack by the bacilli of tubercle, for spinal caries is essentially a tuberculous disease, and in many cases there is a strong family history of tuberculosis.

As the rarefying ostitis advances, the bodies of the

vertebræ undergo absorption, though deposits of new bone may be taking place about the laminae and articular processes. But for this consolidating deposit, what is left of the carious vertebræ would fall together, with the probable result of compression of the cord. Let those who would talk of straightening a carious spine ponder over this mechanical arrangement. It is by ankylosis that nature is able to effect a cure; all that the surgeon can do is to keep the child in the best possible health, and to ensure absolute rest so as to help on this consolidation.

The **diagnosis** of tuberculous ostitis is easy enough when angular deformity has supervened; but the surgeon must detect it in those early days when a view of the vertebræ themselves could reveal little more than a hyperæmic area, for it is then that treatment effects its best results. On paper the diagnosis of early disease is easy enough, but in actual practice it is sometimes impossible for the surgeon to say whether or no a child has vertebral ostitis. In such a case he should give the child the benefit of the doubt, putting him to bed for a while so as to let the equivocal signs clear off; he must never let the child run about until the positive diagnosis asserts itself with unmistakable clearness.

Stiffness of the affected region of the spine is a sign of greater importance than angular deformity, as from first to last there may be no projection whatever of the spinous processes.

Caries is apt to advance much farther without recognition in the lumbar region than in the neck or chest. In the last-named region a slight falling together of the bodies of the vertebræ is accompanied by so obvious a projection of the spinous processes (which are by nature prominent) that the mother herself notices the back "growing out." The adjacent sketches show that a slight falling together of the front of the cervical or lumbar vertebræ produces a straightening of that part of the column, and not a projection (Fig. 59, B and D). (The normal projection of the seventh cervical spine has occasionally been mistaken for a sign of disease.)

A varying amount of localised lateral deviation of the spine may be associated with the angular deformity if the

vertebræ be disintegrated more on one side than on the other.

When there is much angular deformity in the dorsal region (Fig. 60), the child is able to keep upright by producing a backward concavity in the lumbar region, and by over-extension of the neck, as in Fig. 59, E; by this means he keeps the centre of gravity within the basis of support. The upward direction of the face in these cases is very characteristic.

An early sign of vertebral osteitis is *fatigue*, coming on during play as well as in lesson time. The boy does not care to run about, but complains of being tired, and, leaving

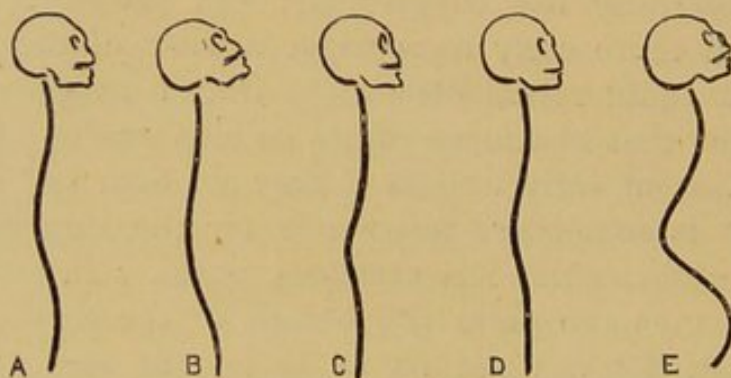


Fig. 59.—A, Normal Curves; B, Cervical Caries, neck stiff and straight, head thrown back; C and D, Lower Dorsal Caries, slight projection, otherwise back straight; E, Advanced Dorsal Caries, marked boss and secondary curvatures; extreme lordosis (saddle-back).

play, he lies on the sofa or hearth-rug. When standing, he supports himself by holding his mother's dress, a chair, or table, or even by grasping his thighs. He flinches or cries as he is taken out of his bath or is lifted from the floor, on account of the resulting disturbance of the inflamed area.

"How does he come down stairs?" The answer may be that he now asks to be carried down, or prefers a leisurely and cautious descent, by the aid of the balusters, putting each foot on every stair, and refusing to jump from the bottom step, for he cannot bear his spine to be jarred. When sitting at meals or lessons he leans forward, and, with a persistent disregard of nursery manners, supports his chin in his hands, the elbows being planted on the table. He is apt to stumble as he runs or walks.

When spinal caries has existed for some years, the attitude and expression give evidence of the disease. The child stands

and walks with care and stiffness, and his face is old and thoughtful beyond his years; the body and limbs are ill-developed; and, judging from size alone, one might be much misled as regards the real age of the little sufferer. Growth is checked by long-continued disease; but the intellect is often extremely bright, and the patient endurance remarkable. From his being constantly in the company of adults, and unable to join in any of the games of those of his own age,

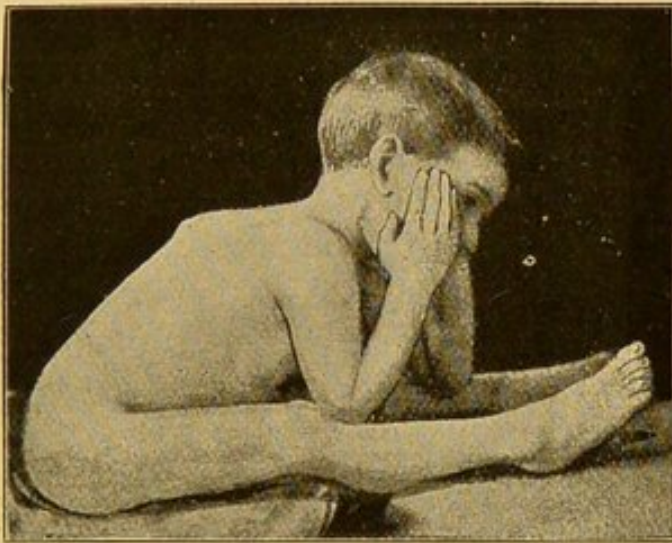


Fig. 60.—Dorsal Caries, with sharp angular projection. The spine being bent forwards and weakened, the child constantly sat with his head supported by his hands. (From a Photograph taken at St. Mary's Hospital by a former Dresser, Mr. A. Tenison.)

the manners of the child become quaint and matured. It may be said of many of the subjects of spinal caries that they have, practically, no childhood.

Pains.—If the disease be in the *cervical* region, there may be pains, possibly called “headache,” over the area of the occipital branches of the second cervical nerve; or in that of the great auricular from the second and third. If the disease be low in the neck, pain may be referred to the pectoral or deltoid regions, where the supra-clavicular branches—from the third and fourth nerves—are distributed. A little girl suffered constant pain over the region between the chin and the sternum, which she described as “belly-ache in the neck”; it arose from pressure on the transverse cervical nerves. Children are not clever at describing symptoms, and a headache “somewhere here” is apt to be the

result of irritation of the trunks of high cervical nerves. The irritation is generally due to inflammatory thickening of the membranes—*pachymeningitis*.

If the lowest cervical vertebræ be inflamed, the trunks of nerves which enter into the brachial plexus are liable to irritation, pain being referred to the shoulders, elbows, or even to the fingers. For pains in each shoulder, arm, or hand, the cervical spine should straightway be examined. And even if obscure pains be not symmetrical, but confined to one side, attention should be directed to the spine. The theory of "growing pains" is as vague as it is unpractical.

When the *dorsal* vertebræ are diseased, there may be neuralgia in the intercostal nerves or their peripheral branches. A child with high dorsal caries, now under my care, fretfully complains of "headache in the chest." When the lower half of the dorsal column is affected, pain may be referred to the epigastric or umbilical region, or even to the skin over the ilium, where the lateral cutaneous branch of the last dorsal nerve is distributed. Sometimes one hears of a "tight" feeling around the trunk, and of "cramps" in the trunk and limbs.

With *lumbar* disease the pains may be referred to the areas of distribution of the ilio-hypogastric, ilio-inguinal, genito-crural or external cutaneous nerves. If, on being asked where the pain is, the child place his fingers in each groin, or over each hip or each iliac crest, it is almost certain that he has high lumbar caries. Pains in the front of the thighs—that is, in the distribution of the anterior crural or obturator nerves—should direct attention to the region of the third and fourth lumbar vertebræ. If it happen that the nerve-fibres destined for the long saphenous branch are irritated as they leave the column, pains will be referred to the knee, the inner side of leg or foot, or to the ball of the great toe.

Symmetrical pains are the result of central mischief, and generally of spinal disease. (Knee-pains may be caused by disease of the sacro-iliac joint, hip joint, knee joint, or by pelvic abscess.) Radiating pains are too often ascribed to "rheumatism."

In the examination for suspected caries, the child should

be stripped quite naked, and if the weather be cold he should be taken to the hearth-rug. To examine his back under his shirt, or to strip him only to the waist, cannot suffice for thorough inspection. To percuss, or to apply a hot sponge along the spine, is a fallacious test, for a touch over even the soundest part is apt to cause apprehension, and, having set the child crying, to spoil the case for further examination on that occasion. Moreover, vertebral caries is often associated with neither local pain nor tenderness—let this



Fig. 61.—Early Dorsal Caries ; child cannot bend the back in stooping, and supports its weight by hand on knee.

be clearly understood. Further, how can touching or tapping the spinous process evince disease of the front of the body of the vertebra? It is altogether a useless method of examination.

Having inquired of the mother concerning the peripheral pains (page 249), and having taken a glance at the back, the range of movement in the column should be noted. For this purpose it is well to throw a pen, a coin, or a toy upon the floor, and watch the child pick it up. If he be frightened or obstinate, and refuse to stoop, the end may generally be gained by letting his sock or shirt fall, and telling him to pick it up so that he may be dressed and taken away. In picking it up, he keeps his back stiff and bends, his knees, letting himself down by his hand on his thigh,

and "climbing" up again in a similar way (Fig. 61). As a further test of stiffness, the child may be made to bend his shoulders and trunk backwards, and then laterally. The range of rotation must also be noted when his pelvis is fixed and he is told to turn his trunk.

If the *neck* be diseased, he cannot bend his face towards the floor. He will not be able to turn the head without wheeling round the shoulders, nor will he shake or nod it. Every movement is carried out with caution; the occiput is drawn back and steadied against sudden jars. Thus the neck is shortened, the shoulders being drawn up also, to steady the base of the skull. If the *dorsal* or the *lumbar* vertebræ be affected, the spine is so rigidly fixed that the child cannot stoop; he will try to bring the hand to the ground by bending the hips and knees, reaching down sideways, and keeping the spine quite stiff. With advanced disease in the dorsal region, the cavity of the chest is diminished, and respiration is hurried and jerky, because the vertebral ends of the ribs have not free play.

If the child be stood upon a chair or footstool, and asked to get down, he will do so with extreme caution, dreading the least shake. The surgeon may stand in front of the child, and, whilst talking to him, gently press down upon the top of the head; or, in the case of suspected dorsal or lumbar disease, upon the shoulders. By watching the facial expression he can at once see if this pressure cause discomfort. A healthy child supports a great deal of pressure thus applied without a wince or change of feature, but a child with spinal ostitis cannot bear it.

Abscess.*—Disintegration of the vertebræ is frequently associated with the formation of abscess, but in certain quiet cases the *débris* is removed by the capillaries and lymphatics as quickly as it is formed, so that no definite abscess occurs. This constitutes *caries sicca*, and is of common occurrence. The question of absorption of pus, is, perhaps, only one of degree, for though in many cases of caries no pus makes

* The terms "abscess" and "pus" in connection with tuberculous disease are used in their popular and comprehensive sense. It would be inconvenient, and—at the present time, at least—it might appear an affectation, to speak of them as fluid "tuberculous granulomata," which, indeed, they are.

its appearance, still some must have existed, and if a small amount can be absorbed, why not a large ?

Sometimes, though abscess threatens, the local disturbance quiets down, and no pus appears, convalescence becoming duly established. But, later, perhaps after injury or illness, the somewhat enfeebled tissues near the cheesy deposit (which was left at the consolidated region) become the seat of active changes, and the suppuration which threatened months or years before, makes its unwelcome appearance. This is known as a *residual abscess*. Its treatment is that of an ordinary cold abscess (page 263).

If inflammation have matted the surrounding tissues into a limiting wall, the abscess will be found close to the diseased segments. Thus, pus from cervical caries may form *post-pharyngeal abscess* (page 205), from thoracic caries, *dorsal abscess*, and from the loin vertebræ, *lumbar abscess*. Suppuration which remains confined to the region in which it takes rise is more amenable to treatment than that associated with infiltration or wandering. In the latter case, long sinuses and inaccessible cavities are apt to complicate the treatment. Often the matter is guided by fascial connections to distant parts, there to be confined or discharged. From *cervical* caries the pus may point in front of or behind the sterno-mastoid, or pass into the thorax to form a *mediastinal abscess*, whence it may be discharged into the trachea, bronchi, œsophagus, or pleura; thus empyema may be produced.

Tuberculous fluid from *dorsal* caries finds its way beneath the internal arcuate ligament into the sheath of the psoas; and *psoas abscess*, from dorsal or lumbar caries may be guided by the sheath of the muscle beneath Poupart's ligament and into Scarpa's triangle; rarely it will wander farther down the thigh beneath the fascia lata. As the fusiform abscess descends beneath the common femoral vessels, it renders them prominent, making the pulsations of the artery conspicuous, and effacing the furrow of the groin. The collection of matter is apt, by following the tendon of insertion of the muscle, to find its way on the inner side of the neck of the femur and to the buttock. On rare occasions the pus finds its way along the ribs or between the abdominal

muscles, and approaches the surface at the outer border of the rectus, or at the external abdominal ring, or by the scrotum; or it may discharge itself into the duodenum, colon, rectum, or any neighbouring piece of intestine, or even into the ureter or the bladder. It may also open into the hip-joint, or the sacro-iliac articulation.

Pus from *lumbar* caries may escape through the great sacro-sciatic notch to form a *gluteal abscess*. Fistula-in-ano from spinal abscess is not a very rare condition, and it is apt to be unrecognised. There is, however, a suspicious look about the opening, and a probe may be passed through it a long way up towards the spinal column, which is found rigid.

An abscess near the spine is not necessarily the result of vertebral caries. If the spine bend freely, it certainly is not. But a large chronic abscess in the neck, trunk, or thigh, is very apt to be due to vertebral caries.

Signs of spinal abscess.—These may be deep or peripheral neuralgic pains, which are not necessarily symmetrical in their distribution. There may be tenderness and fulness, as in the iliac fossa, and the limb may be œdematous from pressure of the pus upon venous and lymphatic trunks.

In every case of dorsal or lumbar caries the iliac fossa should be thoroughly examined for abscess. The child being naked, and lying with the thighs drawn up, steady pressure should be made with the fingers down into the iliac fossæ.

Spontaneous absorption of abscess:—Lilian G——, six years, came under treatment (in Nov., 1880) for dorsi-lumbar caries, for which she was kept lying flat for nine months, during which time night-shriekings, and pains on movement, disappeared. She was, as her mother said, “ever so much better.” A plaster of Paris jacket was worn continuously, and with the greatest advantage, for five months. The next she wore six months, but on its being taken off she complained of pains in the area of distribution of many of the cutaneous branches of the right anterior crural nerve, and especially in the ball of the great toe. Abscess was detected in the right iliac fossa. Other jackets were applied during the next fifteen and a half months, and on their final removal there was not a trace of abscess, the child was free

from pain, quite well, and strong. She was then ordered a stiff canvas jacket strengthened with strips of whalebone.

I have recorded this case that I may say that such a result is never to be expected—scarcely hoped for. The parents should be made aware of the fact of the formation of an abscess (the surgeon being constantly on the look out for it), in order that they may the more fully appreciate the gravity of the case and the need for the thorough rest in the horizontal position. Abscess forms, as a rule, very slowly, the sensory nerves in the neighbourhood gradually accommodating themselves to the altering pressure. There is, therefore, nothing to suggest that pus is collecting in the fossa, except the deep-seated fulness, and for obvious reasons it is better that the surgeon first notice this rather than the mother, the nurse, or the child. He should always be on the look out for it.

Disease of the occipito-atloid joint.—One or both of the condylar joints, and the neighbouring bone, may be inflamed:—An anxious-looking boy of four years had constant pain about the top of the neck and lower part of the head—he had met with no particular injury. He soon got tired, and was glad to lie down by his mother. He could not nod his head, and he dreaded the least pressure upon the vertex. He sat with his head in his hands, and on being asked where “it hurt,” pointed behind the right mastoid process. The head was slanted towards the right side, and he was disinclined to move it. Pressure on the vertex caused great pain on that side. In disease of the atlas the pain is usually confined to one side, because the inflammation (at first, at any rate) is limited to one lateral mass. His disease had begun as a tuberculous synovitis between the occiput and atlas, from which he eventually recovered.

Fig. 62 shows recovery with synostosis after disease of

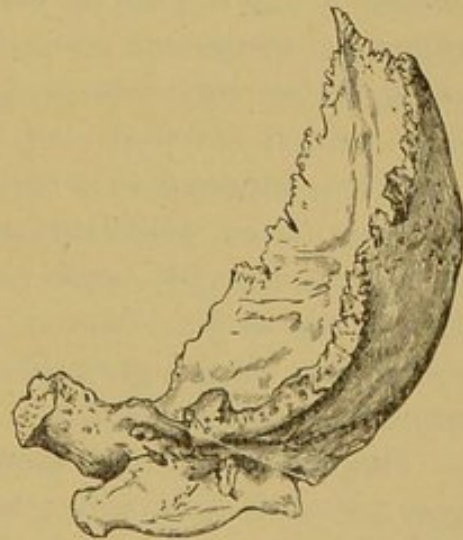


Fig. 62.—Synostosis of Atlas and Occiput, the result of sub-occipital disease. (*Museum of St. Mary's Hospital.*)

the left condylar joint. Plastic deposit has also joined the left side of the posterior arch of the atlas with the occipital bone. The occipital bone has sunk backwards, so that, to avoid disturbance, it might be steadied and fixed by the elevated shoulders.

To obtain so favourable a result early diagnosis and immediate treatment are needed. Unfortunately the first symptoms are particularly liable to be ascribed to "rheumatism."

Disease of the atlas and axis may extend to the odontoid process, and cause rupture of the transverse ligament, with, consequently, compression of the medulla oblongata. The child may hold his head so much awry as to suggest torticollis (*see* page 184), from which, however, the pain and tenderness at once differentiate it. He cannot shake his head with those short, sharp movements which imply "Yes," and he cannot bear any pressure on his head. There are pains and tenderness beneath the mastoid process, and pains in the area of distribution of the greater and lesser occipital, and of the great auricular nerves.

Case.—A boy of twelve complained to the doctor who attended the school of pains in the neck; they grew worse under the treatment adopted. He was, therefore, taken home to be under the care of a physician, who also ascribed the pains, which radiated over the head and neck, to rheumatism. Lastly, a surgeon was called in (not the author), and high cervical caries was diagnosed. The boy was then kept flat on his back, with large sand-bags along either side of his head and neck. Motor paralysis in all four extremities occurred. One night the odontoid process gave way, and immediate death resulted.

The **constitutional treatment** consists in the use of cod-liver oil and steel wine; but if a child turn against the oil, he had better not be forced to take it—probably the stomach cannot digest it. A teaspoonful may be rubbed into the skin every day. The compound syrup of the phosphate of iron, quinine, rhubarb and soda, the laxative iron mixture, may be prescribed as occasions direct, but it may be well to leave the child now and then without medicine, or to give him daily a little maltine and cod-liver oil, or a sardine with unsuspected cod-liver oil—"as a treat."

The diet should be plain and easily digested, consisting for the most part of milk, with now and then some extra cream, milk-puddings, underdone or fat meat and gravy, fruit, and vegetables. The child should not be pampered, and care should be taken that the appetite is not cloyed with cakes or sweet-stuff. Neither wine nor beer is, as a rule, required; but sometimes a little is of advantage.

The **mechanical treatment** of spinal caries is comprised in one word, *rest*. Rest is best obtained by keeping the child flat on his back upon a firm and narrow horse-hair mattress, on which, in fine weather, he may be carried on a board into the garden, or on to a carefully-arranged spinal carriage. Phelps's box-splint and a double Thomas's hip-splint are also convenient apparatus for insuring rest in the horizontal position. Under this treatment he can, nevertheless, be regularly taken into the open air without risk of disturbing the inflamed bones. Except when the disease is in the neck, the boy can be washed and dressed by being gently turned on one side, then on the other, without being at all hurt. After careful drying, some violet powder may be dusted on the skin. All the clothes which he wears as he lies in bed should be open behind, so that nothing has to be slipped over his head as he is being dressed and undressed. The bed must be carefully and smoothly made.

In every case of cervical or high dorsal caries, until the acute symptoms have passed away, the child should be kept lying flat, with only a very small pillow *under the nape of the neck*. The head should further be steadied between two large sand-bags, and neither by day nor by night should he be allowed to raise himself from the horizontal posture. As regards the length of time, it is better that the treatment be carried out for too long than too short a period; thus the risk of abscess and of deformity is diminished to the utmost. For the child of poor patients, an excellent bed may be arranged in one of the long boxes in which oranges are usually imported. After many months of the horizontal position, all complaints of pain, "tightness," and discomfort, having long ceased, the child may be fitted with some form of cervical collar, and may then, under close supervision, be allowed to sit up in bed, or even to get about a little. If I may be allowed to

say so, there is often a want of thoroughness in the treatment of spinal disease, early as well as late.

In a private family it is generally advisable to inaugurate the treatment under the superintendence of a professional nurse; she need not stay longer than is necessary to get matters into perfect working order.

Unfortunately, however, perfect rest is rarely obtained; the various supports aim at securing rest whilst the patient goes about; but this is only the second-best line of treatment, for the "rest" is less perfect. A child does not fret or pine if he be kept constantly in the horizontal position, and he grows more than contented with it when he finds that it frees him of pain. After from six months' to a year's rest, if he have been going on well, relaxation in the treatment may be gradually allowed, a jacket being applied. If there is difficulty in keeping the child absolutely quiet, he must wear a poroplastic jacket as he lies in bed.

The collar, made by Spratt and Brooke, of New Bond Street, is moulded on after the ("undressed") leather has been soaked in hot water. The hardened case is afterwards lined with chamois leather. The front and back halves overlap on the shoulders, and are fixed together by straps and buckles.

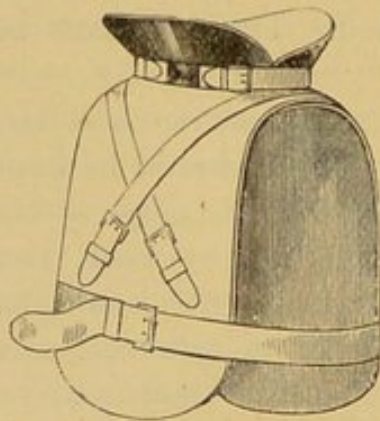


Fig. 63.—Breastplate and Collar for Cervical or High Dorsal Caries.

I have given the **jury-mast** of Dr. Sayre a fair and extensive trial in the treatment of cervical and high dorsal caries, and have now entirely discarded it. It is heavy and cumbersome, and offers no advantage over the leather cervical collar (Fig. 63), which bears up the chin and occiput. The rotatory movement of the neck which the jury-mast is constructed to permit,

is an absolute disadvantage, rest, and always rest, being the one indication. The cervical collar gives relief by ensuring this rest, rather than by actually lifting the superimposed weight, as may be inferred from the fact that its influence is equally beneficial in *high dorsal caries*.

A child was frequently crying on account of pains in the

chest; he had also the habit of putting his hand to his head, as if in pain; he was growing thin, and his mother had "no peace with him." The neck and shoulders were stiff from caries of or about the second, third, and fourth cervical vertebræ. On being fitted with the "collar" the pains ceased, and he grew fat. At the end of a year, though still wearing the support, he was in excellent condition.

I fully endorse Dr. Schapps's opinion that traction applied by means of a head sling is particularly efficacious in cervical or high dorsal disease. To the rings of this is attached a cord, which passes over a pulley and is fastened

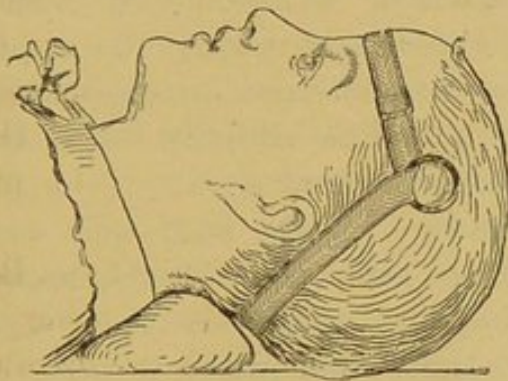


Fig. 64.
Extension in Cervical and high Dorsal Caries (Schapps).

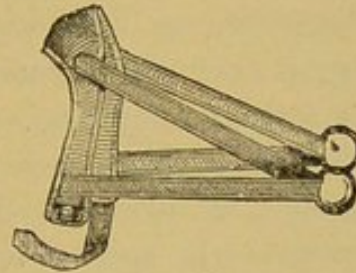


Fig. 65.

to a weight. It is well to have several of these slings made of drilling and lined with flannel, and with straps of webbing. Figs. 64 and 65 show a form of headpiece which is easily made; it answers well when a light weight is to be used and the occipital projection is well developed; it has the merit of not interfering with the lower jaw. It consists simply of a piece of webbing an inch wide, a buckle, and two inch and a quarter iron harness rings. So long as the weight is pulling, the web has a good hold. After the ring has adjusted itself, the two layers of webbing are to be stitched together where they cross. A strap may be added to pass from ring to ring under the chin. It can be removed, so that the patient may eat without intermitting the traction. The child is prevented from slipping upwards by the head of the bed being raised, or by weights being attached to the legs, as in hip-disease (Chap. XXIX.).

The *treatment of dorsal and lumbar caries* by absolute rest is not always obtainable for poor children. The next best

treatment then consists in the use of plaster of Paris jackets, as systematised by Dr. Sayre, or of poroplastic felt corsets; but, as already remarked, this is only the *second best* method, as it does not ensure absolute rest.

To prepare the Sayre rollers, crinoline muslin is torn into strips about five inches wide, and five or six yards long. The muslin should be free of sizing so that the gypsum may be more thoroughly rubbed into its meshes; the gypsum should be fresh, or should, at least, have been kept in a dry place. It is important that the bandages be quite loosely rolled, so that immediately they are put into water every molecule of the plaster may be straightway wetted. The roller is dipped, not soaked in the water, and should be applied dripping wet; squeezing it drier in the hand causes a loss of the gypsum, as well as of time. The addition of a little common salt to the water hastens the setting.

A tight-fitting cinglet is drawn over the body, and a long thick pad run beneath it along each side of the spinous processes, to prevent chafing. The cinglet is then drawn down smooth, and secured in the perinæum by a safety-pin. No so-called "dinner pad" need be used. The rollers should be applied closely and evenly around the trunk from just above the trochanters to high up in the arm-pits. The child need not be suspended whilst the jacket is being applied, but should be standing, with the arms held up out of the way. Some surgeons apply the jacket in strips, as the patient is lying down. But as the jacket is not applied with the idea of straightening the spine, but merely for securing rest, the position adopted matters little. Davy preferred to have the child lying in a hammock during the application, the hammock being incorporated with the casing.

When the jacket is on, the child must still be kept very quiet, and as much in the horizontal position as possible, in order that the diseased bones may be in a condition of continuous rest. I have had many children attending school in their jackets, after permission for them to lie during school hours had been obtained. They should not go to school both morning and afternoon, and Sunday should be a day of perfect rest.

By a little ingenuity the trunk can be washed without

removing the jacket—as by briskly drawing up and down beneath the cinglet a piece of linen which has been damped and soaped. One great advantage of the gypsum treatment is that the jacket is never taken off by the nurse or mother, so that rest is continuous. (I strongly disapprove of the jacket being split up the front, and so rendered movable.) Another advantage is that it is cheap, whilst it can also be applied by the medical man without extraneous help. The poroplastic jacket, serviceable as it is, cannot be fitted by every surgeon, and it possesses the disadvantages of being movable and expensive.

The **treatment of spinal abscess** is not always a satisfactory affair, even if the wound be kept aseptic. Many a child begins slowly to sink when the abscess is interfered with. But the abscess must be evacuated sooner or later, and it is much better to deal with it when it is small than when it is large. Nothing is gained by delay, and it is beyond question that the abscess had better be opened by art than left to nature. Repeated tapping by the aspirator may be beneficial when the pus is thin, but my experience is that the scalpel has generally to supplement the aspirator. Still, if the pressure-symptoms be not urgent, the aspirator should be tried, the withdrawal of pus being repeated at intervals of a few days, so that the cavity has not the chance of re-filling. A single aspiration rarely suffices; repeated trials, however, may accomplish a permanent cure. During the treatment the child must be kept absolutely at rest. Tapping with the cannula and trochar is sure to lead to disappointment, from pus leaking out by the wound and the abscess becoming septic.

Post-pharyngeal abscess.—There may at first be no aggravation in the symptoms of the cervical caries with the formation of the abscess, but as the bulging of the pharynx increases, "sore throat" may be complained of, with difficulty in swallowing, and even in breathing. Ordinary inspection of the throat may not suffice to detect the abscess; the index-finger must explore the back of the pharynx. If pus be there, a doughy swelling, or even definite fluctuation, is detected. There may be also a bulging in the neck, most likely behind the angle of the jaw. Solids cannot pass through the

narrow fauces, and if the bulging be great, even fluids may regurgitate. The child runs the risk of suffocation, both from obstruction caused by the swelling, and from the abscess suddenly discharging its contents into the larynx.

In a fair proportion of cases, especially in infants and young children, suppuration takes place behind the pharynx independently of vertebral disease. Thus, I have met with it as a sequel of tonsillitis, of influenza, of post-nasal or pharyngeal disease (probably tuberculous), and in miserable infants who seem to be victims of general malnutrition rather than of classified malady. In such cases downward pressure may be made upon the child's head as he sits up in bed, without eliciting signs of distress. And, the abscess having been evacuated, the head may be painlessly rotated, and the cervical region of the spine inclined laterally to the normal extent. But, even in these children, where perhaps, no bulging can be detected at the side of the neck, the abscess should be reached and drained from the side of the neck rather than through the mouth. The latter (and old-fashioned) method of evacuation increases the risk of septic or tuberculous pneumonia, as well as of general septic infection. If the case be urgent, however, there may be no choice, but to have the child's head brought forwards and to incise the tumour from the mouth. Still, this procedure is highly undesirable. To open the abscess at the side of the neck a two-inch incision should be made from the mastoid process along the posterior border of the sterno-mastoid, then, working inwards and backwards with the director and forceps, the abscess-cavity is at last reached. It should be syringed out, scraped, dried, and closed.

If the iliac fossa be filled with "pus" coming from lumbar caries, the abscess may be opened in the region of the quadratus lumborum, the child being kept subsequently on his back. Psoas abscess, too, instead of being attacked in the base of Scarpa's triangle, should be opened by the side of the lumbar spine. Nature, however, is frequently allowed to indicate the situation where the pus should be induced to find escape, but in her choice she is guided by anatomical rather than surgical principles.

Though the primary collection of the pus (so called) is

against the side of the spinal column, a second accumulation often takes place in some distant region, as near the sternum, or in the loin or groin. Years ago it used to be the custom to open the superficial abscess only, and to allow the other to leak through it. The result was that pyogenic organisms entered the tuberculous area, and set up a severe and often fatal suppuration; everything went on quietly whilst only the bacilli tuberculosis were there, but septicity followed the ingress of the others. To-day we understand all this, and the surgeon never opens the superficial abscess without being prepared to follow the track to the very end, scraping away the tuberculous granulation-tissue (pyogenic membrane) with which it is walled in, and taking the keenest precautions against the admittance of micrococci. And he makes this security the more perfect by closing the wound as soon as he has dealt with the granuloma, and by doing without drainage and its attendant risks. By clearing away the lining of granulation-tissue the surgeon removes the chief source of "secretion" into the abscess-cavity, and so renders the immediate closure of the cavity not only possible but probable.

Operation.—The part having been rendered aseptic, an incision is made in the loin, close on the outer side of the erector spinæ; a transverse process is then felt for, and working with the director and dissecting forceps towards the spinal column, the abscess is reached. Care must be taken in no way to injure the neighbouring layer of peritoneum. Thorough irrigation with hot iodine-water, decolorised with carbolic lotion, is then used, the granulation-tissue lining the cavity being scraped and washed out. The cavity should then be efficiently scrubbed out by large pieces of sponge securely held in long forceps. When the surgeon is satisfied that the cavity is thoroughly cleared of *débris* and of tuberculous material, he closes the wound with deep sutures and dresses the part with bulky, sterile pads applied under firm and even pressure. He should use no drainage-tube. If the wound break down some weeks later, he may repeat the operation. This is far better than inviting suppuration and septicity by the routine use of a drainage-tube. Of course, every abscess cavity does not thus become promptly and permanently obliterated, but a

large proportion of them does, and this happy result should always be aimed at. The routine employment of drainage-tubes in the treatment of spinal abscesses is a thing of the past. The presence of a tube in the cavity was a constant source of danger, and if the large cavity became inoculated with pus-producing organisms the result was extremely serious.

If the surgeon prefer it, he may attack the psoas or iliac abscess from the front, and, guided by a long director, may then make the loin opening. This may, perhaps, make the operation easier, and render the cleaning out of the cavity more thorough. Both openings are then to be tightly stitched up.

As regards the exploration of the diseased vertebræ through the lumbar opening, the method is of no great importance. Sometimes, on exploring, the cords of the lumbar plexus are felt stretching through the pus, which has effected the complete disappearance of the substance of the psoas. Sometimes carious bone can be felt, or the diseased vertebræ covered with soft granulations. At other times all is anatomical darkness. At present, at any rate, the carious vertebræ are beyond the reach of active interference. The exploration is more a matter of interest than of therapeutic value.

On rare occasions it has happened that a hernia of bowel has followed in the track of an extinct spinal abscess after the skin-wound had soundly healed, and that the tumour has been opened in mistake for a recurrence of abscess. A lumbar hernia would probably be resonant on percussion, and entirely reducible. (See *Brit. Med. Journal*, May 5, 1888.)

It is unpractical to look forward to the spontaneous absorption of a spinal abscess; sooner or later it must be evacuated by nature or art. In this matter art has the advantage, as by her aid the cavity can be at once emptied and cleansed, and its walls brought together. The earlier the abscess is opened, the better; for a delay may entail the extravasation of pus, and the formation of a needlessly large and intractable cavity.

Warm iodine-water (decolorised by the addition of a little

carbolic lotion) is a very suitable fluid for irrigation; the sublimate solution of 1 in 4,000 is not devoid of danger. The most convenient dressings are bulky pads of wood-wool, or sterilised gauze, fixed under a towel tightly pinned as a binder.

With reference to the irrigation of cavities from which tuberculous matter has been removed, sterilised water answers perfectly well, and its employment has this great advantage—that it does not irritate the denuded walls which the surgeon is about to bring together by firm compression applied to the exterior. The scraping and swabbing of the interior of the cavity must be done very thoroughly, and if the cavity be a large one the operation takes a considerable time. After the flushings, the cavity must be thoroughly dried, and it is hardly necessary to say that the surgeon must be careful not to leave a swab or part of one behind him. Mr. Templeton, the Surgical Registrar at the Children's Hospital, seals up the wound (after suturing it) with a little piece of gauze and collodion.

Bilateral abscesses should be evacuated simultaneously; they are likely to be in intercommunication by a narrow passage between the anterior common ligament and the carious vertebræ.

A certain amount of deformity must be expected to follow even the successful treatment of spinal caries, though in some cases the amount is insignificant, especially where the treatment has been begun early and carried out thoroughly. Sometimes the resulting deformity is an abnormal straightness, as in the neck or loins; sometimes, as in the dorsal region, it is angular. By "cure," one means a falling together and consolidation of the diseased bodies. If a projection have been formed along the backbone, no treatment can obliterate it.

Complications of spinal caries may come on with or without the formation of abscess. First among them may be mentioned *paralysis*, from pressure upon the cord, either by the bodies of the vertebræ, or by inflammatory thickening (pachymeningitis). The front of the cord being pressed upon, or in a condition of secondary myelitis, paralysis only as regards motion results. With reference to the use of suspension in the treatment of paralysis, I will not go so far

as to say that it is never to be used when the paralysis has come on as the result of inflammatory pressure upon the anterior columns of the cord; but the cases in which it can do what rest would have failed to accomplish are quite exceptional. The more quickly the curvature advances, the greater the risk of paralysis, as the parts have not time to adapt themselves to the altered conditions. Paraplegia is usually met with in those cases in which no visible abscess has formed, though there may have been a formation of a tuberculous granuloma within the spinal canal. Sometimes paraplegia is one of the early manifestations of caries.

The paralysis may be of therapeutic value, as the child has to lie flat and quiet, during which time the bones obtain needful rest. The power of movement will probably return. A child with high dorsal caries was paraplegic on one occasion for fifteen months, but the trouble passed away without operative treatment. Another child was recovering from a second attack of paraplegia when the last record of his case was made. Sensation being usually unaffected, the skin remains well nourished, and bed sores are of rare occurrence. Control over the bladder is preserved. The result is not always satisfactory, however, for chronic myelitis ascending and descending from the seat of pressure entails an irremediable sclerosis. It is this condition that renders laminectomy, when performed in old cases of paraplegia, so unsatisfactory in its results. In those cases in which the paralysis is due to the pressure of an abscess or of a sequestrum, the operation might effect great good, but the presence of myelitis too often interferes with success.

Patients are frequently lost from tuberculous meningitis even when the spinal trouble seemed to be going on well. Others have died from pyæmia, bronchitis, or some intercurrent disease, such as measles or whooping cough, to which, from his enfeebled condition, the child proves a ready victim. The commonest cause of death is the exhaustion and hectic caused by the chronic discharge, and the absorption into the system of small doses of septic poison; the liver may grow large and hard from albuminoid disease, and the urine become loaded with albumen. Fatal hæmorrhage may occur from the abscess opening up some other large artery.

Not infrequently it happens that the child with spinal caries becomes the subject of chronic tuberculous disease in a hip, knee, ankle, or wrist; and if this complication prove intractable, I am sure that it is inadvisable to keep on temporising with the secondary disease. The child might successfully struggle against one trouble, but under the two he will probably succumb. Amputation affords him the best prospect of complete recovery, provided that excision is out of the question in his state of health. As soon as the diseased joint is dealt with by excision or amputation the spinal trouble may make a start towards recovery.

Laminectomy is the operation for the removal of the posterior arches of the vertebræ which form the angular projection in advanced Pott's disease, in order that search may be made for the cause of the paraplegia, and, if possible, its removal effected. The periosteum having been scraped off, the laminae are cut with special pliers and lifted out. The dura mater is then cleared of loose connective tissue, and the spinal canal is explored. If a localised abscess be discovered, it is gently scraped out, and the diffuse growth of granulation-tissue which is commonly met with is similarly dealt with; so also with organised lymph and sequestra. The wound is closed and drained, and the child is kept prone. Some cases do well. But, as Kirmisson says, "side by side with the happy results, 'what disasters!'" Possibly as we come to understand which are the proper cases for operation we shall have a better proportion of successes. We constantly see long-standing paraplegia recover without operation, for rest in the horizontal position works wonders in these cases, and as laminectomy gives its best results when it is resorted to early, there will be a risk of its being performed without giving Nature her chance. Certainly the operation is useless when long-standing disease has set up gross structural lesions in the cord. My own practical experience of the operation has been very limited, and I am unable to speak with authority on the subject. Many surgeons, however, whose opinions I value highly, say that they have seen no real advantage obtained by operating. But if no advantage is forthcoming, the operation cannot but be harmful, on account of the importance of those elements

of the spinal column which are thus taken away. In some cases of angular deformity the bodies of several adjacent vertebræ are destroyed, the parts of the spinal column being connected simply by the laminæ and the articular processes which are cemented together by new osseous deposit. To perform laminectomy in such a case would be to remove most of the material on which the integrity of the column depends; and though the child might survive the operation, and even lose the paraplegia for which it was performed, he might be left with, practically, a broken back.

I have so often seen paraplegia due to Pott's disease clear up under simple rest-treatment, that I am not misled by reports of "cure" following operation. I have seen recovery quietly take place in children who have been sent into hospital for operation—children whose condition had been deemed hopeless unless radical measures were adopted. I am now content to keep the child flat with a weight attached to the head, as shown on page 259, and with weights drawing on the lower extremities, as shown in Chap. XXIX. Long-continued extension, patiently and efficiently carried out in this manner, offers generally the best chance of recovery.

The attempt to straighten out the angular deformity of Pott's disease by pressure made upon the back as the child lies prone was a method of treatment adopted by "bone-setters" of former days. It appears to me to have all the objections which attend laminectomy in such cases, and none of its advantages—fracturing the spine, it may render it useless; tearing the cord, it may involve it in myelitis, and, disturbing the carious angle, it may determine recrudescence of the disease. It may cause the spine to bend or break near, but not at, the carious angle, and it may set up rarefying osteitis in vertebræ which were previously sound, or it may give rise to immediate compression of the cord by bone or blood. It appears to me to be a method of treatment equally unprecise and unsurgical, equally rash and speculative. This treatment is to-day being carried on in a certain part of France, and I expect that we shall eventually hear more of it. I trust that when the general results are published every case so treated will be fully reported. Nothing should be kept back.

CHAPTER XX.

THE GENITO-URINARY TRACT.

IN the process of development, a hollow growth, like the finger of a glove, starts from the hinder end of the primitive intestine, and, extending upwards and forwards, leaves the abdomen by a wide gap in the anterior wall. This is the allantois. Its pedicle is subsequently dilated into the bladder, whilst the upper part of the tube, continued through the umbilicus, is the urachus. Then a partition grows downwards to convert the existing cloaca into two passages, the urethra and the rectum. Thus at birth the fusiform bladder is an abdominal rather than a pelvic viscus (Fig. 66).

In rare instances the obliteration of the urachus is delayed, so that urine, and even vesical calculi, pass through the umbilicus of the young child. For the treatment of the fistula, the urethra should be explored by a fine catheter; and, if necessary, the water should be drawn off at regular intervals, so as to give the abnormal opening the chance of closing. If cicatrisation be delayed, the aperture may be touched with the cautery. But the treatment of the fistula becomes a secondary matter should calculus or phimosis be present.

Small vascular polypi may grow in the depths of the umbilical cicatrix. They take their origin from the truncated urachus, which granulates after the attached end of the umbilical cord has fallen, or from the cut end of a Meckel's diverticulum. At times no larger than a pin's head, they may attain the size of a currant or plum. They are bright red, bleed at the slightest touch, and are associated with so much irritating secretion that the skin around the

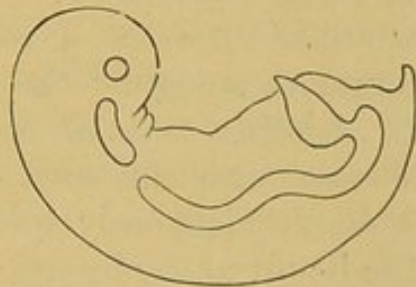


Fig. 66.—Development of Bladder from hinder End of Alimentary Canal; Continuation of Bladder through Umbilicus.

navel may be constantly inflamed or suppurating. They may be removed by a snip of the scissors, or their pedunculated base may be tied with a fine waxed ligature. Occasionally they are so deeply placed in the cicatrix that the walls of the depression have to be held widely apart by dressing forceps before they can be dealt with. In every case of eczema at the umbilicus, careful search should be made for such polypi. Occasionally they are associated with urachal fistula.

Fæcal fistula at the umbilicus may be the result of prolapsed intestine having been included in the ligature of the umbilical cord (in which case discharge is noticed within a few days of birth), or of the rupture of a strangulated umbilical hernia. A more frequent cause, however, is ulceration of the bowel, after inflammatory adhesions have attached it to the abdominal wall. The ulceration is likely to be of tuberculous origin, adhesive peritonitis guarding the general serous cavity against infection. A large abscess may precede the establishment of the fistula. The piece of intestine implicated is often the transverse colon, and on the administration of a rectal injection, some of the fluid is found escaping by the fistula.

Another cause of fæcal discharge at the umbilicus is the section with the cord of a pervious *Meckel's diverticulum*, a duct which, early in fœtal life, led from the lower end of the ileum to the interior of the umbilical vesicle; long before birth it should have dwindled away. This diverticulum, though not pervious to the umbilicus, often exists as a fibrous cord, beneath or around which a piece of bowel may become strangulated.

In the case of fæcal fistula occurring within a few days of birth, the opening is solitary; but when the discharge is secondary to the formation of abscess, there may be several superficial cloacæ associated with a single opening into the bowel. The subjects of fæcal fistula are generally pale and ill-nourished; they must be kept at rest. The diet should be light; cod-liver oil and iron should be prescribed. When the general condition is improving, attention may be directed more definitely to the fistula, but no partial operation or cauterisation is likely to succeed. The bowels should be cleared by repeated doses of rhubarb and soda,

and afterwards should be kept confined for ten days or a fortnight by a course of opium in minute doses; the sore being left untouched under a thick dressing of vaseline and boracic acid.

At the outset of treatment, provided the general health of the child be tolerably satisfactory, all fistulous tracks should be laid open and traced to a single aperture in the aponeurosis of the external oblique. Undermined or unhealthy skin should be cut away and chronic granulation-tissue scraped and freshened.

A tuberculous boy who was once under my care for multiple fæcal fistulæ made a slow but complete recovery under this treatment; when I last saw him, he told me that he had joined the police force.

If palliative treatment fail, it may be expedient to detach the adherent bowel, vivify the edges of the aperture and unite them with fine Lembert sutures, and, dropping the intestinal loop into the peritoneal cavity, to close the abdominal wound.

Hæmorrhage from the umbilicus* may be observed within ten days of birth, and may entail fatal exhaustion. The blood may ooze up from the depths of the depression, without there being any apparent opening in the skin, and soak through compresses and bandages. It may even spurt out when the infant cries, though no opening is distinguishable. The later its appearance, the worse the prognosis. As some of the subjects have lost blood from the rectum, penis, or gums, umbilical hæmorrhage may be an indication of hæmophilia (page 54).

Dr. T. F. Raven records† a fatal case of umbilical hæmorrhage in which he satisfied himself that the child was a true "bleeder" by making a slight scratch on the arm; the scratch bled for seven hours.

Treatment.—The effect of gentle pressure between the finger and thumb may be tried, and, if that fail, powdered matico may be applied, and a pad of amadou firmly bandaged on, the infant being kept absolutely quiet. Minute doses of iron and ergot, or of Ruspini's styptic, may be administered,

* See also "Year-Book of Treatment," 1884.

† *Brit. Med. Journal*, Nov., 1884.

but no operative procedure—either by cautery, needles, or scalpel—should be attempted, for, though it may possibly succeed, it is far more likely to fail, in which case the trouble is immensely increased. The prognosis is highly unfavourable.

Tuberculous peritonitis may come on insidiously or rapidly, either with or without a history of abdominal injury, and may occur in a child who, neither by heredity nor past history, was suspected of tuberculous taint. As a rule, it is a chronic affection, and its onset is marked by nothing more, perhaps, than occasional vomitings and complaints of obscure pains, which are probably ascribed to errors of diet. After a while the belly begins to swell, but it is not tender, and there may be no further complaints of aches. As the swelling increases the skin becomes stretched, shining, and marked over with distended veins.

The distention of the abdomen is due partly to the presence of enlarged mesenteric glands, partly to accumulation of gas in the inactive bowel, and partly to the effusion of serous or sero-purulent fluid into the peritoneal sac. Sometimes a small collection of the fluid causes a bulging at the navel, and at that spot abscess may evacuate itself. The child steadily grows thinner.

In some cases the bowels are confined, and in others there is diarrhoea. The temperature is above normal, especially in the evening—but not always so. Through the thin abdominal walls ball-like masses of matted omentum, distended and floating intestine, or encysted abscesses may possibly be detected. But it often happens that nothing definite can be made out, and that only when the abdomen is opened in order to see what is the cause of an intestinal obstruction, or what is the nature of some obscure tumour, the existence of the tuberculous peritonitis is clearly recognised. Sometimes a quiet abdominal ascites is the only sign of the tuberculosis. As Treves remarks, the constitutional symptoms of peritonitis are in the main those of septicæmia, and it is from blood-poisoning, and not from inflammatory disturbances, that the subject of peritonitis dies.

Treatment.—The child is kept quiet in bed, with a cradle over its abdomen. The diet is carefully regulated and, if

it agrees, a mixture of cod-liver oil and iron is given, with an occasional laxative. And here, practically, the palliative measures come to an end.

In a considerable proportion of cases, however, *abdominal section* gives excellent results. If the peritoneal surface be found scattered over with grey tubercular specks, or if, on the other hand, the bowel be found soft and traversed by ulcerations, operation can avail little or nothing; but even then death is not likely to be hastened by the introspection, whilst the child has been offered the only possible chance of recovery. But in those chronic cases in which the cavity contains serum—the result of the bacillary infection, or pus—the product of the bacterium coli, or of staphylococcus, or serum and pus together, the laparotomy may be the means of arresting the disease and restoring the child to robust health.

Before operating, a soft catheter should be passed into the bladder. The child being placed on a hot-water mattress and well covered up, and the front of the abdomen having been duly cleansed, a two-inch incision is made below the umbilicus, the peritoneum being opened with great care lest adhesive inflammation should have glued a piece of bowel to it in the track of the knife. If the fluid be serous, it should be made to flow out, and the wound should then be closed, neither flushing nor drainage being resorted to. But if the cavity contain pus these measures should be adopted, a glass or rubber drainage-tube, or a skein of mercuric gauze, being passed through the lower part of the wound and into the bottom of the recto-vesical pouch.

In one case (briefly recorded on page 243) there was no suspicion of the boy being the subject of tuberculous peritonitis until—when operating upon his testis—a mass of omentum appeared, studded with grey tubercles. This boy is now, after the lapse of some years, apparently quite well.

Thrombosis of umbilical vein, the result of septic infection at the truncated cord, is associated with local swelling and tenderness, and is likely to entail fatal pyæmia. The treatment consists in using boracic fomentations, and in the incision and irrigation of abscess, whether at the umbilicus or in other parts of the body. Before death the infant is

usually jaundiced. Septic infection at the umbilicus may determine local gangrene—a rare and fatal condition.

Multiple abscesses and other signs of pyæmia occurring in the first few weeks of infancy are likely to be the result of the absorption of septic material at the umbilical scar. (*See* page 66.) The traditional “scorching” which the midwife gives to the scrap of linen is not always sufficient to render the dressing of the wounded cord aseptic; some powdered boracic acid should be dusted over the part. Laurent, quoting Müller, remarks that in the Moscow *crèche* many new-born infants die every year of pyæmia.

Infantile peritonitis may be secondary to septic inflammation of the umbilical vein; it may run its course even in foetal life, and may end fatally. In 180 cases of peritonitis in children, 102 occurred within the first fortnight, 63 in the third and fourth weeks, and 15 of the children were over a month old (Ziemssen). Later in child-life the disease is of rare occurrence, but it may be secondary to internal strangulation, tuberculosis, pyæmia, or injury. Two children have recently been under treatment for peritonitis from this last-named cause. In one the inflammation followed a fall into a brick kiln, and was associated with rupture of kidney; in the other it was caused by a blow. The former patient recovered under the influence of a restricted diet, leeches, and opium; the other was the subject of local suppuration and of obstinate fæcal fistulæ.

Intra-uterine peritonitis may set up so much thickening and adhesion of the bowel as to cause complete intestinal obstruction. In a case of this nature the formation of an artificial anus in the ileum gave relief, though it did not avert a fatal result (*Brit. Med. Journal*, 1885, page 1201).

Umbilical hernia.—Early in the process of development the abdominal cavity is wide open in front; gradually its lateral walls come forward to join along the middle line. The part which is the last to be shut in is at the umbilicus, where the vessels to and from the placenta make their transit. It sometimes happens that at birth the umbilical aperture persists, covered in only by skin, superficial fascia, and peritoneum. In such a condition, a piece of intestine is apt to make its escape, constituting a true *congenital umbilical*

hernia. It has happened that such truant bowel has been tied or cut with the umbilical cord into which it was protruding. Possibly an officious nurse may commit the damage by cutting shorter the stump of the umbilical cord, which the medical attendant has purposely left longer than usual; in such a case she should be cautioned, therefore. Though most of these herniæ gradually disappear if left alone, still judicious treatment advances the natural obliteration of the aperture. A penny-piece wrapped in linen, and fixed by strapping flat over the ring, answers well; no conical pad should be allowed, as this would retard the obliterative process. All straining efforts should be checked.

If the umbilical cord of the new-born infant be found unusually bulky, the medical attendant should examine the root of it with finger and thumb, to see if it contains prolapsed bowel. If it do, he should thoroughly squeeze the knuckle into the abdominal cavity, and then tie the cord close against the surface of the body. In this way obliteration of the hernial sac is promptly and effectually obtained and the hernia cured. True congenital umbilical herniæ are, however, of rare occurrence.

The variety of umbilical hernia usually met with in infancy and childhood is that in which, on account of the umbilical cicatrix being too soft and weak, the intra-abdominal pressure first causes a bulging at the scar, and then an absolute emigration of the bowel—*acquired umbilical hernia.*

Treatment.—On seeing an umbilical hernia, the first thing to be done is to find out why the protrusion has occurred. It may be that it was acquired because the infant had been perpetually straining with vomiting, in which case, if a flat pad is strapped over the aperture and the food and feeding are properly regulated, a cure may be gradually effected. Sometimes, again, the hernia is caused by straining set up by a tight foreskin, by diarrhœa, constipation, a rectal polypus, or by whooping cough. In such cases a radical operation is obviously out of the question. Then, again, in the rickety child, when the bowels are distended by the accumulation of gases, and the linea alba is frayed out and the interval between the recti abdominis is widened, the umbilical scar must needs be weakened, and the occurrence of an exomphalos is invited.

In these circumstances the administration of repeated doses of rhubarb and soda, together with careful dieting and supervision, may effect all that is needed. But when the causes of the rupture are obscure, when no clear "indications" for treatment are discoverable, when the abdominal aperture is large, and the flat pad and strapping have failed, a radical operation may be not only justifiable but necessary.

The *operation* consists in making a semi-elliptical incision on each side of the protrusion and down to the sac. The contents are then returned to the abdomen, and the sac is dissected away. The edges of the aperture are then brought together by sutures, which should traverse the borders of the recti as well as the skin and the peritoneum.

Should an umbilical hernia be irreducible, the radical treatment should be resorted to, and still more urgent would the need be if the hernia were strangulated; but this is very unlikely to occur.

Fissura abdominalis.—When the abdominal walls fail to meet along the middle line, the visceral cavity being closed in only by thin membrane, all the coils of intestine may protrude, as in early foetal life, from xiphoid cartilage to pubes

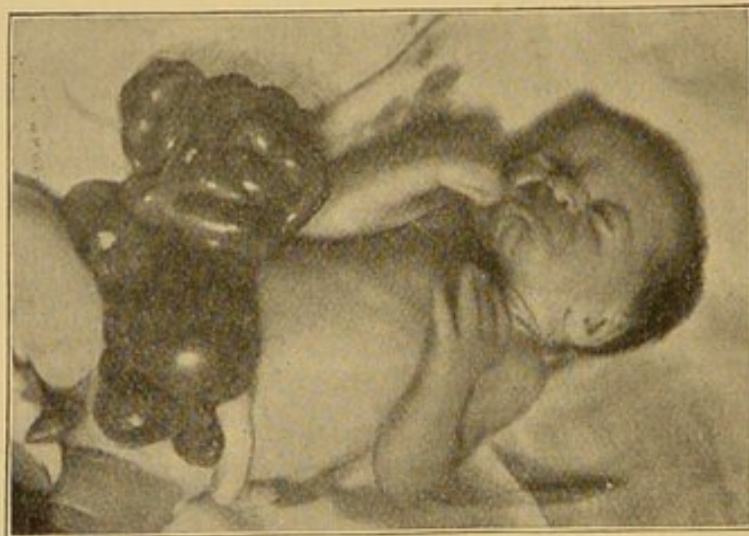


Fig. 67.—Fissura Abdominalis, with Extroversion of Viscera. (From a Photograph lent by Dr. Elliott of Tunbridge Wells.)

(Fig. 67). This defect may be due to retroflexion of the foetus, a position which lessens the capacity of the chest and abdomen. I have seen various degrees of this deformity; all that one can do is carefully to protect the film which covers

the viscera, and await the more complete development, or the early decease of the infant. If the case is not extreme, it may possibly lend itself to operative treatment.

Ectopia cordis is the result of a similar affection of the chest. Even if the infant survive, the case is little likely to invite operative interference.

Hiatus or **extroversion of the bladder** may be found in the male or female; the deformity is not incompatible with a long and useful life. Women affected with it have borne children; but as in man the condition co-exists with a urethra which is represented only by a groove upon the dorsal aspect of a rudimentary penis (*epispadias*), fecundation would be scarcely possible. The testes in these cases often fail to complete their descent, and the penis is small and bent up towards the abdomen. There is no malposition of the bladder, as the term extroversion would imply, but the viscus is wide open on account of absence of its anterior wall, and of the abdominal parietes having failed to meet. The part of the bladder seen is the postero-inferior wall, pushed forwards by the bowels. The umbilicus is in many cases absent; the pubic symphysis also is absent, and the urine, as it trickles from the openings of the ureters, flows over the groins and thighs, and causes eczema or ulceration. Being coated by the mucous membrane of the bladder, the protrusion is soft and bright red. (Plate III., Fig. 2.)

Treatment.—Disappointment is apt to follow plastic operations; peritonitis, nephritis, pyæmia, or exhaustion may bring on a fatal result; the flaps of skin which have been raised and adjusted may slough, or be torn asunder in an attack of vomiting. Whatever be the procedure, too much should not be attempted on any one occasion; if only the bladder can be covered in the gain will be very great, as some apparatus can then be arranged for keeping the clothing dry and the surface of the abdomen and thighs comfortable.

As regards the age at which operation should be undertaken, no definite rule can be laid down; if the child be healthy at four years, there may be no reason why it should not be done then. In some cases it may be advisable to turn the dissected flap with the skin surface towards the bladder, in others the raw surface. In the former instance, should the

operation prove a success, no serious inconvenience need be anticipated from the subsequent growth of hair against the tender coating of the bladder; the continual wetting of the epidermal surface by the urine will render it more like a mucous membrane, and unfit for the production of hair. In dissecting up the scrotal flap, care must be taken that a hernial sac, which in such cases is often present, be not interfered with. It may be well to begin treatment by removing the testes and diverting the rudimentary penis through the root of the scrotum.

In all operations for the closure of the hiatus it must be remembered that the integuments of the abdomen are thin, and that a dissection is apt to involve the peritoneum. Whenever possible, the tissues of the scrotum should be employed for bridging over the exposed membrane; it is often redundant, and is generally tolerant of surgical interference. Trendelenburg's method of treatment consists in disarticulating the haunch-bones from the sacrum and tilting them forwards so as to approximate the defective pubes and vivifying and suturing the edges of the hiatus.

The best result attainable in any case may be that the patient will be able the better to catch the dribbling urine in a well-fitting indiarubber reservoir; operation cannot shape a new bladder, and even if it could, it would be unable to supply a sphincter. In consequence of the constant irritation at the opening of the ureters, and, secondarily, of impairment of proper working of the kidney, suppurative or cystic nephritis may cause the failure of the most carefully-planned operation, and sooner or later entail death. These remarks apply also to other instances in which the normal outflow of the urine has been hindered.

The ureters have been laid into the rectum, with the idea of converting that piece of the bowel into a urinary reservoir. The objections to this are that the recto-vesical pouch of peritoneum is likely to be wounded and a fatal peritonitis to ensue; that, should the patient survive the operation, he may be troubled by constant diarrhœa; that, as the operation-wound contracts, the flow of urine into the bowel will be so seriously obstructed as to cause renal disease, and that the risk of septic nephritis is very great.

Epispadias is associated with hiatus of the bladder, when, the pubes being absent, the urethra is represented merely by a groove along the dorsum of the penis. It may exist without malformation of the bladder. The condition may sometimes be improved by bringing the penis through the scrotum.

In **hypospadias** the urethra is open along the under aspect of the penis. It is due to arrest of development in the process by which the margins of the urethral groove, which begin at the uro-genital sinus, join in the middle line. As the fusion of these lips takes place from scrotum to glans, it is the anterior part of the floor of the urethra that is most often deficient. When the floor of the urethra is deficient in the glandular part of the penis, the defect is generally associated with a redundant, hooded prepuce upon the dorsal aspect. The parts are improved by the removal of most of this hood.

Sometimes the urethra opens just in front of the scrotum, or behind the glans; in these cases the aperture may require dilatation, but a plastic operation, with the view of carrying on the urethra to the end of the glans, is likely to fail. The plan of boring the glans with a red-hot wire, to establish a conduit in the proper position, has probably failed as often as it has been tried. Sometimes the meatus urinarius is closed at birth by a membrane which requires perforation. If, with an orifice in front of or behind the scrotum, the urethra be found to extend to the meatus, and to be blocked there by membrane (*atresia urethrae*), the normal meatus may be opened up, and, if necessary, the abnormal aperture closed by a plastic operation. As G. A. Wright points out, if a probe is passed along the urethra, it is at once seen how thin the floor is. This is the result of the imperfect development of the corpus spongiosum, which is sometimes represented merely by a slender fibrous band.

If the under surface of the penis be adherent to the front of the scrotum (as often happens in the case of hooded prepuce, for instance), the connecting integument and fibrous tissue may be removed by lateral incisions, and the edges of the scrotal wound brought together by fine sutures.

It is much better that all needful or expedient operations upon the penis or scrotum be done before school-life is begun. To advise that an operation be "put off until he is older"

may be to cloud the brightest part of a boy's life and to render him shy and unhappy.

Phimosis.—The prepuce may be so redundant as permanently to conceal the glans, and, by its tight embrace, to prevent its proper development, rendering it corrugated and misshapen. The preputial orifice may be so small as to obstruct or prevent micturition. In the new-born infant the prepuce is large out of proportion to the size of the penis, and at that time definite adhesions exist between the glans and its covering. But although no surgical interference be adopted, the glans may be expected to advance and likewise the prepuce to retire. In fetal life the mucous layer of the prepuce is always blended with the glans; with approaching birth the adhesion melts away. Adherence of the prepuce after birth is the result of arrested development. To draw back the foreskin is extremely advisable, lest the lingering adhesions undergo thickening. Adhesions may cause much discomfort in cradle life, and later may render the boy irritable and unmanageable. I must confess, however, in connection with this subject, that though I am a strong advocate for the prompt removal of a long or adherent prepuce, I have never met with a case in which articular disease or definite muscular contraction was obviously due to sub-preputial irritation. In every case the prepuce of the fretful, whining, and neurotic child ought to be examined, and if there seem to be any redundancy, any adhesions, or any retention of smegma, circumcision should at once be done. It is only fair to the boy to insure freedom from irritation to a highly sensitive part.

The reflex disturbances arising from preputial irritation sometimes closely simulate spinal disease and hip disease. A long prepuce is a constant source of danger to the child; it exposes the adult to grave annoyances, and the old man to the risk of epithelioma.

If the prepuce cannot be completely retracted, the smegma cannot be cleaned from behind the glans, and, undergoing decomposition, it may set up inflammation and suppuration. Flat cakes of hardened smegma may often be distinguished through the prepuce, and sometimes small urinary calculi which have escaped from the meatus are imprisoned by it.

The nurse should be instructed to draw the prepuce back, and gently to wash beneath it when the child has his bath. Many an infant is allowed to suffer irritation in this respect from false modesty on the part of the mother or nurse. If in the cradle, or when on the nurse's knees, the infant pull at his prepuce, an examination should be made. Sometimes there is adherence near the corona, which has rendered the removal of some of the secretion impossible. It will then suffice to tear the prepuce back beyond the corona, or to break down the adhesion with a director. If the prepuce, though long, be not tight around the glans, its orifice only being constricted, dilatation with the blades of the ring dressing-forceps may suffice. But this procedure is somewhat unsurgical and very often disappointing; it is far better at once to perform circumcision, for the parts demand absolute cleanliness. I am a strong advocate for the operation of circumcision whenever there is any difficulty in uncovering the glans, or when, after having retracted the prepuce, there is difficulty in getting it forward. (For Circumcision see page 283.)

The daily drawing to and fro of a prepuce which is swollen and tender, on account of the forcible dilatation to which it has been subjected, is likely to distress the child, and to be objected to by the mother and the nurse. The old-fashioned operation of circumcision, if properly performed, leaves nothing to be desired. Once done, the trouble is at an end; whereas the "dilated" prepuce must be watched, lest contraction recur. A long prepuce may cause such constant peripheral irritation as to direct unwholesome attention to the part, and engender, if not suggest, a habit one would be glad to pass over in silence; the practice alluded to obtains, I have been informed, less amongst the circumcised than amongst other boys.

As regards the treatment of *masturbation*, applications to produce soreness of the parts are likely to lead to aggravation of the disease. I believe that the best course to adopt is to take the boy aside and to talk to him kindly and quietly, explaining that unless he breaks himself from the practice a physical ruin may be awaiting him. But if he be not old or sensible enough to profit by such advice, he must be

carefully watched, and, if thought expedient, his hands might be tied behind him. Cantlie reports the case of a boy of four years who was suffering from a guileless indulgence in the habit. Inspection should be made as regards the presence of a long or partially adherent prepuce, retained smegma, or chronic eczema, and of rectal irritation.

If there be the slightest indication, the boy should be circumcised; or his bladder may be searched from time to time for a possible calculus. The sounding may be undertaken without an anæsthetic, provided it be done with care and delicacy; and the boy should understand that it may be repeated from time to time should occasion demand it. It is well that some punishment be held *in terrorem*. In the case of girls, constant and kindly supervision is needed, and great cleanliness of the parts must be ensured.

Drugs which may be of service are iron, quinine, bromide of potassium, and small and frequently repeated doses of sulphate of magnesia. The child should not be allowed to eat for some hours before going to bed and he should be got up early in the morning. The bed-clothing should be light and the mattress hard.

Probably the baneful effect of the practice has been considerably exaggerated. Sir James Paget remarks that when practised frequently at any time before or at the beginning of puberty, masturbation is quite likely to produce exhaustion and nervousness, and that these mischiefs are nearly sure to happen if the excesses be practised by those who are liable to epilepsy, or any other form of nervous disease. Mr. Lawson Tait writes: "I have always found the chief difficulty to be that of persuading those who have charge of schools that the practice was a physical delinquency rather than a moral evil; and that the best remedy was, not to tell the poor children that they were damning their souls, but to tell them that they might seriously hurt their bodies, and to explain to them the nature and purport of the functions they were abusing."

Balanitis is an inflammation of the glans penis and prepuce; its common cause is phimosis. There may be profuse purulent discharge, which, escaping through the preputial orifice, makes the case look like one of gonorrhœa, with

which, indeed, it may be associated. It may be the result of an injury. The sooner that circumcision is done, the better. The surgeon should not wait until discharge has been diminished by the use of lotions, for the presence of the tight prepuce is keeping up the trouble.

Circumcision is a small matter in infancy, but its importance increases with youth and manhood, and especially when it is performed for paraphimosis, balanitis, or verrucæ. Frequently I have heard a grown patient, whose case called for the operation, say with reproach that it ought to have been done in his infancy. It may be often undertaken with advantage even earlier than "the eighth day."

Before operating, the surgeon should satisfy himself that the subject is in a good state of health, otherwise extensive inflammation and sloughing may supervene. All instruments used during the operation should be absolutely clean, and the surroundings of the patient should be in a satisfactory hygienic condition. I have known two children in one family die of blood-poisoning after circumcision; it was then discovered that the soil-pipe was leaking into the wall of their bedroom. From lack of cleanliness in the instruments, syphilis has been inoculated in the performance of the rite, an indurated sore appearing in due course in the prepuce. And from causes which might, or might not, have been eliminated, erysipelas, tuberculosis, buboes, and pyæmia have followed the operation.

Some surgeons advise that the operation be done under the influence of cocaine: for the adult this answers well, but for children it is far better to give chloroform. Children are frightened by the restraint, by the sight of an instrument, or of a little blood, and before the operation is well begun they may be struggling to be free. Moreover, I deem cocaine to be unfit for injection in children.

The following is an excellent and bloodless way of operating. The child, under the influence of an anæsthetic, and lying upon a pillow with a thick towel folded beneath the pelvis, should be placed in a good light, upon a dressing-table or a low chest of drawers. Having squeezed the blood out of the organ by gentle compression between the fingers, a small elastic ring, doubled if necessary, and tight enough to control the circulation, is looped round the root of the penis, and so

fixed by catch-forceps. Then, lest the glans be injured, the prepuce is to be drawn forwards and held between the blades of the ring dressing-forceps, and the redundant skin cut off by a sharp scalpel—which bruises the tissues less than scissors. The section should be made downwards and forwards so as to avoid the artery of the frænum. The mucous membrane covering, or perhaps adherent to the glans, is not implicated in this cut; so that, to complete the operation, it is necessary to tear it up along the dorsal aspect by the nails, or by two pairs of dissecting forceps. All adhesions between the prepuce and glans must be torn through, and the mucous membrane reflected, though it is rarely necessary to remove any of it. It should be turned back and stitched to the skin-wound by four or six sutures of fine silk, one of these sutures being passed beneath the dorsal vein and another through the frænum. I always use sutures; they obviate the risk of hæmorrhage and promote rapid healing. The preputial stump being drawn back so as to prevent recurrence of the adhesions, a strip of dry lint—not mercuric wool, as it is apt to cause irritation—is lightly wound round the end of the penis, behind the glans—so as to keep back the prepuce. Last of all, the indiarubber band is taken off. The bleeding, as a rule, merely suffices to cause the dressing to adhere to the wound. If no bed-cradle be at hand for keeping off pressure of the bed-clothes, an ordinary willow-shaving hat-box will answer the purpose when the bottom has been knocked out, the remainder being made to encircle the pelvis. The child's feet should be tied together. If he be unable to pass water, he will probably succeed if he be seated in a basin of warm water.

The dressing may be allowed to come off as it may, and the sutures, being fine and not deeply inserted, may be left to work out. Thus the child has no trouble with subsequent dressings, nor is he worried by superfluous attention.

Fallacies.—Circumcision is often badly done; very often too little of the prepuce is taken away, and the operation has to be repeated, much to the annoyance of all concerned. Then, not enough care is paid to breaking down adhesions, and unless this be done all the smegma cannot be cleared away, so irritation continues, and a supplementary operation

is needed. If the skin be drawn forwards too freely before its removal, an unnecessarily wide zone of penis will be flayed; and though this will be covered again when the mucous membrane is turned back and sutured, there will in after-life be no trace of a prepuce.

The plan of passing a director beneath the dorsal part of the foreskin, and then slitting it up with a bistoury, is inadvisable. Though the operation is quick and simple, the result is highly unsatisfactory; the large lateral flaps hang down and, infiltrated with serum, form an unsightly mass. The condition would no doubt gradually improve, but, because of it, boys have sometimes had to be kept back from school for a while. To show that this style of operating is also dangerous, I will quote an instance in which a surgeon had the misfortune to introduce one blade of the scissors into the urethra, and so divided the dorsal part of the glans as well as the foreskin.

Howse has pointed out that hardness occurring in the cicatricial wound suggests an inherited syphilitic taint; so that if there be any suspicion on that score, it would be well to put the child on a mild course of mercury (page 100).

As the presence of a long prepuce may mask as well as give rise to symptoms of vesical calculus, it is well to make it a custom to sound the patient, when under the influence of the anæsthetic, if the circumcision is being done in a case of vesical irritation.

Paraphimosis occurs when a tight preputial orifice is drawn behind the corona and there obstinately remains. It is particularly apt to occur when the subject of a phimosis has drawn back the foreskin—perhaps on account of an irritation beneath it. As an attempt to draw the prepuce forwards is sometimes very painful, an anæsthetic should be administered, so that the surgeon can act more deliberately.

The penis should be compressed by the thumb and index finger of the left hand, whilst the strangled and œdematous glans is squeezed empty of its blood and serum by the continuous compression of the fingers and thumb of the other hand. The corona may be lubricated with vaseline, and in a little while it will slip back through the swollen preputial covering. Another way of reducing the size of the glans is by tightly binding it with a piece of tape.

If the tissues have become brawny and unyielding, from a long-continued paraphimosis, it may be necessary to pass a bistoury under the constriction, which is behind the œdematous mass, and to divide it freely, for the constriction band should not be allowed to free itself by ulceration. As soon after the reduction of a paraphimosis as the tissues have resumed their normal appearance, circumcision should be performed, or the trouble will certainly recur.

Boys are apt to slip metal rings and similar objects over the penis, when, the venous and lymphatic return being obstructed, the organ becomes œdematous. A ring is best got off by winding a tape tightly and evenly around the penis and puncturing the skin with a needle to get rid of the œdema. Whenever a penis is greatly swollen, search should be made about its root for a constriction caused by fine wire, elastic, string, or horse-hair. Other causes of *œdema of the penis* are albuminuria (as after scarlet fever), morbus cordis, and extravasation of urine (page 289).

Occlusion of the meatus urinarius may exist either with or without hypospadias. If a depression be found on the glans marking the site of the end of the urethra, a puncture should be made with a fine bistoury, and the aperture dilated with a director. The orifice must be prevented from closing. A *membranous septum* farther along the urethra is of rare occurrence; it might be recognised and broken through by the introduction of the catheter for the relief of the distended bladder. But if the introduction of a catheter were found absolutely impracticable, suprapubic cystotomy would probably be needful.

Congenital narrowing of the meatus is apt to cause vesical irritation and nocturnal incontinence of urine. It may be enlarged by an incision, and then kept dilated. Sometimes the narrow meatus is completely hidden by a long and tight prepuce, and it is well to examine for it after a circumcision has been performed. If the meatus be small, the child strains to pass water, and in the expulsive effort a hernia may be started or augmented. Frequently, a congenital hernia ceases to descend after the dilatation of a small preputial or urethral outlet has been performed.

Hermaphroditism.—In the beginning of the third month

of intra-uterine life, development has not yet indicated to which sex the foetus shall belong. There is a rudimentary elevation for the penis or clitoris, as the case may be, and just below it is the slit-like opening of the uro-genital sinus. Later, a fold of integument is found on each side of the penis or clitoris; if the foetus be for the female sex, these folds grow into the labia majora and hide the clitoris; if for male, they join across the raphe to form the scrotum. In the female, the lips of the uro-genital canal become the nymphæ; in the male they join to enclose the urethra. Just before birth, the testes descend into the scrotum. If the development proceed from the indifferent to the highest type, a male foetus results; and if it stop short of this, a female. A partial arrest of development may occur at any stage.

A not uncommon type of hermaphroditism results when development leaves the penis without the incurved ridges below it to form the urethra, the integumental folds, though containing the testes, not being joined in the middle line to form the scrotum. Such a child, at the age of sixteen months, was brought that I might decide if anything could be done to improve the appearance. Those who had seen the child at birth had no doubt of its sex, and it was registered by the name of Florence Kate. The labia seemed normal; the clitoris apparently was hypertrophied, and hooded with a redundant prepuce, and beneath it opened the urethra; there was no vagina. But as I could feel the testes in the lateral integumental folds, the subject was declared an imperfectly developed male, and the mother was advised to register him with a boy's name. It is necessary that the sex of such a child be determined at the earliest possible moment, otherwise great disappointment or distress may be entailed.

With simple hypertrophy of the clitoris to such an extent that it resembles the male organ, a careful examination of the parts, especially as regards the existence of the uterus, sets the question at rest. Sometimes it is quite impossible to say, during life, to which sex the subject belongs, but these instances are rare. In such a case one may follow the advice given by Holmes, that the child be brought up as a male; rather than expose it to the disgusting and disappointing consequences of an attempted marriage.

If an error in the determination of sex be committed, it will be that an imperfectly developed male child is taken for a female. This is more likely to occur when the arrest of development has affected also the descent of the testes. Search must be made, from time to time, for the testes, which may sometimes be brought down by pressing with the thumb along the inguinal canal.

Occlusion of the vagina is a congenital defect; it very rarely results from adhesion of the labia caused by antecedent inflammation. The septum extends from just below the urethral opening to the posterior commissure, and, being thin and bloodless, it appears grey and translucent when the labia are gently separated. If, as the infant lies on her back, the labia be firmly drawn apart by the fingers, the membrane tears through like so much wet paper, a few small specks of blood marking its connection with the labia. The thighs should be drawn up over the abdomen, so that the parts are thoroughly exposed; after the membrane has been torn, a small piece of cotton-wool, covered with vaseline, may be placed between the linear wounds for a few days. No instrument or anæsthetic is required for the operation. But a second operation may be needed if the raw edges are allowed to remain in contact during the healing process.

The condition just described is not the same thing as *imperforate hymen*, for the membrane is between the labia majora, quite near to the surface (and is usually discovered by the nurse as she is drying the child after the bath), whilst the hymen is deeply seated, being upon the uterine side of the labia minora. A genuine imperforate hymen is, therefore, not likely to be detected until after puberty, and does not concern us here. The discovery of the membrane between the labia majora usually creates a good deal of domestic alarm, which should be at once allayed by prompt rupture of the abnormal film.

Retention of urine in a male child is probably due to a small vesical calculus being impacted in the urethra; to sarcoma; to inflammation having occluded a narrow preputial orifice, or a pin-hole meatus urinarius, or to a piece of string having been tied round the penis. If, in a child with

retention, the preputial orifice be occluded, circumcision should be performed forthwith.

If neither preputial nor urethral opening be defective, a small calculus may possibly be found, by pinching the glans, or by sounding, lodged within the fossa navicularis, and blocking the outlet; on enlarging the meatus, the calculus is easily turned out. If it be impacted farther down the penile part of the urethra, it can probably be removed by slender forceps after the urethra has been fully dilated; but if it be too tightly wedged to be thus extracted, the surgeon must cut directly down upon it. If it be lodged in the perinaeal part of the urethra, there may be no difficulty in pushing it into the bladder for disposal by lithotrity; but if firmly fixed, it must be removed by a direct incision.

Retention of urine may also occur from rupture of the urethra by a blow; the presence of bruising upon the skin of the perinaeum or scrotum, together with the history, will show what is wrong. Blood may escape from the meatus, or signs of urinary extravasation may be present. In the latter case, an efficient incision in the median line is needed. On convalescence being established, the boy will require years of surgical supervision, lest intractable traumatic stricture supervene.

Soft catheters of small size, as used for adults, may be passed into the bladder of the child. If a metal catheter is wanted—as in the case of a ruptured urethra—a male catheter, of about No. 5 or 6 of the English scale, may be conveniently bent and passed.

Extravasation of urine may be the result of a stone impacted in the urethra, or of a blow upon the perinaeum. Whatever the cause, the treatment is the same; a free opening must be made into the urethra, or into the urinary abscess, down to the urethra, so as to ensure the complete escape of the urine. If there be no history of injury, the surgeon must sound for impacted stone; but if there have been considerable suppuration or sloughing, he may fail to find it on that occasion.

If urine have infiltrated the scrotum, penis, or the inguinal region, incisions are required, and careful irrigations with a warm solution of boracic or carbolised water. The

patient should be made to sit in a warm bath; stimulants, with quinine and iron, should be given. The case must be treated with promptness and thoroughness. The catheter should not be left in the bladder after the operation. The resulting contraction of the urethra requires long-continued supervision and much patience.

Case.—A boy of eight, whilst "doing Blondin," fell astride the top rail of a hurdle; and a large blood tumour formed in the perinæum, and retention of urine supervened. The swelling was incised; a catheter (No. 6, English) was passed every other day. After a fortnight the temperature rose to 102°, and the hypogastric region became hard and tender. Pelvic abscess was diagnosed; an exploration in the linea semilunaris discovered pus below and in front of the superior false ligament of the bladder. A counter-opening was made in the other semilunar line, and a drainage-tube was passed through; the cavity was irrigated with warm iodine water, and pressure was applied. The temperature fell to normal, and the wounds healed; but twice a week a No. 7 bougie had to be passed, to keep in abeyance the traumatic stricture.

Priapism in early childhood is generally the result of vesical or preputial irritation. It may be caused also by ascarides, chronic constipation, or rectal polypus (page 318). A thorough retraction of the prepuce, or circumcision, and a clearing of the coronal sulcus of all irritating secretions, generally suffice to restore physiological rest. Chronic priapism may be the earliest indication of calculus.

Incontinence of urine, or *enuresis* (*ἐνουρέω*, "make water in" [bed]), may prove extremely troublesome. In many cases the mother or nurse regards the habit as simple carelessness, and the poor child is subjected to punishment of increasing severity. This domestic policy generally fails. At any rate, in most of the cases which have been brought to me, it has been ineffectually pursued. These unfortunate children may be no more able to hold their water than they could avoid coughing if a crumb fell into the larynx.

Under the high pressure of modern education children are apt to be subject, through the influence of the sympathetic system, to a simple form of diuresis; and unless the nervous

and excitable child feels that he can at all times obtain a kindly permission to "retire," he should be kept beyond the risk of harm. Under the influence of fear in a school examination I have known a healthy boy to void his urine when standing up in class. Another nervous subject, who was considered to have a "weak bladder," suffered constant and serious distress on account of his master refusing him the opportunity of relieving himself. Occasionally the weakness depends upon epilepsy. A child who constantly wets the bed had better sleep in flannel bed-clothes, as wet sheets become cold and chilling.

The act of micturition is necessarily associated with the shutting up of some urine in the ureters, and, when the event is of very frequent occurrence in a young child, the obstruction may be followed by dilatation, hydronephrosis, and destruction of the renal tissue.*

That a *long prepuce* is apt to be the cause of "irritation" of the bladder is a matter of such frequent occurrence as often to escape recognition; it is the converse of the proposition of

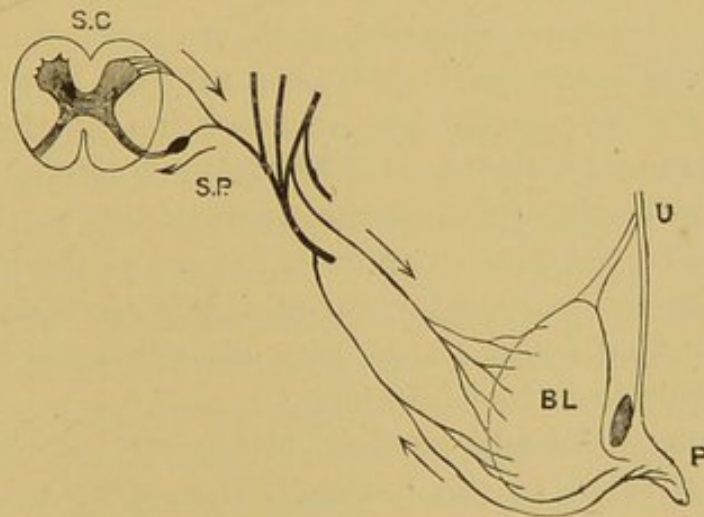


Fig. 68.—s c, Spinal cord ; s p, Sacral ; BL, Bladder ; P, Penis ; U, Umbilicus.

stone in the bladder with pain at the end of the penis. By day the boy endeavours to allay the symptoms by pinching the prepuce; but by night, when the brain is dormant, and the supervision of the genito-urinary tract is left to the care of the grey matter of the cord, a certain mismanagement may occur:—The sensory filaments which are distributed to the muco-

* Dr. Champneys, St. Bartholomew's Hospital Reports, vol. xvi.

cutaneous tissue at the end of the penis are derived from the internal pudic, itself a branch of the sacral plexus. The nerves of this plexus lose themselves in the grey cells of a certain part of the spinal cord, from which pass out the efferent fibres for the supply of the muscular walls of the bladder. This same colony of cells also receives the filaments which carry up sensations from the vesical mucous membrane (Fig. 68). By design and education these cells are specially occupied with the care of the bladder rather than of the end of the penis, and thus they are apt to interpret the afferent messages coming from the less important area as signals of distress from the bladder itself. For these signals they have but one means of relief, and this being put in force, the boy runs the risk of severe punishment in the morning for having unconsciously wetted his bed.

If there be any tightness, redundancy, or adhesion of the prepuce in a boy who suffers from incontinence of urine, this must first of all be put right. Dr. Baruch, who has had unusual opportunities of dealing with cases of nocturnal incontinence of urine, admits that circumcision is a remedy of extremely great value; he has observed that amongst the boys in a Hebrew orphanage under his care, enuresis is remarkably rare. If there be nothing in the condition of the prepuce likely to account for the vesical irritation, a careful examination should be made of the meatus of the urethra. If this be no larger than a pin-hole, it must be incised at the lower part, and kept dilated by the insertion of a tapering bougie. But some days or weeks may elapse after any operation before the bladder entirely loses its excitability.

If both preputial and urethral orifices be normal, inquiry should be directed to the bowels. The child may be the subject of habitual constipation, in which case he will improve on a course of rhubarb and soda; or, if constipated and anæmic, he may improve under a course of laxative iron mixture. The close association between the bladder and rectum through the network of the spinal and sympathetic nerves explains the frequent dependence of vesical irritation upon a loaded rectum. The presence of rectal polypus, also, may give rise to incontinence of urine.

An excess of nitrogenised food may possibly render the

urine irritating; the child should certainly not be allowed stimulants of any kind; he should feed only at regular meal-times; cakes and sweetstuff should be prohibited, and he should not be allowed to eat or drink just before going to bed. I have not found, however, that restricting the amount of meat eaten in the course of the day is an important element in the treatment of the case.

Belladonna is useful in the treatment of enuresis. Dr. Baruch administers the atropine in doses of 1-64th or 1-32nd of a grain in the late afternoon, and regulates the amount to be taken by watching the pupil. My own experience with this method has been satisfactory.

R̄ Atropiæ sulphatis, 1 gr.
Tinct. aurantii, ʒj.
Aquæ, ʒj.

Dose.—One drop for each year, to be given every hour in the late afternoon, or until the pupil is dilated at bedtime, and a dose or two during the night, should the pupil begin to contract. Thus, if the boy be six years old, he will take six drops—minims, shall we say? An ounce contains 480 minims, so that at each dose the boy would have 1-80th of a grain. Suppose he went to bed soon after six o'clock, and the first dose were given at three o'clock, he would have had 1-20th of a grain in all. But if this do not dilate the pupil, a little more may be given. It is, of course, better to begin with quite a small dose.

I would direct particular attention to the simplicity of the construction of this prescription—one grain, one drachm, one ounce, and one drop for each year.

A good deal may be done towards breaking the excitatory chain of the sleeping child of its bad habit by taking him from his bed once or twice in the night for micturition. This may be done at the time of the parent or nurse going to bed or getting up, or the child may be roused at an early hour in the morning. He certainly should not be allowed to lie upon his back, as in that position the urine disturbs the trigone. A cotton-reel harnessed over the lumbar vertebræ will ensure his sleeping on the side. The foot of the bed should be considerably raised, so that the urine may collect

far from the irritable trigone. And if this do not succeed, the child may be so placed and secured in bed that his pelvis is raised high above the rest of the body, so that the urine may gravitate to the comparatively insensitive summit of the bladder.

Heed must be given to the reaction which the urine has when freshly passed; if it be extremely acid, the child may be advantageously treated with a course of soda and gentian. Possibly such a child is born with potential gout or rheumatism. If it be alkaline when freshly voided, as happened lately in a most obstinate case of incontinence, the child's health must be improved by tonics of the mineral acids, and by change of air and diet. Or the reaction may be altered by a course of benzoic acid in doses of two, three, or five grains, in sweetened water. Too much confidence must not be placed in the use of drugs alone; still, the improvement obtained is apt to be ascribed entirely to the medicine given.

Another drug of which patient trial may be made in intractable cases is morphia, in doses beginning at the twenty-fourth part of a grain; whether it acts through the nervous system as a stimulant or sedative, or whether it acts directly through the urinary secretion, is uncertain. The effect of a small blister of cantharides over the sacrum may also be tried. Strychnia may act by improving the condition of the sphincter fibres at the neck of the bladder, or the tone of the tissues generally. Where the sphincter vesicæ has become indolent or has lost its tone, electricity may be of service. In using the weak, continuous current a wide-faced negative electrode should be placed over the lumbo-sacral spine, whilst the other is moved over the perinæum and hypogastric region.

Treatment by elastic bands or pads applied to the urethra is not to be thought of; cases are on record where unhappy children, in their anxiety to avoid wetting the bed, have tied a ligature so tightly round the root of the penis as to cause sloughing. (*See page 286.*)

If every effort to cure the child prove disappointing, it is a consolation to the parents to learn that the trouble will certainly wear itself away. Little boys suffer from it much

more than older ones; and as puberty approaches the trouble is sure to disappear. In the meanwhile it is not advisable that the child should wear an indiarubber urinal, as it would make the nurse and parents less earnest in their endeavours to hurry on the cure, whilst the effect upon the child would be extremely prejudicial.

But if a combination of circumstances lead to the suspicion that the irritation is due to vesical calculus, the child must be sounded once, twice, or as many times as necessary.

All the irritability may cease on a full-sized sound being introduced, even though no stone have been detected, and this should be adopted as routine practice in the treatment of enuresis, even although no symptoms of vesical calculus, beyond that of irritability, exist. To admit that this is empirical is not to detract from its practical value. In some cases, it probably acts by widening out a congenital stenosis in the urethra.

If the enuresis be simply the result of laziness or of any other bad habit, the way in which the sounding (which is to be repeated if necessary) may act is very evident.

Incontinence of urine in girlhood.—Much of what has been remarked above applies equally to incontinence both in boys and girls; but in the case of the female child, incontinence, hæmaturia, and even considerable purulent discharge, may be due to the presence of a *vascular polypus* at or within the meatus urinarius, which, by irritating the peripheral nerves, disturbs the vesical system, much as does the retained smegma in the other sex. The polypus may be no larger than a pin's head, or it may be the size of a currant; it is a bright papillary outgrowth of the urethral lining. For its detection the patient must be anæsthetised and placed in the lithotomy position in a good light. The urethral walls may be held apart by the blades of dressing forceps, the polypus being removed by a snip with the scissors.

On making a careful examination of a girl who was troubled with incontinence of urine by day as well as by night, it was found that the floor of her urethra was deficient. No operation was done for her, but, as she grew older, the muscular fibres at the neck of her bladder acquired increasing power in retaining the urine.

For *sounding*, a female child should be in the lithotomy position and the parts thoroughly exposed; even then there may be some little delay in introducing the sound into the bladder. Holmes remarks: "I hope it may not be impertinent to point out that at very early ages the vagina may be mistaken for the urethra." This caution is extremely pertinent. If there be any doubt, a second sound may be deliberately passed into the vagina to prove that the first has entered the bladder. Or the finger may be passed into the rectum to show that the vagina is free; or the beak of the sound may be felt for above the pubes. Digital examination of the rectum should be made at the same time, as many of the symptoms of stone may arise in the rectum.

If a girl be the subject of incontinence, for the cause of which repeated examinations offer no suggestion, nor medicinal treatment provides relief, it may be advisable to dilate the urethra and explore the interior of the bladder with the little finger; experience shows that the resulting paralysis is transient and is often extremely beneficial. I have resorted to it time and again, and always without injury, if not with success.

One most inveterate case—a girl of about nine years—completely recovered when, as a last resource, the urethra was dilated. The left index finger introduced into the bladder found nothing abnormal. Previous to introducing the finger the urethra was dilated by the dressing forceps. Dilatation by the use of laminaria tents is inadvisable; in a case under the care of Giraldés it was followed by tenesmus, vulvitis, and enlargement of the inguinal glands. Nor should the treatment by dilatation be adopted until other means have had fair trial.

Prolapse of the urethra in female children is apt to be caused by the presence of a nævoid growth or a vascular polypus, and may persist after ablation of the neoplasm. In such cases it may be necessary to reduce the redundant mucous membrane by the removal of some narrow, longitudinal slips by means of scissors or linear cauterisation.

Hydronephrosis.—From congenital defect in the ureter, bladder, urethra, or prepuce, or as the result of a blood-clot blocking a ureter which has been severely injured—as by

a blow, or a severe contusion—urine may quietly collect in the kidney. Expanding its wall, it forms a large, dull tumour, which may occupy the chief part of one side of the abdomen, and also the space between the last rib and the back of the iliac crest. The disease may exist on each side. The size of the tumour may at times diminish with the escape into the bladder of some of the pent-up urine; such intermittence is highly pathognomonic of hydronephrosis. The diagnosis from chronic abscess or sarcoma (*see* page 122) is made by the aspirator, the fluid withdrawn being watery urine of a very low specific gravity. The tumour may be dealt with by aspiration, massage, or, if necessary, by incision through the loin—by nephrotomy, in short. Indeed, if the case be left untreated, complete atrophy of the kidney is certain to ensue, so that, no further addition being made to the fluid, its eventual absorption occurs, and the tumour disappears; the “cure” taking place, however, at the expense of the kidney.

I have recently operated on a little girl—a patient of Dr. Davson’s—for a large hydronephrosis (? congenital), removing it through the linea semilunaris, and suturing and dropping back the ureter. The child made a rapid and complete recovery. An advantage of treating hydronephrosis by abdominal section is that it affords the opportunity of examining the other kidney.

Hæmaturia generally results from vesical calculus, and in every case of blood-stained urine the child should be sounded. Other causes are injury to the kidney, bladder, or urethra; foreign body; malignant or papillomatous disease; acute nephritis, hæmophilia (page 54), and renal calculus.

Rugous bladder.—Occasionally the sound finds the lining of the bladder roughened by certain prominent folds which impart a peculiar leathery feel. What the exact pathological condition may be, I cannot say; certainly, the sensation is not due to the presence of definite tuberculous disease. Sometimes there is a mortary feel on sounding, as if the rough wall were coated over with phosphatic deposit; and this may actually be the case, although the urine is at the time acid. Possibly from errors in diet, or from other causes, the urine had been previously so acid as to irritate the

mucous membrane and set up cystitis, when the phosphates were at once thrown down. Indeed, the rugous condition of the lining itself may have been the result of a quiet, antecedent cystitis. No wonder if such a bladder become irritable and suggest the presence of stone.

When a boy is the subject of this peculiar condition of bladder, he should be put to bed and carefully watched, the bowels being kept relaxed. Cod-liver oil and iron may be prescribed, and a light diet, containing plenty of milk, should be ordered. Oranges and other fruit may be useful, and if the urine still be found over-acid, small doses of citrate of potash may be given. When the child is allowed to get up, he should be very warmly dressed, and should be kept out of the reach of cold winds and wet weather.

Stone in the bladder of a child is more likely to exist in the male than in the female, as in the latter it is likely to escape through the short and dilatable urethra. It may give rise to chronic priapism, and to urgent demands for micturition, so that the poor boy wets his trousers by day and his bed by night; for which uncontrollable acts he is often severely punished. So great may be the straining that, with the expulsive effort, the lower bowel is involuntarily emptied. From fear of soiling his trousers he runs to the closet when the urging comes on, and, sitting there and straining, prolapse of the rectum takes place. From a bruising of the congested lining of the bladder by the stone, blood may be mixed with the urine, so that it is red or coffee-coloured. If the urine be allowed to stand, it may give a plentiful deposit of mucus or pus; and even when freshly passed, it may be ammoniacal and offensive. As the bladder is emptied, the stone is forced against the tender trigone, so that the child screams again, and if the stone be driven against the urethral opening the stream is suddenly and painfully stopped. In these circumstances the boy discovers that he can best relieve himself by lying upon his side, or by getting on to his hands and knees; in the latter position the stone falls from the trigone towards the summit of the bladder. But whatever the position assumed, the boy is apt to feel pain during micturition. There is much pain at the end of the penis; to allay this he pulls at the prepuce, which, from constant manipula-

tion, may be elongated and inflamed. Occasionally his fingers may be found white and sodden, like a washerwoman's, from constant soaking in the escaping urine.

The referred pain at the end of the penis may be likened to that at the knee in hip-joint disease, and may be ascribed to some confusion in transmission through the sacral plexus to the grey matter of the cord—branches of that plexus supply bladder, penis, and prepuce. The converse of the proposition is found in the vesical irritation which is the result of a long foreskin (*see* Fig. 68). Vesical irritation, or, as the parents call it, "weakness of the bladder," is often cured by circumcision (page 292). Sometimes, and especially so in girls, there may be little more than "weakness" of the bowel, or tenesmus, to suggest the presence of vesical calculus.

When two or more of the symptoms detailed above co-exist, the prepuce should be carefully examined, or the child sounded. The persistence of any one of these symptoms should be the hint to sound, and although no stone be found, the mere passage of the instrument often effects a cure. If the result of the sounding be negative, and the symptoms continue, the child should be sounded again and again; for the calculus, if very minute, may escape detection on the first or second occasion, though, as a rule, if a stone be there, it is discovered on the first entrance of the sound. Unless the stone be very small, it may be felt by digital examination *per anum*, especially if the bladder be emptied, and the pelvis be raised so that the stone may fall into the fundus.

If the meatus urinarius be small, or the child frightened, it will be better to "put him to sleep" before sounding, as by a sudden movement the urethra might be damaged. By

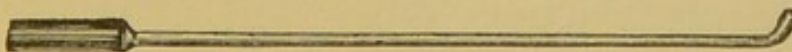


Fig. 69.—The Best Form of Sound. The handle is cylindrical, and of metal, and the beak is short.

engaging a child in earnest conversation on such a topic as that of the names of his brothers, or of his future walk in life, the surgeon may often manage to slip in the warm and well-lubricated sound (Fig. 69) before apprehension is aroused. The sound should have a beak rather larger than the shaft, and

the beak should be short, so that it can make a thorough search. If there is any resistance on the part of the child, chloroform should, of course, be administered. Indeed, in the general run of cases this is quite necessary.

Injection of warm water is not necessary; but lest the stone be hidden behind a mucous fold, and so escape detection, the surgeon should turn the child on the side, and have the pelvis raised. The exploration may be completed by passing the finger into the rectum. The theory of a calculus escaping detection (or, later, removal) from its being lodged in a sacculus in the bladder-wall is rarely acceptable; the bladder of the child is not sacculated. As in a case of Mr. Pitts, rectal examination may reveal a stone impacted at the end of the ureter. Rectal and bimanual examination should always supplement exploration with the sound.

Calculus in the ureter may determine symptoms of stone in the bladder, yet sounding may give a negative result. Blank sounding should always be supplemented by help of the finger in the rectum. If the stone be small, and lodged at the orifice of the ureter, it may evade detection on many soundings; but at last it will escape into the bladder and be struck. The surgeon should not rest contented with *one* sounding, but while symptoms persist he should examine the bladder from time to time.

A stone lying in the orifice of the ureter might be struck by certain turns of the sound, and then, on lithotomy being performed, it might not be discoverable. It might be detected by rectal examination. Later, it might escape and be found in the bed. When impacted within the orifice of the ureter, it may be best attacked and removed by the suprapubic operation (page 306).

Lithotomy and lithotripsy.—A few years ago every boy with stone was submitted to lateral lithotomy. At the present day, with an almost similar want of discrimination, many are being operated on by the suprapubic method. We are not yet in a position duly to appreciate the value of the latter operation; but figures would probably show that in general application its results are far less satisfactory than those of the lateral operation. Cheselden's operation has a

magnificent record in the past, whilst the high operation has a history which, up to the last few years, at any rate, was generally acknowledged to be anything but creditable. And even at the present time, with an improved surgical hygiene and technique, and when adopted by surgeons of undoubted care and skill, it is not, so far as I can form an opinion, doing much towards improving its reputation. Surgeons are, moreover, having recourse to the suprapubic operation in apparent disregard of litholapaxy for boys with small and moderate-sized stones. In one case of lithotomy I found the stone adherent to the mucous membrane. Such a condition is rare, and offers no strong argument against litholapaxy, for the surgeon assures himself that the lithotrite and stone are free before he begins to work the screw.

Appreciation of operations.—Lithotrity after Bigelow's method should be adopted for every boy whose bladder is fairly healthy, whose urethra can transmit the lithotrite, and whose calculus is not too large to be seized, nor too hard to be crushed by it. The lithotrite should always have a trial, and even if it take an hour and a half to remove the stone, the time will have been rightly spent. Mr. Freyer has thus successfully removed a stone of 700 grains, or nearly $1\frac{1}{4}$ oz., from a boy of nine years. This operation lasted two hours, and the boy was practically well in a few days. But in every case of lithotrity the instruments should be at hand to finish the removal of the stone, if occasion arise—as with a locking of the instrument—by a cutting operation. For the boy whose urethra refuses to admit the lithotrite, even when the meatus has been incised, but whose stone is not very large, and for the boy whose stone, though not large, proves too hard for the lithotrite, lateral lithotomy is the appropriate treatment. Lastly, for the boy whose stone is as large as a pigeon's egg, or larger, the high operation should be undertaken.

Thus nearly every child with stone, of two years old and upwards, should be treated after Bigelow's method; infants and a few grown children should be dealt with by lateral lithotomy, and a few large stones must be removed by suprapubic operation; but a resort to this last method should be quite exceptional. I have successfully removed from

an undersized boy of thirteen years a stone of $2\frac{1}{4}$ oz. by lateral lithotomy.

Lithotrity in boys.—To Brigade-Surgeon Keegan our thanks are due for demonstrating, in opposition to old prejudices, the fact that Bigelow's operation of crushing and promptly removing all fragments of a vesical calculus—*litholapaxy*—is as well suited for boys as for men. We had been taught that even if the boy's urethra were capacious enough to allow of the passage of a trustworthy lithotrite, his bladder could not tolerate the interference necessary for pulverising the stone. We now know that this is quite incorrect. Keegan has published a table of 214 litholapaxies performed on patients varying in age from below two years to fourteen years, with a mortality of seven, or a death-rate of 3.27 per cent. These 214 litholapaxies include seven successful operations performed on young girls. The average number of days spent in hospital subsequent to the operation was under seven.

The opinion in England had been that only soft or small stones could be thus dealt with, but Keegan has shown that oxalates of fair size, and urates of 600 grs., may be crushed and removed from the bladder at a single operation. The instruments used were Nos. 6 to 10 of the English gauge—that is, taking the smallest, No. 6, in the angle, and 5 in the stem. Freyer, too, has successfully crushed and removed "a very hard stone" of 700 grs. from a boy of nine years by a fenestrated No. 8 lithotrite, the operation lasting two hours. The boy was well in a few days. The evacuating tubes fitted to the wash-bottle are of the same calibre as the angle of the lithotrite. The evacuating catheters should be short, and should invariably be fitted with stylets for dislodging fragments which happen to get impacted. Sometimes it is necessary to incise the meatus urinarius (downwards) before the instrument can be introduced.

For these operations only the best make of instrument should be used. It would be a terrible predicament, the bending and locking of a "cheap" lithotrite in a boy's bladder! In using, as I have done, Weiss's instruments, the surgeon proceeds with confidence and safety, the operation proving, with but few exceptions, simple and successful.

The operation demands absolute gentleness, and not a particle of stone should be left in the bladder. There should be no hurry, and the stone should be crushed into a fine powder.

For **lateral lithotomy** no special preparation of the patient is required further than clearing the bowels. Whether the bladder be full or empty when the patient is brought upon the table matters little. The only use of water in the bladder at the time of the operation is that its escape may afford information of the knife having entered the bladder; but the delicate sense of touch received through the knife gives this information with more trustworthiness.

The staff, which I strongly recommend to the operator who still feels himself free to make his choice, is shaped like the sound, and its beak is quite short. Its median groove ends in a stop where the beak curves off. Its advantages are that it is used as a sound when the child is on the table, and that it forms a straight director from the perinæal incision into the bladder. There is no chance of the knife slipping from its groove and failing to open the bladder, or of its leaving the groove and transfixing the posterior wall of the bladder—calamities which have happened with the curved staff. The stop at the end of the groove guards the bladder from injury, and the beak prevents the staff from leaving the bladder. The staff should be of a size to pass comfortably; the larger it is, the easier is it to find the groove.

The child lying flat upon the table, and anæsthetised, the surgeon introduces the staff, and feels and hears the click of the stone. Of this both he and his chief assistants should be absolutely certain. If there be any doubt, the operation must be postponed. There is no exception to this rule—that, before proceeding to cut, the surgeon and his assistants make sure of the presence of the stone.

The staff being introduced, the child is brought to the end of the table, and the thighs are flexed and squarely held by two assistants; it is not necessary to tie up the child. A third assistant stands at the left side, holding the staff with the right hand, and, if necessary, raising the scrotum with the other. The surgeon sits in a chair at the breech of

the patient, with a pot of vaseline, the knife, and the forceps at his right hand. He runs his fingers along the pubic arch to the ischial tuberosity, in order to take his bearings, and then, having lubricated his left index finger, he feels by the rectum for the staff, and convinces himself that the bowel is empty, and, therefore, little likely to be cut in the operation. This proceeding should never be omitted, as the staff might possibly have left the urethra, by a false passage, and run between bladder and rectum. Some blank lithotomies were to be explained by the fact of the staff having strayed, and the bladder never having been opened. It matters little how the straight staff is held in the early part of the operation, for when the knife has entered the groove, the surgeon takes the staff into his own hand. A curved staff should be neither thrust towards the perinæum (and rectum), nor hooked up under the pubes. If, when the child is on the table, prolapse of the rectum occur, it should not be returned; to reduce it is to make the lower end of the bowel full, and to render it more likely to be incised.

The surgeon then cleanses the finger, gives a last look to the position of the thighs and the staff, and thrusts the point of the knife well into the middle line of the perinæum, half-way between the anus and the base of the scrotum, cutting freely outwards and backwards into the ischio-rectal fossa. If this first incision be free, the second part of the operation is simplified, as the staff becomes more accessible. Only one knife is used throughout the operation; even for very young children its blade must not be too small, for the finger has to be passed after it into the bladder.

Formerly a great deal used to be spoken about the way in which the operator should hold the knife in the various steps of lithotomy. He should hold it as suits him best; for my own part, I prefer to hold it as a pen.

A little lateral movement of the knife proves the point to be securely lodged in the groove. Then the surgeon takes the handle of the staff from the assistant, and, giving it a very slight turn on its long axis, so as to direct the groove more towards the line of the wound, thrusts staff and knife on together, as one instrument. At the escape of urine, or by appreciation of his having pushed the knife in far enough, he

withdraws it, and passes the *left* index finger through the bladder-wound, and feels the stone. For this he takes the staff into the right hand; but if he find the wound in the prostatic urethra too small to allow of the tip of the finger being passed on to the pubic side of the staff, he enlarges it a little with the knife; otherwise he might tear through the rest of the urethral wall, and push the bladder off the end of the staff. An inefficient use of the knife at the base of the bladder is the commonest cause of blank lithotomy, for the surgeon having detached the unopened bladder, and having excavated a space by his finger in the depths of the pelvic outlet, mistakes it for the bladder. If the urethra have not been completely torn through, the timely opening of the neck of the bladder may yet prevent disaster; but if the bladder have been pushed off the staff, and the stone cannot be struck, the child should be sent to bed for a time, unrelieved; no speculative cuts should be made towards the bladder with the forlorn hope of reaching the stone.

An important rule is not to withdraw the staff until the finger is touching the stone. As the finger is working its way into the bladder, it is stretching some tissues and rupturing others, until a free passage has been effected. When the stone is touched, and the staff removed, a slender, straight pair of forceps is run over the finger on to the stone; the handles are separated, and by a little manœuvring the stone is caught, and steadily drawn in the direction of the pelvic outlet. If the stone be large, it may be necessary gently to work the handles from side to side, and up and down, so as to stretch the wound to the utmost; no jerking is permissible. After the stone is extracted, the finger should be introduced again, to make sure that there is not a second stone. Some small vessel, such as a branch of the superficial perinaeal, may require tying; or, if deeply placed, catch-forceps may be applied; or the pressure exerted between the edges of the wound, when the thighs are brought down, may suffice to check it, especially if a small piece of ice be left near the wound, or a syringe of iced water be thrown into the bladder.

If these measures prove insufficient, a petticoated tube may be arranged. Through a small hole in the middle of

a piece of linen, about four inches square, the end of a gum-elastic tube is thrust, the linen being firmly tied around the tube about half an inch from the end. This end is lubricated and thrust into the bladder, and the space between the tube and the petticoat stuffed with strips of lint.

When the tube is tied in position, a syringeful of iced water may be injected into the bladder, to make sure that the water-way is clear; unless actually wanted, the tube is harmful. The less the wound is meddled with after the operation the better.

After the operation the feet should be tied together, and the buttocks laid upon a circular air-pillow, which rests upon a bed-pan of similar form, the short, hollow handle of which is kept to the side of the cot, so that the nurse, by simply looking down it, may watch against the occurrence of bleeding, and likewise inform herself of the evacuations, without moving the boy.

During the first day or two, all the urine escapes by the wound, but as its edges swell some flows along the urethra; as the swelling subsides, the urine again escapes for a time by the wound. At the end of ten days or a fortnight all is well. From the moment that the child recovers from the effects of the chloroform he is happy and quiet, whereas he was previously anxious and irritated.

The *median operation* is not suited for children, as the rigid structures which fill up the narrow subpubic arch do not allow of the easy passage of any but small stones.

Suprapubic lithotomy.—The bladder is emptied by a silver catheter, and washed out with a warm solution of boracic acid, and as much of the fluid as the bladder will conveniently hold is left in it. The catheter is not withdrawn; a ligature is placed around the root of the penis. A thin indiarubber bag may be passed into the rectum; when gently distended with warm water, it raises the bladder into the hypogastric region and elevates its superior peritoneal fold, though this is rarely necessary. A three-inch incision is made in the middle line, ending upon the front of the symphysis. By the careful use of the dissecting forceps and director, the front of the bladder is reached; it is then seized with mouse-toothed forceps, and opened in the

direction towards its neck; the stone being removed, the bladder should be explored by the finger, lest there be a second stone. The rectal bag is emptied and withdrawn. It is better not to put sutures in either the vesical or the abdominal wound. No drainage-tube is required, but the child may be kept a good deal on his face or side.

The high operation is straightforward and free of the risk of hæmorrhage, of injury to the ejaculatory ducts, and of not opening the bladder (as in certain blank lateral lithotomies); but there is some risk of wounding the peritoneum, also of urinary infiltration occurring in the loose connective tissue around the bladder, and of septicæmia. Moreover, it does not afford to the bladder the perfect drain which is secured by lateral lithotomy. The rectal inflation should be carried out with the greatest care, or the bowel may be ruptured or involved in gangrene. It is safer not to use the rectal bag, for even without it there is no actual difficulty in finding the bladder. In one case the inflated rectum pushed the bladder aside, and, coming forwards to the suprapubic region, was actually opened in mistake for the bladder. In another case, the first object seen after opening the abdomen was the bag, which had sprung forwards through a rent in the rectum. In another case, the peritoneum being wounded, the abdominal viscera appeared when the child was in bed. No; the high operation has not a good history in children.

Stone in girlhood.—Calculi in girls are comparatively rare, for a small stone descending from the kidney would readily escape by the capacious urethra; nevertheless, every girl with obscure symptoms about bladder or rectum should be thoroughly sounded. The symptoms differ from those in the boy. There may be but little complaint of vesical trouble, whilst tenesmus, diarrhœa, and pains about the perinæum may withdraw attention to the rectum. There may also be irritation about the external genitals, and the urine may contain mucus or blood. The stone may be felt through the vagina.

Under an anæsthetic, the stone, if small, may be withdrawn by a pair of ring dressing forceps, though there is often difficulty in seizing it. If it be large, it should

be crushed with a lithotrite, every particle being removed by the evacuator.

Polypoid tumours of the bladder.—The history might begin as one of vesical irritation, then stone would be suspected; the sound, or in the female the finger, may detect a strange substance, and the exploration would be followed by a further bleeding. In a boy no treatment short of suprapubic or perinæal cystotomy would be likely to avail. Digital exploration through a perinæal incision should be undertaken, if only to ensure free escape of urine and *débris*. The tumours may be simple myxomata or sarcomata, and in either case they are likely to be growing from the trigone, multiple and pedunculated. In the female they may protrude from the meatus urinarius.

Case.—A boy of six was admitted for retention of urine, a condition to which he was occasionally liable. Just before sending him into hospital his medical attendant had with difficulty introduced a catheter; when in the hospital the house surgeon also met with obstruction. On my seeing the boy, soon after admission, there was much difficulty in passing the instrument, and there was evident fulness in the perinæum, as if from extravasation of urine. Perinæal section was performed. After a day or two this incision failed to afford sufficient escape for the urine, so the wound was continued on directly into the bladder. A severe outbreak of scarlet fever then occurred in the ward, and the child took infection and sank. Autopsy showed that the obstruction was caused by a sarcomatous growth from the trigone blocking the neck of the bladder. In another boy under my care the tumours could be clearly made out by rectal examination—a sure sign of malignancy; suprapubic cystotomy was performed, and gave great relief. Soon afterwards the growth sprouted through the wound, and the child eventually died exhausted. (*See* Targett's "Lectures on Sarcoma of the Bladder.")

Vulvitis is common in weakly or tuberculous children. It may be due to the presence of thread-worms which have wandered from the rectum. Sometimes it is the result of dirt, or of incontinence of urine. It may be associated with eczema of the pudenda and thighs, or with tuberculous

ulceration. Lastly, the attack may be caused by a foreign body. The tissues are swollen, red, and painful. Attention may first be directed to the condition by the linen being soiled, by the child constantly rubbing or scratching the parts, or by the frequent micturition. The first examination of the parts should be thorough, and may even need the administration of chloroform.

The *treatment* requires soothing measures, and absolute rest in bed. Frequently in the course of the day the child may be made to sit in warm antiseptic water. A mild lotion may also be used with a syringe, the labia being subsequently kept apart by strips of wet boracic lint. After each washing the labia should be carefully dried by a soft towel; they may be then dusted over with boracic acid powder, or anointed with vaseline and eucalyptus. If the urine be strongly acid, acetate of soda may be given. The food should be of a fluid and unstimulating nature. When the acuteness of the attack has passed off, iron and other tonics will be required.

Prolapse of the bladder sometimes occurs in female children who are the subjects of severe and long-continued straining. I have lately had a case of this sort under my care: the bladder was turned inside out through the urethra, which was so much dilated as easily to admit one's index-finger. The treatment consists in removing the cause of the straining (page 316), and in improving the child's general condition.

Gonorrhœa.—Vulvitis of venereal origin is occasionally met with, but the disease possesses no characteristic feature whereby it can be certainly recognised. Whether the presence of diplococci in the discharge can be taken as positive evidence of gonorrhœal infection, it is as yet too early to say. The profuseness of the discharge offers no differential feature. If the parts were bruised or torn, the suspicion of the child having been violated would be grave. But when precocity or hysteria influences a clever girl, a simple leucorrhœa may be made the subject of an accusation which is as groundless as it is serious. Parents are naturally anxious and suspicious when a child is found with purulent vaginitis, but the discreet practitioner will do all in his power to allay groundless fears, and prevent the child from

being made an object of harmful attention and of suggestive questioning.

In certain districts of England, where superstition lingers, and charms are still believed in, the adult male is apt to be under the apprehension that the specific urethritis from which he suffers can be straightway cured by contact with a child. Gonorrhœa is not infrequently communicated in this way. If there were nothing wrong before the time of the alleged rape, and if a thick and copious discharge containing diplococci were noticed within a few days of it, with much swelling and scalding, the suspicions would be grave indeed. As in adults, pyæmic arthritis may ensue.

The *treatment* will be that already described. It is well to begin with a dose of rhubarb and soda, or of castor oil. The child should be made frequently to sit in a mild, warm antiseptic solution. This should be done at least twice a day—night and morning. Being surrounded with a blanket, she may remain in the bath for fifteen or twenty minutes. A weak lotion of corrosive sublimate or Condy's fluid may be used with a common glass syringe, a small piece of boracic lint being inserted between the labia. Absolute rest in bed is a most important element in the treatment.

Apthous vulvitis is spoken of by Sarazin as of common occurrence in hospital practice, especially in connection with measles. The parts are to be frequently washed and carefully dried; boracic powder is to be dusted over the surface, and the labia are to be kept apart by a small tuft of boracic wool. Constitutional remedies must be employed, and the child kept in complete rest.

Noma.—Noma is a gangrene of the external generative apparatus, and is of a like nature with cancrum oris. (*See* page 193.) It is more frequently met with in girls than boys; I have only on one occasion seen it involve the scrotum. It is apt to attack the child who has been reared in an atmosphere of poverty and dirt, especially if her constitution have been taxed by a recent illness such as diarrhœa, measles, or scarlatina. The fever and exhaustion associated with noma are often extreme, and it is no wonder that the miserable child who is the subject of the disease

sinks under it. During the separation of the slough blood-poisoning is apt to set in.

The result as regards ultimate deformity by cicatrisation compares favourably with that left after *cancerum oris*, the lax and abundant tissue in the pudendal region being slowly drawn up to obliterate the gap left after the separation of the slough. Should ulceration implicate either commissure of the vulva, or the adjacent margins of the aperture, careful dressing is demanded. Should a partial atresia supervene, a plastic operation might be required later.

CHAPTER XXI.

THE RECTUM.

Imperforate rectum.—During foetal life the upper part of the rectum, which is developed from the internal blastodermic layer, descends into the pelvis, but is separated by a considerable depth of tissue

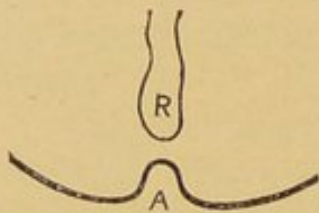


Fig. 70.—R, Pelvic portion of Imperforate Rectum descending towards outlet; A, Anus.

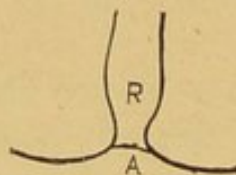


Fig. 71.—Imperforate Anus: R, Rectum; A, Anus.

from the surface of the perinæum. There a depression is found in the skin, at the site of the future anus, which, deepening into the pelvis, forms a shut sac, the upper end of which is

fused into the blind end of the bowel to complete the outlet. If absorption of the partition fail to take place, complete intestinal obstruction results, though the anus itself may be well formed. In every case of obstinate constipation careful inspection of the anus, and of the lower part of the rectum, should be undertaken.

Case.—An infant three or four years old had passed nothing; the nurse had dosed it with castor oil, and it

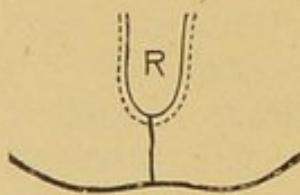


Fig. 72.—R, Rectal Cul-de-sac surrounded with Peritoneum, and ending in fibrous cord.

was desperately sick. On introducing the finger, a septum was detected; this was broken through with a director, and the opening was then dilated with dressing forceps; a motion was passed, and the child did well. Such cases, however, may give perpetual trouble from contraction of the remaining annular constriction (Fig. 70).

Another girl, of five years, was under treatment for a constriction an inch and a half within the anus, which was so unyielding that all that could be done was to wash out the fecal accumulations from time to time by an irrigator.

Excision of the hardened tissues is a speculative and unsatisfactory procedure. If the obstruction increase—and from the nature of the case this difficulty must be expected—the question of colotomy may be considered.

Imperforate anus.—Occasionally, though the rectum is perfectly formed, a thin membrane skins over the anal orifice; the diagnosis and treatment are evident. If the anus be small, it will require dilatation with the finger, the nurse being taught how to treat the child (Fig. 71).

There may be no trace of anus, though the pelvic part of the rectum is properly developed (Fig. 72). It is then necessary to introduce a sound, as a guide, into the bladder or vagina, according to the sex, and, with the child in the lithotomy position, to dissect up along the sacral curve in search of the bulging *cul-de-sac*, exploring carefully with a firm director. If the search prove successful, dilatation must be effected by the dressing forceps and finger, the nurse being instructed how to maintain the dilatation. To diminish cicatricial contraction, the end of the bowel should, if possible, be brought down to the surface, and there secured by sutures. Mayo Robson has advised that, if need be, this dissection be carried up into the peritoneal cavity, and that the dilated pelvic piece of the rectum—or, failing that, the colon—be brought down and opened, and secured at the surface-wound. If, as is apt to happen, the pelvic outlet is abnormally small, no attempt should be made to find the bowel at the breech; for if, as would be not very unlikely to happen, a piece of small intestine were brought down and opened, the child would probably soon sink.

Littré's operation.—If the search for the large intestine prove ineffectual, the child should be placed upon its back and an inch incision made in the left iliac region, through the peritoneum. The first piece of intestine to present is usually the sigmoid flexure, but it is attached by so wide and free a mesentery that it might be taken for a piece of small intestine; absolute size of bowel is no guide as to its kind. The colon being greatly distended, no trace exists of the longitudinal muscular bands, but on following the bowel upwards and downwards its identity becomes established. A loop of it is then stitched to the margin of the wound, and

if it be greatly distended it may be drained by a glass tube, which is secured in a small incision. If there be no urgency, the bowel need not be incised until it has become glued to the wound by plastic lymph.

I have had occasion to perform this operation on six infants with imperforate rectum.* The first did well for three months, at the end of which time another attempt was made to establish a perinæal anus, a flexible bougie being passed down the sigmoid piece of the bowel. This was accomplished, but *post-mortem* examination showed that the serous covering of the rectum had been damaged. The second was a male child whose acute symptoms were relieved by the operation, but who died three days later. The third had peritonitis at the time of operation, and died on the fourth day after it; the lower part of the rectum was represented by a firm fibrous cord. The fourth case was similar. The fifth perfectly recovered from the colotomy; but after three months, on an attempt being made to establish the perinæal anus, fatal peritonitis supervened. The pelvic piece of the rectum was found ensheathed with peritoneum. The sixth case resembled the third.

In five of the six cases the sickness stopped as soon as the intestinal contents found escape, the children obtaining immediate relief. Two of the children might possibly have been alive now had I but rested content with the permanent artificial anus.

Amussat's operation can rarely be done in children without implicating the peritoneal sac; but though the peritoneum be wounded in two places in the loin the child may recover, just as it may after the groin operation (Littre's); but the latter operation is so easy of performance that it should always be chosen. Other objections to Amussat's operation in these cases are that the descending colon is apt to have wandered from its normal position, even to reach the right side of the abdomen; and that the large intestine may be absent or imperfectly developed. If the groin operation be undertaken, this can be leisurely made out and, if necessary, the small intestine opened. "It is argued in some surgical works that the surgeon should

* *British Medical Journal*, 1880.

abandon to death the subject of imperforate rectum. I doubt the morality of this reasoning; I do not think we have the right to abandon a patient to certain death if we know of any means likely to save him" (Holmes). If no operation be performed, the child dies in great distress, unless the bowel empty itself by abscess and faecal fistula.

That a groin anus is not, after all, a dreadful condition is shown in Curling's essay.* Speaking of a lady so afflicted, he says: "She constantly enjoys the best health, goes into society, attends balls, and no one would suspect her to be the subject of any infirmity. She is married, has borne four children, and her pregnancies and labours have been quite normal."

Invagination of the bowel out of the wound is apt to occur after the establishment of artificial anus, and discharges set up troublesome dermatitis, taxing the resources of the medical attendant, the patience of the parents, and the endurance of the child. The greatest local cleanliness is necessary. Lint spread with vaseline must protect the surface, and a soft pad of carbolic tow in gauze should be worn over the opening.

A reference to Fig. 66 shows how the rectum may open into the bladder or urethra; either defect may demand the performance of inguinal colotomy. Sometimes the bowel opens upon the front of the perinæum through a narrow fistulous tract, which, on being laid open, may possibly lead to the establishment of an anus in the perinæum. The least serious irregularity is that in which the fæces are discharged *per vaginam*. If the child have control over the motions, the surgeon would be disinclined to attempt a plastic operation unless the introduction of a bent probe into the orifice revealed a *cul-de-sac* extending towards the normal site of the anus. Then having established a proper anus, he might endeavour to close the opening into the vagina.

Prolapsus recti.—From constant straining, the mucous membrane of the anal region becomes congested and hypertrophied, and the tissue of the submucous layer so stretched that the mucosa bulges in a dusky, annular fold outside the anus. But in other cases the muscular coat of the bowel also

* Trans. of Med.-Chirurg. Society, vol. xliii.

descends; indeed, when an inch or more is protruding, the ring must needs be composed of the entire thickness of the rectal wall, the rectum being then turned inside out. This is the common condition of prolapse in children, the peritoneal coat coming down as well as the muscular and mucous coats.

There is another variety of prolapse, in which, on rare occasions, the upper part of the rectum slips out, in a circular fold, without carrying down the lowest part of the bowel. This is a true intussusception, and it is apt to be mistaken for a large polypus. But digital exploration round the inside of the bowel, and the presence of a central aperture in the protrusion, should render the error unlikely to occur. It may not be in itself a disease, but, like hernia (page 345), should be regarded as a symptom. Among the children of the poor it is often the local expression of constitutional weakness. Sometimes it is the result of weakness, aided by the forced expulsive effort of whooping cough or chronic diarrhoea. It may be due to the straining associated with habitual constipation, worms, rectal polypus, phimosis, or stone. In a case of obstinate prolapse the preputial and urethral orifices should be inspected, the rectum should be explored with the finger and the bladder with the sound.

The habit of allowing a child to sit for an indefinite time trying to pass a motion, and threatening to keep him there until this is accomplished, is reprehensible in the extreme. I have already referred to the danger of letting a constipated child sit over a chamber vessel containing hot water (p. 158).

If the prolapse be allowed to persist, the venous return from the invaginated piece will be delayed, and the tissues will become engorged and œdematous. Strangulation will then ensue and gangrene supervene. If it happen that the prolapse is reduced in this stage, sloughing will extend into the peritoneal cavity, and fatal collapse will take place. I have recently had such a case in my ward at the Children's Hospital. Death occurred within twelve hours of the child's admission, and at the autopsy it was found that perforation, the result of gangrene, had made a wide opening through the peritoneum. In this case the long-continued straining had given rise to complete prolapse of the child's bladder (*see* page 309).

Treatment.—The child should not be allowed to sit upon a closet-seat or chamber vessel, but should be made to lie upon his side and pass his motions into a cloth. And the mother or nurse should be instructed to pull the skin from the neighbourhood of the anus, upwards over the ischial tuberosity, each time a motion is to be passed, so as to put the mucous membrane of the lower bowel on the stretch.

If diarrhœa cause prolapse, the bowels should be thoroughly evacuated, and then kept confined by castor oil and opium; rhubarb and soda mixture, and afterwards a course of soda and gentian, or cod-liver oil and iron, with an occasional laxative, may be resorted to. Whether the prolapse be associated with diarrhœa or not, half-drachm enemata of glycerine may prove of excellent service. Prolapsed bowel should be well washed with warm or cold water, carefully dried with a soft cloth, dusted with finely-powdered alum, and returned by firm but gentle pressure as the child lies upon the face. This position should be kept up as much as possible, a large pillow being placed under the pelvis and thighs. If the case be obstinate, it may be advisable to fix the buttocks close together by a wide piece of adhesive rubber strapping, so that prolapse is mechanically impossible, the child being kept prone, with the pelvis raised to the utmost. The diet should consist chiefly of milk, rice, egg, and beef-tea; coarse bread, oatmeal, fruit, and vegetables, should not be allowed, and all food should be given cold.

Judging from the extremely bad cases I have seen, and successfully dealt with by patient and gentle measures, I venture to express the opinion that the heroic treatment which entails the employment of nitric acid, actual cautery, or scalpel, can rarely be necessary. I, at least, have never had to resort to it. Patient and careful supervision does all that is needed in these cases.

If, however, on account of the obstinacy of the protrusion, the surgeon determine to perform resection of the prolapsed bowel—an operation which I do not think likely to be necessary—he should be careful to secure the upper piece. As soon as the section is made, tension would be removed, and there would be a great risk of the upper part of the

divided rectum being pulled out of reach into the peritoneal cavity, for the prolapsed piece of bowel has a serous covering. Should this happen, abdominal section might have to be performed, in order to prevent the occurrence of fæcal extravasation into the peritoneum.

Polypus is associated with great irritability of the rectum and bladder; the child strains and cries at stool, and often

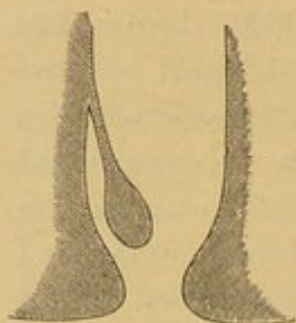


Fig. 73. — Rectal Polypus.

passes nothing but a little blood and mucus. The vascular growth may be attached to the wall of the bowel by a pedicle of sufficient length to allow of its escape during defæcation; it is then tightly grasped by the spasmodic contraction of the sphincter, the sensory nerves at its base are dragged down, and the boy screams with agony. The mother, examining for cause of the distress, may catch sight of the polypus

if it have not already been drawn up again, and she may correctly describe it as being of the size and colour of a ripe currant or cherry (Fig. 73).

Even without the mother having seen it, the history is almost conclusive:—The frequent going to the closet, the bleeding, and the agony when the polypus has been caught by the sphincter. Many of the symptoms are those of vesical calculus (page 298).

With prolapse of the rectal lining, the anus is dilated; but in the case of polypus it is in a condition of habitual and spasmodic contraction, so that before making a digital exploration an anæsthetic should be administered. In every case of bleeding from the rectum, methodical search should be made for polypus; it is sometimes so freely movable on its slender stalk that it may be taken for a fæcal nodule. Even if the rectum contain no fæces, the tumour may glide before the finger, and escape detection. The tumour is an adenoma in structure, and it is probably attached to the posterior wall of the bowel.

The *treatment* consists in dilating the anus, pulling down the polypus, and tying its pedicle tightly with a strong waxed ligature. Unless quite small, it is not safe to tear it off with

the finger nail, as troublesome hæmorrhage may follow the laceration.

Anal abscess.—Suppuration is usually superficial, and begins in the gland-tissue about the external sphincter. Though the neighbouring parts may be red and angry, they soon quiet down after the pus has escaped, and the short fistulous track closes up without further trouble. This simple condition is altogether different from that of

Ischio-rectal abscess, which may arise without definite reason, especially in the tuberculous child, or may be caused by a piece of bone which has been swallowed and passed through the wall of the bowel. The sooner that the tension of the inflamed tissues is relieved the better. The surgeon must not wait for fluctuation, but, with a finger in the bowel as a guide, should thrust a knife into the mass. **Fistula-in-ano** results, for which the ordinary operation will be eventually required; the parts should have quieted down before the external sphincter is divided, and at the time of operating the sinuses should be thoroughly scraped over.

But before proceeding to operate, it must be duly ascertained that the sinus is not associated with chronic bone disease. Spinal abscess occasionally finds its outlet through the ischio-rectal fossa (page 254), in which case a probe may pass an indefinite distance into the interior of the pelvis; or a soft flexible bougie may be directed towards the carious vertebræ. The skin looks dusky and undermined, and with ordinary care it is hardly likely that a subject of this condition would be rashly submitted to operation. These questions should be satisfactorily answered:—Has the child a stiff or excurved back? Has he disease of the sacro-iliac synchondrosis (Chap. XXX.)? Is he tuberculous? Even without disease of joint or bone, the tuberculous child may be the subject of anal fistula, and unguardedly to subject him to a cutting operation might be disappointing. The tuberculous nature of anal fistula in children must always be suspected; but if this suspicion be confirmed, it by no means follows that the fistula is not to be operated on. The prognosis, however, becomes more grave.

Condylomata are large and soft; they grow in crops near, not at, the anus. The neighbouring skin is moist, and

probably similar tubercles exist in other regions. For treatment, see page 101.

Nævus of the rectum may be associated with serious hæmorrhages. To obtain an adequate view of the vascular mass, the anus should be fully dilated, and a duck-bill speculum should be introduced, the child being under chloroform. It is best treated by the thermo-cautery. (*See page 141.*) Hæmorrhage would have to be arrested by plugging with strips of lint saturated in an astringent solution.

I have met with several cases of rectal nævus, and Mr. Barker has recorded one which, later in life, caused fatal hæmorrhage. (*Med.-Chirurg. Trans., vol. lxvi.*)

CHAPTER XXII.

INTESTINAL OBSTRUCTION.

THE most likely cause of intestinal obstruction in a child is **intussusception**. It may be acute or chronic. In the former variety the child is suddenly taken with pain across the umbilical region, and probably with vomiting. He cries or screams, and he tosses about and kicks when the seizure comes on, and he may even be attacked with convulsions. The pain is usually subject to intermissions and paroxysms. Sometimes the first severe attack is preceded by diarrhœa or by warnings of colic; often extreme collapse comes on with the first severe pain. Thus the prominent symptoms of intussusception are those of strangulated hernia, and there is great truth in the statement that the internal strangulation demands active operative interference in a no less degree than an external hernia. No motion or flatus may have been passed, though the bowel below may have emptied itself soon after the first attack of vomiting, or there may be scanty dejections of fœculent mucus. Either with or without urgent or evident straining, mucus tinged with blood, or blood alone, may be passed *per anum*. Indeed, the escape of a little blood-stained mucus is the great feature of intussusception, and it serves to distinguish the disease from volvulus, and strangulation by bands. As a rule, there is a good deal of distressful retching; and at first the matter vomited is the contents of the stomach, and later the bile-stained fluids of the duodenum; still later the vomit may have a fœculent odour. Probably the sickness is the direct result of the shock to, and continued irritation of, the sympathetic system, just as it is by shock to the solar plexus that a boy struck in the "pit of the stomach" when at play is attacked with vomiting. The more persistent the vomiting, the less is the abdominal distension, as the flatus escapes with the vomit. So, also, when the obstruction is not absolute, diarrhœa may be persistent, gas escaping *per anum*, and the

abdominal wall remaining actually flat throughout. There may be no peritonitis, and only local tenderness. Moreover, it cannot be too clearly stated that the abdominal cavity may, and usually does, remain undistended, and its wall flaccid. There is, of course, some enteritis, but peritonitis is a late complication. As a rule, the ileo-cæcal valve itself forms the apex of the protrusion. The prolapsing ileum and cæcum (ileo-cæcal variety), playing the part of a foreign

body, is grasped by the ensheathing bowel (Fig. 74) and thrust on as a mass of fæces would be. Sometimes the intussuscepted bowel is carried along the transverse arch of the colon, or even down to the rectum, or through the anus. In this condition an oblong tumour may be made out by digital examination through the abdominal walls. Such tumour may be firm and sausage-shaped; it is movable, and not very tender, and it may be found in almost any region of the abdominal cavity, the colon, in childhood, being very loosely attached. The intussusception may be due to an exaggerated peristalsis set up by diarrhœa, an



Fig. 74.—Intussusception. (*Museum, Royal College of Surgeons.*)

intestinal polypus or diverticulum, or by some other form of irritation. Sometimes the invagination seems to be the direct result of a blow upon the abdomen or of a fall. More than one invagination may exist in the same child.

Usually the patient is under two years of age, and very often under six months. The higher in the canal that the strangulation occurs, the sooner does collapse supervene. In most cases vomiting comes on at the moment of the strangulation taking place, or very quickly after its occurrence. The constant vomiting, the disinclination to swallow fluids, and the sympathetic irritation combine to diminish the amount of urine passed.

When the strangulation is at the ileo-cæcal valve, a firm, abnormal mass may possibly be detected by palpation, deep in the right iliac fossa; but, on the other hand, if the intussusception be travelling along the colon and there be no tympanites, palpation may recognise an unusual emptiness in the right iliac fossa.

The ordinary situation of hernia having been explored, and inquiry instituted as to whether the child had been subject to hernia, examination by the finger in the rectum must be made; possibly it may reveal the intussuscepted mass. If on withdrawal the finger be soiled with bloody mucus, the diagnosis is more than ever clear. If left to itself, the invaginated piece of intestine may, in the course of a short day or two, become swollen and agglutinated, and quite incapable of reduction. The opposed peritoneal surfaces adhere so firmly that if by good fortune the strangulated knuckle slough off, the continuity of the tube may become re-established and recovery take place. Considerable pieces of invaginated bowel have been happily cast adrift and discharged *per anum*; even the caput cæcum coli and some of the small and large intestines have so passed, and the child has recovered. But for a surgeon to hope for such a result is, to say the least, unreasonable. The child generally sinks exhausted before this can be attained. Indeed, in acute cases, he may be killed by shock ere the strangulation is a day old. In all cases, the younger the child the worse the prognosis.

The report of an instance of spontaneous recovery attracts much attention, whilst fifty children might die of unrelieved strangulation without special record being made. Thus nature becomes accredited with a power of working a cure in intussusception, which, if misapprehended, involves grave disappointment.

Treatment.—From the moment that internal strangulation is diagnosed, laxatives must be withheld, and no food whatever must be given by either mouth or rectum, for to excite peristalsis is to increase the intussusception.

Fomentations by flannel under oil-silk give some relief, but they cannot influence the strangulation.

Distension of the bowel by water or air has, in certain

instances, produced the disappearance of an intussusception, the child, under chloroform, being inverted and the abdominal wall and the subjacent tumour kneaded. But if the tumour, which was evident previously, have now disappeared, it must not be concluded that the obstruction is relieved. The mass may merely have hidden itself behind coils of inflated intestine.

To be successful, this treatment must, of course, be employed before the serous surfaces of the invaginated bowel have become adherent, and when once tried, there should be an end to the method. If it fail to do good, as it almost certainly will, it is likely to do harm to the inflamed tissues by disturbing and straining them. The cases in which it may possibly be of avail are early ones in which there is invagination of the small intestine into the large; for fluid cannot pass back through the ileo-cæcal valve. Intussusception of small intestine into small is of such very rare occurrence that, in a volume such as this, it may be practically disregarded. Almost for certain the acute obstruction is due to intussusception at, but not through, the ileo-cæcal valve. Intussusception of small intestine into small is, however, often met with *post mortem*; it apparently occurs in the dying.

Distension of the bowel should be performed with the greatest care, as it is dangerous. If the child be inverted, about one pint of warm water may be allowed to enter the bowel by a flexible tube, through a funnel raised a foot or so above the buttocks. The bowel, especially if softened by inflammation, may easily give way under greater pressure.

Abdominal section has too often been resorted to only when the child is in the very condition from which a bolder policy might have rescued it. The operation does not in itself entail a great risk, and the chief reason of its being regarded with such disfavour in these cases is that it has not been resorted to early enough. There can be no disguising the fact that the result of abdominal section for acute obstruction in children has hitherto been desperately bad. In cases in which an intussusception has been discovered the surgeon has not infrequently been compelled to close the abdomen without having been able to reduce the

invaginated and adhering piece of bowel, because the operation has been adopted "as a last resource."

Every practitioner meets with instances of intussusception, and whatever be the line of treatment adopted, most of the children have died. The disease is well understood, and it is generally recognised with promptitude. The symptoms are characteristic. There is a severe attack of abdominal pain suddenly coming on in a child who, a few minutes before, was well and hearty; there is local tenderness, and perhaps a tumour is found in the right inguinal region; there is tenesmus, and there is an escape of mucus or blood-stained slime from the anus. Why is the disease so fatal?

Anatomically, the slipping of a piece of bowel into a piece beyond is not in itself so serious a lesion as the acute strangulation of a piece of small intestine in the unyielding neck of a congenital hernial sac; yet the child with the strangulated hernia recovers, whilst that with the intussusception dies. Suppose that the venue of the two lesions were changed, that intussusception should occur in the scrotum, and that the acute strangulation should take place inside the abdominal cavity, what would be the effect upon the relative mortality? My opinion is that intussusception would then show the better result.

I believe that the results of the treatment of acute intussusception would be far better if no subject of the lesion had ever been cured by massage and injection. Frequently after these speculative measures have been fruitlessly carried out the case is reluctantly handed over to the surgeon, who fails to reduce the intussusception because the serous layers have become firmly glued together.

It is quite certain that in such circumstances inflation or injection could avail nothing; and it is equally certain that in those instances in which injection has succeeded, the surgeon could have effected the unsheathing by a cutting operation.

I believe that brighter days are in store for these terrible cases. One is now constantly hearing of or seeing reports of successful operations for intussusception, and it is not unlikely that in due course the occurrence of the unmistakable symptoms will be considered a clear indication for opening the peritoneal cavity.

A short time since I was called to see a case of intussusception which had been treated "in the usual way"—that is to say, the child had been given enemata by funnel and tubing, and had been duly manipulated from without. The intussusception remained, the abdomen was slightly distended, the child was collapsed, and the outlook was hopeless. I at once made a small incision in the right linea semilunaris, and, inserting my finger, found the intestinal sheath rent and the invaginated portion protruding through it. I need hardly say that the child quickly succumbed.

In the *Lancet* of 1895 Mr. Roughton gave a table of sixteen successful laparotomies for acute intussusception in infants.

From this it appears that the average duration of the symptoms in the successful cases was thirty-two hours, in no less than ten of the cases it was twenty-four hours or less, and in only three cases was it two days. These facts teach that, if laparotomy is to be attempted with reasonable chance of success, it must not be deferred longer than twenty-four hours from the onset. The shock caused by abdominal section has often been confounded with that produced by the disease itself and by the previous attempts at reduction by inflation and injection. But for occasional reports of successful injection, professional opinion would long since have solidly settled down in the line of recommending abdominal section so soon as ever intussusception is certainly diagnosed.

The incision should be in the linea alba in those cases in which a tumour is to be made out in the middle line or to the left of it; but if the mass be in the right iliac fossa, the peritoneal cavity may be opened by a curved incision near the front of that iliac crest, or through the linea semilunaris. With a tumour in the right iliac fossa, there is certainly invagination at the ileo-cæcal valve; when the tumour is in the left fossa, it may still be invagination at the valve, but it had better not be sought through the left semilunar line, lest, if an artificial anus have to be made, the ascending colon be dragged a needless distance across the peritoneal cavity. The median incision serves best in the general run of cases.

During the operation, and especially so if there is no hot-water mattress and the room has not been warmed, the child's

limbs, pelvis, and chest should be covered in cotton-wool, so as to lessen the shock from exposure.

The incision should not be longer than may be necessary for the admission of two or three fingers into the peritoneal cavity, otherwise the operation may be impeded by the escape of distended coils of intestine.

If the intussusception be not at once met with, search should be made behind the distended bowel in the right iliac fossa, or an empty coil may be followed onwards. The invagination should then be gently drawn towards the wound for inspection, and an attempt made to squeeze the invaginated portion into its proper position; it should not be pulled out, as this is more likely to cause the softened bowel to tear. But if the intussuscepted piece of bowel be so firmly glued that it cannot be reduced, the best plan will be to push it in a little farther, so as to have healthy tissues to deal with, and then to stitch the ensheathing and ensheathed layers of peritoneum together. A longitudinal incision is then to be made on to the invaginated mass through the ensheathing bowel, and the invaginated piece is to be resected, the cut ends being stitched together. The operation is completed by closing the longitudinal wound in the intestine by Lembert's sutures, and by closing the abdominal opening. This is Barker's method of treatment, and it is well adapted for those desperate cases for which it was designed. The abdominal wound should be closed by sutures which include the peritoneum, and by superficial ones, and should be dressed with a pad of sterilised gauze and a many-tailed binder.

On being put to bed the child must be kept very warm and quiet, a little hot, sweetened water being given by the mouth, and a little hot water with brandy by the rectum. Possibly a minute dose of morphia might be given by the skin, and, if the child survive the shock of the operation, fresh beef-tea might be given in small quantities.

Chronic intestinal obstruction may be caused by the slow contraction of deposits left after peritonitis, by stricture at the junction of the pelvic and anal portions of the rectum (page 312), by imperfect development of the anus, or by invagination of the large intestine, by habitual constipation, or by the compression of some new growth. The prominent symptom is

the smallness of the evacuations and the increasing difficulty of passing them. The child becomes feeble, dyspeptic, and sick; and when the obstruction is at or near the rectum, a doughy mass of hardening fæces may be detected in the left iliac fossa. Above the stricture the bowel becomes enormously expanded by accumulation, and ulceration of the thin wall may determine a rapidly fatal peritonitis. Sometimes the constipation is associated with a watery diarrhœa, the result of irritation of the mucous membrane of the bowel. Chronic peritonitis may begin at, and be confined to, the neighbourhood of the obstruction, but it may in time become general.

A careful examination of the bowel should be made by the anus, and if an organic stricture be found, it must be dealt with as suggested on page 312. Mild cases of obstruction may be trusted to recover without any surgical interference. If the cause of the obstruction be obscure, and the symptoms be increasing in severity, the treatment should be directed towards the quieting of the alimentary canal by the administration of small doses of opium. In some of these obscure cases systematic massage of the belly is found of great benefit. Purgatives must be avoided, but cascara—preferably in the form of an elixir—may be prescribed. If the symptoms become worse, it will be necessary to open the abdomen by a small incision and explore.

Hardened masses of fæces in the sigmoid flexure may be softened by enemata of warm water and oil, and broken up by systematic massage through the abdominal wall. The surgeon must personally administer such enemata; it is too important a matter to be handed over to a casual attendant. Massage, when methodically and repeatedly employed, proves an excellent tonic to the torpid bowel and constipation.

Inflammation of the appendix (*perityphlitis*) is usually caused by catarrhal inflammation, or by the presence of a hardened concretion of mucus or fæces in the vermiform process, or by the process having been twisted, or kinked, so that its secretion can no longer escape into the cæcum. Independent inflammation is very rarely met with. The frequency of the occurrence of inflammation of the appendix in children is probably due to the abundance of lymphoid tissue which that structure contains. The wall of the inflamed

appendix is easily traversed by the bacteria coli, which then set up cellulitis and peritonitis in the neighbourhood.

Symptoms.—There are fulness, hardness, and persistent pain and tenderness in the right iliac fossa. Though the bowels are usually confined, there is sometimes a slight but persistent diarrhoea. The constitutional disturbance is severe, and may be quite sudden in its onset, the temperature running up to 102°, or even higher, and keeping high. A sudden fall in the temperature, together with a quickening of the pulse, suggests perforation or gangrene. The abdomen is more or less distended, for localised or general peritonitis quickly supervenes, and the abdominal muscles are rigid. Although there is pain in the whole of the iliac fossa, the “point” of chief tenderness is about an inch to the inner side of the anterior iliac spine in the direction towards the navel. The child is flushed and anxious; he lies with his knees drawn up, and greatly objects to the right thigh being extended. Indeed, if this flexed and rigid position of the thigh be associated with pains near the knee (as may happen on account of inflammatory pressure upon the anterior crural nerve), the case may be mistaken for acute hip-joint disease; the movements of the hip-joint are quite free, however, whilst a definite fulness is discoverable in the iliac fossa. By careful exploration by the finger in the rectum fulness or hardness may sometimes be found in the cæcal region.

Again, the pains in the limb and the stiffening of the muscles of the abdomen and back may suggest spinal caries and iliac abscess; but this diagnosis is negatived by the sudden history, and by the acuteness of the local pain and tenderness. Moreover, under chloroform, the back is found to bend easily in any direction. The differentiation from intussusception (page 322) is manifested by the presence of localised swelling and acute pain, though the escape of mucus from the anus, which happens in some of the cases, may at first lead to error in diagnosis.

The skin over the iliac fossa is dusky and œdematous; and if gas has escaped into it from the ulcerated bowel, emphysematous crackling may be detected. The inflammation quickly extends from the appendix to the tissues around the cæcum (*περί*, around; *τυφλός*, blind), and the peritoneal

adhesions may shut in a localised abscess. If hardness give way to doughiness, or even to obscure fluctuation, acute abscess must be suspected. Rectal examination may show a tender fulness in the iliac region. Vomiting nearly always occurs, but it is rarely stercoraceous, and is not very troublesome. There may be also shiverings, or even convulsions, and in due course the child becomes pale and exhausted, and is covered with profuse perspiration.

If perforation occur before inflammation has set up firm adhesions, fatal peritonitis is likely to result; but if, as usually happens, advancing inflammation has glued the bowel to the surrounding tissues, abscess may form in the iliac fossa, or become discharged through the groin or the bowel without implicating the peritoneal cavity. If general suppurative peritonitis occur, it is absolutely necessary to give the child the benefit of abdominal section, irrigation, and drainage; no case, however hopeless it may appear, must be refused the benefit of operation.

When suspecting that the septic inflammation has spread to the peritoneum, it must be remembered that the presence of certain toxins in pus may prevent the temperature greatly rising; and such products are especially apt to be met with in connection with appendicular suppuration. As Le Dentu says, one cannot shout it out too loud that there is nothing so deceptive as septic peritonitis; that nearly all the signs of a general peritonitis—temperature amongst them—may be absent.

The *prognosis* in perityphlitis is by no means desperate. If the abscess approach the skin over the iliac fossa, the chance of recovery is favourable; but in many cases the disease ends in resolution without abscess having been formed, and a certain proportion of cases are complicated with rare or frequent relapse. Increasing fulness and tenderness suggest suppuration; if softness occur in the middle of the brawny mass, and obscure fluctuation be detected, the evidence of abscess is sufficient.

Treatment.—From the first moment of the attack the child should be kept absolutely at rest in bed, so as to diminish to the utmost the risk of the occurrence of suppuration. A couple of leeches may be applied over the iliac fossa, and

the part then covered with hot-water dressings under oil-silk. A mild but effective laxative should be given, supplemented, if expedient, by the use of a simple enema. Some would go so far as to treat the child with saline purgatives, so as to make sure that the bowel is not being worried by a collection of fæces or gas; but such a line of treatment appears unnecessarily severe. On the other hand, the treatment of pericæcal inflammation by the continuous use of opium—without the administration of a simple laxative dose—is not to be commended; both extremes are bad. At the beginning of the attack minute doses of morphia may be given, but, as Morton, of Philadelphia, says, "Intense pain is more often an indication for operation than for morphia." The application of belladonna or laudanum to the iliac region is useless. If under palliative treatment the inflammation do not subside, but on the other hand the medical attendant find the local pains and tenderness increasing, the skin growing dusky, and the iliac fossa becoming fuller, he must on no account explore for pus by the use of a grooved needle or trochar. Such a blind procedure is far more likely to prove harmful than useful. Pus there may be, but he, failing thus to discover it, must needs then content himself with dangerous delay. The delay is dangerous because pus is probably lurking close against the outside of the peritoneum, through which, unless relief of tension be afforded from the surface, it is likely to make its way. The use of the grooved needle is likely to spread infection into healthy tissues. The case is, very much like one of abscess close outside a joint, and it is the surgeon's duty to explore the inflamed and swollen area in a business-like way. In this operation it is by no means necessary that the abdominal cavity should be opened, and by its performance a fatal peritonitis may not improbably be averted. The more localised are the swelling and œdema, the more favourable is the case for operation.

Operation.—The child having been placed on a hot-water mattress, and other provisions having been duly made against chilling by cold air and wet towels, chloroform is administered and a final cleansing given to the front of the abdomen. A large irrigator with abundance of hot boracic or saline lotion should be at hand in case it be found that, after all, the

abscess has made its way into the general peritoneal cavity. Then an incision about two inches long is made downwards and inwards over the most prominent part of the swelling, which will likely be some one or two inches to the inner side of the anterior superior iliac spine. The muscles should be traversed by separating their fibres, rather than by cutting them across. The scalpel must not be introduced with a thrust, lest by chance a piece of distended bowel be punctured, but it should work through the œdematous tissues, layer by layer, the forceps and director being used as little as may be; there must be no "exploring" with the director. As the unrecognisable transversalis fascia is reached, pus may come welling up. The deep part of the wound must be sufficiently free, but there must be no poking about with the finger, nor must a search be instituted for the inflamed appendix, nor must irrigation be used, lest the delicate adhesions which may still shut out the abscess be broken down.

If the surgeon do not stumble across the gangrenous or inflamed appendix, he must exercise self-denial, and not search for it. It is easy to spoil these cases by officiousness. No attempt should be made to squeeze out the pus; it must be allowed quietly to well up into the absorbent dressings. If a drain is thought to be necessary, it should be a strip or two of gauze, a spill of indiarubber tissue, or a very soft tube.

If the swollen appendix be seen in the depths of the abscess cavity, it may be amputated at its root, the stump being cleansed and sutured *secundum artem*. It is sometimes advised that the serous covering of the stump be raised, turned in and sutured; the theory is excellent, but in actual practice it can rarely be carried out, as the stump is stiff and sodden.

Directly after the evacuation of the abscess the child begins to improve, even though the appendix was neither dealt with nor seen, and it is quite likely that no further trouble will occur in the cæcal region. It often happens, however, that a sinus persists for some weeks, or even months, at a spot where the wound failed to heal; but so long as the child's general health is not affected by it, no scraping or exploration should be advised. It will close up in time.

If during the operation the swollen appendix come into view, but be found ulcerated at its very base or closely adherent to the surrounding tissues, it is best to follow Treves's advice and leave it untouched in the depths of the abscess; nature is there better able to deal with it than art.

If, in making the limited incision in the iliac region, it be found that the abscess has already burst its barrier and set up general septic peritonitis, it will be well to open the abdomen in the middle line, to flush and cleanse with abundant hot saline lotion, to wipe out the pelvic and other recesses with soft sponges, and to drain.

When should one make the incision over the inflamed appendix?—This is often a very difficult question to answer. If too early, as Delore says, there may be no pus, and the introduction of a drain may be of no use; if too late, the chances of fatal septicæmia are overwhelming. But, says he, it is better to be too early than too late. He ends with the old adage, "Le mouvement, c'est la vie; le repos, c'est la mort." This is somewhat theatrical, but it shows in what direction we shall probably have to look for the answer. And it is well to remember that the mere act of cutting down on to the inflamed tissues may give immediate relief, although no pus be found.

Mayo Robson is of opinion that when the inflammation comes on acutely with a rapid pulse, and with tenderness over the appendix, but without the presence of a tumour, the case should be looked on as one demanding immediate operation; while a more gradual onset, with a quiet pulse (not over 100), and the early formation of a tumour, are signs that delay might be safe. But, in the course of inflammation of the appendix, whatever its apparent character, the occurrence of a rigor with rise of pulse and temperature should be looked on as indicating septic absorption, and as pointing to the necessity for operation. The pulse rather than the temperature is the guide to treatment. Relief or cessation of pain, with a marked rise in the pulse-rate, is an indication for immediate operation, as it frequently means gangrene of the appendix; while distension of the abdomen, with vomiting and rapid pulse, are signs that admit of no delay, as they indicate extending or general peritonitis. The effect

of opium in disguising the symptoms must be remembered, and if it have been given, it might be necessary to delay offering a decided opinion until it has been withheld for a few hours; when, if the pulse increased in frequency, or there were anxiety of countenance, operation would be required.

Relapsing cases.—If, either with or without abscess having formed, relapse takes place, the child may be treated by rest, fomentations, and restricted diet, etc., as in the first attack, abscess being dealt with as already described. But if the boy's life is rendered miserable and uncertain by repeated attacks of inflammation, it is better, on the subsidence of an attack, to cut down upon and remove the provocative appendix after the method duly systematised by Treves.

CHAPTER XXIII.

HYDROCELE, AND DISEASES OF THE TESTIS.

At an early period of development there is nothing in the structure of the internal organs of generation to indicate to which sex the foetus will belong. The testis or ovary is placed in the renal region to the front of the Wolffian body. The testis reaches the internal abdominal ring at about the seventh month. During the eighth month it is in the inguinal canal, and at birth it has generally reached the depths of the scrotum.

The descent through the external abdominal ring may be delayed for some days or months after birth; or, appearing now and then outside the ring, the gland may as constantly be retracted. A testis which lingers in the canal, or at the ring, may be encouraged by well-directed and frequent manipulations to complete its descent. But when it long delays its descent, it is apt at last to appear in close company with a piece of bowel; probably the adhesion is the result of limited peritonitis. If there be a congenital hernia, and the testis of that side have not made its appearance, the permanent wearing of a truss is inadvisable, lest the late descent of the gland be prevented; for at or just after puberty the healthy testis may make its complete descent. The earlier descent of the left testis explains the more frequent occurrence of congenital hernia and hydrocele upon the right side (page 338). It is not certain that a testis which has failed to complete its course will be valueless; nevertheless, it is generally imperfectly developed.

Misplaced testis.—Though the testis have left the abdominal ring, instead of passing into the scrotum, it may wander into the groin or perinæum, but it is unable to stray beyond the limits of the deep layer of the superficial fascia. A testicle in the perinæum would eventually preclude its possessor from horse-exercise, and, if injured, might demand ablation. The general health of the child and the condition of

the gland being favourable, transplantation may be attempted. *Case*:—The right testicle of a boy of two and a half years was well developed and in the normal position. The left was of equal size, but was in the perinæum. An incision was made over the small left scrotum, through which the misplaced testicle was reached and freed from adhesions. It was easily drawn into position. But as it obstinately slipped back into the perinæum, a deep suture was passed across the left scrotum behind the testicle; this effectually kept it in position, and the operation proved an entire success. If there is difficulty in keeping the transplanted testis in its new position, it may be well to anchor it to the thigh by a strong suture passing through the scrotum, and keeping the thigh quiet by a long outside splint.

In cases where a misplaced testicle has failed to develop in size it is a question whether it is deserving of surgical attention. If it be a fact that an imperfectly developed gland is specially prone to malignant disease, it would be advisable to remove it without delay. And if it is associated with a reducible inguinal hernia, ablation should also be practised, so that the inguinal canal may be securely blockaded. But, given a healthy child with a well-developed, wandering testis, a simple operation like the one described is not only justifiable, but expedient.

Axial rotation of the testis is apt to occur in boyhood, especially if the testis has not completed its descent. Though the symptoms usually occur after violent exercise, the torsion sometimes takes place without obvious cause. The symptoms are partly those of strangulated hernia, and partly of acute orchitis; but they are sufficiently urgent—without being definite—to warrant an incision being made down to the tender swelling. The testis is then found in a condition of actual or potential gangrene. Ablation is advisable. If the testicle be left, the wound will probably be long in healing, and atrophy of the damaged organ is almost inevitable (*Lancet*, 1893).

A testis has been known to leave the abdomen by the femoral ring and to reach the surface of the thigh through the saphenous opening. (I have operated upon a woman in whom the ovary had taken this unusual course.*) If there

* *British Medical Journal*, December 13th, 1873.

be any doubt as to the nature of a small, firm, and oval swelling in the neighbourhood of the pubes, perinæum, or of Poupart's ligament, the scrotum should be examined with reference to the presence of both testes. This simple matter is often forgotten.

If one gland be absent, the finger should be made to sweep with firm pressure down the course of the inguinal canal; this may suffice to reveal the lingering testis. If the testis, coaxed down from the ring, ascend again, the pad of a truss may obstruct its return.

Fig. 75 shows the testicle behind the peritoneum passing into the inguinal canal. Fig. 76 shows it in the scrotum behind the cul-de-

sac, which is to persist as the tunica vaginalis. In Fig. 76 the tunica vaginalis has separated from the funicular process. Obliteration of the tubular prolongation should take place soon after the testis has passed

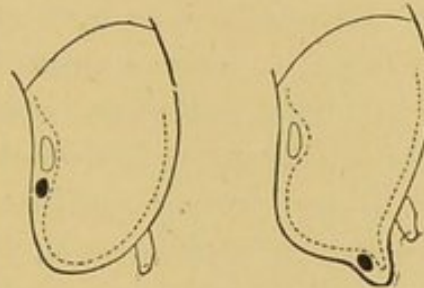


Fig. 75.—Testis descending behind Peritoneum from Renal Region.



Fig. 76.—Tunica Vaginalis connected with Peritoneal Sac by Fibrous Thread.

into the scrotum; a slender fibrous cord then connects the peritoneal sac with the tunica vaginalis.

If the serous fluid moistening the peritoneal cavity gravitate into the tunica vaginalis, a **congenital hydrocele** (Fig. 77) results. The fluid can be emptied into the abdominal cavity by placing the patient on his back and raising the scrotum; but on lowering the pelvic region the fluid trickles down again. If the spermatic cord be then loosely pinched at the external abdominal ring, and the scrotum squeezed by the other hand, the fluid may easily be felt gurgling up the narrowed passage. If, when all the fluid has been returned, pressure at the ring be remitted, the fluid slowly descends. This examination shows that scrotal fulness is due to serum, not to intestine. In the latter case the descent would have been sudden and bulky. The smaller the aperture, the slower the descent; and if the passage be very minute

pressure may fail to return it. But even in this case the mother will probably say that before the boy gets out of bed in the morning there is no fulness whatever.

Congenital hydrocele and hernia (page 348) often co-exist, and in the case of but a slight scrotal fulness in a little child, the test of translucency may be impracticable. Moreover, in a child, inflated bowel is translucent; this must not be forgotten.

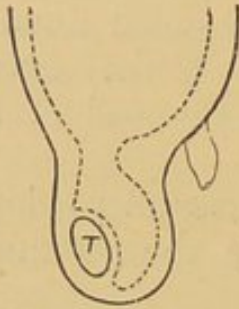


Fig. 77.—Congenital Hydrocele. T, Testis.

In employing the light-test, the room should be darkened, the scrotum screened by the hand, a lighted vesta held on the other side of the scrotum, and inspection made through the tube of an old-fashioned stethoscope, or by a sheet of paper rolled up so as to leave a small lumen.

The complete obliteration of the peritoneal process of a congenital hydrocele is desired, lest during vomiting or straining a knuckle of intestine also descend. In some cases the aperture may be so slender as almost to induce the surgeon to regard the occlusion as perfect. To inject such a hydrocele, with a view of producing a radical cure, might be to set up fatal peritonitis. If the hydrocele be so large as to interfere with the truss, the fluid may be drawn off by a fine clean cannula. Lotions of sal ammoniac or of spirits of wine are, in my experience, of no therapeutic value. If the child cannot bear the pressure of the truss, it may be advisable to perform a radical operation for obliteration of the funicular process, as described on page 350.

In **funicular hydrocele** the tube of peritoneum has been shut off from the tunica vaginalis whilst it communicates with the peritoneal cavity. The testicle is below the hydrocele, and the tunica vaginalis is empty.

In **infantile hydrocele** the fluid collects in the tunica vaginalis and in the funicular process, but is shut off from the peritoneal cavity. The tumour is pear-shaped, with the stalk extending up to, or even within, the external abdominal ring. The swelling is translucent and unyielding, no fluid passing up under pressure. Such a hydrocele should not be injected; the surgeon cannot be absolutely certain that the occlusion is perfect, and in any case the peritoneum is

near. The cyst may be occasionally punctured with a needle, or, if necessary, the fluid may be withdrawn by a fine cannula, after which that side of the scrotum should be carefully strapped (Fig. 78).

Hydrocele of the tunica vaginalis, without any communication with the funicular process, may exist at birth. When it has been certainly ascertained that a persistent hydrocele has no communication with the peritoneal cavity, multiple puncture may be performed with a clean and slender sewing needle. No other treatment is likely to be required, though tapping with a hypodermic needle may, if necessary, be resorted to. It is unsafe to inject iodine or any other irritant; I have known extensive sloughing of the scrotum follow that treatment, and in another case suppurative orchitis supervened. Expectancy has much to recommend it in all cases of hydrocele in childhood.

Encysted hydrocele of the cord (Fig. 79) is often met with both in boys and

in girls. I have sometimes seen children wearing trusses over such cysts, on the supposition that they were herniæ. The swelling is at times so hard as to appear solid; it may resemble a testis in feel and size. If close up against the ring, it must be drawn down for examination; the light-test is impossible when the tumour is high up and covered with fat. It is sometimes difficult to recognise for certain an encysted hydrocele which is lodged in the inguinal canal. But if it seem to have a definite upper limit it is not likely to be a hernia; moreover, it is fixed and painless. If the scrotum contain both the glands, it cannot be an undescended testis; and, as the swelling does not increase in size, it cannot be a commencing sarcoma. A hard, painless, rounded swelling above the testicle can scarcely be anything else than encysted hydrocele. The surgeon must assure himself that the swelling is not associated with a piece of intestine; the

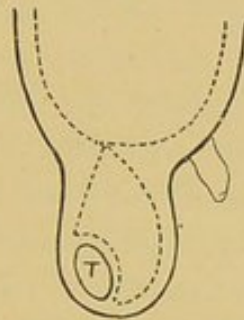


Fig. 78.—Hydrocele of Tunica Vaginalis and of Funicular Process (Infantile). T, Testis.

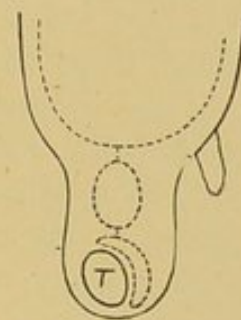


Fig. 79.—Encysted Hydrocele of Cord. T, Testis.

external abdominal ring must be quite clear. When it has been steadied and fixed by the fingers and thumb, a hypodermic needle may be thrust into it. About half a teaspoonful of pale serum escapes, and the tumour disappears, perhaps for ever; but it may possibly require a second tapping. Obscure swellings in the inguinal region, even if translucent, should never be injected, as they may communicate with the peritoneal cavity. They may, however, be safely removed by dissection, and this is by far the best method of radical treatment.

Encysted hydrocele in the canal of Nuck.—Close below the external abdominal ring is a round, hard swelling, perhaps small enough to be pushed up into the inguinal canal, from which it descends again, unaltered in size. On pulling it down towards the labium it is found to have no definite connection with the interior of the abdomen. It may have been noticed for days or weeks as a hard, painless swelling. It is rarely large enough for examination by transmitted light. Puncture by a needle confirms the diagnosis and disposes of the tumour. It may possibly recur, in which case it should be dissected away.

Hæmorrhage into the scrotum or along the spermatic cord may be met with in newly-born infants, especially after breech presentation. Patience will clear up the diagnosis. It is hardly likely that the dusky swelling would be mistaken for melanotic sarcoma. Before resorting to castration in a doubtful case, exploratory incision should be practised.

Acute orchitis may be the result of a kick or blow, or of sudden and forcible adduction of the thighs. In childhood it is rarely a sequel of mumps.

Acute epididymitis may be due to irritation or abrasion of the urethral mucous membrane, such as may follow the escape of a vesical calculus or the passage of an instrument. If the epididymitis be secondary to urethral irritation, the vas deferens is swollen and tender along the back of the cord. With acute inflammation of the testis or epididymis, the child is in great distress, the scrotum being red and swollen. He should be placed upon his back in bed; a full dose of castor oil should be given, and a leech may be applied. Acute inflammation is apt to be followed by atrophy of the gland,

but before this is discovered the patient has probably passed from under supervision. Atrophy is due to pressure by effusion within the fibrous capsule. Immediate relief to the tension may be obtained by a few punctures by a grooved needle. The application of a lotion of lead and opium does not meet the urgent demands, but the leech is of great service. If the testis remain thickened from chronic inflammatory effusion, the scrotum may be strapped.

Tuberculous inflammation of the testis, or, rather, of the **epididymis**, is not infrequently met with in children, and I have seen several instances of it in very young infants. Hereditary taint predisposes the epididymis to the invasion of the bacilli, and children have sometimes been born with tuberculous epididymitis. A blow or a kick upon the scrotum may start an orchitis or epididymitis, and the part may be then invaded by the bacilli of tuberculosis which may be circulating in the child's blood, and on the look-out, as it were, for an area of diminished resistance. The variety of the disease usually met with in children is of the chronic form rather than of small tubercular nodules scattered through the gland.

Symptoms.—By chance, on drying the boy after his bath, the nurse or mother notices an enlargement in the scrotum, but, finding it free from tenderness and pain, she may for a time give it no further heed. When the surgeon sees it, he finds it hard, and irregular in outline, nodular and painless. The skin over it is neither œdematous nor discoloured, but, on careful comparison with the other side, the vas deferens is probably enlarged, and possibly the testis also. Sometimes it happens that both testicles are affected at the same time. Rectal examination may prove the vesicula seminalis to be enlarged.

Diagnosis has to be made from syphilis and from sarcoma. In congenital syphilis the testis, rather than the epididymis, is attacked, the swelling having a smoother outline and being less hard than in tuberculous disease. There is more likely to be hydrocele with it; scars at the mouth or anus, or some other signs (page 89), point to the specific nature, and the swelling subsides under mercurial inunction.

The fact of the tuberculous disease implicating the

epididymis rather than the testis helps to distinguish it from sarcoma. Sarcoma increases much more rapidly, and may quickly cause an enlargement of the lumbar glands that may be detected through the abdominal wall of a thin child.

The tuberculous inflammation is apt steadily to advance, spreading into testis, vas, and vesicula. The lowly organised deposit of granulation-tissue caseates or liquefies, the scrotum becomes adherent and undermined, the dusky skin gives way, and an unhealthy cavity persists with overhanging walls and protruding granulations. The other epididymis and testis are very apt to be involved, and—what is far worse—the tuberculous infection is exceedingly likely to be disseminated and to cause a fatal inflammation of the spine, the membranes of the brain, or the lungs.

Treatment.—Whilst there is still a doubt as to the nature of the enlargement, the child should be treated with cod-liver oil and iron; he should be warmly dressed and, if practicable, subjected to the influence of sea air and sunshine. The testis should not be strapped, as this may help in causing dissemination, nor should any local treatment be adopted. But, however carefully the palliative treatment of tuberculous epididymitis may be carried out, it is very likely to end in disappointment, and during that time dissemination is apt to be taking place. I am strongly in favour, therefore, of removing the testis as soon as positive diagnosis is made. Clinical experience shows that the disease is far more disastrous than is, for instance, a tuberculous affection of a cervical gland or of a knee-joint, and the sooner the child can be freed from it the better. The epididymis and testis are so small that the scraping out of a tuberculous focus, to be efficient, must entail physiological destruction of the gland, and even then there is great risk of infective material being left behind. When discussing the question of removal of the gland, the surgeon and the parents should be guided by common sense, and not by sentiment. And if, as time goes on, the opposite gland be involved, it also should be removed.

The presence of enlargement in the vesicula seminalis does not, in my opinion, contra-indicate removal of the testis. Indeed, after its removal, the vesicular swelling may possibly

subside. I have no experience of resection of the vesicula seminalis.

On one occasion, when I was removing the testis for tuberculous disease, a piece of omentum, which happened to protrude through the open funicular process of peritoneum, was found to be thickly studded with tuberculous nodules. This was the first indication of the boy being also the subject of tuberculous peritonitis, though other symptoms were manifested subsequently. This boy has been for some years since under supervision, and he has apparently triumphed over his disease.

Syphilitic orchitis is a rare manifestation of hereditary taint. Both glands may be affected, the swelling being for the most part even, regular, and confined to the body of the testis. This condition is much more likely to be associated with hydrocele than is the tuberculous disease. The *treatment* which is found invariably successful is mercurial inunction. Small doses of iodide of potassium, or of iodide of iron, might be also given.

Sarcoma of the testis is not of infrequent occurrence. When the testis is growing rapidly into a large, ovoid, firm, and comparatively painless mass, sarcoma must be suspected. The vas deferens is not enlarged; the heavy mass drags itself downwards, and the abdominal ring is clear. The abdomen should be examined for enlarged lumbar glands. The diagnosis may be obscured by some hydrocele. Exploratory puncture is useful in confirming diagnosis; it can do no harm, if a drop or two of blood escape. (*See last page.*)

If the disease be allowed to run its course, the scrotum becomes involved, and a fungating mass starts through the sloughing skin, the child wasting rapidly and dying exhausted. Early removal offers the best hope of recovery, but even this treatment often disappoints, deposits being usually found *post mortem* in the lumbar glands, or in the lungs, or in some other viscus.

The child who has been previously pale and fretful, who has been losing appetite and getting thinner, may at once improve when the diseased gland is removed. Delay affords time for secondary implication of the lumbar lymphatic glands, which may then almost fill the abdominal cavity.

Operation.—The child having been anæsthetised, the scrotum and adjoining parts are again washed with weak carbolic lotion. The integuments are pinched up between the finger and thumb, and transfixed; the cord is laid bare, and, with the testicle, is raised from its bed. An aseptic silk ligature is passed round the entire cord and firmly tied. The spermatic cord is then cut.

The ligature should be tied well above the testis and cut short, and if the vas deferens or the lymphatic tissue of the cord be thickened, the higher it is placed the better. The thighs are tied together, and the knees bent over a pillow.

Dermoid cysts of the scrotum are of more frequent occurrence than of the testis, being the result of imperfect fusion of the lateral halves of the body. Sometimes, however, they are connected with the testis. They may contain bone, hair, or other strange material, and are probably noticed soon after birth. The tumour is hard, painless, and irregular in shape; the mass is apt to undergo suppurative inflammation. The *treatment* is ablation, and if in the course of the operation the testicle be found but imperfectly connected with the mass, it should be saved.

CHAPTER XXIV.

HERNIA.

IT is well to regard a hernia as the result of some abnormal condition rather than as a pathological entity. Information should be obtained as to the circumstances in which the "rupture" first appeared, and what is now most calculated to bring it down. In one case the hernia first came, perhaps, with a fit of vomiting, and now after every meal the child is sick and the tumour appears. Thus the treatment must be directed to the feeding of the child. If he be at the breast, is he allowed to overload the stomach? Is he rickety? How often is he fed? If the reply be, "I give him the breast whenever he cries, and I let him have as much as he will take," the mother is to feed him at regular intervals, and for a limited number of minutes *by the clock*. Each case must be treated on its merits; and the more precise the directions the more likely they are to be attended to. If the child be brought up by hand, attention must be given to the nature of the food, the bottle used (page 11), and the way of feeding. Errors of diet, especially in infancy, cause crying and vomiting; they should be specially sought out and corrected. Violent expulsive efforts must be always checked before the child can be cured. If the hernia come down with coughing, medical aid will be required. A long uvula may be the cause of either coughing or vomiting. With some children the hernia appears during micturition: are the preputial and urethral orifices free? is a long or adherent prepuce causing irritation and making the child strain? is there a vesical calculus? (page 298). Diarrhœa, chronic constipation, the abdominal distension of rickets, and also rectal polypus (page 318), may cause a hernial protrusion, or retard its permanent disappearance. A child should not need to strain at defæcation, nor should he be allowed to sit long upon the vessel. If the child

be premature, or badly developed, he must be kept warm, and rubbed with cod-liver oil. He must not be allowed to wear that useless but harmful article known as the "binder," nor anything which may constrict the abdominal cavity. Whatever the cause, it is very necessary that the hernia be kept up, or in time it may become absolutely unmanageable or strangulated.

Concerning trusses.—To apply a stiff truss to an infant is likely to cause eczema, excoriations, or pressure sores, either in the groin or where the band of the truss passes across the loins. The pad, when wetted with urine, is hard and irritating. A slight hernia may get well in the first or second year of life without treatment by rigid trusses, and if a careful supervision be kept over the little child with congenital hernia, he may possibly do without any truss. But if a truss be required, care must be taken that it fits, and that a second one is kept in reserve. Frequently I have found the truss so adjusted as to allow the escape of the bowel, and to exert pressure upon it afterwards. A badly-fitting truss is far worse than none. The pad should fall flat over the inguinal canal, pressing gently upwards and backwards, and, like the band, should be evenly covered with soft, clean linen. For the bath, a truss covered with indiarubber should be used, but not with a strong spring, as is so often the case.

If a congenital hernia have not disappeared whilst the child was "in arms," it may probably get worse as he begins to run about, so that a truss must be obtained. But when he is running about it is more difficult to find a truss that will keep the bowel always up. When the truss is applied for the first time, or a new one is being worn, the child should be kept quiet, so that the pad may have the opportunity of settling down well to its work. Often the pad is too small and conical, and, as a rule, the spring is much stronger than necessary. If, except under compression, the hernia be constantly down, the truss must be worn continuously, night and day; but if it come down only on exertion, it need not be worn when the child is in bed, though it must be re-adjusted before he gets out of bed. The skin beneath it should be carefully washed and dried, and dusted with violet powder at least twice every day. If any excoriation appear,

the truss must be taken off, and the child sent to bed until the place is quite well again.

In the choice and application of a truss too much should not be left to the instrument maker. He views the matter from a purely mechanical standpoint, and he rarely has anatomical or surgical knowledge to enlighten him. Often, when the hernia is associated with a hydrocele, the steady pressure of a truss may cure both; but if fluid interfere with the pad, it may be withdrawn before the truss is applied, care being taken that no bowel is in the sac.

For tender infants, spring-trusses are ill-suited; for them Lund's plan of treatment should first be tried. A thick folded skein of Berlin wool should have the loop-end laid

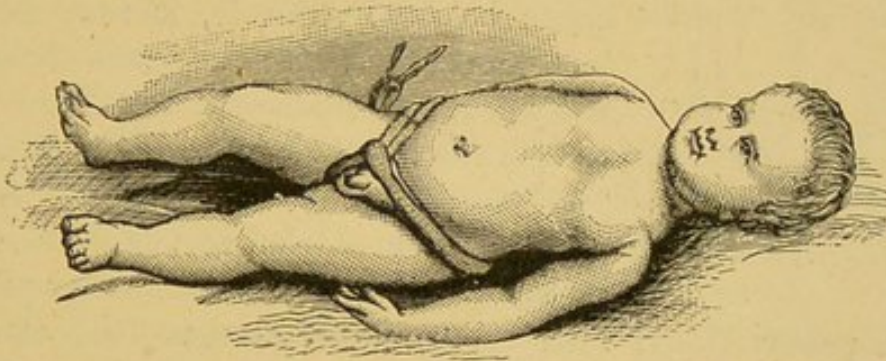


Fig. 80.—Wool Truss for Infant.

over the emptied inguinal canal—the other ends being carried spike-wise above the opposite pubes, across the front of the abdomen, round the loins and back, and over the hip of the weak side. This running end is then passed through the inguinal loop, carried round the inner side of the thigh, and over the buttock, to be firmly secured to that part of the skein which is already just above the great trochanter. The infant can be washed with this truss on, a fresh one being subsequently applied. The arrangement is well shown in the accompanying illustration from Pye's book (Fig. 80). When used with patience and intelligence, I have known this suffice; but for a severe case, of course, it will not be enough.

I have recently had a male infant under my care in whom an inguinal hernia had been produced by applying an appropriate band for the treatment of a troublesome umbilical rupture. When he was first brought, he was apparently

sound in the inguinal region, and there was no history of his having had any other protrusion than that at the navel.

Congenital hernia is that variety in which the bowel passes along the open funicular process into the tunica vaginalis. (See remarks on congenital hydrocele, page 338.) Though often found at, or soon after, birth, its appearance may be delayed for weeks, or even years. Frequently it exists

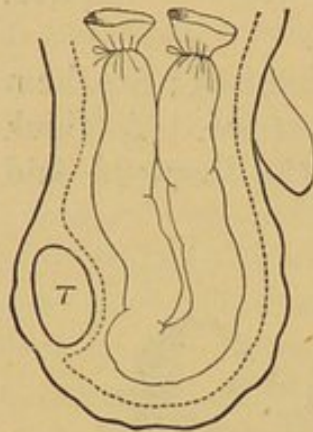


Fig. 81. — Congenital Hernia. T, Testis.

with congenital hydrocele, when, on the bowel being returned into the abdomen, the serous fluid can be made to follow it by raising the scrotum. Sometimes the bowel descends only a short way along the funicular process, when, if there be no hydrocele, it may be impossible to recognise the exact variety of the hernia—a matter of but little practical importance, however (Fig. 81).

Congenital hernia may occur in girls as well as in boys; in the former the intestine drops into the funicular process which passes down with the round ligament—the canal of Nuck; in one child the ovary had thus descended as a hernia on each side of the body.

Hernia of the ovary with torsion of the pedicle.—Cases of this extraordinary affection in infants have been published in the *British Medical Journal*, June 13th, 1896, and in the *Lancet*, March 21st, 1896. They bear a close resemblance to cases of torsion of the spermatic cord. In Fig. 82 is shown the twisted pedicle and the œdematous ovary removed in one of the two reported cases.

In **funicular hernia** the bowel has descended along the open tube of peritoneum, but on account of obliteration of the process having already taken place just above the testicle, it has not, as in the congenital variety, passed into the tunica vaginalis. This is a common variety of hernia in children.

Infantile, or encysted hernia, is of rare occurrence; its exact nature could hardly be recognised, except on operating. The tubular prolongation of peritoneum has been obliterated

at the internal abdominal ring, whilst the tunica vaginalis and the funicular portion remain in free communication; an expulsive effort drives the bowel in a special sac, and into the open funicular process and tunica vaginalis. (See Lockwood, Trans. Soc. Med. Chir., 1886.)

Case.—A weakly male child had a small, tightly strangulated hernia of the left side, reaching half way to the testis. The child was very ill; the hernia could not be reduced under chloroform. A diagnosis was made of “congenital hernia,” but, on opening the sac, a second sac was seen; at the bottom of the opened sac lay the testicle. After a slight use of the hernia knife, at the top of the tunica vaginalis, the contents of the small sac were returned without being exposed. On the eighth day death occurred from pneumonia; the preparation is in the museum of St. Mary’s Hospital (No. C. d. 20). (Fig. 83.)

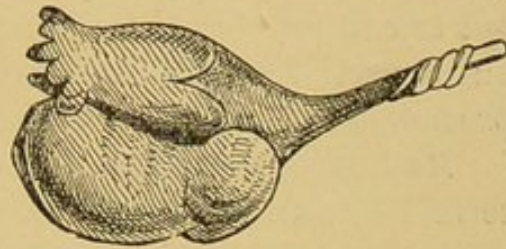


Fig. 82.—Ovary with Twisted Pedicle and Edematous Fimbriæ.

There is a *second variety of infantile hernia*, in which, the funicular process being closed at the abdominal end, a

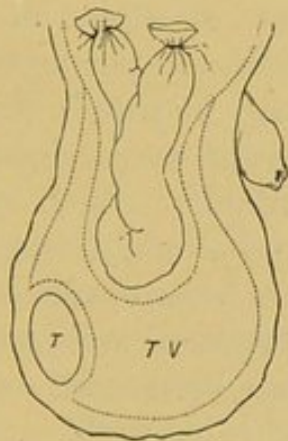


Fig. 83.—Encysted Hernia. T, Testis; TV, Tunica Vaginalis.

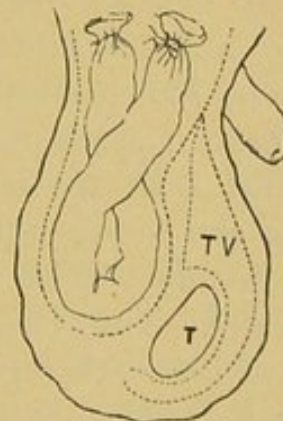


Fig. 84.—Hernia behind the T, Testis; TV, Tunica Vaginalis.

piece of intestine passes down in a sac behind the tunica vaginalis. It would then be necessary to cut through three layers of peritoneum before reaching the bowel (Fig. 84).

Cæcal hernia occurs in the right inguinal region, and usually has, though not always, a complete sac. The tumour is large, and reduced with difficulty; yet it rarely becomes strangulated, perhaps on account of the large size of the abdominal aperture. Sometimes the vermiform process can be felt through the scrotal covering; but the exact nature of the protrusion may be detected only on operating. The cæcal hernia is peculiarly unmanageable by truss, and is very apt to call for radical treatment. The cæcal hernia may have but a partial sac of peritoneum. Sometimes the vermiform process alone forms the hernial protrusion.

Radical treatment of reducible hernia is a preferable term to "radical cure." It is by no means always a cure, and so to speak of the operation is to surround it with a specious attractiveness.

There are some herniæ with which it is beyond the power of the parents and of the surgeon successfully to deal by trusses; the protrusion may keep up for a short while, but as soon as the child begins to get about it slips down again, and lies compressed beneath the pad. If a truss with a stronger spring be employed, the pressure becomes intolerable; so the child is allowed to go about with bowel in the scrotum, which generally becomes an increasing quantity. To offer an equally unsatisfactory state of affairs, though the hernia of another child is not large, nor particularly unmanageable, his parents are too poor to supply him with the necessary apparatus, or too ignorant or careless to give the needful help in making it available. Such cases are proper for the radical operation; but I would strongly insist that if a hernia can be kept up by a truss, operation should not be urged. The treatment by subcutaneous injection of a solution of oak-bark or of alcohol has been tried and found wanting; it is not only unsatisfactory, it is unsafe.

There is certainly no age-limit as regards resorting to the radical treatment. Indeed, the younger the child the more difficult it may be to keep up the hernia, and, so far as my experience goes, the more satisfactory is the result of operation. The question of operating must be decided by the unmanageableness of the hernia rather than by the age of the child.

The child being in a state of perfect health, and duly prepared for operation, an incision is made over the inguinal canal—as high above the scrotum as possible—until the funicular process is reached. The coverings are disturbed as little as possible during the dissection. The serous process is freed, the vas deferens and the spermatic vessels being jealously protected from injury. The process is securely tied by a sterilised silk ligature, close to the internal abdominal ring, so that no depression may remain upon the abdominal aspect likely to encourage subsequent emigration of bowel; to effect this it may be necessary to lay open the inguinal canal. Half an inch below the ligature the funicular part of the sac is severed, its stump being turned up and stitched to the abdominal wall. Some surgeons affirm that so long as the funicular process is obliterated high up, the inguinal canal needs no suturing. Certainly the effectual ligation of the process is the more important part of the operation, but I prefer to adopt the additional precaution of lacing up the inguinal canal by silk sutures cut short, leaving only sufficient room for the transit of the spermatic cord. So that they may have a firm hold upon the aponeurosis of the external oblique, they should be inserted at some distance from the margin of the ring. The skin-wound is sutured, and the part is covered with a firm pad of sterilised gauze. No drainage-tube is needed. By the last turns of the bandage a piece of waterproof jaconet is adjusted over the region, a hole being cut in it for the penis.

I am opposed to the plan of twisting the sac to cause its obliteration, as a piece of omentum or bowel, or some elements of the cord may easily be snared thereby. In the after-treatment no truss need be applied. If the operation has been efficiently performed it is not wanted, whilst its pressure is actually harmful by promoting absorption of the plastic deposit needed for blocking the canal. Within four or five weeks of the operation I have the child up and about, keeping him under supervision for a few weeks more.

If the **testicle and bowel be adherent** in a reducible inguinal hernia, the case is highly suitable for radical treatment. Assiduous endeavour should first be made to coax

down the testis and imprison the bowel, but the complication is an unsatisfactory one for palliative measures. If, in the performance of the operation, the testicle be found fully developed and easily separable, it may be brought down and secured in the scrotum. But if translation do not seem practicable, or the gland be undeveloped, it had better be removed. The operation is likely to be attended with perfect success, for the inguinal canal can then be completely and permanently closed. When Mr. J. J. Clarke was my house-surgeon at St. Mary's Hospital, we had several operations for the radical cure of congenital hernia in adults in which the protrusion was associated with an imperfectly developed testis; and careful microscopic examination of each gland after its removal proved it to be destitute of spermatozoa, and, therefore, of no physiological value. Mr. Crowle, moreover, tells me that in five other cases in which I had removed an atrophied testis which was associated with congenital inguinal hernia in adults, the gland was in each instance destitute of seminal filaments. When the imperfectly developed testis is removed, together with the open funicular process, the cure of the hernia is almost certain to be effected, for the inguinal canal can then be completely closed. The argument for preserving an undeveloped testis when performing a radical operation for hernia is only sentimental, and, in my opinion, should not be regarded.

When estimating the risks of the radical treatment, it must be remembered that, unless the boy is perfectly cured of his hernia, he will be every day of his life in peril of a knuckle of bowel becoming strangulated. And if the strangulation occur at a time when, and at a place where, adequate assistance is not forthcoming, the risk will, indeed, be great. Far better is it for the time of operating upon a congenital hernia to be left to the choice of the surgeon, than that it be forced upon the patient later in life by blind chance, when the bowel has been caught and strangulated.

If death follow the operation of radical treatment of hernia, it may be due to peritonitis, or blood-poisoning; and though the chances of that contingency are small in clean and careful surgery, still, the occurrence is within the range

of possibility. If this fact be constantly kept in view, due attention will be paid to the simpler treatment, the knife and sutures being reserved for those cases which are otherwise unmanageable.

Strangulated hernia is of rare occurrence in childhood. When a hernia cannot be returned, the child should be at once placed upon his back, the pelvis raised as high as possible upon a pillow, and the knees tied up under the roof of a cradle, so that the blood may be encouraged to drain away from the congested piece of bowel, a little ice in a bladder being suspended over the tumour. As Pott says, "The nearer the posture approaches to what is commonly called standing on the head, the better." In a recent case I actually hung a child up by his feet, the top of his head just resting on the bed. The bowel had been strangulated for many hours, during which time he had been constantly vomiting. The boy slept comfortably in this inverted position, and the bowel quickly went back. The child should be allowed nothing by the mouth.

If the hernia persist, chloroform should be administered and taxis undertaken, with the understanding that, if this fail, a cutting operation must be performed. No doubt, the child is in danger so long as the hernia is imprisoned, and needless delay must, therefore, be avoided; but if the treatment suggested above be fully carried out, herniotomy is very rarely needed; in this respect the case differs widely from that of the adult. Later, when the child has recovered from the shock, the radical operation had better be performed. If, however, operation is required when the bowel is strangulated, the sac should be removed and the inguinal canal occluded as described on page 351.

Femoral hernia is seldom met with, probably because, the pelvis not yet having taken on growth, there is sufficient resistance in the tissues filling up the space below Poupart's ligament. A reducible hernia must be treated on those principles which guide us in dealing with an inguinal hernia.

Case.—Laura G., six years, was brought to the Hospital for Sick Children, for a small tumour, just below Poupart's ligament on the right side. The skin over it was red and oedematous. Her general condition was suggestive of enteric

fever, sordes covered the lips, and the tongue was furred in the middle and red at the tip and edges. The sac being opened, a knuckle of small intestine was found, dusky and œdematous from a tight strangulation of about forty-eight hours. The bowel was returned, and the thin sac was stuffed in to block the aperture in the crural sheath. The patient made a complete recovery.

I have on rare occasions had to perform a radical operation for the cure of reducible inguinal hernia in girls.

CHAPTER XXV

LATERAL CURVATURE OF THE SPINE.

LATERAL curvature of the spine (scoliosis) is not a disease; it is a local expression of general enfeeblement. It is often found in the subjects of flat feet; and, like flat foot, is due primarily to a yielding of muscles and ligaments under superimposed pressure—especially when, from one cause or another, that pressure is received obliquely. It is found chiefly in girls who are physically weak or rachitic, or in whom growth has advanced beyond strength and solidity, but it has no special association with tuberculosis. Girls with lateral curvature have often fallen into lolling habits when standing, or when sitting at meals, at the pianoforte, or at lessons. Boys are but little liable to the deformity, as they possess greater physical strength and keep their muscles and other tissues vigorous by outdoor exercises. The children of the poor are less affected than are those of the upper classes, who take but little exercise and pass much of their time sitting. Although the curvature is generally most marked between childhood and puberty, it usually begins quite early and progresses slowly. The more solid the vertebræ become, the more slowly does the defect advance. At about the age of eighteen it has usually reached its maximum, and will probably get neither much better nor much worse, as the skeleton is then practically solidified.

Attention may first be called to it by the mother noticing that a hip or shoulder is "growing out"; but as the child makes no complaint, surgical advice may not be sought until the deformity is but little amenable to treatment. In the early weeks of the deviation there is simply a yielding of feeble muscles and ligaments; but, later, when the habit is confirmed, the intervertebral discs and the bones become misshapen, and a peculiar rotation is produced.

A growing or weakly girl, standing much in class, finds

that she can diminish muscular fatigue by throwing her weight on the right foot, keeping the knee extended, and advancing the left foot, and slightly flexing the left knee. Thus she falls into the "stand-at-ease" position of the soldier. Deprived of its support, the left side of the pelvis drops, and the strain of keeping the body erect falls upon



Fig. 85.—Lateral Curvature in a Rickety Child.

the right ilio-tibial band, the capsular ligament of the hip joint, and the articular processes of the vertebræ—tissues which are unconscious of fatigue. With the dropping of the left side of the pelvis the lumbar spine is inclined to the left, and, therefore, to bring the centre of gravity of the trunk over the basis of support, she inclines the dorsal region well over to the right, the head and cervical vertebræ inclining secondarily to the left. The dorsal curvature having the convexity usually to the right, the right shoulder is noticed to be "growing out." The

hip bone of that side is apparently "growing out" also; because by the inclination of the lumbar vertebræ to the left, the soft parts of the flank are carried away from the right iliac crest; at the same time the left hip bone is hardly distinguishable, being hidden under the inclined body (Fig. 85).

The child who sits badly at school, on account, it may be, of faulty arrangement of form, or desk, or lighting, or because of defective sight, is apt to throw the chief part of her weight upon the left ischial tuberosity, and then, with the left hand upon the table and the elbow hanging at the side, and with the right elbow resting upon the table, the right shoulder is kept constantly raised and the loin region of the column inclined towards the left.

In either sex lateral curvature may be secondary to infantile paralysis of spinal muscles, to collapse of lung tissue (page 156), or to obliquity of the pelvis from congenital dislocation of a femur, or some other form of shortening of a lower extremity, and it is often induced in a child by

carrying about a baby; weakly girls should never be allowed to lift heavy infants. Sometimes the curvature comes on after illness. The chief of the early symptoms are "back-ache," lassitude, and lolling and stooping, especially if a walk have been long or lessons fatiguing.

With the lateral deviation of the column the weight is unevenly distributed upon the bones and cartilages, so that that part of the bodies of the vertebræ which is directed to the concavity, and the corresponding articular processes atrophy. The body of the vertebræ being squeezed, as it were, from out of the region of excessive pressure, the tip of the spinous process is twisted into the concavity of the curve, the whole vertebra undergoing *rotation* on its vertical axis. When, therefore, the line of the spinous processes is dotted out on the naked back, the track represents only approximately the extent of the curvature, the bodies of the vertebræ being much more deflected from their normal site than one would be led to infer. The vertebræ may be so much rotated that the transverse processes are directed actually backwards.

On the concave side the ribs are crowded together, whilst on the other they are widely spread out; and from the rotation of the vertebræ, the angles of the ribs on the convex side are pulled far back and rendered more acute, as shown in the accompanying diagram (Fig. 86). But great as the thoracic deformity may be, on account of the gradual and quiet manner in which it has been induced, the heart and lungs will have accommodated themselves to the situation without material inconvenience.

For **examining the patient** the clothes should be removed to below the level of the iliac crests, so that it may be seen if they are on the same level when the girl stands with her heels together; the girl should then bend forward, and the line of the spinous processes should be traced out from occiput to sacrum. Being then partially dressed, she should be placed

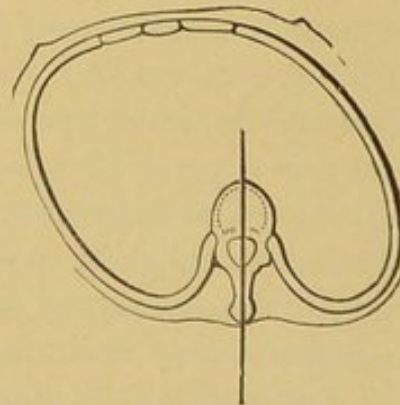


Fig. 86. — Section of Chest, showing Deformity consequent on Lateral, Rotary Curvature. (After Shaw.)

on her back on a firm couch, and, the pelvis having been brought flat and square, it must be seen whether the legs are of the same length, for a slight inequality may cause a tilting of the pelvis and the deflection of the lumbar spine.

It is only in the early stages of lateral curvature that treatment can have a curative effect. Neither exercises nor supports of any sort can untwist the rotation of the spine, nor restore the original form to vertebræ which have once become misshapen by irregular pressure.

Treatment.—The spinal muscles should be so strengthened by exercise that the patient may sustain an improved position without great fatigue. At first she may be able to maintain it only for a few seconds, but strength comes with exercise of the muscles. The thorax should be developed by systematic breathing, and by methodical exercises acting directly upon the ribs. Gymnastics and movements are designed on the Ling-system of Swedish exercises, and are best carried out in classes, or under the special supervision of a well-trained and competent instructress. They should not be conducted so as to leave the child fatigued. In the introduction of the exercise-treatment Roth has done much good work. Boys are so rarely the subjects of lateral curvature, chiefly because in their games they use all their muscles, and do not sit cramped over music or needlework, nor, as a rule, too much over books, as girls are apt to do. Swinging by the hands from a horizontal bar, firmly fixed by staples and cord from the top of a doorway, is a good exercise. It gives the intervertebral disc the chance of re-expansion, strengthens the scapular muscles, and probably helps in undoing some rotation of the vertebræ. After the exercises the patient should again place herself squarely in a reclining chair; she should not stand about. She should not be allowed to cross the thighs when sitting, as this act tilts the pelvis; standing on one leg is also harmful. A good deal may be done by vigorous manipulation of the child's trunk as she lies flat upon the table, the convexity of the lateral curves being boldly drawn in opposite directions.

Parents are often solicitous that some support be ordered; occasionally, indeed, they go to a shop and buy one for themselves, either without, or contrary to, the advice of the medical attendant.

To the tradesman lateral curvature and angular deformity of the spine are often the same thing; at least they need the same treatment, an expensive spinal support. Spinal supports of every kind are not only quite ineffectual in the treatment of lateral curvature, but absolutely prejudicial. They contain a weight of metal which exerts its influence chiefly in tiring the child, in helping to crumple up the pliable pelvic bones, and in effectually preventing due muscular development.

The child with lateral curvature should not remain too much in the horizontal position, as this increases the enfeeblement of the spinal muscles, and she must not be kept a prisoner to the house. She should be dressed in flannel, but not overweighted with clothes; and as the circulation is often feeble, the legs and arms should be well covered. None of the clothes should be tight; "hygienic braces" and all apparatus of that sort should be discarded. A cold bath should not be allowed, except in the height of summer; but douchings with warm and cold water, and shampooings along the muscles of the spine should be persistently carried out night and morning. Massage, rubbings, douchings with hot and cold water, not only ease the dull achings and discomfort met with in some of these cases, but they also improve the strength and vigour of the muscles. The continuous or the interrupted current may also be resorted to with the same object. Beyond all this, the lungs must be fully exercised, and the respiratory muscles brought into play by slow, deep inspirations by the nose and expiration by the mouth.

Another exercise is by fixing the patient prone, with the whole of the trunk, upwards from the level of the iliac crests, projecting beyond the end of the couch; the shoulders are allowed to sink towards the ground, and then, by calling into action the masses of the erector spinæ, the shoulders are raised even above the level of the rest of the body. This exercise may be gone through several times in the day. Firm longitudinal strokings of the patient's back by the attendant's two palms generally remove any aching caused by the exercises. These strokings are also usefully employed at home to relieve backache. After each exercise the patient rests a few minutes. Several of the simpler exercises have to be practised at home for about fifteen minutes twice daily.

When not walking about in the open air, or employed at gymnastic exercises, the patient should be sitting in a chair with a high, sloping back, with the sacrum as well as the scapula against the chair-back, in order that the sitting posture may be kept up without a relapse into the vicious position. She should be made to see the importance of, and interest herself in, maintaining the correct posture when standing as well as when sitting; and in order that she may herself correct error and watch for improvement, she may practise before a good-sized looking-glass. The ordinary music stool must be discarded, and in its place she should have a high chair with a back, which should be drawn close up to the piano, so that she may avail herself of the support of the back of the chair.

A serviceable and cheap reclining chair may be obtained at an outfitting or furnishing warehouse. It is the long "deck-chair," made of cane, with a sloping back. But if no reclining chair or couch is at hand, the child should be made to lie prone on the hearth-rug or by the window; and in this way, with the chin supported on the hands, she may daily spend several hours reading, looking at pictures, or amusing herself. She should go to bed early, and should not work at lessons or music before breakfast. She should not be allowed to sleep upon the side of the convexity. The bed should have a firm mattress and a flat pillow. A very useful seat can be obtained by cutting a few inches off the hind legs of a common Windsor chair which has vertical rails up the back. If, after this, it appear unsteady as the child thoroughly supports herself in it, it may be kept with its back standing against the wall.

In every case the eyesight should be carefully tested.

If the lateral curvature be secondary to a tilting of the pelvis from an inequality in the length of the limbs, the iliac crests should be brought to the same level, by increasing the thickness of the sole of the boot on the affected side. Such elevation should be gradual, so that the spinal column may have time to arrange its elements in accordance with the changed conditions.

The meals should be plain, and taken at regular intervals. Cakes and sweet-stuff cloy the appetite; stimulants are not

needed. The laxative iron mixture, or that of cod-liver oil and iron, or the simple tincture of iron in water, may be prescribed. If continued supervision be given, even an unsightly curvature may be expected to cease to increase, so that later, by an artful arrangement of corset and dress, the deformity is hardly to be detected even by the critical eye.

Before pronouncing a child cured of or free from curvature, she should be kept standing for several minutes, until the muscles are weary of holding the spine erect. A curvature which can be detected only in this way is, of course, very slight.

The **rickety curvature** is evenly distributed from the neck to the loins, the head falling helplessly on to the chest, or down towards the child's knees. This condition has been dignified by the name **kyphosis** (*κυφός*, "bowed forwards"). The curvature is, at a glance, altogether different from that of caries, whilst the abnormal mobility of the spine gives evidence of the absence of inflammatory disease. If the child be put flat on the table, or laid prone across the surgeon's knees, the knees being gradually drawn apart so as to stretch the child's trunk, the spine comes as straight as ever.

Weak and growing girls are particularly apt to develop this hoop curvature, especially if they be the subjects of nearsightedness, because they have constantly to lean forwards to read, or even to see the food on the plate. Both shoulders are said to be "growing out," the explanation being that the shoulder-blades cannot lie flat upon the rounded back.

Treatment.—If the subject be an infant, careful feeding and clothing, and the administration of cod-liver oil by the mouth or skin, and the maintenance of the horizontal position, are needed. No support of any kind is required. If the child be a few years old, he should take his meals as he lies on the floor; or if he be allowed to sit at table, he should be made to lean back in his chair. Lolling over plate, picture-book, or toy should not be allowed. For the growing girl, the treatment will be that prescribed upon page 358; and care must be taken that if the eyes be weak she be supplied with glasses which have been selected

by one skilled in ophthalmic surgery, and not merely picked out by the tradesman, whose business should be to sell rather than to select. At lessons she must be made to sit as directed in a previous part of this chapter. She should not, for a time at least, be allowed to continue music lessons.

Neuro-mimetic (hysterical) affections of the spine are met with in growing girls; occasionally nearly all the signs of vertebral caries are detailed, whilst the skin is found marvellously hyperæsthetic. Fortunately (page 185), these nervous symptoms are generally so exaggerated that the nature of the disease is promptly detected. The pain and tenderness are generally *in the skin*, the child complaining loudly, if her attention be directed to the part, when the skin is gently pinched; stiffness of the spine is conspicuous by its absence (page 247).

Treatment.—Such a child may require change of air and scene; possibly some studious habit should be given up, and more exercise in the open air insisted upon. A course of iron and quinine, early hours, and social and domestic quiet, are requisite.

CHAPTER XXVI.

BONE AND PERIOSTEUM.

Acute septic osteomyelitis is one of the most serious diseases to be met with in children and young adults. Its diagnosis is not always easy at first, the affections for which it is mistaken being usually acute rheumatism and erysipelas, whilst some of the symptoms resemble those of typhoid fever.

The disease usually begins at the end of a diaphysis, spreading in many cases through the whole of the diaphysis, and causing purulent effusion not only beneath the periosteum, but through the compact and cancellated bone and the medulla.

Typhoid and scarlet fever, measles, influenza, bronchitis, fatigue, and exposure to wet and cold play an important part in preparing the child for the attack. Among the local causes are blows, sprains, and injuries of all sorts. And seeing how many poor and ill-nourished children there are who are forever exposing themselves to injuries, it is almost a matter of surprise that this infective osteitis is not more frequently met with. Probably the explanation of the comparative rarity of the disease is that, at the time at which the injury is received, the child's blood-stream happens to be destitute of those particular micro-organisms whose seizure upon, and cultivation in, the bone constitute the disease in question.

The micro-organism determining the disease is, for the most part, the staphylococcus pyogenes aureus; but streptococci are often, and the cocci of typhoid and of pneumonia are sometimes, in evidence. The staphylococci can be produced in gelatin from generation to generation, and when inoculated into one of the lower animals—especially if a bone has been prepared by injury—they produce again septic osteomyelitis. But in those instances in which injections of the cocci have not been preceded by injury to the bone, acute suppuration

has occurred at the seat of the injection. After the death of the animals septic inflammation is found in the liver, the kidneys, the joints, and elsewhere; and even from the blood itself cultures of staphylococci have been made. Indeed, the local condition runs hand in hand with pyæmia.

The staphylococci probably enter by the capillaries of the mouth, naso-pharynx, respiratory tract or alimentary canal. Sometimes they have been received through a septic wound near to, or remote from, the region of osteal attack.

The disease is truly infective. For instance, if any of the septic micro-organisms gain admission into the surgeon's finger, they may go on developing after their kind and involve him in pyæmia. A scratch received whilst removing a sequestrum from a child or a young adult, after septic ostitis, is apt to end disastrously.

The starting-point of the disease is the soft tissue at the end of a diaphysis; being the most delicate part of the bone, it is most likely to suffer from injury, and it offers to the micrococci a very suitable habitat. But these micrococci are not the only germs which select this delicate tissue; the bacilli of tuberculosis affect it with equal readiness, as in the case of spinal caries (page 246), and in many instances of joint disease.

Very often the child has been playing about well and strong, has been at school, or has been engaged in light work, until the moment that he is attacked. I use the masculine pronoun advisedly, for a considerable proportion of those coming under treatment are boys. Out of a total of 165 cases collected by me, 96 were in males and 69 in females—the figures working out about five boys to three girls. In these 165 cases the femur was affected in 83, the tibia in 47, and the humerus in 20. Next in order came the fibula; and in still smaller proportions came the radius, ulna, clavicle, and os calcis. The reason for boys being more often attacked than girls is that they are, in their work and play, more exposed to injuries; and injury is usually the determining cause of acute inflammation.

It is surprising that, with so intense an inflammation at the end of a diaphysis, the neighbouring epiphysis should so often escape; but the diaphysis has practically nothing to

do with the epiphysis; the two parts are separated by the junction-cartilage, and each has its own system of blood-vessels. But the invasion of streptococci is not always confined to the diaphysis; traversing the junction-cartilage, they may swarm through the epiphysis and wreck the joint, especially in the case of infants. Indeed, of so frequent occurrence is the invasion of the joint a result of the acute diaphysitis occurring on the threshold of life, that Mr. Thomas Smith described the condition some years ago under the title of "Acute Arthritis of Infants." In some such cases the septic ostitis no doubt begins as an **acute epiphysitis**, but it so constantly starts as a para-epiphysitis—a localised diaphysitis—that I do not deem it necessary to write a separate account of the epiphyseal affection. It is the same disease wherever it begins.

Case.—A child of twenty-five months was admitted in June, 1892, in a state of serious exhaustion; a fortnight before he had a series of fits, and on the day of admission both shoulders were swollen. He was extremely anæmic; the temperature was 104·4° F. The shoulders were red and tense, and fluctuation could be obscurely obtained in them. We diagnosed acute septic diaphysitis; and within an hour of his admission we opened and irrigated the joints, resected the softened epiphyses, and scraped away the diseased end of the humeral diaphyses. On one side a small sequestrum was removed from the end of the diaphysis; on the other side the end of the diaphysis was surrounded by pus and septic granulation-tissue. The child made a rapid recovery, with freely movable, though shortened, arms. On each side the disease had begun at the end of the diaphysis, and expended itself upon the epiphysis and the joint rather than on the shaft of the bone.

So rapid is the advancement of this infective disease that pus may be found beneath the periosteum within twenty-four or forty-eight hours of the beginning of the illness. There is purulent infiltration of the ends of the diaphysis and of the marrow; the Haversian canals are blocked with pus, necrosis and septic nephritis occur, together with grave constitutional symptoms, and the disease is constantly mortal.*

* See the account by Cornil et Babes.

I regret to say that this condition of affairs has been described as a distinct pathological entity under the heading "Acute Necrosis." But the actual disease was acute septic osteomyelitis, and necrosis is the result of it. To look upon the necrosis as a disease by itself is, in my opinion, unscientific; and, what is worse, it draws away the practitioner's attention from the primary trouble.

The terms applied to the disease by the older pathologists—acute diffuse periostitis, and infective periostitis—show clearly that they considered it to be primarily a periostitis. The general and local signs apparently justified that view, and the evidence in that direction seemed conclusive when they found the membrane separated from the bone by extensive suppuration. To them it appeared far more probable that the pus came from the periosteum than the bone.

The periosteum, however, is usually involved only to this extent—that it is hyperæmic, thickened, and œdematous. But so also are the adjacent muscles and fasciæ, and even the skin over the inflamed tibia, for instance, is thick and œdematous. After the evacuation of the abscess, or the removal of the necrosed piece of the diaphysis, the periosteum at once resumes its work of forming new bone, which it would have

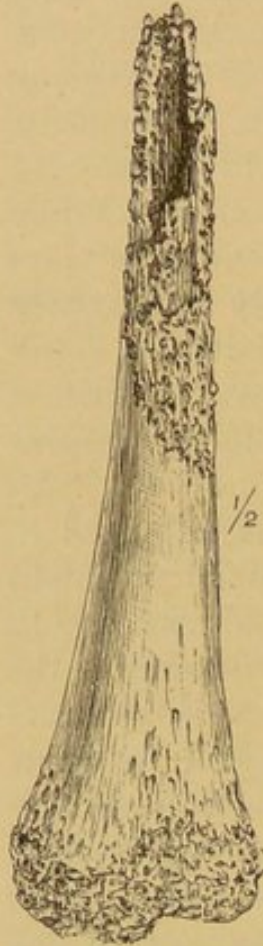


Fig. 87.—Necrosis of Lower End of Femoral Diaphysis, the result of septic osteomyelitis. (Museum, Royal Coll. of Surgeons.)

been unable to do had the antecedent disease been an acute periostitis. Moreover, it often happens that the sequestrum which is removed from the diaphysis is conical, tapering away from the junction-cartilage into the centre of the bone. Thus, in the figure of a sequestrum taken from the lower end of the femoral diaphysis of a boy (Fig. 87), the part first infected was killed in its entire thickness by the Haversian thrombosis; but, as the inflammation extended, it spread along the central part of the bone rather than along the compact tissue. If the disease had been a periosteal

affection, rather than osteomyelitic, the outer part of the bone should especially have suffered. The irregularity upon the tapering part of the sequestum shows how the necrosed tissue was cast adrift by a rarefying inflammation in the surrounding part of the diaphysis. At the time of writing, I have a girl under my care, in St. Mary's Hospital, who was admitted with a high temperature and with a little redness and tenderness over the lower end of the right tibial diaphysis; cutting down upon the bone, no pus was discovered, but, on exploring the interior, the marrow and the soft bone were found soaked with pus. Obviously in that case the disease was central, for there was no pus found until the bone was drilled, and so it is in many cases. I think this is the common form of the disease, though doubtless, in certain cases, the suppuration may begin closer to the periosteum, and appear even to be derived from it.

Symptoms.—Probably the first indication of there being anything amiss with the child will be a complaint of aches and pains near some joint. Very likely this is during convalescence from some illness, and perhaps after the receipt of some disregarded injury, or after exposure to cold or to unusual fatigue. The limb swells; and if the bone is not too thickly enshrouded in muscle, the skin becomes hot, red, and œdematous. A central and exquisitely tender enlargement would then be discoverable, due to swelling of the periosteum; the swelling cannot be actually of the bone, for osseous tissue cannot become swollen after a few days' inflammation. The pains steadily increase. The boy cannot sleep; his temperature rises to 103° or 104°, or even higher; maybe, if very young, he has a convulsion; if older, he may have shiverings or a genuine rigor. He is evidently extremely ill; and, in all probability, he is delirious at night, because of his brain being poisoned by the absorption into his blood of the products of decomposition at the septic focus. Suppuration takes place, and very likely some other diaphysis becomes affected, or a pyæmic abscess forms in some other part of the body. Possibly septic pneumonia, pleurisy, or pericarditis supervenes, and, quickly or slowly, he may sink exhausted and unconscious.

“Multiple necrosis” is a term sometimes applied to a not uncommon variety of this disease; it merely implies that

more diaphyses than one are affected, and it points to the pyæmic nature of the affection. At the moment of writing I have under my care a boy whose primary point of attack was the lower end of the left ulnar diaphysis; then followed in quick succession the lower end of each tibia and the hinder end of the calcanean diaphysis. From each site a sequestrum has been removed, and the child is now doing well, but many children succumb to the acute toxæmia before the pyæmic ostitis has had time to establish such widespread disease. And I can well understand that if a practitioner has never previously met with one of these fulminating cases he might easily fail in his interpretation of the clinical symptoms.

Treatment.—Immediately the limb should be thoroughly cleansed, for the presence of foulness within must not be taken as rendering external asepsis superfluous. Under an anæsthetic, a free incision should be made down upon the bone. Assuming that this reveals suppuration, the surgeon should freely open up the cavity and wash it out with a hot solution of mercuric perchloride—one in two thousand. Then he should see what extent of the diaphysis is bare; and he may be quite sure of this, that the length of bone denuded is not equal in extent to that in which the vessels are in a condition of septic thrombosis.

If the chief part of the diaphysis be bare both in length and circumference, the probability is that that piece will necrose bodily. But it may not do so, especially if the tension has been quickly relieved. I have met with an instance in which I could pass a probe completely round the bare tibial diaphysis of a boy in a considerable extent of its length; yet, after thorough irrigation and drainage, the periosteum became again adherent, and no necrosis supervened. Cases differ in their intensity, and in the amount of necrosis which ensues.

If, on opening the abscess, the diaphysis be found denuded of periosteum, and one end be detached from the epiphysis by suppuration, there is little chance of its surviving. It is better, then, to resect the denuded part of the bone forthwith, and to hope for the regeneration of a diaphysis from the periosteum. And such an occurrence is by no means unlikely.

This treatment may in some cases be followed by failure; the periosteum not resuming its osteogenetic function; the limb remaining useless, and amputation being called for after much disappointment and delay. But when this treatment succeeds it is extremely successful; and when it proves disappointing it is pretty certain that less radical measures would not have achieved a better result. I have witnessed the occurrence of necrosis in so many of these cases that I am convinced that we err upon the side of doing too little rather than doing too much in the treatment of osteomyelitis. "Expectancy" in osteomyelitis generally entails widespread disaster or death.

If both ends of the denuded diaphysis be detached, there can be no doubt as to the advisability of lifting it bodily from the bed of pus in which it is lying. Amputation may, however, be deemed the better alternative.

In every case of septic diaphysitis with a detached epiphysis resection of the diaphysis cannot be carried out. Probably if the lower end of the femoral diaphysis were bare and detached, amputation would be preferable. The value of the femur for the purposes of support and progression might be so seriously interfered with by the operation of resection of the end of the diaphysis that there is much to be said in favour of amputation.

In those cases in which the diaphysis is bare and its continuity with the epiphysis persists, resection is not called for, as necrosis is not inevitable, though it is probable. In such circumstances it is advisable to lay the compact tissue freely open by gouge or trephine, and to scrape out the septic marrow and the cancellated tissue. After this, the hollowed bone is to be washed out with hot mercuric solution (one in three thousand), and gently dressed with mercuric gauze, the limb being carefully fixed in a splint and raised on a pillow. By these measures the intra-osseous tension is effectually eased and the septic foci are cleared away, with the great advantage of diminishing to the utmost the risk of extensive necrosis and of pyæmia.

The *indications for amputation* cannot be concisely and definitely formulated; each case must be considered by itself. Exhaustion, high temperature, rigors, and delirium do not by

themselves establish the expediency of amputation; grave as these symptoms are, they are usually associated in every severe case. Nor, among the local signs, are great swelling of and tenderness in the part, extensive subperiosteal abscess, and detachment of an epiphysis to be taken as affording that indication, for they co-exist in many a case in which a useful limb is eventually secured. Nor does the conjunction of these two groups of general and local signs necessarily demand amputation. But when the child is evidently sinking from blood-poisoning and exhaustion—when there is practically no hope of his surviving unless the septic focus be promptly and absolutely cleared away—the limb must be sacrificed. Usually after amputation the patient makes a rapid recovery, though sometimes his convalescence is retarded by the occurrence of secondary pyæmic abscesses.

In the case of the disease extending into and causing acute suppuration of the neighbouring joint, it is generally expedient to amputate. But even in these circumstances free incisions, irrigations and drainage, or resection, may sometimes be successfully resorted to.

In the later stages, when the disease has been allowed to drift on until the end of a bare diaphysis is making its way through a mass of granulation-tissue, and the boy is worn out by long-continued suppuration, there is no alternative treatment to amputation. In such a case the periosteum is likely to be wholly replaced by granulation-tissue, so that even if a large sequestrum were lifted out, there would be little likelihood of a new diaphysis being formed. Thus, temporising would lead to disappointment, and an inevitable amputation would be unfortunately postponed. For the regeneration of a diaphysis, or of part of one, early resection of the infected bone is necessary.

If after the primary focus has been dealt with the temperature do not come down, probably one of two things is happening—either the treatment has not been sufficiently heroic, so that local absorption of toxins is still taking place, or else an osteomyelitis is about to manifest itself in some other bone. Every diaphysis, therefore, that can be reached should be carefully examined, and, if one be found tender, it should at once be cut down upon and efficiently explored.

But if no tender or painful diaphysis or epiphysis be discoverable, the original seat of infection should be again inspected, and dealt with as occasion may direct. The lungs also should be examined all over.

When two or more diaphyses are affected, it may sometimes be expedient to amputate that which was the seat of the original disease and to temporise, maybe, with the other. But amputation of a single limb by no means suffices for the successful issue of all these pyæmic cases. Double amputation of the thighs is sometimes absolutely demanded.

The fact of a boy having well-marked pyæmia is not of itself an indication that the primary seat of septic disease should be removed by amputation, though, doubtless, in many cases amputation offers the safest course. Pyæmia and metastatic abscesses appearing shortly after the primary manifestation are much more likely to demand amputation than are similar conditions appearing later in the progress of the case.

I have recently had under my care at St. Mary's Hospital a boy of thirteen years, whose illness began a little more than a year previously, with acute para-epiphysitis in the lower end of the left femur. The bone was incised through the interval between the ilio-tibial band and the tendon of the biceps, a central sequestrum was removed from the end of the diaphysis, and septic granulation-tissue was cleared away. Within a few weeks he had severe constitutional disturbance, and acute diaphysitis manifested itself at the upper end of the right humerus. This was also dealt with by scalpel and gouge, and everything went on well, though the femoral wound did not heal. Some months afterwards he again came into the hospital and more sequestra were removed from the thigh. The wounds had entirely healed when he had a further disturbance, acute synovitis appearing in the opposite knee, and intra-articular suppuration ensuing. This pyæmic abscess was treated by free incision and mercuric irrigations, and he is now convalescent, with freely movable knee-joints. I should think that this boy's blood has been so fully leavened with the toxins elaborated by the cultivation of the micrococci that he is now proof against further infection. Very different is this form of pyæmia from that which sometimes appears in the early weeks of septic osteomyelitis. In the latter case the

dose of toxin cast into the blood-stream not only paralyses the nerve-centres, but it may be so potent that the patient sinks rapidly beneath its fatal influence.

Septic diaphysitis is not always of the same intensity. A mild attack may give rise to but slight local disturbance, and to the quiet formation of a localised abscess or a small sequestrum. In this respect the disease may resemble certain forms of syphilitic (page 93) and tuberculous (page 59) ostitis.

Complications.—The commonest and most serious complication of acute septic ostitis is pyæmia. Indeed, these cases are essentially from the beginning pyæmic. Certainly the constitutional symptoms are those of pyæmia, and it is only a question as to the entrance of the staphylococci into the blood-stream, and the establishment of secondary foci of suppuration, as to whether or no the general signs of infective blood-poisoning shall be manifested. In some cases the septic intoxication is so acute that the subjects perish almost at the onset; at any rate, they do not live long enough to give the usual manifestations of the disease. In other cases the children struggle bravely through the acute stage of pyæmia, to fall victims to a lingering form of that disease, or to hectic fever, albuminoid disease of blood-vessels and of the viscera, or to exhaustion.

One of the most likely complications of the para-epiphysitis is extension of the disease into the neighbouring articulation. In the case of the primary disease attacking the upper end of the femoral diaphysis (Ch. XXIX.), implication of the hip joint is almost inevitable, as the end of the diaphysis is included within the capsule. But in the case of a diaphysis being inflamed near a shoulder, knee, or ankle, the pus would have to burrow into the joint. This it may accomplish, either by transversing the junction-cartilage and epiphysis, or by creeping beneath the periosteum of the epiphysis. At one time I had under my care in the same ward two children into whose knee joints the pus had made its way direct from the seat of septic infection. In one case the pus had effected its entrance by working (Fig. 88) through the head of the tibia, and in the other by passing beneath the periosteum and the capsule. In each case the invasion was signalled by an attack of acute arthritis, but a resort to immediate resection of the

joint and a radical dealing with the septic bone was the means of saving the limbs.

When septic inflammation attacks the upper end of the tibial diaphysis, pus is apt to find its way into the knee joint by tracking upwards along the tendon of origin of the popliteus, which arises within the capsular ligament.

Differential Diagnosis.—The two diseases with which septic diaphysitis is most often confounded are acute rheumatism and erysipelas. Of the two errors the former is by far the more common, and I have known even experienced practitioners commit it. The practitioner should in every case examine for himself and make his own diagnosis, as it is very easy to fall into error with cases of septic diaphysitis. Thus:—A boy of ten years is playing in the beginning of a thaw, sliding and snow-balling. He comes in with his boots and trousers wet through. Within a week of that occurrence—probably because of it—staphylococci begin to cultivate themselves in the lower end of his femoral diaphysis. He complains of pains about his knee, which his mother attributes to rheumatism. So she puts him to bed and foment the knee. He gets steadily worse. In two days she sends for the doctor, because, as she says, her boy has “rheumatic fever.” The doctor finds that the temperature is 103° F. The skin about the knee is flushed and burning hot; there is swelling near the joint, and there is so much tenderness close above it that the boy will scarcely let him examine it, and he begs for the fomentation to be reapplied at once. Next day the boy is worse, in spite of the salicylic acid which was prescribed; he has not slept an hour; his temperature is a degree higher; he had a shiver during the night, and was “wandering”; moreover, he has now acute septic inflammation at the other shoulder, and, perhaps, some pyæmic pericarditis.

By gently pinching the femur between his finger and

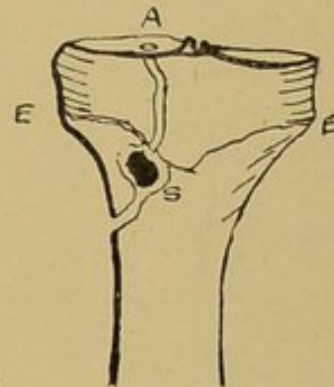


Fig. 88.—Septic Diaphysitis at upper end of Tibia; S, central necrosis; A, pus finding its way into the knee joint through E, E, the epiphysis. (From a case in the Hospital for Sick Children, Great Ormond Street.)

thumb, the doctor would have found that the disease was in the *bone*, and not in, though very close to, the joint.

Septic diaphysitis is sometimes taken for erysipelas. Each is an infective blood-disease, and when the diaphysis concerned is superficial, as in the tibia, the extreme local swelling

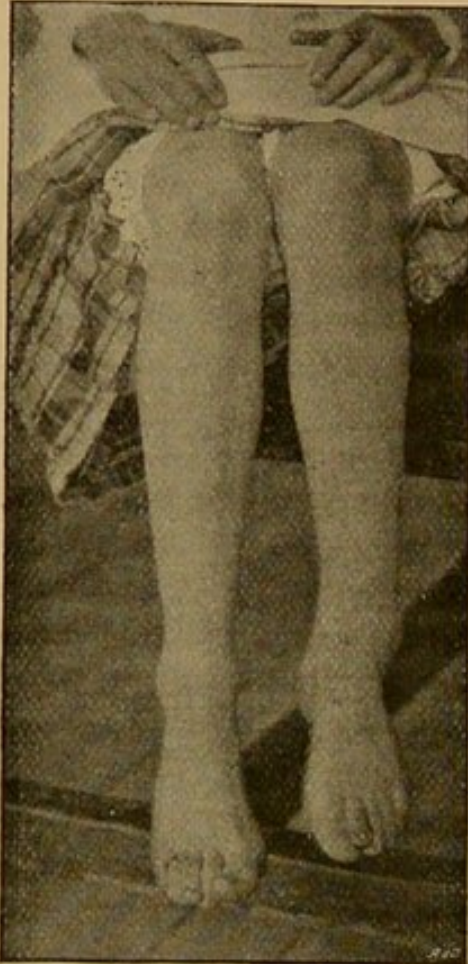


Fig. 89.—Shortening of Left Tibia, the result of septic diaphysitis near ankle.

and the marked redness of the skin may, with the background of general symptoms, lead to error. But gentle pressure of the diaphysis between the finger and thumb would show that the swelling and tenderness were evidently in the bone and periosteum, and not in the bright red skin.

Subsequent condition of the bone.—If the necrotic diaphysis is removed without needless delay, the periosteum, which is lined with granulation-tissue, will form a new shaft, bearing a close resemblance to the original. Sometimes, however, it is but a short and clumsy imitation.

If, as the result of the Haversian thrombosis, a sequestrum be permitted to linger in the interior of the diaphysis, it becomes the source of constant irritation and hyperæmia, the result being that the shaft is thickened by deposit from the deep layer of the periosteum, and gradually lengthened by the organisation of chronic inflammatory deposit upon the diaphyseal side of the junction-cartilage. If, however, the growing tissue at the end of the diaphysis be completely destroyed by the septic inflammation, or the disturbance cause premature fusion of the shaft and epiphysis, inevitable shortness of the bone results (Fig. 89).

(Compare with syphilitic osteitis, page 94.)

Central necrosis in the shaft of a bone—the result of

a quiet osteomyelitis, or of tuberculosis—may be the cause of persistent enlargement and pain. A free opening into the shaft will reveal the exact nature of affairs, and may obviate the risk of a calamitous amputation. When a sequestrum is quietly isolated in the end of a long bone, the bone swells, and, unless the sequestrum be removed, the joint may be at last destroyed. When the disease is symmetrical, it will probably be of syphilitic origin. A sequestrum, surrounded by an extensive formation of new bone, closely resembles a sarcoma; but the introduction of a scalpel or a steel director shows sarcoma to be soft and succulent, whilst the inflammatory disease is hard, or yields pus. The clinical history and symptoms often mislead (page 120), and the surgeon will do well to hold his judgment in suspense until he has, under chloroform, thoroughly explored the interior of the tumour.

Chronic periostitis may be the result of wet, cold, or injury. It is most often met with in the syphilitic or tuberculous subject, and is generally associated with ostitis. The bones most frequently affected are those of the extremities. As always happens when a fibrous tissue is inflamed, the pain is worse at night, and when the days are wet and cold, and after exercise.

The *treatment* consists in the application of leeches; in enclosing the limb in a plaster-of-Paris splinting; and in aiding venous return by raising the limb on a pillow. Iodide of potassium and iron, and (later) cod-liver oil, may be prescribed. Experience suggests that, out of hospital, the treatment of chronic disease is not always carried out with sufficient firmness and thoroughness. (The subject of *dactylitis* is dealt with on page 61.)

Chronic diffuse ostitis is due to congenital syphilis, and is referred to in the chapter dealing with that disease (page 93).

Chronic osteomyelitis may be a mild form of the acute process just described, or it may be secondary to disease of an articulation, an amputation-wound, or other injury to the bone. The femur and tibia are most likely to be affected. The symptoms are deep-seated thickening in the limb, with general enlargement of the bone; pain, tenderness, and constitutional disturbance.

Treatment.—The limb should be secured upon a splint, and raised. Tonics and anodynes will be required. If the child be losing strength, and the local trouble do not improve, exploration should be made under chloroform, and search made for localised abscess or necrosis. These cases are apt to drift on indefinitely unless the enlarged bone be cut into.

But if the case give no improvement, either scraping out the medulla or amputation will be needed. Supposing that the femur be involved, a free incision is made along the outer side of the thigh. The bone is opened up, and, if necessary, trephined, and the soft interior is thoroughly scraped out in nearly its entire extent. The cavity is then syringed with a hot solution of corrosive sublimate (1 in 4,000), and the cavity is gently stuffed with sublimate gauze, and the limb is dressed with wood-wool.

Acute epiphysitis is, as a rule, secondary to inflammation of the adjacent end of the diaphysis. Indeed, I do not think that the disease often exists independently of a septic parapiphysitis. Its description, therefore, must be sought under the heading of *acute osteomyelitis*, at the beginning of this chapter.

Chronic epiphysitis is likely to be secondary to a syphilitic (page 91), tuberculous (page 58), or a quiet septic inflammation at the neighbouring end of the diaphysis.

In the last case the diagnosis will be assisted by finding that the tender swelling does not clear up under the influence of mercury. Both in the tuberculous and in the quiet septic disease the enlargement may be associated with the presence of a sequestrum, the resemblance to myeloid sarcoma being close. If redness of the skin and deep-seated softening do not indicate the presence of abscess, it will be well to incise the swelling and explore. It is so easy to mistake a swelling at the end of the bone, due to the presence of a sequestrum, for myeloid sarcoma, that it is advisable to explore even when there seems to be no room for doubt. The removal of a central sequestrum may prevent a grave and needless operation (p. 120).

Abscess in connection with a rib is apt to come on very quietly, and to be discovered only when there is a considerable swelling beneath the skin. The surface is not discoloured. The child may have complained of a "stitch"

in the side ; and, on examining, local tenderness may be found about a rib. The sooner that the abscess is opened and scraped out the better, lest, perchance, more ribs become affected, or the pus find its way into the pleural cavity. Tuberculosis is the cause of these abscesses, and, in examining them, the surgeon should satisfy himself that the spine moves freely, and that the pus is not tracking its way from a vertebral caries. If, when operating on the abscess, it is found that the pus is connected with a roughened area on the deep aspect of the rib, it is advisable to resect that piece of the bone, after detaching the periosteum, and then thoroughly to scrape the granulation-tissue from the walls of the cavity, and to clean it out with dossil of sterilised gauze.

CHAPTER XXVII.

FRACTURES.

IN the rickety child the bones, though containing an excessive proportion of animal matter, are brittle. This may be due to the fact that the conversion into the solid bone is accomplished by a process of calcification rather than of ossification.

From the continuous crying or fretfulness, the mother suspects that there is something wrong, and when the part is disturbed during washing or dressing there are manifestations of pain. Sometimes the nature of the injury is not recognised for a day or two. Often, no history of the child having met with injury is to be obtained.

The first step in the *examination of an injured child* is to have it completely stripped of clothing, without unnecessary exposure to cold, and laid on a firm, flat surface, such as a table on which a blanket has been folded. Inspection is made for bruises or swellings. Then the limbs are examined, any apparently tender part especially receiving attention. Each joint is cautiously exercised, and the integrity of the epiphyseal cartilages tested. The child should be turned over and the spinal column examined. The ribs are rarely broken, on account of their great elasticity. The child should be kept in his cot for a day or two, for the appearance of some local swelling and tenderness may prove that, after all, a joint has been sprained or a periosteum bruised.

The diagnosis of fracture may rest upon circumstantial evidence; thus, the child was well in the morning, later he is found crying, and unable to move the swollen limb. The suddenness of the occurrence, the existence of circumferential and deeply-seated swelling, and the evidence of tenderness, suffice. The swelling is due to effusion of blood around the fractured part; but if the periosteum and

muscular attachments be not torn through, there will be no displacement. The periosteum is thick and tough, and steadies the fractured surfaces, and, as a rule, the bone breaks straight across, like a carrot. To inquire for crepitus in such circumstances is unnecessary; it might damage the periosteum, or convert a partial into a complete fracture. In children, fracture is apt to be situated at the line of an epiphyseal cartilage, in which circumstances crepitus might not be definitely obtainable except by violence.

Chloroform may not be required for the examination unless the fracture be near a joint; but if the child screams, or the surgeon is in doubt, anæsthesia must be resorted to.

If, after careful examination, the surgeon be unable definitely to ascertain the existence of fracture, the limb should certainly be dealt with, at any rate for the time, as if that lesion existed. Cases of this sort need great care and circumspection; otherwise a fracture may be overlooked, and, treatment being omitted, non-union may occur. With due care, the surgeon will, at any rate, render himself secure against future anxiety and accusation. He will do well, moreover, to make it a rule to carry out a careful examination of the elbow in every case of injury to arm or fore-arm, as the head of the radius may slip from the orbicular ligament, or an epiphysis or a condyle may be detached without any very obvious local signs.

In certain delicate, but otherwise healthy children, the skeleton is extremely brittle, one long bone after another breaking from slight injury, and perhaps on more than one occasion. The fact of firm consolidation taking place under appropriate treatment is evidence of the non-malignant nature of the condition. The term usually applied to it is *fragilitas ossium*. The child requires careful supervision, rest, massage, fresh air, good food, and medicinal tonics.

The greater the proportion of animal matter in the growing bone, the greater is the liability for the bone to be bent without its tissue being entirely broken through. There are two varieties of this **incomplete fracture**—the bone may be broken half-way through, whilst the other part is only bent, or it may be bent without real breakage having occurred. The term green-stick "fracture," which is applied

to this second kind of injury, is a misnomer. The clavicle of the rickety child is very liable to green-stick bending.

General caution.—In every case of fracture near a joint or through an epiphysis, it is desirable that the surgeon, however skilled and competent he may be, do not take the undivided responsibility of the case. Some untoward event is apt to ensue which no exercise of art can with certainty avert. Thus, suppuration may occur, and death follow from pyæmia; or synostosis or other form of permanent stiffness may result; or there may be obvious deformity; the humerus may fail to be properly developed, and the limb may be less useful than was anticipated. Injuries near a joint, skilful as the treatment may have been, sometimes entail disappointment as well as undeserved censure. Therefore, the parents should be made at once to understand the serious nature of the injury, at least as regards the future effect. A shoulder or elbow left permanently stiff may well-nigh ruin a professional reputation; its existence is never forgotten. Even in a country village some brother practitioner can and should be found to help share responsibility.

In the case of uncertainty as regards the nature of an injury to bone or joint, exact information may generally be secured by the help of the Röntgen rays. And even in the case of disease of a bone or joint a skiagram may often give great help. Separation of the humeral epiphysis, and even tuberculous disease of the acetabulum, may thus be clearly demonstrated.

A word of caution must be given against applying bandages tightly or unevenly. The softer and more elastic the material of which the roller is made the better; domette and butter-cloth muslin are preferable to cotton, but the soft open-work cotton-rollers do well. If plaster-of-Paris be used (and there is no better material for the purpose), it should not be applied in the meshes of a roller bandage, but in lateral splints of house flannel which have been duly cut to shape. This splinting is evenly secured by a few turns of a muslin roller to one side of the limb, the other side being then similarly dealt with. So applied, the splints can be easily removed.

Ages at which epiphyses become ossified.—The special

nutrient arteries of the long bones course in their respective bones *towards the elbow and from the knee*. Now, the epiphysis towards which the nutrient artery runs is invariably the first to join the shaft, therefore the elbow-ends of the humerus and radius are attached early, whilst the knee-ends of the femur and tibia are attached late. Thus, in the growth of the arm, the elbow epiphyses are of secondary importance to those near the shoulder and wrist; whilst, in the lower limb, the knee-ends of the femur and tibia are of chief concern. Roughly, one may say that the epiphysis towards which the nutrient artery is running is ossified to the shaft soon after puberty, while the other epiphysis delays its attachment until about the twentieth year, that is, until growth is completed.

The long bones may be *broken in utero* by injuries received by the mother. During parturition, also, fracture may take place, even in the well-developed and healthy foetus, either from the forcible expulsive efforts, or under the influence of vigorous assistance rendered by the mid-wife. A case is on record in which, from officious help at birth, the lower epiphysis was separated from the shaft of the femur, and the upper one from the tibia.

The *treatment* of incomplete fracture demands the forcible effacement of angular deformity. The straightening should be accomplished under an anæsthetic, and during its performance it is quite possible that the unbroken fibres of the bone may be felt to yield, and a definite crepitus may declare itself. The limb is then put up in moulded splints. For fractures in the limbs I generally use lateral splints of house flannel which have been soaked in creamy plaster-of-Paris. The constitutional condition must be attended to (page 70). Lime-water may be advantageously mixed with the milk, and especially so in hot weather. These cases generally do well, the bone becoming quickly consolidated, whilst the improved hygiene to which the child is subjected produces general improvement. The less that the part is disturbed the better, and it will be advisable to preserve it long at rest, lest the uniting medium be found of insufficient stability, and *angular deformity* supervene. If, either without, or in spite of, surgical treatment, marked angular

deformity be found on the completion of union, it will be better to administer chloroform and to straighten the bone, the existence of epiphyseal cartilages being remembered. But if the deformity be not unsightly, it will be better (ensuring rest) to leave it to nature. With the growth of the bone, and with the absorption of the redundant callus, the angularity steadily diminishes. Thus, great improvement may be confidently looked for. Refracture should be undertaken only after the conclusion has been deliberately arrived at that the case is beyond the range of adequate improvement if left uninterfered with, for sometimes, after refracture having been performed, delayed union results.

The **clavicle** of a weakly or rickety child may be broken by a small amount of violence. The child cries and does not move the arm, and a swelling quickly appears at the spot. To diminish as much as it possibly can the pressure on sensory nerves, the child holds his head down to the damaged side, shrugging up his shoulder, and it becomes a difficult matter for the surgeon thoroughly to inspect the part. Probably the periosteum will not be torn through. Occasionally, in very rickety subjects, both clavicles are found bent or broken.

There will be no "dropping of the shoulder," as in the adult, and no search is to be made for crepitus. It suffices that the child has met with an accident, and that he now does not move his arm, that a tender swelling and an irregularity have suddenly appeared about the middle of the clavicle, and that the head and shoulder are approximated. Not infrequently the fracture is overlooked, and is discovered by the deformity which is manifested after the swelling and tenderness have subsided; but sometimes an angular, rickety bending of the clavicle is mistaken for an old and unrecognised fracture.

Separation of the sternal epiphysis of the clavicle I have met with on one occasion. The appearances closely resemble those of dislocation; the presence of the epiphysis in its proper position makes the diagnosis clear.

The *treatment* demands rest for the bone, by fixing the arm to the side with a few turns of a soft, wide roller, the hand being imprisoned as well. The turns of the roller may

be kept in place by a few stitches, and a close-fitting cinglet may be drawn over all. A thin layer of linen may be laid between the naked arm and chest, and violet powder dusted on the skin. An axillary pad will not be required; the arm is simply to be steadied against the chest for three weeks. Strapping is not suitable for fixing the limbs, as it becomes loosened by the warmth of the body and is then thrown into cord-like bands; moreover, it may cause dermatitis.

Non-union is apt to occur in those cases in which, on account of the fracture having followed a very slight injury, the lesion is for a time undetected, and, therefore, not efficiently treated. Still, non-union is rarely met with. It is most likely to implicate the tibia and fibula, and, in a lesser degree, the humerus, the femur, and the clavicle. The bones affected become atrophic, and resection of and wiring the fractured ends proves ineffectual. In the case of the leg, at any rate, amputation has reluctantly to be resorted to.

In the discussion which followed the reading of Mr. D'A. Power's paper on this subject at a meeting of the Royal Medical and Chirurgical Society, in 1891, I showed two cases of ununited fracture which were then under my care in the Children's Hospital, on both of which I had operated without success.

One was that of John J., seven years. There was nothing to suggest either rickets or syphilis. When he was fifteen months old he fell down the area steps, injuring his left leg. He was taken three days afterwards to the Victoria Hospital, where his leg was put up in wooden splints. The mother took the child home with her, leaving him to crawl. The splints were kept on for some weeks, after which, probably because the case was not going on well, he was secured between two long outside splints to prevent his using the leg. This treatment was carried on for about a year. The leg continued useless and bent; it was, therefore, straightened and secured in a Bavarian splint. No good result followed, and until May, 1890, when the boy was admitted into the Great Ormond Street Hospital, he was getting about as best he could with splints and crutches. By an anterior incision I cut down upon the false joint and removed the ends of the bones, together with much fibro-cartilaginous material, and,

having divided the tendon of Achilles, I placed the leg straight in lateral splints of plaster-of-Paris. The wound healed without rise of temperature. Considerable care was expended over the after-treatment, but all was in vain. The boy's leg remained small, deformed, and useless, and it was eventually amputated at St. George's Hospital.

The second case was that of Charlotte H., three years. She was born at full time; the labour was lingering, and the midwife was officious. Three days afterwards the mother noticed that the infant's right leg was bent, and that she cried when it was moved. Three weeks later the mother took the child to a doctor, who secured the limb in plaster-of-Paris splints for three months, and subsequently said that the child must not be put on her feet "for a very long while." The child had never walked. There was nothing to suggest either rickets or syphilis. When she was two years old she was admitted into the Great Ormond Street Hospital for an ununited fracture below the middle of the right tibia and fibula, with considerable angular deformity in front. I exposed and freshened up the ends of the tibia and fibula. The Achilles tendon was divided, and the limb was fixed upon a back-splint with a foot-piece. The temperature remained normal. At the end of a fortnight the first dressing was done, and gypsum side-splints were applied, which the child was wearing when she was sent home at the end of another fortnight. The leg proved flail-like and useless, and eventually I had to amputate it, though, with the kind help of Mr. Spencer, I previously and unsuccessfully tried the effect of grafting bone-fragments from the humerus of a puppy that was sacrificed for the purpose.

In his article on "Ununited Fractures in Children," Sir James Paget said that he could only guess at a possible explanation of the cause of measures usually sufficient for the cure of this defect in adults being, in three cases which he had met with in children, "completely useless." He threw out the suggestion that the bones affected may have been the seat of a localised morbid condition of the nature of osteomalacia, though he did not offer a suggestion as to why a general disease of the osseous system should be limited to a single bone, nor why it should occur at all

in a child who in every other respect was, as far as one could see, perfectly healthy.

The wasted condition of the limb below the seat of fracture seems to me to suggest that the cause of non-union may possibly be due to some trophic influence following disturbances of the anterior cornu of the grey matter of the cord (pp. 163, 413) as the result of the fracture.

So far as my experience goes, the result of active treatment in these cases is most unpromising, but I should be inclined in every case to give a thorough trial to the operation of freshening up the ends of the bones and securing the limb in gypsum splints.

I have seen ununited fracture of the clavicle and in the ulna in children, but for them no operation had been desired.

The **humerus**.—For fracture of the shaft of the humerus lateral splints of house flannel, stiffened with creamy plaster-of-Paris, form the most satisfactory retentive apparatus. The entire limb should be enclosed, from shoulder to wrist, the elbow being fixed at a right angle. The halves of the splint should not overlap, so that they can be readily loosened or taken off if the hand swells. The limb may be further steadied by being covered by the cinglet.

If the child make persistent complaint of discomfort, the limb must be inspected. Children do not complain without cause; perhaps a piece of hardened splint is pressing unevenly, or one turn of the roller has become tightened, or an abscess is forming about the fracture. At all events, the limb must be examined and secured again. It gives comfort gently to rub the bared limb in the direction of the venous return before reapplying the bandage, but the mere readjustment may afford relief. The limb should be kept at rest for four weeks, but it should be gently massaged from time to time. (Fig. 90 shows epiphyseal lines of humerus.)

Fracture may take place **through the upper epiphyseal junction**. The line of the cartilage is not quite horizontal,



Fig. 90.—Humerus, Upper and Lower Epiphyses, and Inner Condyle detached.

the head of the bone receiving the conical end of the diaphysis in a sort of socket. Thus the fracture traverses soft bone as well as cartilage. With so extensive and rough a fractured surface complete displacement is hardly likely; nor is one certain to obtain a definite crepitus, for on rotating the arm the upper fragment would very likely rotate with the shaft. To search too closely for crepitus is to cause undue pain and needless local disturbance; but it may be advisable to put the child under the influence of an anæsthetic, and thoroughly but gently to examine the swollen shoulder. The shaft of the bone may be moved without disturbing the articular end. As a rule, the upper end of the diaphysis is displaced forwards and inwards, so that it forms a sharp and characteristic projection beneath the skin at the anterior border of the deltoid. Separation of the upper epiphysis of the humerus is by no means an uncommon injury in children and young adults, but the correct diagnosis is not infrequently missed. When once the peculiar ridge formed by the top of the shaft-fragment has been seen, the recognition of the lesion should be a simple matter.

Treatment.—Whether the diagnosis be clearly made out or no, a small pad of cotton-wool, folded in a soft handkerchief, may be placed in the arm-pit, and the arm and hand fixed against the side of the chest, as in the case of fracture of the clavicle. It is well to mould a splint over the deltoid region; no inside splint can be of service, the fracture being high in the arm-pit. The chest affords an excellent lateral support for the shaft-fragment. The forearm and hand should be worn in a sling.

The elbow and fore-arm must not be raised in the sling, lest the upper end of the shaft-fragment be shifted from its proper position, and so, after the removal of the bandages, unevenness would be found at the line of fracture. Even after the exercise of much skill and attention, some irregularity may be detected on the removal of the splint. This should cause neither alarm nor anxiety; it will probably be smoothed off with the subsequent growth of the bone; and when the deltoid has been fully exercised again, any little shapelessness will be shrouded under the muscle. I have seen most marked deformity at the shoulder

completely disappear within a few months of the arm being released.

If, when all swelling has subsided, union be taking place with some deformity, the surgeon should think twice before breaking it down with the idea of readjusting the ends. Such interference might result in fracture of the bone in a fresh place, or might be followed by serious local disturbance. Nature may be trusted to effect a marvellous improvement in the course of time.

Union of an epiphysis is, as a rule, quickly effected, so that the parts should not be fixed for more than three or four weeks; they should then be allowed complete freedom. If

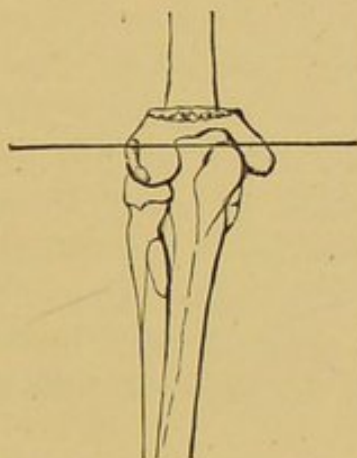


Fig. 91.—Fracture through Lower Epiphyseal Cartilage.

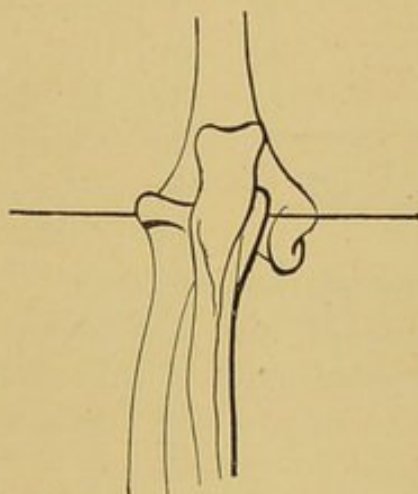


Fig. 92.—Dislocation of Radius and Ulna backwards.

the arm be kept longer in the bandages, the stiffness is slower in working off. Exercises and massage expedite the usefulness of the limb, and they may be resorted to before the arm is entirely restored to freedom.

Fracture through the lower epiphysis of the humerus is apt to be mistaken for dislocation at the elbow joint. The epiphyseal cartilage passes horizontally just above the condyles, the trochlea, and the capitellum. These portions of the humerus have separate centres of ossification, and (with the exception of the internal condyle) coalesce to form an epiphysis which is united to the shaft in the sixteenth or seventeenth year. (The internal condyle joins with the shaft in the eighteenth year.) (*See Fig. 90*).

The fracture is most likely caused by a fall upon the

elbow, by a wheel passing over it, or by a fall upon the outstretched hand (Fig. 91).

Diagnosis.—If the elbow be swollen and painful, an anæsthetic should be administered and a deliberate examination made. It may be noticed that the front of the fore-arm is

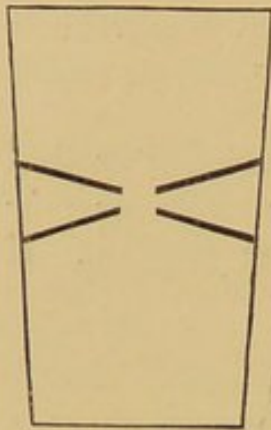


Fig. 93.—Pattern for Elbow Splint.

shortened, and that there is a projection behind the lower end of the humerus. On grasping the limb above and below the joint a strange lateral movement is detected. The lower fragment, if previously displaced, can be easily restored, though it is apt to slip back again. The movements of pronation and supination are permitted, and the top of the olecranon process is still in the normal horizontal line with the condyles of the humerus. Now, in the dislocation, as shown in Fig 92, the top of the olecranon is raised above the condyles of the humerus. The fracture is not necessarily accompanied with displacement. The injury is not likely to be overlooked if the shaft be grasped with one hand and the condyles with the other, and the characteristic lateral movement be looked for.

In the case of the backward dislocation being incomplete, the elevation of the olecranon will not be characteristic; its

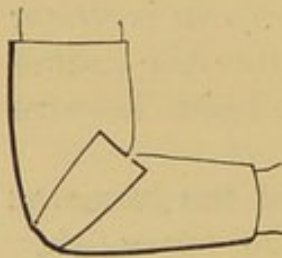


Fig. 94.—Elbow Splint applied. (After Lonsdale.)

absence, therefore, does not exclude luxation. In the case of there being uncertainty as to the exact nature of an injury near a joint, a skiagram proves intensely interesting and helpful. Indeed, one's only fear is lest the too frequent resort to the X rays should eventually suggest that diagnostic skill in obscure injuries near the joints is both superfluous and obsolete.

Treatment.—The hand and forearm should be evenly bandaged, and a layer of cotton-wool should be secured around the flexed elbow joint, the bandage being subsequently continued up the arm: A flannel splint having been already cut to the paper pattern, and prepared with gypsum, should

be moulded to the elbow, the joint being arranged at a right angle, and being steadied as the mould hardens. But it matters not of what material the splint be composed so long as the surgeon be handy with it; common house-flannel soaked in creamy plaster of Paris, poroplastic splinting, guttapercha—any one of them will do—but it must be applied with evenness and firmness. It should be long enough to reach well up the arm and down the forearm. Figures 93 and 94 show the material notched ready for application, and the splint moulded on to the elbow. The arm had better be secured inside the dress for three weeks. When using plaster of Paris, the house-flannel splinting may be applied directly against the skin, without the intervention of padding or bandage.

Thickening and stiffness of the joint subside in due course, and it is not advisable to attempt to expedite matters by forcible manipulation. Parents should (page 380) understand that the joint must be stiff for some time subsequently, and that in rare instances the joint remains permanently affected, and that fracture at that particular spot is always a serious injury. Should deformity with synostosis follow, excision might be deemed expedient; but such radical treatment should not be hastily resorted to.

Separation of the epiphysis may be complicated with a *vertical fracture into the elbow joint*, in which case it is found that on catching the condyles firmly between the fingers and thumb they are not in solid connection with each other or with the shaft (Fig. 95). The *treatment* does not differ from that advised in the previous case, and from the first it must be explained that deformity and stiffness may ensue, and that it is also possible that some arrest of development may possibly occur. Early resort to massage is useful.

Fracture may extend obliquely into the joint through the epiphysis, without there being a detachment of the epiphysis. This is made out by the fact that one condyle is loosened,

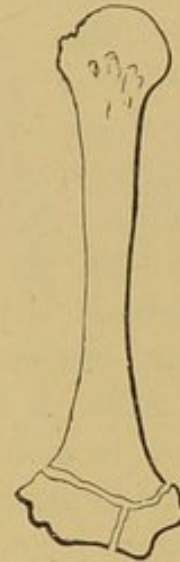


Fig. 95. — Fracture through Lower Epiphyseal Cartilage of Humerus, extending into Elbow Joint.—“T” fracture.

though not detached, and that a certain amount of lateral movement is obtainable at the elbow joint. Crepitus may be detected on flexing and extending the joint, or on rotating the radius. The *treatment* is that just described.

One of the condyles may be broken off without the joint being implicated, or the lower epiphysis being otherwise hurt. The inner condyle is specially likely to be detached, on account of its being more exposed to injury in a fall upon the elbow—it does not join the shaft of the humerus until the eighteenth year. To secure bony union of the loose internal condyle, the elbow should be flexed for a few weeks in a moulded splint. Sometimes it becomes attached to the humerus by ligamentous tissue only; but, fortunately, this faulty union entails no serious inconvenience.

After a limb has been confined in absolute rest for a week, or a little less, it may be advisable to take it down for a few minutes, in order, with the utmost care and gentleness, that each joint may be judiciously exercised. In this way the early return of free movement is greatly helped. But in this manipulation and massage there should be no disturbance of the fracture, and immediately afterwards the limb should be restored to security. If the movements give pain, they should not be persisted in; in this case there would probably be some inflammatory trouble still lurking about the joint. The surgeon thus reassures himself of the parts being in perfect apposition, and, if by chance there had been any misconception of the nature of the original lesion, the error could at this early date be easily rectified.

But if weeks or months after the injury, when all thickening has disappeared, the bones be found much out of place, speculative force should not be resorted to; it is better still to leave nature to effect a gradual improvement in the usefulness of the arm than to hurry in with operative interference. If, however, after due hesitation, little or no improvement ensue, resection may well be advised.

Stiffness following injury to a joint should not be dealt with by speculative force; the violence necessary to break down adhesions might cause disjunction of a neighbouring epiphysis. In any case it is apt to set up a serious arthritis. With fracture near the extremity of a long bone, the joint is

sure to suffer temporarily from adhesive synovitis. Roughly to move the joint might be to wreck it completely. Stiffness in childhood almost certainly works off in time, unless a fracture seriously damaged the joint. Sir James Paget wrote that happily "bone-setters" are allowed to have but little practice among children. Happily; for children's joints are much more imperilled by violence than those of older patients.

Fracture of the **radius and ulna** may be **incomplete**. The bones may require straightening before the splint is applied. The limb should be evenly bandaged from the hand upwards, and enclosed in plastic splinting. Wooden splints are inconvenient for children. For about three weeks the apparatus should be worn, and for the first few days it will be convenient to keep the child in bed, with the arm raised upon a pillow. Traumatic effusion is much better treated by even compression and by gentle massage than by lotions. If wooden or tin splints are used, they must be padded and adjusted with great care, and the child must be kept under close supervision, as pressure, tightness, or unevenness is very apt to cause sloughing and suppuration.

The **radius**.—Fracture may take place through the lower epiphyseal cartilage, from a fall upon the outstretched hand; the symptoms are similar to those of Colles's fracture, but, from the squared direction of the separation, malposition of the fragment is likely to occur. Such an injury may interfere with the due growth of the bone (Fig. 96). The head of the **ulna** is rarely detached.

In the event of an injury to the lower end of the ulnar diaphysis causing arrest of its growth, whilst the radius continues to be developed, either the hand is thrust into the position of extreme adduction, or else the head of the radius



Fig. 96. — Arrest of Development of Radius caused by Injury to Lower Epiphysis. (*Museum of St. Mary's Hospital.*)

slips from the capitellum of the humerus, a persistent dislocation resulting. This lesion may need resection of the displaced head of the radius.

Contraction of fingers after fracture of the radius and ulna, or of the lower end of the humerus, is a rare and grave affection. The fingers, thumb, and wrist are obstinately flexed, and the hand is pronated. The sense of touch may be interfered with. The condition is especially met with where suppuration has followed the use of splints. It may be due to pressure of callus upon the ulnar or median nerve, or it may be caused by a peculiar shortening of the flexor muscles secondary to traumatic myositis. The joints themselves are unaffected, but they are rendered rigid by contractures. The contracted muscles are chiefly represented by pale, fibrous material.

Treatment.—Massage, douchings, and electricity may be tried, and if these measures prove inefficient—as they are apt to do—the nerves may be cut down upon and freely explored with the view of liberating them from cicatricial pressure, osseous or fibrous. If this offer no improvement, every contracted tendon must be divided from the flexor carpi radialis to the flexor carpi ulnaris, without any attempt being made to secure subsequent union. Indeed, the contraction is far too great to render simple elongation possible. I have treated one case on this method; and though I am by no means hopeful as to the ultimate usefulness of the hand and fingers, they are at least in a good position, and are promising improvement, and the lumbrical and interosseous muscles are giving excellent help in flexion of the fingers.

Fig. 97 represents a forearm and hand thus deformed and rendered useless after fracture in the upper part of the radius and ulna. The child came up from a county town, where the fracture had been treated by anterior and posterior splints of wood. I was given to understand that when the splints were removed their pressure had caused the formation of a suppurating sore upon the front of the forearm. I know of another case in which the deformity occurred after the broken limb had been treated by gypsum splints. I cannot but think that the muscular contracture is due to the fact that more pressure has been applied than was expedient.

And if this be so, it should render us careful in keeping the child under constant supervision whilst he is wearing splints; in taking them down from time to time to look at; in gently massaging the limb; and in being ever on the look-out for complaints of "soreness" whilst the part is hidden from sight. Some children appear to be extremely intolerant of all pressure and constriction (*see page 7.*)

Metacarpus.—The first metacarpal bone is developed like a phalanx, the epiphysis being at its proximal end. A blow from a stick or a cricket-ball may detach the epiphysis, and the lesion may be mistaken for a dislocation. The treatment for each injury is the same. A splint should be moulded on, and the hand should be worn in a sling.

The **femur** may be fractured at the birth of the child, especially in a breech-presentation, and if the delivery be assisted by the blunt hook. Packard* quotes an instance in which the femur had been fractured within the uterus, and had become consolidated before birth. He also refers to a case in which the leg doubled up as the child was simply walking across the floor, the thigh bone having given way in the middle of the shaft. Spontaneous fracture is more common in the femur than elsewhere, by reason of the great leverage afforded by the length of the bone.

There is, as a rule, no displacement at the seat of fracture, the line of which is transverse. There is, therefore, no shortening of the limb. Near the middle of the shaft a deep-seated and tender swelling may be detected—a swelling which promptly followed an injury.

Treatment.—For an infant at the breast, or in arms, it is sufficient to bandage the two limbs together, from the feet and ankles up to the pelvis. A few stitches may be used for

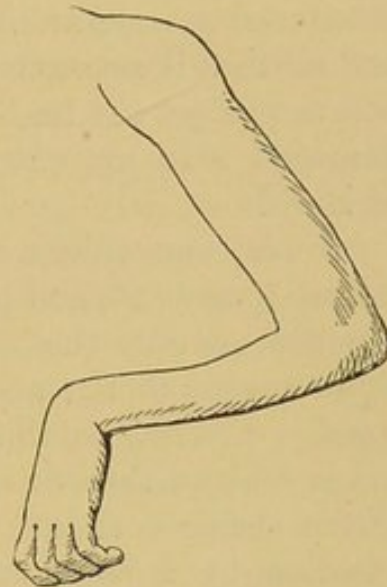


Fig. 97.—Contraction of Wrist and Fingers following Fracture of Radius and Ulna. Limb much wasted. (*From a Photograph taken by Mr. Templeton.*)

* Ashurst's "Encyclopædia of Surgery," vol. iv. p. 200.

securing the turns of the soft roller, and some padding of cotton-wool should be placed between the ankles and knees. An infant at the breast obviously cannot be kept in bed.

Broken thighs in children always do well; extension and counter-extension are not wanted, for there is no overlapping, and all that is necessary is to keep the little patient at rest and to protect the limb from disturbance. Or the limb of the damaged side may be enclosed in lateral splints of plaster of Paris.

A very convenient method of treatment is by applying a stirrup (page 414) and passing a cord from it to a pulley *above* the bed, so that the limb, extended at the knee, is flexed at right angles to the abdomen, the sole of the foot being constantly directed to the ceiling. If the child be small, both limbs may be thus fixed. Thus the child is easily kept clean. Older children should be kept flat in bed, the thigh being steadied by a long outside splint, with three short splints around the limb at the seat of fracture.

Dr. Laurent thinks that I underrate the frequency with which vicious union of the shaft occurs. At any rate, malposition should be corrected under chloroform as soon as ever it is detected, either by simple osteoclasis or by a cutting operation.

The **upper epiphysis** of the femur is sometimes detached violently, and because the line of fracture is entirely within the joint, the capsule quickly becomes distended with blood. Even after examination under chloroform the exact nature of the injury can only be guessed at. Probably the thickened periosteum is not torn across, so that a few weeks of complete rest in bed suffice to secure solid union. The detached epiphysis remaining in the acetabulum, and the neck being displaced upwards as far as the lower part of the capsule will permit, the limb is slightly shortened, and the top of the great trochanter is above its proper level, as shown by Bryant's line. Recovery takes place with a shortening of about half an inch, and though there is slight malposition of the fragments, they are solidly united by bone.

The **lower epiphysis** of the femur joins the shaft at about the twentieth year. It may be separated from the diaphysis, tearing away much of the periosteum from the shaft. Unless

the case were seen directly after the accident, the exact diagnosis might be obscured by effusion; lateral movement, and possibly crepitus, are the chief signs. It is hardly likely that there would be much displacement, unless the violence were great, or the fracture compound. The injury is best treated by placing the knee in the extended position in a small McIntyre splint, or in a plastic one moulded on the limb, the tendon of Achilles having been divided. The part must be inspected from time to time, without disturbing the fragments. If the popliteal vessels are pressed upon, gangrene may result. In any case, the injury is very serious. Sometimes reduction cannot be effected without operation, and in a considerable number of cases amputation has, for one cause or another, been eventually demanded.

Sometimes the separation of the epiphysis is associated with a vertical fracture into the joint. At other times violence stops short of the separation of the epiphysis, but causes an oblique fracture into the joint between the condyles. The looseness of the condyle points to the nature of the injury.

The upper epiphysis of the **tibia**, which includes the tubercle, is united with the shaft at about the twenty-second year, and the lower joins at about the eighteenth year. In simple fractures of the bones of the leg in childhood, the most convenient treatment is with the lateral splints of plaster of Paris. The knee can thus be bent, the limb laid on its side, and all tension taken from the gastrocnemius. The even compression, if applied early enough, prevents the occurrence of swelling and ensures rest.

If a rickety child be the subject of fracture in the thigh or leg of a valgus or otherwise deformed limb, the parts should be arranged so as to effect the greatest amount of improvement in appearance. During the confinement of the child in bed, the other limb, if that be also deformed, will likewise undergo considerable improvement (page 85).

Compound fractures do better in children than in adults; the kidneys of children have not been damaged by high living and alcoholic irritation, nor has the system been taxed by over-work, and by the worry and anxiety inseparable from the struggle for existence. Suddenly incapacitated from lessons

or play, the child's present and future are as free from care as the past is from regrets. Children live from day to day, and, like the lower animals, which in many respects they closely resemble, they bear serious injuries with patience, and generally surmount them with triumph. The popular idea is that a child frets and grows thin if kept in bed week after week. As a matter of fact, however, children bear confinement better than adults. All that is needed is that they be made to realise the fact that they are under authority, and must be obedient. Weak or indulgent parents, and family nurses—especially if they are old and “experienced”—are rarely fitted for the charge of sick children, and in most cases the services of a hospital nurse are of equal advantage to the child and assistance to the medical attendant. Nature, so generous and thoughtful in most respects, shows, as a rule, but little skill and discrimination in the matter of parental selection.

Fracture of the skull.—Children may recover from desperate injuries to the head, for the brain is in an imperfect stage of development. I have seen the side of the skull deeply indented from a kick, a great portion of the parietal bone being thrust inwards; yet, without interference, the elasticity of the bone has effaced the dent, and all signs of disturbance have passed away. Even with the occurrence of symptoms of compression, the surgeon should hesitate before proceeding to trephine. Nature should be afforded full opportunity of working recovery in her own way. If, however, depression be obvious and persistent, the use of the trephine and of the elevator must be resorted to.

On account of the thinness of the skull bones, *punctured wounds* of the brain are apt to occur, but though the instrument causing the puncture may have been driven several inches within the skull, still no symptoms may arise. Later, however, intracranial hæmorrhage or suppuration might occur, with symptoms of compression. In every case of punctured fracture trephining should at once be done, in order that spicules of bone which have been splintered from the skull-wall may be removed. If the case be left to take its course, although the child may have no intracranial hæmorrhage or suppuration, thickening may occur in the

damaged area, and give rise later to convulsions or to epilepsy.

I had a successful case of trephining for subdural hæmorrhage in a boy who was in St. Mary's Hospital with aphasia and right hemiplegia, which came on a few days after a fall (*Brit. Med. Journ.*, Oct., 1888).

Traumatic cephalhydrocele is met with only in childhood. It is the result of a fracture of the vault of the skull with escape of cerebro-spinal fluid beneath the occipito-frontal aponeurosis. If the fracture were compound, there would be no tumour, as the fluid would run away through the open wound. The wave of intracranial pulsation may be transmitted through the fissure to the swelling, but pulsation is not always present. There may be but little constitutional disturbance, and recovery often takes place. (For the common blood-tumour of the scalp, *see* next page.)

In a child under the care of Hey, of Leeds, in 1809, a watery fluid was discharged from a compound fracture of the forehead for three weeks. Another child recovered after the escape of fluid following an injury caused by a kick. In another case, a pulsating tumour, occurring after simple fracture in the frontal region, was tapped with a fine trochar. The child eventually died, and it was found that a probe could be passed through the fracture into the brain. Godlee has recorded two cases.* An infant of eight months fell from a height on to the head; a pulsating tumour occurred, which was punctured, a muddy fluid being withdrawn. The infant died. Examination showed a large hæmatoma, which communicated with the descending cornu of the lateral ventricle through a gap in the parietal bone. The other case was similar; at the autopsy the bone was found thin and partially absorbed. Some of the fluid may be inflammatory effusion, and some, especially when the tumour is associated with recent injury, may be blood serum. If the fluid become purulent, the gravity of the *prognosis*, which is always considerable, is much increased. Abundant discharge does not necessarily entail a fatal issue, but in any case meningitis may supervene. The pulsating tumour must be taken as

* *Medical Times*, Jan. 10, 1885. *See also American Journal of Medical Science*, July, 1884; and *Guy's Hospital Reports*, 1884.

evidence of a fissured skull, and of damage to the dura mater and arachnoid, and of laceration of the brain.

Treatment.—No further interference than the occasional tapping of the tumour is advisable, but if suppuration ensue, free incision, washings, and drainage are demanded. Pressure by pad and bandage may prove serviceable. The child must be kept quiet, and fed on milk and water. The bowels and the bladder must be duly attended to.

Cephalhæmatoma is a blood-tumour, occurring between the bone and pericranium, the result of blow or fall, of bruising which may result during the passage of the head through the pelvic straits, or of the pressure of the forceps of the obstetrician. Vessels are ruptured, and blood is effused beneath the pericranium. The effusion may follow a slight injury over the parietal bone of an unhealthy boy, may attain a great size, and may persist for a long while, the blood remaining fluid.

There is sometimes a strangely deceptive feel about these blood-tumours, especially if the area of the contusion be limited: a firm, definite, and elevated ring of inflammatory lymph surrounds the softer and bruised tissue, and sometimes ossification actually takes place in the bone-forming periosteum which overlies the border of the tumour. Feeling this for the first time, one might suppose that the central part marks a depressed fragment of the skull, and that the raised and hard margin is the edge of the bony gap. There are, however, no "brain-symptoms." In the case of fracture, the hard ridge would not be above the level of the rest of the skull, but with the blood-tumour it is so. Sometimes the cephalhæmatoma presents slight pulsation. The tumour is distinguished from meningocele by its not lying over a suture.

When a thin layer of effusion exactly occupies the parietal area, the condition may suggest absence of the parietal bone; as the blood is absorbed at the periphery, the bone seems to be ossifying. When the ossification around the tumour is considerable, the head remains misshapen through life.

Treatment.—The surface of the tumour may be gently rubbed with oil several times a day, to promote absorption,

but no active interference of any kind is demanded. It is only a question of time as to when the fluid blood will be absorbed, and as the surgeon cannot be sure that the tumour is not associated with fracture of the skull and with intracranial hæmorrhage, he had better not interfere, even by aspiration. Should suppuration occur, incision and irrigation will be needed.

CHAPTER XXVIII.

DISLOCATIONS.

DISLOCATIONS from injury are extremely rare; violence near a joint is more likely to detach an epiphysis. Of traumatic dislocations, one that is not unlikely to occur is that of the *bones of the forearm backwards*, the coronoid process of the ulna being detached. The dislocation having been reduced in the ordinary way, the elbow had better be enclosed for a fortnight or three weeks in a moulded splint. (For differential diagnosis from separation of epiphysis, *see* page 388.)

A dislocation of the radius peculiar to early childhood is that in which the head of the bone slips through the orbicular ligament; it is apt to occur when a child is lifted, swung, or dragged by the hand. No characteristic deformity is presented, but the elbow is swollen, tender, and slightly flexed, and its movement is interfered with. The nature of the lesion is very apt to be overlooked.

The reduction is best effected by flexing the elbow to a right angle, or beyond it (so as to bring the radial head up to the capitellum), and gently but fully pronating the forearm, so as to screw, as it were, the head of the radius back through the orbicular ligament. The elbow had better be fixed at a right angle for a week or so. Sometimes, however, even under chloroform, the surgeon fails in his attempt to reduce the dislocation. He must then be content to leave the head upon the anterior plane, and trust to its acquiring a useful articulation outside the joint. And in this he is not likely to be disappointed. The question of resection should not be considered until considerable time has elapsed.

I have recently had under treatment two children with dislocation of the **radius forwards** from injury. One case had been an uncomplicated luxation, the other had been associated with fracture of the humerus into the joint. The former was of some months' standing and did not prove amenable to treatment.

Luxation of the *proximal phalanx of the thumb* may require excision of the head of the metacarpal bone.

Congenital dislocation of the femur may exist on one side or both sides, and is more often found in girls than in boys.

The *signs* are by no means marked in infancy; the probability is that the lesion will pass unrecognised until the child begins to stand, when, from the centre of gravity being in advance of the normal line of support, the equilibrium is unstable. If luxation be symmetrical, the child develops incurvation in the loins (lordosis), in order that the centre of gravity may be brought to the proper situation by bringing the shoulders backwards. Thus the abdomen is extremely prominent, and the buttocks are large (Fig. 98). When the child is in the horizontal position, the chief characteristics of the luxation are effaced. On account of the shortness and the small girth of the lower limbs, the upper part of the body may appear disproportionately large. Where the affection is unilateral, there may be difficulty in forming a positive diagnosis. The child walks with a waddling gait, the thigh of that side is small and flabby, and its range of abduction is greatly limited. The top of the great trochanter is above the line which is drawn round the buttock from the anterior superior spine of the ilium to the tuberosity of the ischium, and the head of the bone may be felt rotating beneath the gluteal muscles.

Pathological anatomy.—Many of the subjects of this lesion have entered the world breech first, and the displacement is in consequence sometimes attributed to the thigh having been hooked down by the accoucheur. But this theory is not proved; there has been, moreover, no tenderness detected at the hip joint after birth, such as would surely follow traumatic dislocation. I have seen cases of congenital displacement

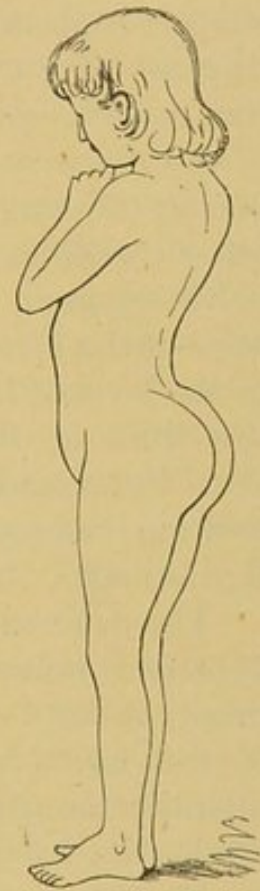


Fig. 98.—Congenital Dislocation of Femora. (After Brodhurst.)

in which the children have come breech first into the world, but without any external assistance. It is probable that the imperfect development of the joint is the result of a vicious packing of the foetus in utero, the legs being extended on the thighs, and the thighs flexed upon the abdomen; and this would account for the luxation being so often associated with breech presentations.

Dissection shows the head of the femur, though misshapen, enclosed within the capsular ligament (a fact which disposes of the theory of traumatic dislocation), the acetabulum is undeveloped, triangular, shallow, and rimless.

To measure the limbs.—A simple and exact way of comparing the length of the lower extremities in this or in any other condition is to lay the child flat upon the back, with the pelvis squared, and, having extended the knees, to bring the soles of the feet straight up towards the ceiling. The difference in the level of the malleoli is at once manifested. If, however, the limb of the affected side be fixed in a faulty position, the sound limb must be placed in an exactly similar position before attempting to estimate the amount of the shortening.

The *differential diagnosis* is from hip-joint disease (page 411) and infantile paralysis. In the former condition the thigh is kept rigidly fixed, and any attempt at eversion of the limb is attended with pain. From the effects of infantile paralysis the diagnosis is not difficult, as, after paralysis, the trochanters are on the same level. In "dislocation" the trochanter can in most cases be thrust up and drawn down, and that without pain. This distinguishes the dislocation from rickety deformity of the femur. A third condition from which congenital dislocation has to be distinguished is pseudo-hypertrophic paralysis (page 166). This is effected by the great development of the calves and deltoids, and the elevation of the heels; and also by the fact that in the pseudo-hypertrophic condition the heads of the femora and the tops of the great trochanters occupy their proper positions.

Treatment.—Provided that the deformity is in an infant or a young child, an attempt should be made, after Lorenz's bloodless method, to return the head of the femur into the

socket, by flexing, abducting, and vigorously manipulating the limb. After this, improvement may be obvious; and though in some cases the femur may retain its improved position, in others it may be necessary to secure the gain by fixing the limb in the abducted position, with the knee bent, until the pressure of the head of the femur has caused the permanent establishment of a natural and practicable socket. But even at the best, the case will require careful and prolonged supervision ere the limb will be sound and trustworthy. The inconvenience of the deformity is not sufficient to warrant the resort to any speculative operation with the view of improving the position of the undeveloped femoral head. I have under supervision a lady with congenital luxation of one femur, and by keeping the boot raised in proportion with her growth, the ill-effects of the deformity have been rendered little noticeable. No doubt her condition is now as satisfactory as it would have been had the limb in early childhood been subjected to months or years of continuous and vexatious extension. By careful drilling much of the effect of the displacement has been overcome; indeed, she now shows but slight lameness, though her limb is very short.

In comparison with that of the hip joint, no other congenital displacement is possessed of much practical importance. Rarely the **tibia** is found partially **displaced forwards** upon the femoral condyles at birth, the toes pointing towards the infant's face—**genu recurvation**. Slight difficulty is usually found in bringing the leg down straight, and, this being done, the knee is kept extended on a well-padded splint. Subsequently, rubbings and shampoos render the joint sound and trustworthy. The defect is probably the result of malposition *in utero*. In a case lately under treatment in the Children's Hospital, the deformity could not be remedied by anything short of free division of the quadriceps. This was effected by an open wound above the patella. (*See Trans. Med. Soc., 1891.*)

I have seen several instances of congenital dislocation of the **radius backwards**. The head of the bone lay quite behind the lower end of the humerus; the lesion but little affected the strength of the joint. No cutting operation need be

undertaken for its improvement, unless in after years the radius, free of opposition, had grown inordinately backwards; then it might be resected.

Congenital dislocation of the patella.—With knock-kneed children, the patella is necessarily displaced considerably outwards. Attention may be drawn to the condition only after the receipt of some accident.*

Some cases may be improved by transplanting the insertion of the ligamentum patellæ, by osteotomy of the lower end of the femur, or by removing some of the inner part of the capsular ligament of the knee joint.

* See Trans. Clin. Soc., Oct., 1884.

CHAPTER XXIX.

HIP-JOINT DISEASE.

THE hip joint differs from most other joints in this, that the end of a diaphysis enters into its formation. In Fig. 99 A A represents the attachment of the capsular ligament into the anterior intertrochanteric line; the entire area of the junction of the diaphysis, and, E E, epiphysis, and a considerable amount of the diaphysis thus being within the capsule. At the very end of the diaphysis there is a considerable amount of delicate bone-tissue, and this young bone is extremely prone to tuberculous and to septic inflammation.

The hip joint is unfortunate in the fact that it is deeply shrouded in soft tissues, and is thus placed comparatively far out of surgical reach.

The term hip joint disease is convenient in that it conveys a definite idea of a series of pathological changes which frequently affect that joint in childhood. It should not suggest, however, that these morbid conditions differ from those which may be found in other articulations. It usually begins as a tuberculous osteitis or synovitis, the head or the intra-articular part of the femoral diaphysis being most usually attacked. In the latter instance the head of the bone is apt to be eventually cast adrift in the interior of the capsule where, on exploring the joint, it may be found bathed in pus and much eroded. Primary disease of the acetabulum is of far less frequent occurrence.

Though one cannot affirm that hip-joint disease is invariably the result of injury, still it may generally be learnt that some weeks or months before the trouble began the child had met with some definite injury to the hip. But, on the

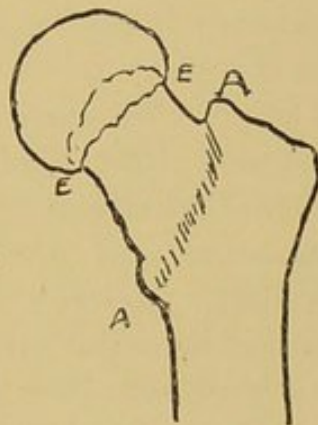


Fig. 99.—Front of Upper End of Ossifying Femur. A A, Line of attachment of capsule of joint; E E, Line of junction of epiphysis and diaphysis.

other hand, the joint may be attacked in a tuberculous child who for a year or more has been bed-ridden and not exposed to injury. All these cases are tuberculous; and when the arthritis supervened on an injury the hurt had impaired the nutrition of the tissues, and so rendered them an easy prey to the bacilli. Sometimes the disease closely follows one of the exanthemata, but even in these circumstances the chronic disease is tuberculous; the acute disease, however, is not infrequently septic (page 364).

It has been suggested by Barwell, Sayre, and others, that the irritation set up by a long prepuce may be the determining cause of articular disease, or of spasmodic club foot. But I must confess that, though I have long been trying to find unmistakable confirmation of this theory, I have hitherto failed to do so. It is quite possible that disturbance of the grey matter of the cord thus brought about may have a trophic influence (page 412) upon a joint, and it appears to me more than likely that the long-continued or severe peripheral irritation might cause serious disturbance, not only of articular and muscular nerves, but of the entire nervous system. Many a time have I seen a fretful, unhappy or excitable child quietly settle down in improved health and contentment after the prepuce has been removed.

Mechanics of the disease.—When the hip joint is inflamed it is necessary that the head of the femur shall be so placed in the acetabulum as to exert the least possible pressure between the affected surfaces, and also that there shall be no sudden movement at the joint. The first provision is obtained by the thigh becoming slightly flexed, for then the strong and unyielding part of the capsular ligament (with the ilio-femoral or accessory ligament) is rendered slack. In flexion this strong part of the capsule is loosened, and the head of the femur lies gently in the joint; the more that the ligament is tightened, as happens in extension of the limb, the more firmly is the femur forced into the acetabulum, and the greater is the intra-articular pressure.

The provision against sudden and jarring movements is made by the various muscles at the front of the joint being kept, by reflex influence, in a state of watchful and shielding tension. Just as the shrouds ascend from the hull of the

ship to steady the mast, so do these muscles, from the tensor fasciæ femoris on the outer side to the adductors on the inner, concur in the fixation of the thigh bone. Probably the most important service in this respect is rendered by the mass of the psoas and iliacus.

The synovial membrane being inflamed, a considerable increase of its secretion takes place, so that distension of the fibrous capsule occurs.

When fluid is injected with a syringe from the pelvic side into the interior of a freshly dissected hip joint, the first amount causes abduction of the femur, whilst a further injection determines flexion. From this it must be inferred that the greatest capacity of the joint is obtained when the thigh is slightly abducted and flexed. It is to a large extent the effusion into the capsule which, in this stage of the disease, causes fixation of the limb. This also may be demonstrated by injection of the dissected joint, as well as by the effect of puncturing the capsule in the case of acute effusion (as detailed on page 420), when the position of the limb may be straightway improved.

Though in the early days of hip-joint disease, when the fluid is beginning to accumulate, the thigh is slightly abducted, this position passes so quickly into flexion that it is often unnoticed. It is not that the sero-synovial fluid of the inflamed joint *forces* the limb into these positions; but rather that by the assumption of these positions the intra-articular tension, and therefore the pain, are reduced to a minimum. After flexion has accomplished its utmost in the diminution of the tension, and the anterior muscles are found by the timid patient to be insufficient in shielding the inflamed area against accidental shocks from without or muscular startings from within, comfort is obtained by resting the bad knee over the opposite thigh, or even upon the chest itself, where the child can steady it with his hands and chin. He has usually passed through intense and prolonged suffering before the limb takes up this position of extreme flexion, adduction, and inversion.

Whatever the stage of the disease, stiffness of the joint and dread of movement are the prominent and characteristic signs.

Pain in hip-joint disease is apt, like the cry of the plover, to decoy one from the object of the search. At the beginning of the trouble it is usually located at the knee, over the patella, or along the front or the inner side of the thigh; that is, in the area of distribution of the terminal filaments of the obturator nerve, the obturator nerve supplying both the hip joint and the knee. An analogous phenomenon is met with in the case of pain referred to the end of the penis in vesical calculus (page 291). Sometimes in hip disease pain is referred to the calf, and sometimes there is entire absence of pain, attention being drawn to the joint, not by the child complaining, but merely by his limping. The knee pains are worse after the child has been running about, and sometimes his mother finds him crying because of them. They may cause him to start in his sleep, and this long before ulceration of the cartilage of the joint has supervened. These painful startings are due to muscular spasms excited by peripheral irritation of nerve filaments in the inflamed joint. The startings occur at night, because, as the child goes to sleep, the sentinel muscles are off their guard, and, having temporarily relaxed their watch, resume it with sudden contraction, and greatly to the injury of the articular nerves.

The pains are often ascribed to "rheumatism," and thus the child loses that early treatment which is so urgently demanded. Sometimes, indeed, relief for the pains is ineffectually sought in the application of poultices to the knee, or of liniments to the thigh! Later, pain occurs at the hip itself. Its presence is made evident by gently pressing with the fingers in the middle of the base of Scarpa's triangle, or between the ischial tuberosity and the great trochanter; also by pushing the trochanter inwards, or by gently rotating the thigh outwards. The old method of diagnosis by striking the heel or the great trochanter is unscientific; it does not differentiate disease of the hip from that of the sacro-iliac joint, or of the vertebræ. In each case pain may follow the blow, and the child, being thus hurt or alarmed, will burst out crying, and spoil the case for further examination.

The *attitude* is characteristic. The intra-articular pressure being increased, the child cannot stand evenly upon his two feet; were he to do so, the head of the femur would be

thrust up into the already distended capsule. The thigh being advanced from the vertical line, as already explained, he supports all his weight upon the sound side, the other knee being flexed, and the toe just touching the ground. When standing, he supports himself by a chair or table. When the deformity is great, he may not care to walk or stand. A casual observer might take the limb to be lengthened or shortened, according as the affected side of the pelvis is raised or allowed to drop, as will be explained further on. But, as a matter of fact, there is no alteration whatever in the length of the limb in the early stages of the disease, and lengthening there never can be. Months later, however, there may be marked shortening, which may be due to arrest of development of the femur, etc. (page 424).

The *walk* is characteristic; for the thigh being permanently advanced, and incompetent to transmit weight, the child limps uneasily, just touching the ground with the toe of the affected side, and paddling himself along. This method of progression soon tires him, and he gladly leaves his play and lies down.

For *examination of the joint* the child should be entirely stripped and placed supine upon a firm couch, or upon the

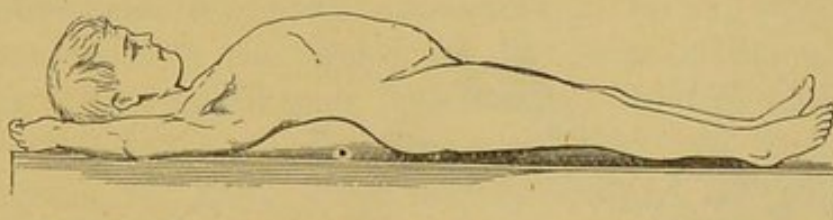


Fig. 100.—Limb brought down flat, but loin arched; lordosis.

table or hearth-rug, the range of movement in the sound limb first being tested. The diseased joint being stiff, and partially flexed, it necessarily follows that when both thighs are brought flat down a compensating excurvation (lordosis) (Fig. 100) occurs at the loins beneath which the hand can be easily passed; this is effaced by raising the knee (Fig. 101). The explanation is that the thigh being advanced and rigidly fixed at the acetabulum, a serviceable joint has developed in the lumbar region, the rigid system of femur and pelvis becoming capable of greatly increased flexion and extension on the spine. When the loins are flat and the pelvis is

squared, the amount of the fixed flexion becomes manifest. So as to be certain that the loins and pelvis are flat and square, the sound thigh should be fully flexed upon the chest, the affected limb being slowly and carefully raised at the same time, the relative position of the articular surfaces being

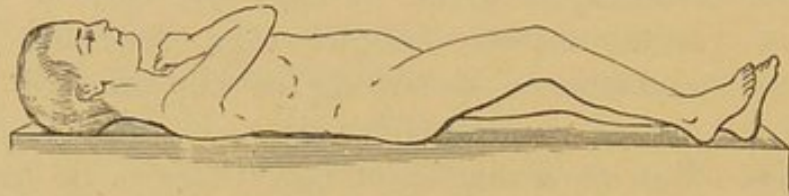


Fig. 101.—Loins now flat, but thigh cannot be brought down.

kept absolutely undisturbed. When this has been done the precise amount of flexion and adduction is shown (Fig. 102). Any apparent shortening is then explained away, and, moreover, a limb which hitherto might have been considered in good position may be found of normal length, but greatly flexed and adducted.

Fig. 103 represents (A) normal pelvis and lower extremities seen from the front, and (B) disease of left hip joint, pelvis tilted and left limb apparently shortened but in the normal line; (C) shows pelvis squared, and the limb,

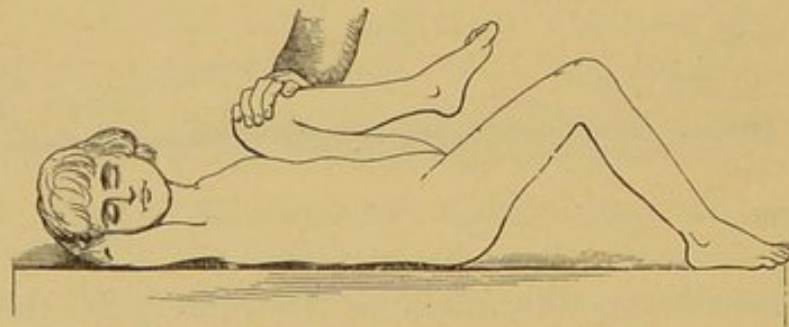


Fig. 102.—Sound thigh flexed on abdomen for ascertaining exact amount of deformity.

being brought down, found greatly adducted, yet of normal length; (D) represents disease of left joint, the pelvis having been tilted (possibly dropping from want of accustomed support), so that the left extremity seems lengthened, though still in normal position. But, on bringing transverse line of iliac crests at right angles with spinal column as in (E), the left limb is found of normal length, but greatly abducted.

(Fig. 102 shows the method of squaring the pelvis.) When inflammation has left the joint fixed and the thigh adducted, an attempt to bring the leg down straight will cause that side of the pelvis to be raised and the limb to appear shortened.

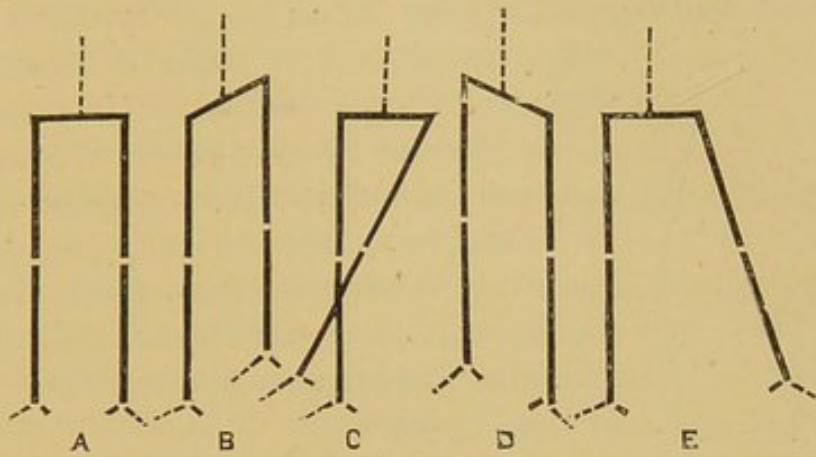


Fig. 103.

On the other hand, when a stiff and abducted thigh is brought straight the limb appears lengthened. Actual shortening of the limb may be due to inhibition at the areas of growth of the bones, to early union of the epiphysis, or to disintegration, the result of rarefying osteitis or necrosis, as explained by reference to page 424.

Differential diagnosis.—Stiffness at the hip joint may be due to abscess in the sheath of the psoas or iliacus, and to various other conditions which may be differentiated by flexing the thigh of the damaged side and then gently rotating it. A child may bravely endure the slight pain and dread of the examination, and then burst out crying, so for a while his face must be watched for the slightest expression of pain; if he be hurt or frightened, the value of the examination is diminished. To obtain the confidence of the little patient, the examination should always be gone through first with the sound limb.

Unlike adults, children cannot give definite information as regards pain, but their complaints demand careful consideration. The oft-repeated cry of "My leg does ache!" must not be disregarded. If the child allow the head of the femur to be gently rotated in the acetabulum without complaint or expression of pain, there is no disease of the articulation; cause for the stiffness must be sought elsewhere.

If, when the thigh has been partially flexed, rotation is permitted, the stiffness may be due to spinal or iliac abscess rendering the sheath of the psoas or iliacus full and tense (page 253); to inflammation of the bursa between the psoas tendon and the capsule of the joint; to perityphlitis (page

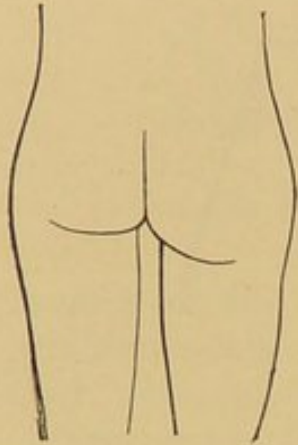


Fig. 104. — Disease of Right Hip Joint; Buttock widened and flattened, and gluteal fold dropped from normal level.

329); to gluteal or other extra-articular abscess; to inflammation of the upper end of the femur (page 432) to congenital displacement of the femur (page 401), or to infantile paralysis (page 164). (For sacro-iliac disease, see page 433.) In other words, fixation of the femur against intra-articular disturbance characterises disease of the hip joint.

If, when the subject of diseased hip is lying on his back, a gentle attempt be made to abduct and rotate the thigh outwards, the pelvis and the whole body will follow the guiding movements rather than allow a disturbance between the femur and the acetabulum.

Supplemental signs of hip-disease may be fulness beneath the middle of Poupert's ligament, due to intra-articular effusion; a flattening and widening of the buttock, together with a dropping of the gluteal fold (Fig. 104), and a loss of symmetry where the line of the gluteal fold meets the median line of the body. The widening of the buttock is due to the slight thrusting out of the head of the femur from the depths of the acetabulum by the intra-articular effusion. The flattening is due partly to the widening of the buttock, but chiefly to atrophy of the gluteal muscles. The alteration in the gluteal fold is partly due also to the slight flexion of the thigh. The fulness beneath Poupert's ligament may be partly due to secondary effusion into the subpsoas bursa, but there is often a good deal of inflammatory thickening in the various tissues surrounding the capsule. Sometimes this material breaks down into a puriform fluid, though the joint itself escapes.

Muscular atrophy is an early and characteristic sign of joint-disease. The muscles, the bones, and the joint, are all under the nutritive care of nerves coming out from the

anterior cornu of the grey crescent of the cord, and when the joint is in trouble Nature inhibits the free supply of nutritive fluid to the bones and muscles, so as to secure rest for the articulation. Thus it is that the muscles so quickly begin to waste. It is often suggested that the wasting of the limb in joint disease is merely the result of want of use. But that is not the correct explanation of the phenomenon; for if a child has hip-joint disease, say on the left side, and he is fixed in a double Thomas's splint, or some other apparatus which prevents his using either limb, the sound limb wastes but very little—at any rate, not nearly to such an extent as does the limb of the affected side. In a similar manner, the smallness of the femur in these cases is explained, and the smallness of the main vessels when amputation has to be resorted to. (See also article by Miller, *Edin. Med. Journ.*, 1896.)

Treatment.—With the earliest symptoms of disease, the surgeon must adopt vigorous measures; he must begin energetic treatment. Even if he think the boy has but “sprained” the joint, he should put him to bed and apply the stirrup and weight; only having done this should he assume the expectant attitude. When the symptoms are not sufficiently clear for absolute diagnosis, the child should be kept in bed till every suspicious feature has passed off; he must not be allowed to run about until the nature of the disease has become evident even to the unskilled. Nor should the treatment at any period become half-hearted. Disappointment will follow the promise that the child will “grow out of” his obscure trouble. Treatment effects most in the early and apparently equivocal stages of the disease.

Details may vary with the stage of the disease, but the principles are unchanging; they are the insurance of absolute, uninterrupted rest for the joint, and correction of the deformity. As a rule, the only drugs required will be cod-liver oil, iron, quinine, and an occasional laxative. The oil should be given in small doses, and not persisted in during the warm weather if it make the child sick; in large doses it may cause diarrhœa.

In the early days, though there may be but little effusion, and signs may be slight, confinement in bed is absolutely necessary. Even if no other sign of the disease exist than

that of obscure pains in the limb, or an unwillingness to have the thigh moved, the child must be put to bed. If the surgeon cannot quite satisfy himself as to the presence of actual disease let him, by all means, keep the child in bed whilst he is making up his mind, or whilst the obscure symptoms are clearing off. Hip-joint disease would not be so intractable a complaint if only it were diagnosed early and methodically dealt with.

Pain may be relieved by a blister near the region of the joint, and though this is very rarely required it may sometimes promptly end the pains which have been disturbing the child's sleep.

When in bed, the child should *never be allowed to sit up*, for that would be to flex the pelvis on the femur, and to

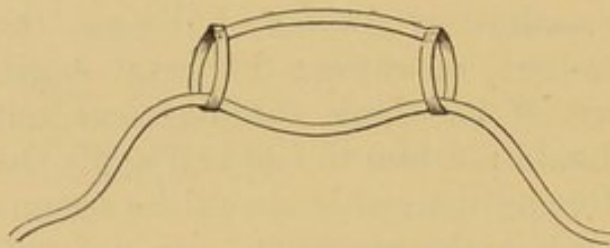


Fig. 105.—Armlets for keeping a child flat in bed the long band is run through the shoulder loops and behind the child's shoulder blades, its ends being secured to the sides of the bed under the mattress.

perpetuate the faulty position of the limb. He must be kept absolutely flat, and should be allowed but a thin pillow. The horizontal position may be enforced by the application of two small circles of webbing, which are run over the arms and up to the shoulders, and fixed together across the chest by a short band of like material. Then a long piece of webbing is run through them, across the back of the shoulders, and secured to the frame of the bed (Fig. 105). If the "harness" be covered with some bright stuff, the child may not regard it as a fetter; but in any case he is to be kept absolutely flat on his back.

Every case of hip-joint disease might, from the very beginning, be treated by means of Thomas's splint. But, unfortunately, parents are often too poor to find the necessary fifteen or eighteen shillings. In such cases fixation may be obtained by a weight of from three to eight pounds, suspended from the leg (Fig. 106)—one pound for each year up to the sixth.

To apply the stirrup, a strip of adhesive strapping is cut,

long enough to form an ample loop below the foot, and to reach up on each side of the leg to the lower third of the thigh. The strip is narrowest in the middle, and there, upon the adhesive side, is laid a slip of deal, three inches long by two wide, with a hole bored through the middle. Extending for a few inches beyond the ends of this piece of wood is placed another strip of strapping, with the adhesive surface towards that of the other slip, the wood being between them. This second strip is to prevent the loop of the longer one sticking to the malleoli when the stirrup is fixed, and also for securing the wood, which is for the purpose of keeping the strapping from the sides of the foot and ankle. When adjusted,

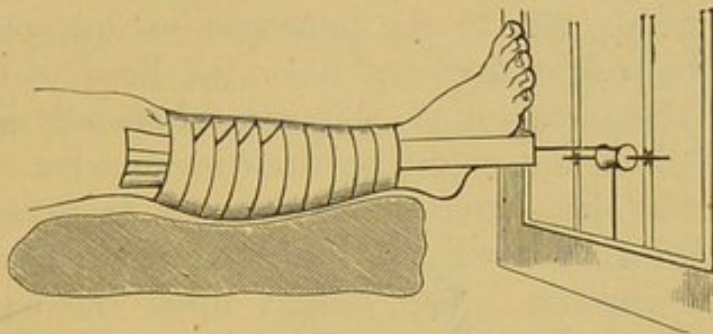


Fig. 106.—Stirrup applied ; strapping should be shown extending above knee.

it should be secured by a soft roller, the weight being applied when the strapping has obtained a firm hold. Then the cord is passed through the strapping and wood, a knot is made at the upper end of the cord, and a weight or shot-bag is hung at the other, the cord being passed over a pulley. The pulley may be made of a cotton-reel, which has running through its axis a knitting-needle, which is to be fixed to two of the upright bars of the cot.

The traction must always be in the axis of the femur ; if it be arranged only in the axis of the body, the apparent improvement in position is obtained by a still further tilting of the pelvis, or arching of the loins. From time to time, as the thigh can be brought flatter without arching the loins, the pulley must also be lowered. In order to keep the child flat and straight in bed, a padded wooden splint may be fixed along the sound side from axilla to ankle.

When there is so much flexion of the thigh that the pulley has to be considerably raised in order to keep the

traction in the line of the thigh, a wedge-shaped pillow may be placed beneath the leg, for the sake of support; it will be made thinner as the limb comes down (Fig. 106). A bed-cradle is needed to keep the weight of the blanket from the toes; every morning the foot should be gently but fully flexed.

A convenient bed may be made of a wide board, on which is laid a thin mattress. To the end of the board a short upright bar with a pulley is screwed. This arrangement is handy for travelling; and daily the child can be taken out of doors upon it. In the house it can be rested on two chairs.

The stirrup and weight diminish pain and correct deformity by ensuring rest to the joint and to the apprehensive muscles. The weight does not draw the head of the femur from out of the acetabulum; this is mechanically impossible. The head of the bone might be drawn somewhat out of the socket if at the same time the flexion were increased; but in its effort at bringing down the limb the strain bears on the front of the capsule. The weight upon the leg actually thrusts the femur farther into the socket, and increases the intra-articular pressure, but the compression is so even that it is comforting to the inflamed joint, and promotes absorption, just as external compression may do in the case of fluid effusion in the knee joint. Moreover, it steadies the limb.

Thomas's splint consists of a flat piece of malleable iron $\frac{3}{4}$ in. by $\frac{3}{8}$ in., and long enough to extend from the level of the inferior angle of the scapula, down the loin, between the great trochanter and ischial tuberosity, to the lower part of the calf. If the thigh be but little displaced, only slight bending of the bar will be required to make it lie easily along these surfaces (Fig. 107). The splint is to be moulded to the limb in its faulty position; the limb is not to be forced down to fit the splint. Sometimes, therefore, the splint has to be wrenched very considerably into the position of flexion and inversion; but, under the influence of the rest which is thus secured, the deformity steadily diminishes, so that the splint can be gradually straightened.

For converting the bar into a splint three cross-pieces of iron are riveted on, one is bent round the chest, a second

grasps the upper part of the thigh, and a third comes just below the calf. These cross bars are of hoop metal, so that they may be easily bent. The metal frame is then padded with a single layer of boiler-felt, and covered with basil leather. The mattress on which the child is laid should not be so hard that the splint is pressed unduly against the skin.

The splint secures the joint against all movement, for it fixes the trunk as well as the limb. It is light, and fits close to the body, which rests comfortably upon it, the patient being secured within it by straps and bandages. The splint may be covered from time to time with a strip of old soft linen.

Whilst undergoing treatment, the child in his splint may be conveniently carried from room to room, or out into the fresh air, by anyone who has had a little experience in lifting. Fig. 107 shows the manner of lifting, and how securely



Fig. 107.—Method of lifting Child with Hip-Joint Disease, in Thomas's Splint.

the joint is protected as the patient is moved. When the limb has been brought down straight, and the disease is becoming quiescent, the child may be taught to walk out, and even attend school, without interference with his progress towards cure. This is accomplished by raising the sound foot four or five inches, by a clog or patten (Fig. 108) fixed beneath the boot of the sound side. It is highly important that the tuberculous child (and the subjects of hip-joint disease are tuberculous) should be able to enjoy the fresh air and

sunshine, and even take exercise, whilst the cure is being wrought. As soon, therefore, as the acute symptoms have passed away and the child has become accustomed to his splint,

he should be got out of bed and out of the house—and to the seaside if possible.



Fig. 108.—Iron Patten, to be screwed to sole of boot of sound foot.

Having used the splint many years, and in cases of every stage of the disease, and in all sorts of patients, from the diffident girl to the heedless boy, the more I see of it the more highly do I appreciate it. My experience is that, however rough and active a boy may be, he is always particularly careful about the way

he treats his weak limb. Now and then he may get a fall or a hurt, but the limb is fixed so securely that a day or two in bed will generally suffice to put matters right again. After this he is more careful than ever. But for Thomas's splint, scores of unhappy children would to-day be still in bed, who are now in the fresh air, and hurrying on the progress towards cure (Fig. 109). Lastly, the more the splint is used, the less becomes the probability of excision or disarticulation.

“**When may the splint be left off?**” is a question which is often put in the progress of the case; the best answer is, “When the child is well.” Relapse is the result of discarding it too early. The prolonged wearing of the splint is not the cause of the ankylosis which may follow its lengthy employment. A child may recover with free movement in the joint after continuous wearing of the splint for several years. It is the inflammation, not the rest, which leaves the joint ankylosed; prolonged rest of the joint will not leave it permanently stiffened. On no account, therefore, should movement be imparted during the treatment; such interference would be meddlesome and unsurgical. As Thomas remarked, the best commentary upon the treatment of hip disease by extension and movement is the remarkable frequency with which its principal advocate had to perform excision of the joint. The treatment of many a case is spoilt because of the dread which haunts the mind of the parents—and sometimes also of the practitioner—that prolonged rest

will surely entail permanent stiffness. This superstition is as groundless as it is widely spread.

Any splint designed to allow some movement at the joint during the treatment is wrong in principle and unsatisfactory in practice. Dr. Ridlon, of Chicago, confesses that "the old

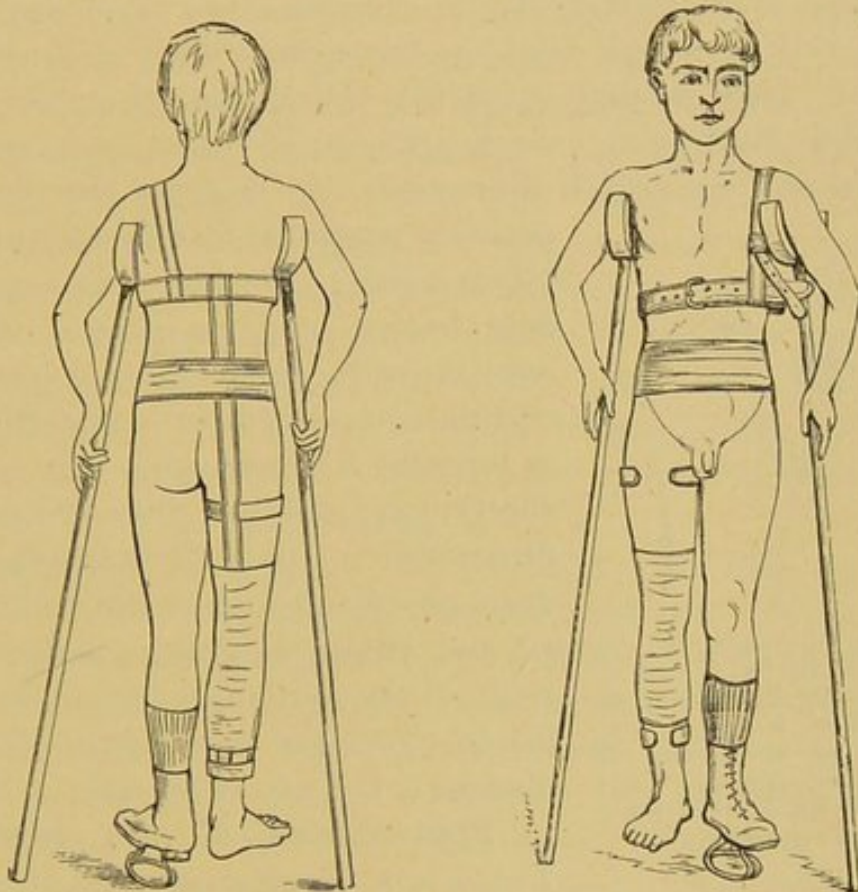


Fig. 109.—Disease of Right Hip Joint, splint applied ; patten beneath foot of sound side.

American method of motion without friction has passed away," and that American surgeons now "believe in fixation first, last, and all the time."

The surgeon must be cautious in pronouncing recovery from hip-joint disease as complete. There is always a great risk of the rest-treatment being discontinued too soon ; as convalescence advances the parents are apt to importune for release from the splint. One very cheering sign is when, on the surgeon attempting to move the thigh, the adductor longus and the other muscles cease to throw themselves into apprehensive contraction. This is an indication either that the disease is at an end or that a serviceable ankylosis is taking place.

At first the splint may be left off when the child is put in bed, once a week, twice a week, every other night, and, lastly, if all go on well, every night. Then it may be left off for an hour every afternoon, as a reward for careful and obedient behaviour. Gradually, all going on well, the child may discard it every Sunday, twice a week, every other day, going about with the high boot on the sound limb, and with the crutch. Then he may leave the splint altogether, using still the high boot and crutch. Eventually the boot may be lowered and the crutch shortened. At last the boy finds his

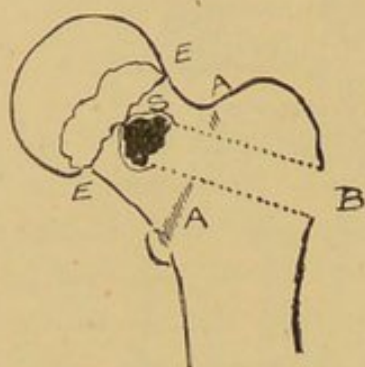


Fig. 110.—s, Sequestrum in abscess cavity at end of femoral diaphysis; B, Track of trephine; A A, Line of attachment of capsular ligament of hip-joint; E E, Line of junction of epiphysis.

patience rewarded by all restraint being taken away. During this period of approbation *chi va piano va sano* applies with equal force to surgeon and patient. Each time that the child is brought for inspection the surgeon should examine him after the method illustrated on page 410; when, if lordosis be detected, or if the child wince as the thigh is gently abducted or rotated, the joint must again be absolutely fixed, for it is certain that the disease is not yet at an end.

Paracentesis of the capsule.—

There is a peculiar springy resistance in the limb which is fixed by acute effusion within the capsule, and there is generally a distinct bulging to be made out about the joint itself. The puncture may be made through the gluteus maximus, or by working inwards from below the anterior superior spine of the ilium. The surgeon does not hesitate to tap an acutely distended knee, and why should there be so much delay in the case of the hip? I strongly urge the practitioner in every case to look out for a fulness at the base of Scarpa's triangle, and for a doughy swelling between the trochanter and the ischial tuberosity, and to explore it with a clean cannula and trochar. The operation may prove of great value, enabling the surgeon to bring down a limb which, previous to the paracentesis, was resolutely fixed. It may, moreover, completely arrest the disease, and if aspiration show that the joint contains pus the

surgeon must be ready to incise and wash it out, provided the paracentesis afford but temporary relief. (Trans. Internat. Med. Congr. Washington, 1887, sec. ii. p. 563.)

Diaphysitis.—When acute inflammation has attacked the growing tissue at the end of the diaphysis to such an extent that thrombosis has occurred in its blood-vessels, that area of tissue is practically a sequestrum, and, lying close to the joint, is very likely to destroy it. In the ordinary course of events it is impossible that the trouble can clear off without implication of the joint, as the end of the diaphysis is within the grasp of the capsular ligament. If, in an early stage of hip-joint disease, we find considerable thickening about the neck and about the trochanter, it should render us very suspicious of the presence of such a sequestrum. And if in such cases an exploratory trephining is made through the great trochanter and neck we may remove the sequestrum, and save the joint from implication (Fig. 110).

Abscess is a frequent complication. It may come on quietly, without local disturbance, and without any elevation of the child's temperature being recorded. It is an error to think that the thermometer must denote the collection of pus. On the other hand, abscess may supervene rapidly, with intense pain, with sleeplessness, loss of appetite, and convulsions—the rigors of childhood; the hip becomes swollen and extremely tender, and the axillary temperature rises. If increasing pain and swelling suddenly subside, the thin posterior part of the capsule has probably burst, and the abscess has diffused itself. This is likely to be a septic case, as represented in Fig. 111. (See also page 372.)

With the formation of pus, the limb, if previously in good position, though not on the splint, becomes rigidly flexed.

When suppuration has taken place, and is approaching the surface (the capsule having probably given way), the pus may be withdrawn by several aspirations, undertaken at short intervals—a single aspiration rarely sufficing. If the pus finds its way along the course of the trochar wound, the abscess cavity should be laid freely open, and thoroughly washed with mercuric solution, the wound being closed with sutures, and no provision being made for drainage. This treatment by no means always succeeds, but when it does it

is extremely gratifying. If it fail, the abscess can then be irrigated, scraped, and cleansed in the usual way, the wound being closed by sutures. My experience, however, with aspirating hip abscesses is by no means satisfactory. I now incise and wash them, and tightly suture and close the wound.

Abscess in the thigh—even when high up and deeply placed—is not necessarily the result of hip-joint disease. It may be due to vertebral caries (page 253), or to disease

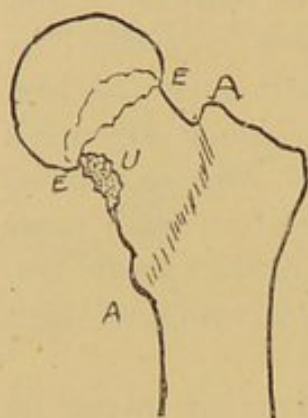


Fig. 111.—U, Septic ulcer at end of diaphysis causing acute abscess in hip joint; E E, Line of junction of epiphysis; A A, Line of attachment of capsular ligament of hip joint. (The child in whom this condition was detected died in St. Mary's Hospital of acute septicæmia.)

of the os innominatum or femur, or the collection may be independent of bone disease. If the femur can be moved freely in the acetabulum, there is no hip disease (page 409). The abscess in the thigh must be incised, scraped, washed, and dried; the wound must be closed and the cavity compressed by sterilised gauze and bandage, movements being provided against by the application of a long outside splint. The abscess should be incised before the skin over it becomes red and thin.

A favourite place for pointing is near the great trochanter, that is, in front of the cover of the gluteal muscles, the pus having worked its way beneath the tensor fasciæ femoris. Some few abscesses reach the surface just below the middle of Poupart's ligament, through the opening by which the synovial membrane of the joint communicates with the subsoas bursa. The pus there is apt to find its way up under the psoas and iliacus, and to determine disease of the pelvis or of the sacro-iliac joint (page 433). Excision of the head of the femur is generally required in such a case.

Straightening under chloroform may be resorted to in some very few cases, where deformity is due to fibrous adhesions rather than to intra-articular effusion or muscular contraction. But it should be undertaken with absolute gentleness, and only to a slight extent on each occasion. In certain cases a little help is required just to start the improvement; at the same time, subcutaneous section of the

adductor longus, or tensor fasciæ femoris, or of a band of fascia lata, may be required. Bone-setters do infinite harm in attempting to "put in" such "dislocated" hips. In one case, by their empirical manipulation, the head of the femur was actually thrust right into the pelvis, as revealed at the autopsy. A very satisfactory way of getting down the flexed limb when the disease is at an end is by letting the boy wear a leaden sole to his boot.

Dislocation of the femur from hip-joint disease is an extremely rare occurrence. Thomas went so far as to say that he had never met with an instance of genuine dislocation from disease. I have, however, met with one or two unmistakable examples of it whilst performing excision. Certainly the upper border of the great trochanter is often found raised when tested by Bryant's or Nélaton's line, whilst the shortened, flexed, and inverted position of the limb is highly suggestive of dislocation. But all this is generally accounted for by the carious and undeveloped condition of the head and neck of the femur, the ulcerated state of the acetabulum, and the chronic inflammatory thickening about the joint, as shown in Plate V.

Prognosis.—Many months or even years may pass before the disease of the hip joint has entirely disappeared; and, however prompt and efficient the treatment may have been, some deformity is likely to result. Children may recover absolutely; but in such cases the constitution has generally been fair, the disease vigorously treated, and the supervision long continued. Even after suppuration the abscesses may heal, freedom of movement ultimately returning to the joint, especially when the case has been one of suppurative synovitis rather than arthritis. Should the disease end in ankylosis, and the limb be in a good position, the result must be considered as satisfactory. Synostosis is brought about by the deposit of bone salts in the fibrous material into which the granulation-tissue in the head of the femur and in the acetabulum has been evolved. For the production of solid synostosis some years are generally needed. Abscess may form, and the patient sink from exhaustion, albuminoid disease, or intercurrent disease. Caries sicca may cause absorption of the head of the femur without suppuration.

Tuberculous meningitis is a not uncommon ending of the disease (page 65).

Permanent shortening of the limb may follow even the most skilful treatment of the disease. There may have been no abscess during the months or years of absolute rest, yet the diseased limb is shortened by as much as one, two, or three inches. As explained by reference to Plate V., the shortening is due to the following causes:—Actual absorption of tissues in the haunch-bone as well as in the head and neck of the femur, destruction of temporary cartilage in both bones with, as a result, premature consolidation and dwarfing, trophic changes, as described on page 412. These trophic changes extend through the entire limb; the bones are slender and liable to fracture; the femur, as seen in Furneaux Jordan's amputation (page 431), is divided by a mere stroke or two of the saw; the main arteries are small, and the amount of blood in the cut tissues is insignificant. Sometimes the shortening is associated with inversion of the limb. The possible occurrence of deformity should be thoroughly recognised at the outset of treatment, lest disappointment or even unjust reproach be entailed.

The original of the interesting print (Plate V.) was taken by Dr. John Macintyre, of Glasgow, from a boy with advanced hip-joint disease. On the sound side (to the spectator's right) the line of the temporary cartilage is shown in the floor of the acetabulum, and the rim of permanent cartilage, the cotyloid ligament, is also seen. There is, moreover, a faint trace of the layer of cartilage joining the head of the femur with the diaphysis. The outlines of the neck and of the great trochanter are very definite.

On the affected side the Y-shaped cartilage and the cotyloid ligament have been entirely destroyed by the growth of granulation-tissue, which has also caused absorption of the head and most of the neck of the femur. The result of this femoral absorption is that the great trochanter is inconspicuous, and that it is considerably raised above the normal level. The destruction of the Y-shaped cartilage has determined a premature consolidation of the os innominatum, which is seen to be considerably smaller and shorter than its fellow. The long-standing articular disease has, moreover,

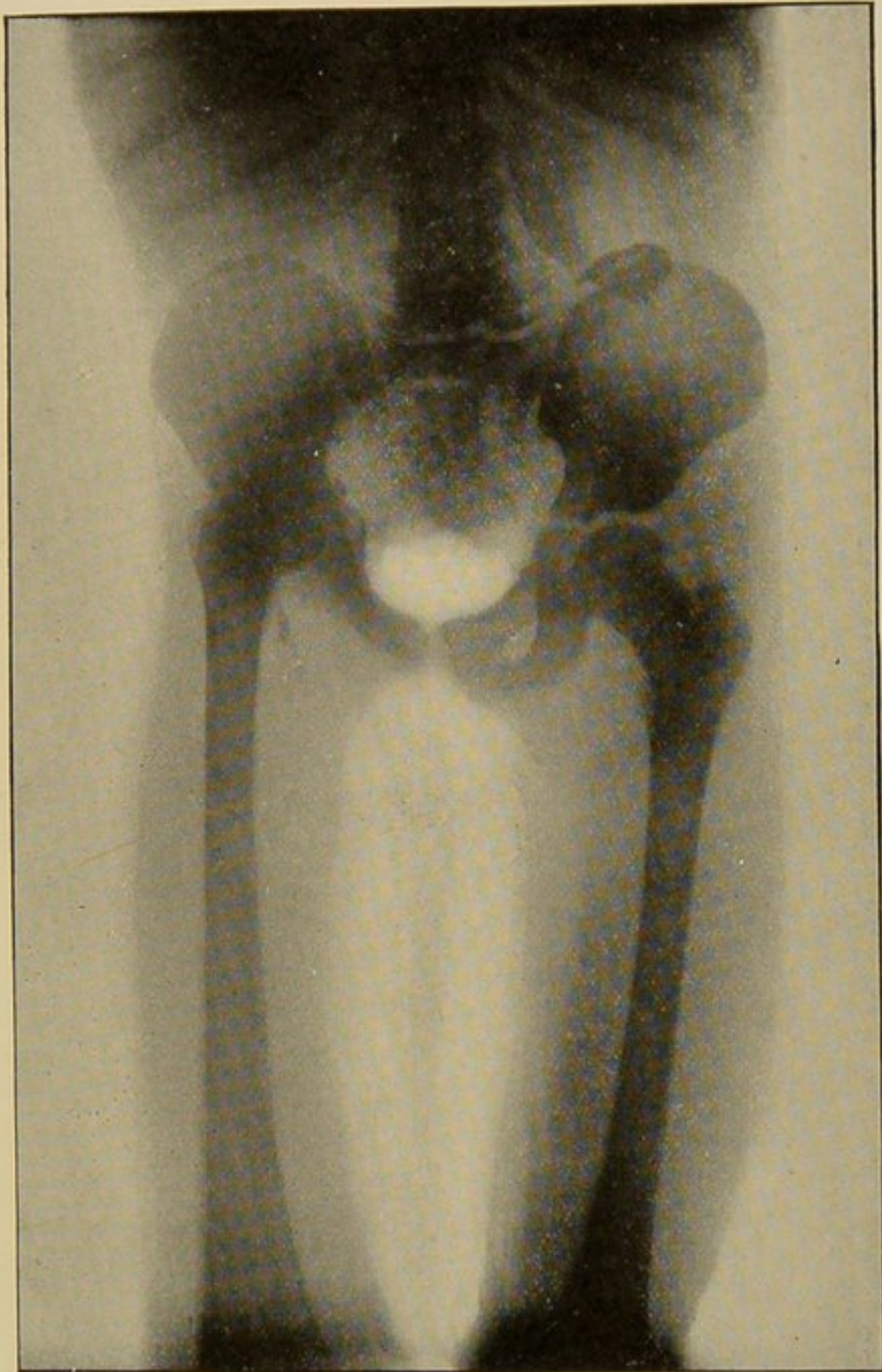
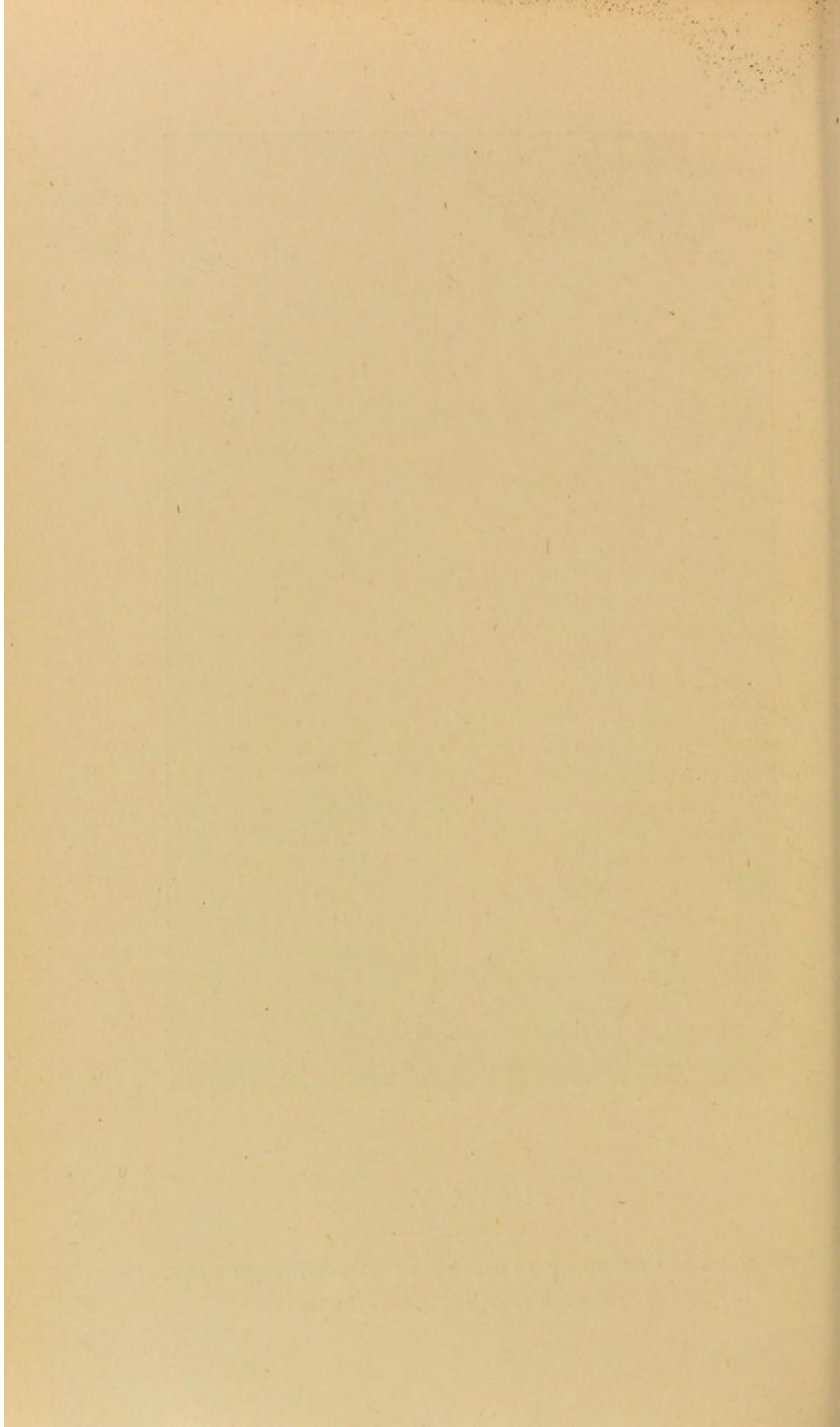


PLATE V.

TUBERCULOUS HIP-JOINT AS SHOWN BY THE RÖNTGEN RAYS.

(After a Photograph by Dr. John Macintyre, Glasgow.)



had a prejudicial, trophic influence (*see* page 412) upon the upper part of the femur, which, just below the trochanter, appears wanting in solidity and strength. There is, in fact, an obvious dwarfing of the femur and the haunch bone, and the measurements of the affected limb would show a very considerable and inevitable shortening.

The plate thus shows that the shortening in old-standing hip joint disease is the result of a considerable number of causes. It also shows how absurd is the suggestion that it may be corrected by forcible manipulation and operation. Nevertheless, operative treatment has been recommended for lengthening the limb in these cases.

As Dr. Macintyre remarks, the arrest of development of the os innominatum occurring in a female subject might have an important and a prejudicial influence from an obstetric point of view.

Synostosis in faulty position should not be interfered with directly the disease appears at an end; the patient's health should be improved, and the parts allowed to consolidate. The thigh must not be brought down by forcible manipulation, as this may awaken the old articular trouble; and, for the same reason, it is better to divide the bone below the trochanter than through the remains of the femoral neck, close to the seat of the disease which has only recently cleared off. Osteotomy is indicated. The best way of performing it is with a slender but trustworthy saw, just below the great trochanter. The course for the saw-blade through the muscles is cleared by a firm director. When the section of the bone is almost completed, a sudden and sharp jerk finishes the operation. Dry dressing and a splint are then applied. No attempt should be made at keeping up a false joint. I have performed this operation very frequently, and have every reason to speak well of it. The limb remains stiff, but in good position. The attempts which I have made to establish a false joint at the seat of osteotomy always ended in failure.

Double hip-joint disease.—In several cases, the opposite joint has become quietly affected when the child has been lying many months in a position of perfect rest. Such children are best treated by Thomas's double apparatus. The limbs must be placed in the straight position, for should

ankylosis supervene in an adducted position, progression would ultimately be accomplished with great inconvenience and unsightliness. This **scissor-legged deformity** may be partially remedied by osteotomy. (Trans. Clin. Soc., 1881.)

When osteotomy or excision is performed for faulty synostosis on each side, the surgeon would naturally wish to maintain a movable false joint in at least one hip. Endeavours in this direction are likely to end in disappointment, even when the hip joint is entirely resected.

Excision affords the only chance of recovery in certain advanced cases. Statistics are not satisfactory; each case must be treated on its merits. No array of figures as to the results of excision influence the question; for joints may have been excised which might have been treated less rigorously, whilst others are left uninterfered with until the child is past all surgery. Truth lies somewhere between these extremes. But truth seems more difficult of discovery in connection with the subject of excision of joints than in any other department of operative surgery, and for obvious reasons. Thus, some surgeons excise too early, and show "good" results—almost as good, perhaps, as if their energy had been expended in helping Nature in working her own cure—whilst others, disliking the operation, resect too late. Lastly, the "good results" are more likely to be exhibited and described—as a rule, far too soon after the operation—without any attempt at submitting the child to the test of time.

It sometimes happens that a child who has been becoming daily feebler from exhausting discharge, suddenly takes a turn for the better without any operation, and convalescence is established and eventually completed. These happy instances are not of frequent occurrence; but they are met with, and occasionally in those inconvenient circumstances when the surgeon has committed himself to positive statement that no treatment, short of excision, can avail in saving the child's life (page 372). It is rarely wise for even a surgeon to be positive. It may be that on the child being removed from his care an abscess quietly bursts, or a sequestrum is cast off, or some tuberculous infiltration in bone undergoes caseation; and perfect rest being still maintained, and drainage provided for, under the beneficial influence

of change of air and scene the unexpected improvement is inaugurated.

Excision is sometimes called for to relieve the child from the constant and distressing pain associated with ulceration of cartilage and bone. In such cases the operation may afford immediate and permanent relief. Operation may also be demanded when what is left of the upper end of the femur has been displaced upon the dorsum ilii, or when permanent malposition of the limb is associated with chronic suppuration.

In the case of suppurative arthritis, when incision, scraping, and irrigation have failed to diminish the local and constitutional disturbance, excision is demanded. And as the pelvis in this instance is free of disease, and as the tissues surrounding the joint are neither saturated with inflammatory effusion nor riddled with sinuses, a favourable result may be anticipated, both as regards the rapidity of the convalescence and the ultimate usefulness of the limb.

Excision is demanded also when the pus is finding its easy way into the pelvis through an ulceration in the depths of the acetabulum, as made out by digital examination through the rectum.

Incipient phthisis is no contra-indication to the operation; indeed, the removal of the tuberculous bone may afford the child the only chance of triumphing over the pulmonary disease.

Albuminuria, and the presence of a large, hard liver, should be taken as a suggestion rather than as a contra-indication for operation; the symptoms may entirely disappear after relief has been afforded to the articular disease.

When the patient is losing appetite, flesh, and vigour; when, from the constant absorption of toxic discharges, he is becoming pale or hectic; when his temperature chart is daily marked with lengthy ups and downs, or when bed-sores are appearing, something must be done. At least the operation ensures a free escape for discharges, and renders the socket accessible to irrigation. I have sometimes been astonished at the way children have picked up after the operation. On the other hand, it often proves more than the already exhausted

system can bear up against; but even then the fatal event has merely been advanced a little. Lastly, as regards length and strength and usefulness of the limb, it is generally a disappointment even at the best. In my opinion, the operation should be resorted to only when further reliance cannot be safely placed upon conservative measures.

Operation.—The buttock and thigh should be carefully cleansed. The child should be exposed as little as possible, and should be placed on a hot-water mattress. If he is very feeble, a brandy-and-water enema should be given just before taking him from his bed.

The operation should be conducted with as little cutting as possible, old sinuses being used whenever they may serve. The head of the bone may generally be removed by cutting forceps. If, as often happens, the larger trochanteric epiphysis be detached as the raspatory is being used to clear the upper end of the femur, and it appear healthy, it had better be left with its muscular connections uninterfered with. The muscles and other tissues around the joint should not be disturbed more than is absolutely necessary. Every ulcer and fistula should be scraped and disinfected. All diseased synovial membrane should be erased, and all granulation-tissue and denuded osseous surfaces thoroughly scraped.

If the existing sinuses do not serve for the excision-wound, and if suppuration is likely to persist, the joint had better be attacked from behind, through the wasted gluteus maximus, as the posterior wound answers extremely well for drainage. Only in rare instances is excision, when performed late in the disease, followed by speedy recovery.

When *acetabular disease* exists, thorough scraping with a Volkmann's spoon is necessary, sequestra being picked out. The cavity should be stuffed with carbolised gauze, and a thick pad of absorbent wool should be firmly bandaged round the hip. The limb may be fixed at rest by a stirrup and weight; it is better not to apply a splint. Next day the wound must be dressed under an anæsthetic, and much less stuffing left in the cavity. An excellent lotion is iodine water decolorised by carbolic acid; carbolic lotion should not be used too freely, as children often show great intolerance of it (page 9). The compression should be

readjusted and the dressings attended to as circumstances may suggest. Opium, quinine, iron, and port wine will be prescribed as occasion directs, and as soon as possible the patient should be got out of doors.

If the skin over the back becomes sore, the child may be kept for most of the day on his face, the bed being arranged so that he may see what is going on in the room. No attempt should be made at keeping up movement of the joint. If the case succeed, the boy will eventually be going about as depicted on page 419, the joint becoming firmly synostosed.

Mr. Barker has urged the early adoption of **Hueter's method** of attacking the joint from the front, between the tensor fasciæ femoris and the glutei on the outer side, and the sartorius and rectus on the inner. The incision is begun just below the anterior superior iliac spine, and runs downwards and inwards for three or four inches. The lower inch or so should divide only the skin; the upper two-thirds should reach the neck of the femur at once. The opening thus made in the capsule can be enlarged if necessary, care being taken, however, that the Y ligament is left as far as possible intact. The joint having been examined by the finger, a narrow-bladed saw or cutting forceps is introduced, and the neck of the femur divided. Then the head is extracted with sequestrum forceps, and the acetabulum, if diseased, is thoroughly scraped with a sharp spoon. Every trace of diseased synovial tissue is removed, special care being also taken to clear out abscesses communicating with the joint. All this should be done with as little damage to surrounding tissues as possible, so that none of the tuberculous *débris* shall be forced into the fresh-cut surfaces. When every portion of diseased tissue has been removed, the cavity is then thoroughly irrigated with zinc chloride solution (grs. 5 to ʒi), well dried and dressed. But when everything looks clean and fairly promising, it is advisable to close the wound entirely, without making any provision for drainage, some of the cases thus treated proving successful beyond all expectation. Then if discharges collect within the tissues, the wound must be partly opened up and the blood-stained fluid allowed to escape. It is usually little more than thick

odourless serum. It exudes in very small quantity, and ought never to become truly purulent.

But when the micro-organisms of pus, as well as those of tuberculosis, have taken possession of the joint, it is unlikely that primary union will follow the clearing out of the cavity and the suturing of the wound. Nevertheless, even in these circumstances permanent closure of the cavity should be adopted—it can but fail, and if it fail, drainage can then be resorted to.

When examining an old-standing case of hip-joint disease, the points to which particular attention should be directed are the aspect of the patient, the size of the liver, and the state of the urine. Another matter to which the surgeon pays particular attention is the condition of the pelvis. Suppuration may extend very quietly, and without observation, from the interior of the acetabulum, through the Y-shaped piece of cartilage into the pelvis, and it is only by digital examination through the rectum that the surgeon can learn the progress which the disease is making in that direction.

In one case of resection for tuberculous disease of the femur the interior of the head and neck came away as soft as fresh mortar, leaving the articular layer of the head, and the incrustation cartilage securely lodged in the acetabulum. The simulation of acetabular disease was perfect, and it was only at the *post-mortem* examination that it was discovered that the acetabulum was unaffected.

If, after the excision, the wound continue to discharge profusely, and the child do not emerge from the retrogressive course; if the albuminuria persist and appetite fail, or the shaft of the femur become swollen or tender, as the result of chronic osteomyelitis, a still further chance may be afforded by amputation of the thigh. One is always loth to amputate, but this is certainly the only treatment for many of these old-standing cases. If one watches and waits too long, the child is at last carried away with what the old pathologists called “colliquative” suppuration or diarrhœa.

The cause of the enlargement of the liver and of the albuminuria is albuminoid disease, or, as it is incorrectly

called, "amyloid," or "lardaceous" disease. There is, however, no connection with starch (*ἄμυλος*), nor with bacon-fat (*lardum*). One constantly meets with it in children who are subjects of chronic suppuration in connection with joint or spine disease. Probably it is due to septic absorption. It may also be met with in certain cases of congenital syphilis. It has been suggested that the infiltration is caused by the continued loss of certain blood-salts in the long-continued discharge; but this does not account for it in congenital syphilis, where there is no suppuration. It is certain that it is a blood disease, and it makes itself manifest, first of all, in the arteries. Then there is an enormous deposit of this albuminoid material through the kidney, liver, and spleen, and a leakage of it takes place from the kidney into the abundant and limpid urine.

The best method of **amputating at the hip joint** is a modification of Furneaux Jordan's operation:—The limb having been washed and raised to empty it of blood, an elastic tourniquet is applied as high up as possible. An assistant drags up the skin, grasping the thigh with the two hands, and the surgeon makes a clean circular sweep vertically upon the femur, sawing the bone in the upper third. The chief vessels are easily tied on the flat surface of the stump, and the compression is gradually relaxed. Bleeding having ceased, an incision is made, if necessary, along the outer side of the stump, and the end of the femur is loosened by a strong raspatory, the periosteum being easily detached from it. In this way the loss of blood is diminished to the utmost, without the disadvantage of aortic or rectal compression. The acetabulum is then scraped out and the whole area is washed with a solution of zinc chloride (grs. 5 to ʒi); a drainage-tube is put in, and the rest of the wound is closed with sutures. Amputation is specially indicated when there is extensive pelvic disease.

The operation is simple; it entails comparatively little shock; it leaves a long stump, and bone may become developed in the periosteum, which may eventually prove useful in the support of an artificial limb (*Lancet*, March 20, 1886).

Trochanteric disease.—The epiphysis of the great trochanter begins to ossify in the fourth year, and joins the shaft

at about the eighteenth year. Sometimes it is detached as the result of direct violence or of muscular action. The



Fig. 112. — Necrosis of Great Trochanter and of Adjacent Part of Neck of Femur probably the result of tuberculous osteitis; secondary plastic periosteitis. (*Museum, St. Mary's Hospital.*)

separation may be conveniently treated by a bracketed outside splint, or by a Thomas's hip-splint. After about three weeks massage should be employed, and the boy should gradually be allowed to regain his freedom.

Acute septic osteitis attacking the trochanter will cause great local and constitutional disturbance (page 367). It had best be treated by free incision and scraping. The disease has to be distinguished from acute bursitis, and this can generally be done by pinching the trochanter between the finger and thumb from before backwards. In either case incision is probably needed, and thus any doubt might promptly be cleared up.

Tuberculous (page 57) and *syphilitic* (page 91) *inflammations* of the trochanter are of rare oc-

currence. They scarcely need separate description. If central necrosis, occur the surrounding bone will slowly and solidly thicken, and exploration by gouging will probably be called for. In Fig. 112 extensive tuberculous disease of the trochanteric epiphysis had determined the formation of a small sequestrum, which is represented by the white patch.

CHAPTER XXX.

DISEASE OF THE SACRO-ILIAC JOINT.

SACRO-ILIAC disease comes on insidiously after injury or exhausting illness in the tuberculous subject. Though it may thus be a primary affection, it is often secondary to disease of the spine, os innominatum, or hip joint; suppuration having taken place in or beneath the psoas or iliacus, the pus readily finds its way into the sacro-iliac joint.

Symptoms.—The child complains of feeling tired after exercise, and of his back aching. He walks with caution, so as not to jar the diseased articulation; he does not care to run. The pain may be constant and greatly intensified by a cough, a shake of the bed, or a stumble. The persistent pain may suggest spinal or hip disease, but in disease of the spine the pains are referred to the area of distribution of the nerves whose trunks pass by the carious region (page 249); in disease of the hip the first pains are in the knee or thigh (page 408). If, however, the trunk of the obturator nerve give a branch to the diseased sacro-iliac joint, there might be complaints of pain down the limb, or at the knee, as in hip-joint disease. As in hip-joint disease, also, the limb is wasted; but on squaring the pelvis no alteration in the length of the limbs is found. The limb assumes no characteristic position, but most probably lies extended; moreover, if gently handled, it can be freely rotated in the acetabulum. The pains of sacro-iliac disease are sometimes ascribed to "rheumatism." The buttock of the affected side begins to waste as soon as the pains come on.

Points in the differentiation from spinal disease are the absence of symmetrical pains in the thighs and legs, the absence of stiffness, straightness, or deformity (page 248) in the lumbar region. The great feature in sacro-iliac disease is the localised tenderness. By tracing the iliac crest to the posterior iliac spines the finger detects a spot where pressure causes deep-seated pain. In the more advanced stage of the

disease there is sometimes a puffy swelling at that part, and the skin over it becomes discoloured, and eventually yields to the pressure of the increasing abscess, intractable sinuses forming. Suppuration, however, does not ensue in all cases of sacro-iliac disease, and caries sicca is, fortunately, by no means of uncommon occurrence. Examination for abscess-formation should be made by the finger in the rectum.

On pressing the iliac crests together with the palms of the hands, or on cautiously thrusting them asunder by grasping the anterior iliac spines between the fingers and thumbs, the disturbance at the sacro-iliac joint causes distress. Striking the heel or the great trochanter would necessarily cause pain; but as pain would also result were the case one of hip or spine disease, this rough method of procedure is useless.

Treatment.—The child should be put to bed and kept flat, and as much as possible in the prone position; he must not be allowed to sit up, as that attitude disturbs the joint. If the weather be warm, he may be carried out into the open air, if this can be done without disturbance of his position. With rest in bed, fretting pains will probably pass away. Should they persist, two leeches might be applied over the tender spot. I doubt if much is gained by edclosing the pelvis in a stiff bandage; there is practically no movement at the joint, and the material used cannot but render the horizontal posture more irksome. Armlets (page 414) and a stirrup may be useful in managing a refractory patient.

When the disease is apparently arrested, and if the child is deemed sufficiently trustworthy, he may be fitted with a Thomas's hip-splint, and allowed to get about on crutches, as shown in Fig. 109. When not on crutches, however, he should be kept lying flat on a couch or hearth-rug, and on any return of the pain he ought straightway to be put back to bed.

If, in spite of the adoption of palliative treatment, the disease continues to advance, it is advisable to cut into the joint, and with trephine, gouge, and spoon thoroughly to clear away the articular surfaces and all the tuberculous granulation-tissue. The joint is within easy access, and readily lends itself to erosion. To wait until abscess has formed and suppuration has found outlet in unhealthy

sinuses is to court failure. If the abscess is allowed to extend unchecked, it is apt to invade the pelvis, rectum, or ischio-rectal fossa, or to wander down the thigh.

The drugs will comprise cod-liver oil, iron, quinine, and possibly small doses of opium.

Prognosis is always grave if abscess supervene, but if the health be kept up, and absolute rest be secured early the disease may end satisfactorily—probably in synostosis. If abscess have formed, recovery can take place on the occurrence of ankylosis, especially after the performance of a thorough erosion. Most museums contain a preparation of firm synostosis of the os innominatum and sacrum, the result of disease. If suppuration continue, the health becomes undermined, and death is apt to follow from phthisis, meningitis, exhaustion, pneumonia, or metastatic abscess, or from albuminoid disease, or general tuberculosis.

CHAPTER XXXI.

DISEASE OF THE KNEE JOINT.

Osteo-arthritis (chronic rheumatic arthritis) is occasionally met with in children in the knee as well as in other joints. Deformity steadily increases, and, in the few cases that I have met with, treatment has been of slight avail. At the time of writing I have a boy under my care at St. Mary's Hospital with masses of new bone on the margins of the articular surfaces of his knee joint. The osteo-arthritis followed an injury; but the other knee is also affected, and I fear that the disease is progressive. (*See Trans. Soc. Med. Chir.*, 1896, for Dr. Still's Essay.)

Pyæmic arthritis may be caused by gonorrhœa, conjunctivitis, osteomyelitis, or any other septic inflammation. Thus it sometimes comes on as a sequel to ulceration of the throat, the result of scarlet fever or diphtheria, several joints being, perchance, affected in its course. (*See page 371.*)

Acute synovitis is frequently met with after a fall, a wrench of the fibrous capsule, or after exposure to wet or cold. It may come on with extreme rapidity, and with the effusion of much fluid, so that the patella is pushed from the trochlear surface of the femur. The distended capsule causes a fulness on each side of the patella, and on each side of the upper part of its ligament; there is also a bulging under the quadriceps extensor. The depressions which are normally found at the knee are obliterated—a delicate diagnostic sign, for it is often manifest before effusion into the joint can be detected by palpation.

Atrophy of the thigh and leg quickly supervenes, and the joint becomes fixed. In estimating the amount of the muscular wasting in the case of a fat child, absolute measurement with a tape may give little tangible result. A far better way of appreciating the flabby and wasted condition is by encircling the leg in the firm grasp of the finger and thumb, and carefully noting by how much the tips of those digits fail

to meet or overlap, and then comparing with the other side. (This style of measurement serves well also for the upper extremity.)

The skin becomes hot and red, and the child dreads the limb being touched. If rest on a splint, leeches and fomentations do not promote resolution, suppuration will come on. The local signs will then be intensified, the temperature will mount up, and there will probably be shivers or convulsions. If the introduction of a hollow needle reveal the presence of pus, the joint should then be opened on each side, and washed out with a hot mercuric lotion (1 in 5,000).

When irrigations of carbolic lotion are used, they must be no stronger than 1 in 40, lest the child suffer from the effects of *carbolic acid poisoning*, the signs of which are drowsiness, depression, sickness, collapse, and a low temperature, the urine being olive-green or dusky. Such symptoms may even follow absorption of carbolic lotion, applied on cloths to the unbroken skin previous to an operation.

Having thus relieved tension and cleaned out the suppurating joint, the surgeon should make an attempt at securing immediate and permanent closure of the wound. If he fail, no harm is done; re-accumulation taking place, the wound can be opened once more, and the joint irrigated as before. This time a drainage-tube should be left in. I am satisfied that drainage-tubes are considerably abused. By employing irrigation, scraping when applicable, and by using firm and even compression, many a joint-abscess may be straightway cured. Abscess in a joint does not differ from abscess elsewhere, at least as regards its treatment.

But too often there is delay in opening the suppurating joint, the prognosis being gravely affected in consequence. Under the influence of prompt and energetic treatment I have often seen acute articular abscess clear up absolutely, leaving the joint as freely movable as before. I have witnessed this even when the cause of the acute suppuration was pyæmia, which had begun as osteomyelitis in the humerus. Acute suppurative arthritis is far less serious in children than in adults (*see page 371*).

If an *abscess* be *extra-articular*, the swelling and fulness are not evenly distributed around the patella, and the patella itself

may be partially or completely obscured; it is not "floating." Moreover, the joint can be moved, provided the examination be gently conducted. Extra-articular abscess, which may be started by acute bursitis or cellulitis, should be quickly opened and scraped. If left, the pus may find its way into the joint or set up disease in the neighbouring bone.

Abscess in the subcrural bursa is at times so suggestive of articular disease that it may be impossible to say with certainty whether or no the joint is implicated. I have met with several cases of this sort; doubtless, if they had been allowed to run their course, they would in time have involved the joint. There is with this condition considerable constitutional disturbance; swelling and œdema exist about the knee, but the joint is not bent, and the enlargement appears to involve chiefly, or altogether, the upper pouch of the synovial membrane. If there be but a small quantity of pus the case may look like one of inflammation of the lower end of the femur, but the thickening is almost entirely at the front. The fluid, even when the child is under an anæsthetic, cannot be driven beneath the patella nor by the sides of its ligament, and the patella is not floated.

The *treatment* consists in cleansing the part and making an incision into the swelling. On introducing the finger, the limits of the bursal cyst are manifested. The abscess must be irrigated, scraped out, and closed; the knee must be firmly and evenly compressed and the limb fixed on a splint.

Hydrops articuli sometimes follows slight chronic synovitis. The most probable predisposing cause is tuberculosis or syphilis. The joint should be aspirated, and compressed, and enclosed between lateral splints of gypsum or leather. Minute doses of grey powder or iodide of potassium may be given; iron and cod-liver oil may be needed.

Bursal tumour behind knee.—The bursa beneath the insertion of the semi-membranosus is often distended with serous effusion. The cyst is rounded and tense when the knee is extended, but when it is flexed, and the tendon is rendered slack, the bursa disappears between the tendon and the inner head of the gastrocnemius. As the bursa may communicate with the interior of the joint, its enlargement must not be treated by injection. As a *placebo*, tincture of

iodine may be painted on the skin. In due course the tumour may subside, but if it persist, and interference be deemed necessary, it may be dissected out, a fine ligature being placed around its neck.

Tuberculous bursitis.—As a primary affection, or as an extension from a neighbouring joint, tuberculous inflammation sometimes attacks a bursa or synovial sheath. It is a quiet, chronic, and often an intractable disease. If rest do not secure its subsidence, the capsule had better be laid open and the granulation-tissue, the melon-seed bodies, or the flaky, puriform material scraped entirely away. It is a serious matter, and if left to run its own course, may wreck the joint. The trochanteric and pre-patellar bursæ are those most frequently affected. I have known pre-patellar bursitis invade the knee joint.

Syphilitic synovitis attacks the knee more often than any other joint. It comes on somewhat mysteriously, and is, as a rule, symmetrical and painless. The physiognomy and the teeth are likely to give evidence of syphilis, as does also the clinical history. Under the combined influence of warmth, rest, and mercurial inunction, together with compression of the joints in gypsum splints, the trouble disappears—at any rate for a time (page 97.) Syphilis may attack bursæ and synovial sheaths in the same way that it may the lining of a joint.

In **tuberculous disease of the knee joint** (*white swelling*) the synovial membrane is gradually converted into a thick, pulpy mass. The disease may begin as a primary synovitis, or as a tuberculous epiphysitis, or osteitis; the membrane becomes œdematous and soft, and eventually is converted into granulation-tissue. It bulges evenly, and forms a padding by the side of the patella and its ligament, and under the lower part of the quadriceps extensor. Sometimes it gives the sensation of fluid in the joint, but fluctuation can rarely be transmitted from side to side beneath the patella. The ligaments give way, the articular cartilage softens and disappears, and the bone becomes carious. Abscess may form in the joint, but the contents are not actually purulent. The condition is rather one of fluid tuberculous granuloma (page 60).

Destructive changes may extend to the skin, which becomes red and tender, ulceration permits the escape of the

unhealthy pus, and also of an extension upwards of the fungating mass of granulation-tissue, which is now the sole representative of the softer elements of the joint. One tissue of the joint is so quickly implicated after another that clinically it is inexpedient to try to draw a distinction between synovitis and arthritis.

The cause of the disease is likely to be wet, cold, or injury which has rendered the tissue incapable of resisting the bacillary invasion. Scarlet fever or measles often precedes the attack. The more unhealthy the child the greater the probability of histological destruction, whilst the joint of the ill-nourished subject is, of course, most speedily disorganised. Members of the family of the child with chronic joint-disease very often have a history of phthisis, or of some other form of tuberculous disease. Chronic joint-disease in childhood is almost invariably tuberculous.

Symptoms.—Attention may first be called to the joint by the child limping, and though he may have complained of nothing more than an occasional aching after exercise, or of the knee feeling "hot" at night, a careful examination may show the part swollen and the muscles already wasted. Sometimes, however, there is almost complete absence of pain from beginning to end of the disease, and thus the case is overlooked and treatment neglected. The knee becomes stiff, and if the child continue to limp about, the joint becomes more swollen and flexed. The globular or ovoid mass looks still larger on account of the muscular wasting. The osseous tissue is not enlarged unless, indeed, the trouble began as an epiphysitis. There is rarely fluctuation in the joint, the swelling being due to œdema of the synovial membrane, or to an intra-articular growth of granulation-tissue. Sometimes, however, there is a good deal of sero-synovial fluid to be made out in a tuberculous joint. The skin is thin, pale, and shining, and marbled with turgid veins, the general appearance justifying the epithet of "white swelling." (For "Syphilitic disease of knee," see page 98.)

As the disease advances, the pain becomes increased, and the least movement or shake causes intense suffering. The child is awoken from sleep by sudden and painful startings. These startings suggest ulceration of the cartilage, but they

may occur previous to any definite lesion of that tissue; they are explained on page 408.

In due course *characteristic displacement* of the leg ensues. The head of the tibia is drawn backwards (flexion), so as to relax the lateral ligaments, which are placed well behind the axis of the joint. Later, the muscles which steady the joint in this easy position undergo permanent shortening, and the head of the tibia is displaced to the back of the condyles. As the ligaments soften and yield, and as for ease and comfort the limb is resting constantly upon its outer side, the head of the tibia, from the mere weight of the leg, drops to the outer side. At the same time, the weight of the foot rotates the leg outwards. Thus the head of the tibia is carried backwards and outwards, and is rotated outwards. This deformity goes on increasing until the internal condyle of the femur projects beneath the skin like a morbid outgrowth, atrophy of the vastus internus rendering it still more conspicuous. Internal rotation of the tibia, which is prevented in the sound joint by the locking of the crucial ligaments, is sometimes obtainable after long-standing inflammation. It implies destruction of the crucial ligaments and advanced articular disease. Though the ends of the bones may appear to be enlarged, as a matter of fact they are not—the thickening is all in the soft tissues about the joint, which the wasting of the adjacent muscles renders all the more conspicuous.

The *treatment* of tuberculous disease demands absolute rest. If the child be young or untrustworthy, he should be secured in his cot, the thigh and leg being encased in a rigid splint from buttock to ankle. This may be made of undressed leather moulded on to the sides of the straightened limb, and secured by straps; or lateral splints of plaster of Paris may be applied. It is useless to adopt this treatment if the child is still allowed to get about. The family attendant should, therefore, from the very onset be firm in insisting on absolute rest.

Thomas's knee-splints consist of an ovoid ring of $\frac{3}{8}$ -in. iron, well padded, and covered with leather. It is welded obliquely upon the upper ends of two parallel iron rods, which are long enough to reach several inches below the sole of the foot, where they are joined by a ring. A leather apron is stretched across

the bars to support the back of the limb. The lower and more thickly padded part of the upper ring fits against the ischial tuberosity, supporting it like a crutch, and is kept in its place by a brace passing over the shoulder of the sound side. The thigh is first fixed in the trough of the splint by a wide flannel roller, but the leg is not to be so firmly bandaged

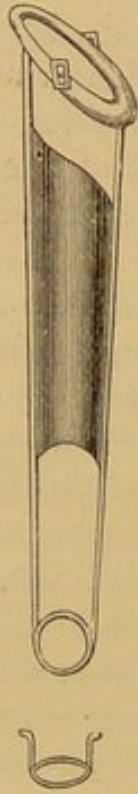


Fig. 113. — Thomas's Splint for Right Knee or Ankle, with a patten to be fixed to the sole of the other boot.

to the splint as the thigh has been, so that as the limb yields to the pressure, the foot may descend. The limb cannot twist round and escape the gently straightening pressure. During the treatment friction is arrested, and the child, if old enough, can walk about without fear of hurting the knee (Figs. 113, 114).

If there be considerable displacement of the tibia, the use of Thomas's splint will be well nigh indispensable. Though no child is too young for these splints, it is only the trustworthy child that can be allowed the patten and crutches.

The method of treatment by *weight and pulley* is not nearly so satisfactory as this, either in bringing the knee straight or in completing convalescence; besides, whilst the cure is being wrought the boy has to be kept in bed.

With the intelligent use of Thomas's knee-splint persistently carried out until all pain has disappeared, either from perfect recovery or synostosis having occurred, excision would be rarely needed. The force thus applied is altogether different in its effect from energetic straightening under chloroform, the result of which is but to shift the tibia farther back upon the femoral condyles, or else partially to detach the epiphyseal cartilage. The popliteal vessels and nerves, moreover, may be injured by rude treatment. forcible straightening is mentioned only to be condemned; deformity can be improved if not corrected by the patient and gentle use of Thomas's apparatus or of a series of leather or gypsum splints.

Either with or without the occurrence of abscess, the joint

may become solidly ankylosed in a faulty position, the limb being left fairly useful. The gait of such a patient may be eventually improved by a thick boot.

The value of *Scott's dressing* of camphorated mercurial ointment probably depends upon the combined effects of compression and rest. With the use of the iron splint, external applications are superfluous. Cod-liver oil or quinine and steel may be prescribed with advantage.

No forcible attempt to straighten the ankylosed knee should be undertaken; nor, unless the deformity be extreme, should resection be advised. If there be enough movement to show that there is no synostosis, an attempt may be made to straighten the limb gradually by Thomas's splint. To leave well alone is an adage peculiarly applicable to the slight deformity left after the clearing up of old-standing articular trouble. With care and patience, even extremely unpromising deformity may be effaced by the splint. But the straightening of the limb, even by the use of Thomas's splint, may take place vicariously, through the cartilage below the head of the tibia; even then, with the growth of the child, an extremely serviceable limb may be secured.

Prognosis.—Under prolonged treatment the disease may clear up completely, or end in useful ankylosis. But in every case there is a great risk of the joint being freed from restraint too early. So long as there is any excess of heat of the surface of the limb, or the child complains of pain at night, the splint must be worn, and even for a good while after that. Parents can rarely be made to understand that it is inflammation, not rest of the joint, which produces permanent stiffness. When a joint which has been allowed some short period of freedom, or of gentle exercise on approval, is found to be neither warmer, stiffer, nor more painful than it was before restraint was left off, there can be little doubt that the

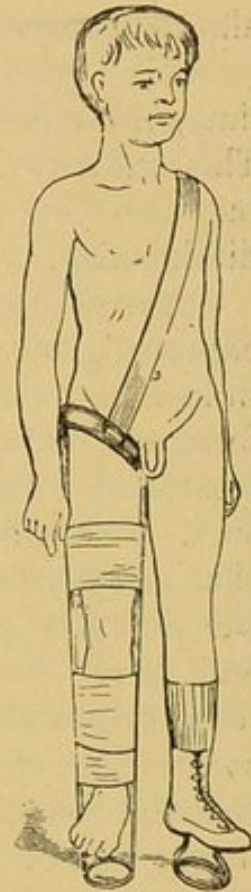


Fig. 114.—Disease of Right Knee Joint. Patten raising sound side.

disease is at an end. But if the surgeon be not satisfied on this head, he should, notwithstanding the disappointment which his edict may involve, insist on a return to perfect and uninterrupted rest. No "passive movements" should be tried, but skilful and judicious massage will be of assistance, and from time to time the ankle must be moved. If the limb is long fixed at rest care must be taken that the foot is not allowed constantly to remain in the extended position.

It is a good sign when, notwithstanding the wasting of the limb, the enlarged joint begins to resume its proper shape. This means not only that the fluid is being absorbed, but also that the thickening of the synovial membrane is diminishing.

Operative measures.—The surgeon should be guarded in expressing his opinion, however strongly he may hold it, that unless he obtains the consent which he asks for the performance of arthroctomy, excision, or amputation in the treatment of a case of advanced knee-disease, the child will sink. It has happened to me, as, doubtless, to other surgeons, that in thus definitely demanding the sacrifice of the joint or the limb, the parents have removed the child from hospital, and have eventually watched his happy convalescence at home or elsewhere! Possibly the case was just about to mend at the time of its being taken from hospital. Or it may be that the change of air should have the credit of the improvement; but the awkward fact has remained, that after the treatment urged by the surgeon in measured words had been declined, the joint began to mend. The course for the surgeon to adopt is to lay the facts clearly before the parents, explaining the risks and the alternatives, advising from opinions founded on broad principles, urging operation, but never commanding it; our art cannot yet claim infallibility.

○ A great deal may be done by ensuring a free escape for discharge. If this source of irritation be removed, and the parts kept at rest, what is there to hinder the supervention of ankylosis? Much of the value of exploration, of the so-called "partial operation," and of the sulphuric-acid treatment depends upon the ensurance of free escape for discharge. In suppurative cases, much general constitutional disturbance is caused by the constant absorption of small doses of the

products of decomposition which fail to find free escape; exhaustion and hectic fever being also thus produced.

Arthrectomy.—The limb is thoroughly “cleansed,” and a horse-shoe incision is made into the joint, as described under the heading “Excision” (page 447). With the use of scalpel, scissors, and Volkmann’s spoon, the whole of the diseased synovial membrane is cleaned away, and every part of the affected surfaces of bone and cartilage is thoroughly scraped. The semilunar fibro-cartilages are taken away, as are also all diseased parts of the capsule of the joint. Special care is paid to scraping out every ulcerated patch of cartilage and bone, cavities thus being excavated in the femur or tibia large enough to receive the top of the finger or thumb. The saw is not used. The posterior surface of the patella is thoroughly scraped, but that bone is not taken away unless it appear extensively and deeply implicated. The lateral ligaments should of course be spared, and the crucial ligaments must not be cut; otherwise the joint might be rendered feeble and untrustworthy. Abscesses and sinuses communicating with the joint are zealously cleaned out, and the granulation-tissue in the subcrural pouch is also efficiently dealt with. From time to time during the operation the interior of the joint is washed out with a warm solution of zinc chloride (grs. 10 to ʒi), and when, after the expenditure of a large amount of time and industry, there seems to be not a particle of diseased tissue left, the interior of the joint is dried, and the wound is closed with a continuous suture, a strong suture being inserted in the divided patellar ligament. No drainage-tube is to be used.

The wound is then dressed with sterilised gauze, and is evenly compressed with a thin cotton bandage; and the leg, knee, and thigh are enclosed between lateral splints of house-flannel and plaster-of-Paris. If all goes well, these first dressings may not need changing for two or three weeks.

I have often been astonished at the general improvement which the child has manifested after this thorough operation. After the operation the child may at once begin to get well, and sometimes without the temperature being raised a single degree throughout the convalescence. Though the operation of arthrectomy has been described in connection with the

treatment of a joint somewhat advanced in tuberculosis, it is often to be resorted to in cases where disease is much less extensive.

It seems specially adapted for those chronic cases of knee disease in which a joint—swollen, shining, and deformed; stiff and painful—refuses to improve under a long and carefully-conducted course of rest and of general treatment. These cases are as common as they have hitherto been troublesome and disappointing; some of them have been treated by excision, whilst others have been allowed to drift until they were complicated with extensive suppuration and albuminoid disease, and until amputation held out the only chance of saving life. The great feature of the operation is that it in no way interferes with the growing ends of the bones, and that, in consequence, no great amount of shortening is to be anticipated.

Mr. Wright, of Manchester, has premised that arthrectomy is applicable to cases in which treatment by real rest has failed, and when there is not such disease that removal of the whole of the extremities of the bones forming the joint is demanded. Tuberculous disease of the synovial and ligamentous tissues, with or without local lesions of bone and without extensive disintegration, are the cases most suitable.

After the operation the limb is to be kept absolutely fixed in moulded splints for many months; and if at the end of that time a certain range of movement be discovered, the joint may be left to shake itself free, no manipulations being resorted to. Miller, of Edinburgh, truly says that movable knee joints after arthrectomy are apt to be got in circumstances in which recovery might be obtained by immobilising the limb.

If during the performance of arthrectomy the bones are found so widely implicated that the crucial ligaments have to be sacrificed, a thin slice should be taken both from the femur and tibia, so that solid synostosis may ensue. In such cases arthrectomy simply means a most economical excision, with a thorough removal of all diseased tissue from the joint and its neighbourhood.

It is hardly necessary to remark that arthrectomy is adapted for other joints than the knee; but its principles having thus been fully described, it must be unnecessary

to recapitulate them when dealing with the subject of chronic disease of the hip, ankle, shoulder, elbow, and wrist. (*See Trans. Soc. Med. Chir.*, 1889.)

Excision.—If the disease have been running a long, intractable course, and have made, after many weeks or months of careful supervision, no real improvement; if the bones do not appear too extensively diseased, or their shafts expanded; and if the patient be the subject neither of marked tuberculosis nor exhaustion; if the lungs be sound, and the urine contain no albumen, excision may be fairly undertaken. In many cases excision is resorted to after an unsatisfactory arthrectomy. It is better not to operate with the assistance of Esmarch's band, as the bleeding is far more troublesome after the compression has been removed. An incision is made from the lateral swelling (tuberosity) of one femoral condyle, through the ligamentum patellæ, and up again to the tuberosity of the other condyle. The horns of this incision should reach well back, so as to be available for subsequent drainage; the knife should pass right down to the bones. The patella is removed; it can be of no use on the occurrence of synostosis. The knee is then flexed; the lateral and the crucial ligaments are divided, and a slice is squarely cut from the end of the femur by a broad saw, directed straight down to the head of the tibia. This section must be made high enough to leave a wide surface, but not high enough to trench upon the junction cartilage. If there be partial ankylosis, force may be required in detaching the patella and flexing the joint, but when the joint is flexed the section of the femur can be effected, as described above, without risk of wounding the popliteal artery. After excising and straightening a knee which has been long flexed, the skin is found rucked and redundant at the front of the joint. In these circumstances, I usually follow A. G. Miller's plan of making two crescentic incisions, when beginning the operation, and taking away the included piece of skin along with the patella. One of these cuts crosses the middle of the patella, the other descending to the level of the head of the tibia.

The layer of cartilage between the shaft and epiphysis of the femur should not be damaged; on the integrity of this layer the subsequent growth of the thigh bone depends. So

also with the upper epiphysis of the tibia. The epiphysis which is last to join is that most concerned in the lengthening of a bone, and the knee-epiphyses of both these bones are late in joining. The surgeon then looks if he have two evenly cut and healthy surfaces which come flat together without much strain on the tissues behind the knee. If the strain prove excessive, the ham-string tendons must be freely divided, but bone must not be sacrificed. If after the section the condition of the bone appear untrustworthy, the gouge may be used with advantage; but broad and healthy surfaces of the bones must be left in apposition, or a good result will not be obtained. Osteal ulcers or abscesses met with in the course of the excision must be scraped, and all granulation-tissue and degenerate synovial membrane removed by using Volkmann's spoons. Thus, excision as performed to-day means an economical removal of diseased bone, supplemented by a thorough arthrectomy; the classical excision of former days is rarely performed.

If oozing of blood be troublesome and delay the final steps of the procedure, the cut surfaces may be swabbed again with a solution of chloride of zinc (grs. 10 to ʒi).

When all bleeding has ceased, the sawn surfaces are adjusted, and the limb steadily held whilst ample dressings of sterilised gauze are applied and lateral splints of house-flannel, soaked in creamy plaster of Paris, are evenly adjusted. These splints, which, in my opinion, are better suited for children than any other apparatus, should be long enough to reach from the top of the thigh to just above the ankle. So as to keep the child flat and straight, a long wooden splint should be secured from the axilla to the ankle along the opposite side. As a rule, the dressings do not need removal for two or three weeks; but if it happens that blood or serum soaks through, the limb may have to be put up afresh next day. And, if expedient, this may be done under chloroform. No provision is made for drainage.

When the wound has become sound and solid after excision, the child should be fitted with a Thomas's knee-splint, patten, and crutches. If, though the case do fairly well after operation, a chronic discharge continue from a sinus which is evidently leading down to ulcerated bone, the wound may

be enlarged and the bone explored and scraped. If this be unsuccessful, it is a question whether a secondary excision be performed or amputation resorted to. The former line of treatment should be undertaken only if the general health be satisfactory, and, judging from the result gained by the previous operation, if still further improvement seemed likely to be obtainable.

When about to excise, the surgeon must have all matters arranged so that he may amputate if, as he proceeds, he consider the adoption of that course expedient.

The intercurrence of albuminuria, tuberculous deposit in the lung, or hæmoptysis, may call for immediate sacrifice of the limb. Sometimes an excision goes on well for weeks or months, and then a degenerative process supervenes which entails amputation.

However well the case may do, no weight must be placed upon the limb for considerably more than a year, lest the union yield and deformity ensue. It must be borne in mind that the child is constitutionally feeble, and that the line of operation cannot quickly become strong and trustworthy. It will be advisable to let the boy go about with a Thomas's knee-splint and patten (Fig. 114).

Deformity after excision is very apt to occur unless the child is carefully watched and kept off his feet. It is usually in the direction of progressive flexion, but in one of my cases it was in the opposite direction, the salient angle being backwards, like a bird's.

Treatment.—If the uniting medium be not firm, it may gradually give way to appropriate bandaging in a Thomas's splint; or, if too firm for this, the original wound may be opened up and the uniting material cut through; or, lastly, if the bones be solidly fused together, a wedge-shaped piece may be removed from femur or tibia, or from both bones, the line of the epiphyseal junction being avoided in the section. Each method of procedure, in appropriate circumstances, gives good results, and the prolonged and careful supervision to which the child is afterwards subjected should ensure him against further relapse. In all such cases imperfect development of the limb must be expected. (Page 413.)

In domestic practice one rarely excises a knee. I have

watched cases for years steadily recovering under conservative measures—genuine tuberculous knees which have, after much patience, completely recovered with perfect movement. It is a relief to find from time to time that a tuberculous knee is not necessarily a doomed knee; that the bacilli (if they are the actual cause of the disease) are not as yet entirely beyond our control. Some of these children to whom I am referring would, I feel sure, have had their knees excised if they had by chance found their way into hospital wards—but they are now walking about with sound and movable joints. At the very best, an excised knee gives but a poor result, for the limb must inevitably remain both short and stiff. A few months after the operation, everything looks satisfactory—the swelling and pain have gone from the joint, and, with a slightly raised boot, there seems nothing to be desired—but if the patient is seen five or ten years afterwards, the case is, as a rule, far less suitable for exhibition. Probably there has been so serious an arrest of development that the limb is several inches short. Possibly the junction between femur and tibia had begun to yield soon after the operator had lost sight of the child, and now the leg is, though synostosed, considerably flexed on the thigh; or tuberculous disease may have started afresh, and serum is still leaking from unhealthy sinuses; or, lastly, the union may have broken down long since, and when the patient is seen after a considerable interval, it is found that he has been under hospital treatment elsewhere, and that the surgeon found it necessary to amputate the limb.

Amputation.—If the child be rapidly going down hill, be losing appetite, growing restless, maintaining a high temperature in the evening, and a constant morning fall; if the joint-ends of the bones themselves have become softened, or the surrounding tissues grievously infiltrated with matter or riddled with sinuses; if the urine be albuminous, the liver large and hard from albuminoid degeneration; or if moist *râles* be heard over part of a lung, or the presence of disease in that tissue be rendered evident by occasional attacks of hæmoptysis; or if the occurrence of severe diarrhœa threaten a fatal issue, amputation at the lower third of the thigh is clearly indicated.

In many of these poor children the limbs are covered with long silken hairs; these had better be shaved off, as they adhere to the dressings. This hairiness is generally associated with constitutional weakness. The limb should be raised to empty it of blood, and its circulation controlled by the fingers of a colleague, or by a flat elastic band; but there must be no severe constriction of the wasted limb. The first flap is cut in the front of the thigh by a large scalpel, but not by transfixion, and it should be long enough to fall over the sawn bone. The skin at the lower end of the flaps should be healthy, but the presence of an old sinus or ulceration matters little, provided it be efficiently scraped.

Soon after the operation the child should be placed in the sunshine or open air. When the stump has become perfectly sound, and free from pain, the child may, if old and strong enough, be trusted on crutches, but there should be no hurry about his being supplied with an artificial leg or even a pin.

Though amputation for knee-joint disease should be resorted to only in extreme cases, it is a highly satisfactory measure as regards the rapidity of convalescence. A child in the last stage of exhaustion from knee-joint disease may, a few days after amputation, be sitting up in bed, playing with toys and enjoying his meals.

CHAPTER XXXII.

DISEASE OF THE SHOULDER AND ELBOW JOINTS, ETC.

THE shoulder joint.—The head of the humerus is held against the shallow glenoid cavity in the loose embrace of the capsular ligament. Thus, practically, every movement of the arm is unlimited, and the scapula plays freely over the chest, so that violence is little likely to affect the joint.

A not uncommon cause of **synovitis** or arthritis is pulling or swinging a child by the arm. Pain is complained of, but as the joint is thickly covered by the deltoid, and no redness of the skin supervenes, the mother, seeing nothing amiss, gives the matter no further heed. The boy meanwhile uses the arm as little as possible, putting on his dress cautiously; with this rest the joint may recover, provided that the child be healthy. If the surgeon were called in, as he should have been, he would probably have found the skin over the shoulder warmer than on the other side, and the joint swollen, elastic, and tender. If he abducted the arm he would have found that the scapula moved with it—unmistakable evidence of stiffness of the joint. The muscles quickly waste and leave the bony eminences unduly prominent (page 412).

Treatment.—Complete rest must be enforced, and while the joint is painful, the child should not be allowed to disturb it by passing his arm through his sleeve. In this way the arm is effectively rested, for he must wear it beneath his clothes. It had better be raised in a sling and fixed to the side, and he should not have free use of it until all swelling and pain have disappeared. (For the means of confining the arm refer to page 383.)

Suppuration may supervene if the child be unhealthy, or if the violence which set up the synovitis were extreme. Suppuration in the shoulder joint demands early relief of tension; unless the matter be afforded free escape, the joint may be completely destroyed. If in any case there be

doubt as to the presence of pus a hydrocele cannula may be introduced.

Case.—A nurse girl swung an infant violently by the hand; immediately afterwards the left shoulder became swollen and tender. Attempt to abduct the arm caused the shoulder blade to move with it. The arm was fixed to the side. Three days later the infant was sleepless, and without appetite. There was evident tension in the joint. Under anæsthesia a tenotomy knife was passed through the deltoid and into the joint, and, pus escaping, the track was enlarged with the dressing forceps. The cavity being washed out with iodine water, a small drain was inserted, the arm fixed to the chest, and the shoulder covered with dry dressings. Relief was immediate and permanent. Two years later there was no evidence of the old articular disease, except a small white scar which indicated the site of the operation wound. (To-day I should not insert a drainage-tube after thoroughly evacuating an articular abscess.)

Even with the early adoption of therapeutic measures the inflammation may advance, suppuration becoming abundant and continued. After a prompt evacuation such a joint may entirely recover. Or the inflammation may give place to synostosis, but as the scapula plays so freely upon the chest the deficiency of the joint movements can be thus vicariously and ably performed. It is doubtful if a better practical result could be obtained by excision than is sometimes seen in cases where ankylosis has supervened in childhood.

If the bones be implicated, and discharge continue in spite of treatment, there may be no option but to excise the head of the humerus and scrape out the joint.

Caries sicca.—Tuberculous inflammation of a very quiet nature is apt to follow injury of the shoulder, the articular surfaces being destroyed by granulation-tissue without any suppuration having occurred. In due course this granulation undergoes ossification, and the joint is left permanently stiff. The epiphysis also becomes fused with the diaphysis long before the proper time, so that the arm is eventually much shortened. A little while ago I excised the head of the right humerus of a coachman, who had a synostosed joint

and a shortened arm after tuberculous disease, for which he had been under my care eighteen years previously.

But *excision* is rarely required; patient and prolonged supervision of the child, and perfect rest of the limb, may restore the joint, even after long-continued suppuration; still, excision of the shoulder joint in childhood is a very satisfactory operation, both as regards immediate and remote results. It is performed by a long anterior incision, and is combined with arthrorectomy. No splint should be applied after the operation, and movements of the limb should be early resorted to.

For **epiphysitis**, see pages 91 and 365.

The **elbow joint**.—Entering into the formation of the elbow joint are the humerus, the ulna, and the radius, their articular surfaces being enclosed in a capsular ligament, and lubricated by a single synovial membrane, one reflection of which descends into the superior radio-ulnar articulation and lines the orbicular ligament.

Synovitis.—One of the first objective signs is the partial effacement of the dimple below the external condyle of the humerus when the elbow is extended. At the depths of this dimple are the head of the radius, and the most subcutaneous part of the elbow joint. When synovitis is suspected, a careful comparison of the two elbows should be instituted, and first as regards this dimple. Bulging may also be found at the front and back of the internal condyle; and as the joint becomes more distended, a fulness may be detected on each side of and above the olecranon process, and even at the front of the elbow against the pronator radii teres. Another sign is increased warmth of the surrounding skin; but in estimating this, due allowance must be made, perhaps, for the fact of this elbow having been carefully wrapped up, or the other arm being left exposed through a short-sleeved frock. Redness of the skin is not an early sign of inflammation unless the synovitis be excessive. Some stiffness there is certain to be. The child will not allow the forearm to be completely extended, because in this position the strongest part of the capsule is put on the stretch and the intra-articular pressure thereby increased. As the synovitis increases, the whole neighbourhood of the joint becomes

enlarged; the forearm is partially flexed, and more than half way pronated; the skin is flushed and hot; there are complaints of pain and tenderness, and of disturbed nights, and the muscles are greatly wasted (page 412).

The cause of the synovitis may be wet, cold, or injury, delicate children being the more likely to suffer. The fashion of making little children wear low frocks and short sleeves, regardless of weather, is prejudicial. Inflammation running a chronic course is almost certainly tuberculous.

Treatment.—If the inflammation be slight, the limb should be evenly enclosed in plaster-of-Paris splints. Or the elbow may be firmly bandaged and fixed to a light splint; or a plastic splint may be moulded on as shown in Fig. 93, the elbow being fixed at a right angle, lest disease end, perchance, in ankylosis. Slight synovial effusion must invariably be treated with precision from the earliest moment.

If suppuration occur in the joint the abscess must be laid open and the joint washed out. The elbow should then be surrounded with wood wool dressings, and evenly compressed between moulded splints. But if, in spite of rest, tonic treatment, and change of air, fluid continue to escape, thorough exploration should be made, all carious surfaces and flabby granulation-tissue being scraped away, and irrigation being performed with a zinc chloride lotion.

Excision.—Before the anæsthetic is administered the arm is thoroughly washed with soap and water, and with an antiseptic lotion. Esmarch's band should not be applied, on account of the troublesome oozing which takes place on its removal; all bleeding vessels should be secured as the operation progresses. With a short-bladed scalpel a median incision is made down to the humerus, the olecranon process, and the upper end of the posterior border of the ulna. The thinner the arm and the less swollen the elbow, the shorter may this incision be.

A raspatory is used for separating the periosteum, and with it much of the muscular and ligamentous fibres. The attachment of the triceps to the olecranon process requires the knife, but the fibrous expansion from it to the deep fascia at the back of the forearm must be jealously guarded; much of the future power of extension will depend upon its

integrity. The ulnar nerve should not be seen during the operation; it should be raised from its bed between the internal condyle and the olecranon, and kept out of the way by a retractor. Then, by forcibly bending the elbow, the end of the humerus is made to project; the articular end being cut off with a scalpel or with a fine saw. The articular ends of ulna and radius are then removed, and the interior of the capsule, the sinuses leading to it, and the abscesses associated with it, are treated as under the heading "arthrectomy" (page 445). There is this great difference between the operation on the knee and the elbow:—in the former case as little tissue is removed as possible, because synostosis is aimed at; whereas, in the case of the elbow, a false joint is desired. It is advisable to remove the head of the radius, lest, lying against the end of the humerus, it eventually become ossified to it, the usefulness of the limb being thereby diminished.

The cavity should be washed and dried, the edges of the wound being closely approximated with sutures. The dressings being applied, the forearm and arm are enclosed in a soft bandage, with firm compression round the elbow. The cavity should not be stuffed, nor need provision be made for drainage. No splint should be applied, but the arm should be laid upon a pillow. The sooner it is moved the better, and the child may all the while be going about with the arm in a sling and using the fingers.

Excision of the elbow, combined with arthrectomy, for chronic disease is, in my experience, a highly satisfactory operation.

If after excision suppuration persist, though, perhaps in diminished amount, and if the swelling about the elbow do not materially subside, and if, in brief, the local and general improvement be disappointing, still the arm must not be condemned to amputation; it is very rarely necessary to remove a limb for chronic disease of the elbow; albuminuria, hæmoptysis, or some other indication of advanced tuberculosis may, however, render amputation necessary. The wound must be opened up under chloroform, and thoroughly scraped out again, and washed with a solution of chloride of zinc (gr. 10 to ℥i). And as soon as possible after this, the

child should be got to a change of air—to the seaside if practicable—wearing the arm in a sling, and possibly for a little while on a splint. As the muscles gain strength, and as the material connecting the ends of the bone shortens, a strong and useful joint results.

Partial excision of the elbow may be resorted to when intractable tuberculous arthritis lingers in a limited area of the joint, as around the head and neck of the radius. On the synovial granulation-tissue and the softened bone being thoroughly scraped away, the wound completely closed, and the arm temporarily secured in lateral splints of gypsum, a freely movable joint may be expected. After the operation sea air will, of course, be of great advantage.

Synovitis of the wrist joint may follow a sprain or other injury. The wrist is hot and swollen, and every movement causes pain. The synovial membrane bulges all round the articulation, the bony landmarks and the tendons being obscured. This universal enlargement affords ample evidence of the joint itself being diseased.

Treatment.—The forearm should be closed in moulded splints, and the swollen part submitted to even compression. The splints should be applied at the front and back, and should extend from just below the elbow to the tips of the fingers. As a rule, an inflamed joint does not obtain sufficient rest. For instance, in the case of an inflamed wrist joint, the fingers are not always enclosed in the splint, with the result that the boy uses them, and that rest is but imperfectly secured for the wrist. There need be no fear that such confinement will ultimately render the fingers stiff. It cannot be too clearly insisted on that it is inflammation which leaves a joint stiff, and not the rest which is resorted to with the view of causing subsidence of the inflammation. If the disease linger, as it is apt to do in an unhealthy subject, suppuration may supervene; but abscess need not imply a permanent stiffness.

Tuberculous disease of carpus is very apt to follow injury, inflammation having prepared the tissue for the invasion of the bacilli. Sometimes the disease begins as a synovitis and sometimes as an ostitis, the membrane and bone in due course being invaded by tuberculous granulation-

tissue. Disintegration occurs, and abscess having been opened about the back or sides of the wrist, the probe may touch carious bone. Probably the disease begins more often in the synovial membrane than in the bones. With prolonged treatment the disease may come to a tardy conclusion with no worse result than a stiffened wrist. Therefore, gouging or other piecemeal treatment should not be hastily adopted. With perfect rest of the part between moulded splints for a few or for many months, a satisfactory result may be expected. Still, scraping and irrigation may eventually have to be resorted to. Thorough scraping of the diseased carpus takes the place of the classical excision of the wrist, but even the most complete carpal arthrectomy is often attended with disappointment. On a few occasions in advanced tuberculous diseases I have found it necessary to amputate the hand. But in the surgery of the upper extremity conservative principles usually give good promise; still, to secure it, time and attention to matters of detail and of general hygiene are very necessary.

Ganglion.—The cysts are small and rounded, and often so hard at the back of the wrist as to suggest their being out-growths of the bone. In such circumstances they are tense hernial protrusions of a synovial pouch through a gap in the fibrous sheath. They are best dealt with by the introduction of a stiff grooved needle. After evacuation they should be firmly compressed by the thumb each day, so as to prevent their refilling. If the ganglion be more extensive, as when it implicates the sheath of the tendons of the thumb or fingers, it is best treated by drawing off the sero-synovial contents with a hypodermic syringe and injecting Morton's fluid (page 243). The cyst is then to be freely manipulated, and the hand and forearm secured on a splint.*

Chronic disease of the synovial sheaths and bursæ is likely to be of tuberculous origin (page 439), and it is apt to foreshadow, to cause, or to run with tuberculous disease of the neighbouring joint. It must be treated with complete rest, and if it do not yield to the injection of Morton's fluid, it may be necessary to lay open and scrape out the cyst, or, in the case of its being of limited extent, to dissect it away.

* See paper by Martyn Jordan, *Lancet*, July 29, 1893.

Let it be first clearly settled, however, that the bursitis is not dependent upon hereditary syphilis (page 439).

With regard to the synovial sheaths and extra-articular bursæ, it may be briefly remarked that, being of the same nature as the synovial membranes, they are subject to the same diseases; and they may thus be involved in inflammations which may be due to injury, syphilis, or tuberculosis.

Club hand is usually a congenital deformity. There are many varieties of it, the hand and fingers being inclined either backwards, forwards, or laterally; sometimes the position taken is a complication of two varieties. The bones of the forearm or hand may be imperfectly developed or partially or entirely absent, and often the condition is associated with some other bodily defect, such as club foot. If the deformity be slight, it may be corrected by manipulations, frictions, splintings, and apparatus. If more serious, subcutaneous or the open division of fascial bands, tendons, or even of bone, may be required. If the unsightliness be extreme and the member useless, the propriety of amputation may require consideration.

In a case of acquired club hand lately under treatment, the hand was strongly adducted, the deformity being due to an injury to the lower epiphysis of the ulna some years previously by a chaff-cutting machine. The normal growth of the radius being unchecked, whilst the ulna remained undeveloped, the radius was strongly curved inwards. The appearance and the usefulness of the hand were eventually improved by the removal of a large wedge-shaped piece from the shaft of the radius.

Webbed fingers result from imperfect notching of the distal extremity of the bud which, in the early weeks of foetal life, represents the arm. The defect may be hereditary, and is often associated with imperfect development in other parts of the body, and not infrequently with defective cerebro-spinal evolution. Several digits may be thus fused along their lateral borders. The uniting medium is composed of skin and subcutaneous tissue, with ordinary vascular and nervous supplies.

Treatment should be undertaken in early childhood, provided the defect is unassociated with serious physical or

intellectual deficiency. Mere division of the web does not suffice, for, careful as the subsequent dressing may be, and widely as the fingers may be kept apart during the progress of granulation, reunion is sure to occur through a greater or less extent.

A successful operation has been devised by Mr. A. T. Norton* :—A dorsal and a palmar flap of skin and subcutaneous tissue, of about half the size of one's finger nail, are dissected up at the level of the heads of the metacarpal bones. This being done, the web is divided, and the flaps are adjusted across the cleft by fine sutures. Primary union taking place between these flaps, adhesion of the contiguous borders of the fingers is effectually prevented. For a few days the hand should be fixed on a splint and worn in a sling.

This operation, which I have practised a great many times, is, in my opinion, far superior to any other. The crescentic flaps must be cut long enough to meet easily across the cleft, yet not so thin as to run the risk of sloughing. If the flaps unite by first intention—which they usually do—the case progresses without trouble or anxiety.

Onychia maligna is the result of acute inflammation of the matrix of the nail. It usually follows an injury to the end of the finger in a child in broken health. The sore is highly septic, and is best treated by removal of the loosening nail (under an anæsthetic) and by weak mercuric lotions; the hand should be secured upon a splint. If there is a suspicion of the child being the subject of congenital syphilis, he had better be treated by mercurial inunction. In any case, cod-liver oil and iron and a good hygiene are needed.

Polydactylism.—If, as often happens, the supernumerary finger is attached merely by a soft pedicle it is easily removed, but if it possesses a distinct articulation its amputation may demand the sacrifice of some small part of the metacarpus.

* *Brit. Med. Journ.*, 1881, p. 380.

CHAPTER XXXIII.

DISEASE OF THE ANKLE JOINT.

COMPARED with the hip and knee, the ankle joint is rarely the seat of disease, as its mechanism renders it less liable to the effects of violence. If, however, it be severely sprained, a considerable amount, if not of blood, at least of altered synovia, is quickly poured into the interior of the joint.

The *treatment* should be energetic and complete, lest, on the apparent subsidence of active symptoms, chronic inflammation or persistent weakness remain, or the invasion of tubercle bacilli be invited. The child should at once be put to bed and kept there for as long as necessary. The foot and ankle should be secured and gently compressed between gypsum splints. The foot should be fixed at a right angle, or else when the child begins to walk again he will be unable to get down his heel and the joint will be strained, because the weight is transmitted unevenly through it. Pressure and rest not only prevent the effusion of more fluid, but hurry on the absorption of that already poured out. Fomentations and lotions are not so efficacious in the treatment of the sprained joint as is compression.

When the effusion has disappeared and the movements of the joint have become painless, the child may be allowed to use the foot; but even then and for some time afterwards, the part should be enclosed in gypsum or leather splints. The more delicate—potentially tuberculous—the child, the more need for care; but even for the most robust these measures should be adopted. How constantly is the answer to the question, "How do you account for it?" "He sprained his joint some time ago, but we did not take much notice of it."

Tuberculous synovitis or arthritis being established, the skin becomes hot, the joint is slightly extended and is incapable of painless movement. There is, moreover, a globular swelling at the ankle. The capsule is full and bulging and as the child walks he paddles himself along with his toe.

Care is required to determine if the disease be in the joint itself or in some extra-articular bursa, or other structure, the joint itself being free. In each case there would be swelling, ineptitude to motion, and pain; but when the articulation is implicated, the synovial fulness is found to be beneath the tendons at the front of the joint, around the malleoli, and at the back—the posterior bulging being on each side of the tendon of Achilles, so that the tendon lies in the depths of a soft mass, which swells up on each side of it. Extra-articular abscess could not give rise to such universal fulness. Other morbid conditions, from which the ankle disease has to be diagnosed, are inflammation of the astragalo-scaphoid joint, and caries of the astragalus, calcaneum, or scaphoid. In the first case, the universal swelling about the tibio-tarsal junction would be absent, and the tendons just above the front of the ankle joint would not be obscured by effusion, and probably the movements of that joint would be but little, if at all, interfered with.

With astragalo-scaphoid disease the chief part of the redness and swelling are over the front of the head of the astragalus, rather than at the line of the larger joint. If the disease be confined to the os calcis, the skin about the heel is red, whilst the movements of the ankle joint are free. When an inflammation has been lurking long about the astragalus, or one of the lower synovial membranes connected with it, the morbid process may eventually spread to and involve the ankle joint. These cases are generally tuberculous.

It is far less important, however, to be able to say exactly where the disease is situated than it is to be thorough in dealing with it. If I may be allowed to write it, there is often too much supineness in dealing with cases of apparently slight articular disease. A week's complete rest for a limb is really no great infliction for a child, whilst it may preserve him from a lengthened period of articular disease. Parents are, as a rule, very averse from having a child kept from play or school because of a "sprained ankle," and they are under the influence of that widespread superstition that the child will suffer from being kept in bed. The risk is invariably in the opposite direction.

The *treatment* of acute synovitis of the ankle consists in

complete rest, the adjustment of rectangular splints, and as much even compression as the inflamed tissues will bear. The leg and foot should be raised upon a pillow. A little castor oil may be required, and maltine and cod-liver oil or iron may prove useful.

If **abscess** follow, the constitutional disturbance increases, and the joint becomes more hot and swollen. An incision should be made into the most prominent part of the swelling; this will probably be out of the way of either of the tibial arteries. The joint should be washed out with perchloride lotion, packed around with absorbent dressings, and permanently steadied by rectangular splints of leather or gypsum, without drainage being resorted to. Before fixing the foot at a right angle, it is often expedient to divide the tendon of Achilles. After the tenotomy the position of the foot can be rectified with far less strain and disturbance at the joint.

Suppuration of the ankle joint is often determined by septic ostitis at the posterior end of the diaphysis of the os calcis (page 486), especially if there have been delay in cleaning out the primary focus. Such cases are apt to entail the resort to Syme's amputation.

The inflammation may be *chronic* from the beginning, the joint being enlarged on account of the swollen synovial membrane. The skin is marbled and the muscles of the leg and thigh are wasted. The disease is tuberculous and may run its destructive course without the formation of abscess, even though the ligaments have disappeared and the cartilages have undergone extensive ulceration.

A gypsum casing, or leather splints, moulded from the roots of the toes well up the leg, may be adjusted. With this protection the child may be carried about the house or taken into the open air. If he can be trusted with crutches, his leg may be fixed in a Thomas's splint, as for knee-disease (Fig. 114), and he may then daily attend school, if appropriate arrangements can be made with the teacher. The foot must be persistently kept at a right angle.

Much time will elapse before the joint is fit for work; it may be a question of months, or possibly even of years. But neither surgeon nor parent must be discouraged; care must be taken that the foot is never put to the ground, and that

the child does not stand up in bed. Scott's dressing is a favourite application for chronic ankle arthritis; its beneficial influence is probably exerted through the pressure and rest which its employment ensures; for tuberculous inflammation is not likely to be specially influenced by the blue ointment, even with the help of the camphor.

Too often it happens that, in spite of all treatment, the joint goes on from bad to worse. The ankle becomes more swollen, or discharge takes place, and the child's health fails.

Free openings should be made into the joint through some sinus, which is perhaps partly blocked by unhealthy granulation-tissue. All unhealthy skin and synovial membrane, granulation-tissue, and carious bone, should be thoroughly scraped away by a sharp spoon, and the cavity should be scrubbed out and irrigated with a solution of chloride of zinc (grs. 10 to ʒi). After this the joint should be firmly packed around with absorbent wool, and the leg and foot should be fixed by rectangular splints of flannel and gypsum.

Excision is very rarely needed. The treatment described above will probably answer as well as the more formidable operation. When efficiently performed it has all the advantages and none of the drawbacks of excision. Still, when the arthritis fails to clear up after scraping, and rest, and change of air, and the disease seems to be confined to the region of the ankle joint, excision may be advantageously resorted to. In my experience, the best way of performing it is after the method of Arbuthnot Lane, who cuts across tendons, vessels, and nerves, at the front of the joint, and so gains complete command of the tuberculous area.

Syme's amputation is often the only satisfactory treatment for advanced tuberculous disease of the foot and ankle in unhealthy, ill-fed children; but it is rarely needed in the well-to-do classes of society, in which the patient is likely to have been under surgical attention from the commencement of the trouble. Immediately the mass of diseased tissues is removed, the child begins to mend. Anxious, sleepless, and exhausted as he was before the operation, he is henceforth at rest and happy. The pinnacles of the temperature chart sink into slight upheavals from the normal line, and even on the

day following the operation the child may be found amusing himself with toys or pictures.

The limb having been raised, to empty it of blood, and the circulation being controlled, the tip of the external malleolus is noted, and a spot upon the inner side of the ankle, which exactly corresponds with it. These two points mark the extremities of an incision which is made by a scalpel around the plantar aspect of the heel, dividing all the structures down to the bone. The incision should slope backwards, or else, when the os calcis has been enucleated, the cup-shaped flap will be found unnecessarily large. A second incision straight across the front of the ankle connects these same points. Then the foot is firmly depressed, and the knife made to traverse the ankle joint. Carefully the knife is to clear the loose tissue from along the upper aspect of the os calcis behind the astragalus, then round the posterior part of the os calcis, through the insertion of the tendon of Achilles, and around the bone within the limits of the incision. Whilst enucleating the os calcis, the skin may be wounded unless the point of the knife be kept close against the bone.

The articular surface of the tibia is scraped, and the malleoli are removed with a strong scalpel or with a fine saw. The ends of the tibial arteries (or the two plantars) are secured, and any long-cut tendons pulled down and shortened with the scissors.

The **fallacies** in the operation are in not making the inner end of the incision on the exact level with a spot immediately below the tip of the external malleolus; in attempting to shape a dorsal flap, and so getting the second incision in advance of the tibio-tarsal joint, and thus opening the astragalo-scaphoid joint (by forcibly depressing the foot, and feeling the flexure of the ankle joint, this error is not likely to be committed); in bringing the first incision so far forward in the sole, that the cup of the heel-flap is awkwardly large; in scoring the flap when enucleating the os calcis: this accident is less likely to happen if the flap be dissected from above instead of from below, as Syme did it, and if the blade be short and kept well in view. The left index finger applied to the skin behind will give information of the thickness of the integuments between it and the knife. Sloughing is extremely

unlikely to happen if the flap be not too thinly raised, nor pulled and twisted during the operation.

Though the integuments may be discoloured, thickened with œdema and riddled with sinuses, Syme's amputation need not be precluded; even in unpromising cases it should be preferred to amputation in the lower third of the leg.

Conical stumps.—Unless the fact be recognised that a conical stump is apt to follow certain amputations in childhood, parents may be dissatisfied and the surgeon disappointed when a sawn humerus or tibia is found pressing against a tender and threadbare scar. Still, this occurrence is almost as physiological as that of the growing schoolboy's sleeves and trousers "getting too short." When amputation is done in the diaphysis, the humerus or the tibia still keeps on growing from its upper epiphysis, regardless of the fact that the skin and subjacent tissues have no provision for keeping pace with it.

The important epiphysis in the growth of the humerus and of the tibia is the upper one. In the case of the bones of the thigh and forearm, however, the lower epiphyses are the more important, and it is, therefore, quite exceptional if the stump of a child's thigh or forearm becomes conical. (See *Lancet*, Oct. 3, 1891.) The inconvenience may be dealt with by removing the end of the protruding bone from time to time, as circumstances may direct, or it may be prevented by destroying the growing end of the diaphysis at the time of the amputation. But this might have the effect of leaving too short a piece of bone in the stump. I greatly prefer the former and less radical line of treatment.

CHAPTER XXXIV.

DEFORMITIES OF THE FOOT.

Supernumerary toes, like supernumerary fingers, may be traced to hereditary transmission. Unless the additional toe be in the way it may be left uninterfered with. If there happen to be several superfluous toes, trimming may be advisable. In the case of a toe being attached by simple fibrous tissue and skin, the connection may be severed. **Webbed toes** should be left alone.

Pes gigas is congenital hypertrophy of part or the whole of the foot. The skin is coarse, the subdermal tissue is infiltrated with fat, dilated veins, capillaries and lymphatics, and the bones are overgrown. Sometimes only one or two toes are thus enlarged; sometimes the overgrowth extends up the leg. The *treatment* should consist in even and gentle pressure with an elastic cotton roller, or, if necessary, with a fine Martin's bandage. Compression should be carried out with care and perseverance, and amputation should be resorted to only in extreme cases.

Arrest of development may affect the whole, or part of one, or both feet; the surgeon can do nothing to improve the condition.

Annular constrictions may be found in the limbs, extending as a narrow groove almost to the bone. They are errors of development (Fig. 115), possibly due to a twisting of the umbilical cord; they are not due to the contraction, as has been suggested, of intra-uterine inflammatory deposits. The opposed surfaces may sometimes be denuded and the edges adjusted by suture.

Club foot may be congenital or acquired; of the former variety, the commonest is that in which the heel is raised

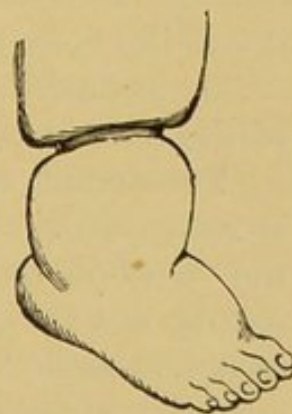


Fig. 115.—Congenital Annular Constriction.

and the sole inverted—*talipes equino-varus*. It is a combination of two defects, neither of which by itself is often met with at birth. In utero the feet are in a position of inversion and extension, enforced by the muscular walls of the uterus, in order that the space occupied by the foetus may be reduced to the smallest limit. The fact that the deformity can be perfectly cured is evidence that it is not due to defect in structure of nervous or muscular tissue.*

At and soon after birth a slight amount of talipes varus is found in nearly all children. It does not require surgical treatment; it is effaced by gradual development. But if from tightness of the intra-uterine packing the twist of the foot be extreme, development during cradle-life might fail to procure its effacement; and unless the deformity were dealt with surgically, the foot and leg would remain undeveloped, the os calcis being particularly small. The superior articulating surface is lengthened backwards, the neck of the bone is sloped downwards and inwards, and the tuberosity of the scaphoid is close against the internal malleolus. The inner border of the foot is drawn more upwards, and the weight of the body in progression will fall on the cuboid bone, the base of the fifth metatarsal, and the external malleolus. In these situations the skin will become hard and cornified, bursæ being developed between it and the bony projections.

Occasionally there is a considerable amount of rotation of the tibia inwards, upon its vertical axis.

Treatment should be begun as soon as the deformity is recognised. Sayre graphically remarks that immediately the newly-born infant has been washed the practitioner should set to work at the deformed foot. In these early days but slight force may be required to place the foot in the correct position, and that parents should be advised to postpone all interference for a year—as they often are—is most unfortunate. A very considerable degree of inversion will in due course yield to frictions and manipulations persistently carried out by an intelligent nurse—provided they be begun in early infancy. From time to time the surgeon should watch the nurse at her work in order that he may satisfy

* See Paper by Messrs. Parker and Shattock in Trans. Path. Soc., 1884.

himself that his instructions are being efficiently carried out. Three or four times a day the foot and the muscles of the leg should be rubbed and kneaded, the heel drawn down and the foot methodically untwisted. If, after a few weeks of this treatment, the condition do not improve, though the employment of a slight amount of force suffices to place the foot in the desired position, it may be evenly enclosed in a domette roller, or a soft, closely-fitting sock, and fixed in an over-corrected position between lateral splints of house-flannel and plaster of Paris, being held in the over-corrected position until the plaster has firmly set. It may then be left uninterfered with for several weeks, at the end of which time, the twist having disappeared, the parts may be again treated by massage and manipulations, or the foot may be readjusted in the over-corrected position with fresh gypsum. The tendon of Achilles should be divided without hesitation if there be any considerable elevation of the heel. Procrastination or temporising, so often adopted from a mistaken kindness to the mother, is a grievous injury to the child.

After the foot has been for about half an hour in the strained position ensured by the gypsum, discomfort wears off. It is not so, however, when a child is being treated with a Scarpa's shoe; in that case the improvement is obtained chiefly through the localised pressure of narrow straps, a pressure which creates a constant irritation. With the gypsum bandage the pressure is evenly distributed along the foot in the over-corrected position. When the gypsum splints are applied, the end of the sock should be cut off, so that the mother or nurse may be able to watch the colour of the toes. If they become dusky, or be constantly cold, the casing must be removed and the child brought for inspection and probably for further adjustment. The plaster-of-Paris method enables one to treat the club foot of a tender infant with security and success, and without the expense of a mechanical apparatus requiring daily attention and, even then, occasionally making the skin sore. Thus children may be dealt with in the out-patient department of a hospital, or in the outlying districts of a country practice, with as much convenience and success as if they were inmates of a hospital. An important matter in applying the splint is to

see that when the foot is being twisted into position the thumb or fingers are not indenting it.

Tenotomy.—If after some weeks of the manipulative and plaster-of-Paris treatment there remain considerable inversion of the sole and some drawing up of the imperfectly-developed os calcis, tenotomy must be resorted to.

Hitherto it has been much the custom to advise that the inversion of the foot should be dealt with by the division of the tendons of the tibial muscles first, the elevation of the heel being attended to at a subsequent period. The reason of this separation of the treatment into two regular steps was that the heel might be left as a fixed point from which the transverse working of the mechanical shoe might be effected. Then when the fixation of the heel was no longer needed, the tendon of the Achilles was divided and the gradual flexion of the foot proceeded with.

With the use of plaster of Paris this practice gives place to the simpler one of dividing the tendon of Achilles to start with and then, with the employment of some force, of bringing the foot at once into position.

This large tendon is often the head and front of the offending and, having contracted to the utmost in drawing up the heel, it has obtained a still farther shortening by twisting the os calcis inwards on its antero-posterior axis; its section reduces, if it does not efface, each element of the deformity. Several times it has happened, when speculating as to which tendons would require division, to find all inversion disappear on section of the large heel-tendon.

For division of the Achilles tendon simply, it is not imperative that an anæsthetic be administered; the tissues implicated are not highly sensitive. But if the child be frightened, or the tendon not perfectly accessible, or if the foot is to be at the same time forcibly wrenched in position, chloroform should be given.

The region of the proposed operation having been cleansed, the child should be laid prone; the nurse steadying the body and arms, whilst an assistant takes firm hold of the one leg and prevents the other from interfering with the operation. Then the surgeon flexes the foot and seeks out the most slender part of the tendon, which is a little above its insertion.

If the child be small the foot may be flexed with the left hand whilst tenotomy is performed with the right, the strain on the heel tendon being diminished as the knife passes through, so that the edge does not complete the section with a jump and wound the skin; but to render this contingency still less likely, the tip of the left index finger should be kept on guard over the skin at the line of section.

It is better not to introduce the knife between the skin and the tendon, lest, after the section, the edge should suddenly come against the posterior tibial artery. When there is much deformity the tendon is likely to be close behind the artery.

Having ascertained that all the fibres of the tendon are divided, a small pad of dry lint is strapped over the puncture and secured with a few turns of a soft roller. The foot is then twisted into and fixed in an over-corrected position and immediately enclosed in the gypsum bandage. This is a great gain on the old method of waiting some days before straightening the foot. There need be no dread of failure of a firm fibrous splice connecting the ends of the severed tendon. It is different from the case of a tendon divided in its synovial sheath; then it is quite possible that the sundered ends may fail to be connected. But I have never known non-union to occur even after the widest separation of the ends of the Achilles tendon and even in operations upon paralytic feet. The foot, therefore, should be unhesitatingly fixed up in the over-corrected position, care being taken that no padding be thrust in between the divided ends of the tendon.

If the deformity do not yield to simple Achilles-tenotomy, all resisting structures must be freely divided in the sole. The old treatment consisted chiefly in tenotomy and in the stretching of obstinate ligaments and fasciæ; the modern one demands section not only of tendons, but of ligaments, fasciæ and all tight bands; forcible rectification and subsequent manipulations and frictions. The short bands which are mostly in need of section are at the front of the internal lateral ligament of the ankle and at the astragalo-scaphoid joint. They, together with the insertion of the tibialis posticus, the abductor, and the long flexor of the great toe, may, in the ordinary run of cases, be effectually dealt with

subcutaneously, the foot being then fixed in lateral gypsum splints in an over-corrected position.

But if the deformity is severe, or if it has relapsed, it may be found that the undivided skin offers an effectual impediment to the correction. In such a case the open operation of A. M. Phelps, of New York,* may be resorted to. Subcutaneous tenotomy in the treatment of severe and of relapsed cases is rapidly making way for this more thorough method of treatment, and the old operation of tenotomy of the tibial tendon above the ankle is now practically discarded.

The open operation.—The child being in good health, and the foot being thoroughly cleansed, the tendon of Achilles is divided and, by vigorous manipulation, the heel is brought down to the utmost. A vertical incision is then made with a small scalpel from dorsum to sole between the tip of the internal malleolus and the tuberosity of the scaphoid. This passes over the head of the astragalus and, dividing the anterior part of the internal ligament, opens up the astragalo-scaphoid joint. In the lower part of the wound the plantar fascia, abductor hallucis, and tibialis posticus are cut. Then more force is applied and probably the tendon of flexor longus digitorum is found awaiting division. By the help of more forcible manipulation, the foot becomes farther straightened out and the scaphoid must needs be pulled forwards from the astragalus, the astragalo-scaphoid joint being left wide open. Placing the end of the finger in this joint, the surgeon may distinctly feel the fibres of the inferior calcaneo-scaphoid ligament maintaining some deformity. When these have been divided, some of the inner fibres of the calcaneo-cuboid ligaments may be found to want a touch of the scalpel. In short, every structure which prevents the full and unobstructed straightening of the foot and, indeed, an over-correction, must be cut.

When the bleeding has been controlled—and it is usually quite insignificant—the wound and the foot are washed over with a warm mercuric solution (1 in 5,000), the yawning incision is gently stuffed, the foot is enveloped with sterilised gauze, and the foot and ankle and the lower part of the leg are enclosed in a flannel bandage. Two lateral splints

* See Trans. Med. Chirurg. Soc., 1893.

of common house-flannel are then soaked in creamy plaster of Paris, and are firmly and evenly applied under a gauze bandage. During their application and hardening, the foot is held in the over-corrected position, good heed being given that the plaster casing is not dented in by any uneven pressure of thumb or fingers. The toes are left uncovered for inspection, so that prompt information of obstructed circulation might be obtained.

In some of my earliest operations I was apprehensive lest the anterior segment of the foot might show signs of gangrene, not only because of its being rigidly confined in the gypsum casing, but because of the depth of the wound which traversed the tissues from dorsum to sole. Practice, however, has shown such fears to be groundless. The casing, though rigid, is not actually tight, and although the internal plantar artery may be cut in the operation, the dorsalis pedis and the external plantar artery, which are of far greater anatomical importance, run no chance of being injured. But small though the internal plantar artery is, it may sometimes be recognised in the progress of the operation and avoided. The child suffers but little distress after the operation, and on one occasion only did a house surgeon deem it advisable to remove the dressings to examine the foot. In that particular instance the toes had become blue and cold; a fresh casing was at once applied and everything went well.

As a rule, the first dressing is done at the end of ten days or a fortnight. The casing is opened out, the bandages are cut up, and the sterilised gauze, already loosened by a little aseptic discharge, is lifted out of the wound, the surface and depths of which are thickly covered with healthy granulations. The foot is then washed and lightly dressed as before and again secured in plaster of Paris. In seven or eight weeks the wound is healed and the treatment by manipulation and massage is entered upon.

The necessity of resorting to a tarsectomy in conjunction with the open operation, in the case of children, must be very rare. In certain cases Phelps completed the open operation by dividing the neck of the astragalus, or by removing a wedge from the outer side of the os calcis. I do not think that section of the neck of the astragalus can give much

advantage over the insertion of a thick wedge of space into the astragalo-scapoid joint. And if one is too ready to excise a piece of the os calcis there will be a risk of obtaining an improved position of the foot by the shortening of its outer border, rather than by the lengthening of the inner border. But in the case of children, the simple and thoroughly free incision on the inner side of the foot is sufficient. And if the results of treatment by lengthening the inner border of the foot can eventually be shown to be equal to those following the removal of a wedge of bone from the outer border, preference may surely be claimed for the simpler method. My own experience is that they are far superior.

A few days after operating, or as soon as is thought advisable, the child may be allowed to walk about in his plaster casings; if the plaster breaks and softens it is not necessary to apply fresh, for as he is getting about on his flat feet, relapse is impossible. Indeed, if the operation has been thoroughly done, there is no strain on any tissue and there is nothing to cause relapse.

When the foot is placed in the corrected position there is a large ruck of skin upon the outer parts of the dorsum which, following Kellock's suggestion, may be conveniently raised in a large flap, and left for five or six days attached by each end, the edges of the dorsal wound being brought together beneath it. This flap is eventually detached from its lower end and transplanted into the granulating wound on the inner side of the foot.

The more I see of the open operation the more pleased I am with it; it is so much better to divide the tendon of the tibialis posticus, for instance, where it can be seen and felt, than, in a somewhat speculative manner, as it runs near the artery above the ankle. By the open method nothing is cut in the dark and there is no large artery in the way of the knife. Such an extensive operation could not have been done with safety in the pre-Listerian days, but now a careful surgeon can undertake it without apprehension.

Partial excision of the tarsus in the treatment of club foot is seldom needed in childhood. With plaster of Paris, after free employment of the knife, the most extreme

deformity of childhood can be greatly improved, even if it cannot always be entirely removed.

Of the various operations I would give preference to that of Mr. Lund, who enucleates the astragalus, and allows the upper surface of the os calcis to ascend between the malleoli, where, in due course, an excellent joint becomes established.

The subject of **talipes equinus** scarcely requires separate consideration after what has been already said of it in its association with inversion of the foot.

Slight talipes calcaneus, which as a congenital affection is exceedingly rare, can, as a rule, be corrected in infancy by systematic frictions and manipulations carried out by the nurse. If the deformity prove obstinate, the foot might be straightened out under chloroform and fixed in the extended position in plaster of Paris. Subcutaneous division of the tendons at the front of the ankle is little likely to be called for.

Paralytic calcaneus may be treated by excision of half or three-quarters of an inch of the elongated tendon of Achilles.* The ends should be cut obliquely and sutured splice-wise. When the whole of the calf muscles have undergone fatty degeneration, however, little benefit can be expected from the operation.

Talipes valgus, as a congenital defect, is rare. If the deformity cannot be cured by frictions and manipulations, nor by the methodical employment of plaster of Paris, it might be necessary to divide the peroneal tendons. But if the treatment with plaster of Paris be begun early, it is unlikely that tenotomy will be required.

Pes cavus, or *hollow club foot*, is a secondary deformity to talipes equinus and, according to Parkin, is due to the toe-walker trying to bring down the heel for increased support. It is not associated with extreme equinus, for all attempts to arch down the heel are then hopeless.

Case.—As the boy from whom Fig. 116 was made walked, the chief part of his weight was received by the ball of the great toe, where the integument was thickened, inflamed and tender. He could not get his heel to the ground. A long walk made him tired, sore and lame. The instep was highly

* *Brit. Med. Journal*, 1884, pp. 1058 and 1147.

arched, and the muscles of the sole of the foot were so thinly spread out beneath it as to suggest the idea that the deformity might be associated with their paralysis; but they responded in electrical examination and their substance could be made out when they were thrown into action. The plantar fascia was contracted. The heel was drawn up. The great toe, as constantly happens in talipes equinus, was in the position of dorsal extension. But on flexing the foot to the utmost,

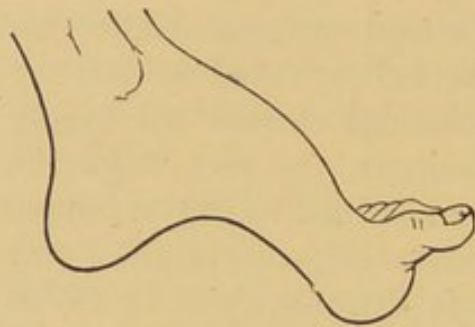


Fig. 116.—Pes Cavus, secondary to talipes equinus.

and so slackening the extensor proprius hallucis, the digit came down to its proper level. Then, on again extending the foot, the first phalanx was well-nigh completely dislocated on to the back of the head of the first metatarsal bone, as shown in Fig. 116.

Treatment.—The tendon of Achilles and the plantar fascia were divided, and the foot was vigorously flexed, and then enclosed in lateral splints of plaster of Paris, in a greatly improved position. After about ten days the casing was taken off and a course of massage adopted. The result proved highly satisfactory; the boy was able to run and walk without any of his old trouble. When he was seen after some weeks of exercise, the skin beneath the head of the first metatarsal bone was no longer tender. But I must confess that subsequent experience of operations in like cases has not always been equally satisfactory. However, in every case the heel tendon must be divided and the foot wrenched into and fixed in an improved position, and, if necessary, the plantar fascia and other structures must be freely divided and the foot wrenched into a better shape.

Is the talipes congenital or paralytic?—If the mother affirms that the condition was noticed within a few days of birth, the question is answered, but the statement of the child or of some friend that it has “always been so” is not worth attention. In the congenital defect the muscles and the legs are often well developed and the legs are warm; but it often happens that in congenital club foot the legs are

spindle-like and chilly. Actual size of the limb, therefore, is not a sure guide. If the child can be made to move its toes and feet the case is not a paralytic one. Imperfect development of the thigh as well as of the leg points to paralysis, and in any case of doubt the normal reaction of the muscles to electrical examination confirms the diagnosis of the congenital defect.

Talipes equinus is a paralytic effect, and paralytic equinovarus is never so marked as is the congenital variety; moreover, in the former condition the limb is often flail-like and cold. The variety of talipes assumed by the paralysed foot is due partly to contraction of unopposed muscles, partly to shortening of paralysed muscles, and partly to the natural inclination of the paralysed foot, assisted in many cases by the pressure of the bed-clothes.

In many cases of **lameness** without apparent cause, the error is due to slight talipes equinus, and it is very apt to be overlooked. When a child walks badly and limps without evident reason, he should be stripped and laid flat on his back on a firm bed, and the presence of hip disease excluded. The knees and ankles are examined and the equality of the limbs tested; the points of the heels are placed together on an even surface—such as a book—and it is seen if the feet are of exactly the same length. Then it is noticed if the feet are capable of an equal amount of flexion upon the leg. In each case the angle at the front of the ankle should be reducible to somewhat less than 90° , whilst the knee is extended.

If one ankle yield less than the normal amount, the probability is that there is contracture in the calf muscles, in which case the circumference of the leg will be less than on the sound side. The amount of the difference in the development of the two legs may be nicely estimated by encircling the calves in the grasp of the fingers and thumb. In all cases of raised heel, the tip of the sole of the boot will be used up before the rest shows signs of wear. If the child be made to stand upon the table, and told to bear his weight evenly upon the two feet, the knees being straight, it will be found that a sheet of paper can be slipped in beneath the imperfectly developed heel.

The limping may entirely disappear after section of the

tendon of Achilles. To treat it by simply increasing the thickness of the heel of the boot is to obtain but specious relief, and to prevent the proper development of the heel, the foot, and the entire limb.

Deformity as the result of infantile paralysis may often be improved, up to a certain point, by operative measures which comprise the removal of the articular cartilage from



Fig. 117 —Splay feet, from Paralysis of Inner Tibial Muscles.

the elbow, knee, or ankle, so as to render a useless joint solidly fixed, and so that the lower part of the limb may thus be placed under the control of muscles like the deltoid, triceps, and biceps—ilio-psoas and glutei—which have retained all, or most of their vigour. Possibly, after thus getting the tibia synostosed and in a straight line with the femur, the tender and useless foot may be advantageously removed by Syme's method, the natural peg limb being afterwards furnished with an artificial foot. A hopeless flail-limb is often best treated by amputation through the thigh. (*See "Arthrodesis,"* page 166.)

A paralytic limb, however, does not lend itself to highly successful treatment. When the leg, for instance, is affected, it is wasted and cold, and the skin is liable to patchy congestion and ulcerations. The deformity after paralysis is due to permanent shortening of the affected muscles or to unopposed contraction of the opposite group; the foot is extended or inverted, perhaps both; horny patches may be formed upon the skin, wherever unequal pressure is received; the child swings the foot in a characteristic manner. He may even walk on the dorsum of the foot. The elevation of the heel after infantile paralysis is due to an atrophic shortening of the unopposed muscles rather than to a physiological contraction.

If the muscles on the front the leg be paralysed, so that the posterior group are unopposed in their action upon the extension and inversion of the foot, the tendons may be dealt

with as for a congenital defect (page 470); in this way a splice is put into the tendon, and the acquisition of the normal position becomes possible. The foot is then fixed at a right angle.

Case.—A girl of about nine or ten, with extreme talipes equinus of each foot, the result of infantile paralysis, had for years walked only on the tips of her toes, but soon after the division of the tendons she walked flat and well. No india-rubber springs or strappings could have accomplished such results, even if the enfeebled skin could have borne their pressure. If a foot is to be comparatively useless, at least let it be so in as nearly the normal position as possible. A thickened sole and heel are generally needed in these cases.

Inversion of the foot may be due to the presence of a sore about the ball of the great toe. If the sore be not cured, it is likely that the muscles on the inner side of the ankle will in time shorten and produce uncomplicated talipes varus. I have recently had under treatment a boy with a little toe which was so badly deformed and so sore that, in order to avoid hurting it, he walked persistently upon the inner border of the foot, and thereby acquired spurious talipes valgus.

Hammer toe is a congenital deformity, and is probably caused by a shortness and rigidity of the plantar ligaments at the first inter-phalangeal joint; the first phalanx (generally of the second toe) is raised, the second phalanx being bent down again, so that the first inter-phalangeal joint presents a stiff and salient angle upwards, which in due course becomes marked by an inflamed corn. In early childhood the digit may be permanently straightened out by persistent manipulations by the nurse; or by weaving a strip of adhesive plaister over the hammer toe and under its neighbours, arranging it so that it keeps the toes on the same plane. If the toe be still unmanageable, a digitate steel plate with a strap for each toe may be worn under the sole of the foot night and day, a specially large boot being made. The plantar fibres of the lateral ligaments are usually too short, so that the head of the phalanx is rigidly fixed in its elevated position. The best treatment for a severe case consists in excision of the head of the first phalanx. Amputation of the toe has the serious

disadvantage that it is likely to be followed by hallux valgus and bunion.

Flat foot.—All the structures supporting the tarsal arches are relaxed—the muscles and tendons of the leg and foot, and the plantar fascia and ligaments; so the astragalus sinks inwards and the foot is splayed outwards. The feet ache, and the child complains of pains in the legs.

It is in vain that the instep of the flat-footed child is surrounded with a strap, or the ankle encumbered by an iron support; such measures are often carried on with serious expense, and abandoned in disappointment. Perhaps the child is altogether out of health, and requiring change of air, and other tonics; or he may be standing too much at school or work, or frequently carrying weights too heavy for him.

In the case of the flat-footed girl it may be found that there is a heavy baby or young child that she is constantly carrying; or she may be standing through many hours at her usual work, or walking a long distance to and from it daily, perhaps carrying a heavy parcel. The boots should be examined; possibly they have high heels and narrow toes; such heels give no fair support and allow the foot to fall inwards and to receive unequal strain. Flat foot is often associated with obscure pains along the front or back of the leg; I have known them treated for "rheumatism." Flat feet may result from infantile paralysis of the posterior tibial muscles, the legs being much wasted along the inner aspect (Fig. 117).

Treatment.—The feet must have rest and be fairly shod; old and badly fitting boots should be discarded. Frictions and shampoos, rubbings and kneadings, are to be methodically carried out; the child must be taught to exercise the enfeebled muscles, so as to impart to them renewed strength. He should also be shown how to cause the tibialis anticus and posticus, and the flexors of the toes, to contract until the inner border of the foot can be drawn up at will, and until at last he can, in standing, support his whole weight on the outer side of the foot, with the heel raised. Skipping-rope exercises are good, as they keep the child constantly on his toes, and so strengthen the muscles of the calves and feet. Cycle-riding, with the anterior part of the foot working the pedal, is excellent exercise, for it keeps the weight

off the feet and imparts strength to the muscles. He should be made to walk about on the outer border of the feet. This exercise should be done morning, noon and night; after a short time, when improvement becomes evident, the boy will take interest and pleasure in it. When these gymnastic exercises are earnestly and patiently carried out and are supplemented with daily massage of the muscles, improvement is sure to follow, provided that the giving way of the arch is not due to infantile paralysis.

The boots should be after Thomas's pattern, with the heel and sole raised all along the inner side, as shown in Fig. 118. The inner border of the heel and sole are made to form a continuous surface. This design is much more efficacious than that of raising the instep by a pad of leather or cork, or a steel spring, placed inside the boot; the weight of the body should not be received through the weak inner border of the foot, but along the solid outer border, by arranging the heel and sole along the inner side, after the manner of the thick part of a wedge. A bootmaker who has a little common-sense, and will do exactly what he is told, can thus, in the course of an hour, convert a pair of boots or shoes into the most efficacious "supports"; unfortunately, however, the bootmaker usually believes that he knows a more excellent way. A grown boy may object at first to the appearance of the wedge-soled boots or shoes (for shoes do as well), but he soon finds great comfort from them and gets to like them. As he improves, the low heel-end of the wedge may be separated from the sole part; but still, for a long while, the inner side of the heel should be carried well forward under the instep, so that the effect of the wedge may continue.

Seeing how, with careful supervision and attention, children grow out of their flat-footedness, the propriety of performing any cutting operation on bones or tendons need rarely be contemplated. The forcible manipulation of the foot under an anæsthetic is hardly likely to be required, nor is the more serious operation practised with success in the

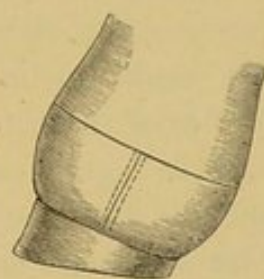


Fig. 118.—Heel of right boot for Flat Foot.

adult by Ogston, of pegging together the freshened surface of the astragalus and scaphoid bone. If, however, the deformity be so severe and intractable as to demand heroic measures, the wrenching and inversion of the foot (under chloroform), the thrusting up of the astragalus, and the subsequent enclosure of the foot in the over-corrected and adducted position in plaster of Paris is the preferable operation. This energetic treatment causes very slight discomfort, and often gives excellent results. On leaving off the gypsum, the special boot, as designed above, must be worn, raising the inner border of the foot.

Flat feet and weak ankles are often associated in feeble children, but sometimes they occur in children who are in every other way strong and flourishing. Most infants have the weakness in some degree, but it is only when they begin to "find their feet" that the defect attracts attention. The "ankle" gives way upon the inner side, much as it does in an awkward boy who is making his first attempt at skating. The weakness is, for the most part, at the astragalo-scaphoid and calcaneo-cuboid joints; it is a popular error to locate the deformity in the tibio-tarsal joint. The condition is not serious, but if the surgeon make too light of it the mother will be apt to go elsewhere for assistance, perhaps to a "bone-setter."

Treatment.—The child must be taken off his feet. Perhaps it is a first-born, and the mother is too anxious about his physical development, and is unconsciously overtaking the strength of the tarsal arches and ankle joint. All this should be stopped, and the feet must have a complete rest; also proper diet and tonics must be prescribed. The ill-nourished and rickety child, too, with a heavy trunk, flabby limbs, a large head, and weak bones and ligaments, is very apt to "tread over."

To the foot and ankle strength may be directly imparted by shampooing. Sea salt may be dissolved in the bath water. This water may be used warm at night, and cold or tepid in the morning. The parts should be well dried and rubbed in the direction of the return circulation, and warmly covered in worsted socks. The feet and legs should never be allowed to get cold. If they become so during the night, the child

should sleep in wool socks; or a hot bottle, or a warm brick wrapped in flannel, may be tucked in at the foot of the cot. High heels are bad, as are, of course, tight garters. The mother will probably ask if, for the sake of the extra support, lace boots are advisable. The slight support which they afford is often at the risk of retarding free circulation; to admit the support may be to suggest to the mother or nurse that, with it, the recourse to the other measure is, after all, not essential, and this would be extremely unfortunate.

Hallux Rigidus.—Sometimes in young, flat-footed people the great toe is stiff, flexed, and painful. Improved boots should be ordered and massage tried, but in all probability the troublesome condition will yield to nothing short of resection of the head of the first metatarsal bone.

CHAPTER XXXV.

DISEASES OF THE FOOT.

LIKE the vertebræ, the tarsal bones consist almost entirely of spongy tissue ; they are much exposed to injury and, therefore, to tuberculous inflammation. They are, moreover, separated by folds of synovial membrane which are ready to become inflamed from any strain or blow. The child complains of his foot "hurting" or "aching," and at first there may be no local indication of disease ; but the parts soon become swollen and, perhaps, the skin grows dusky. In due course an abscess forms and is incised, or, effecting its own discharge, an indolent sinus remains, from which a thin fluid is constantly oozing. The skin-opening is in time encircled with a ring of unhealthy granulations and becomes adherent to the subjacent tissues, even to the bones. Probing such a sinus distresses the child and, as it is already obvious that diseased bone exists in the depths, the probe affords no fresh information. Nor is it necessary that the surgeon inquire too closely as to which bone or joint is specially diseased. The information can be only obtained at the expense of harmful examination and will in no way alter the treatment. At last the rarefying osteitis destroys the tissue invaded and nothing remains but the thin shell of compact bone filled with granulation-tissue. Chronic inflammatory disease of the foot, whether started by a definite injury or not, is tuberculous.

The *astragalo-scaphoid* joint is, on account of its size and range of movement, specially apt to be attacked, and the astragalus being invaded, there is a great risk of the disease extending to the ankle joint. Indeed, in whatever part of the tarsus the inflammation may arise, it is apt to ignore all anatomical boundaries and, gradually spreading from

joint to joint and bone to bone, to involve the whole foot. (See also page 461.)

The *treatment* should be prompt and thorough. The foot, ankle, and lower half of the leg should be enclosed in lateral leather splints or gypsum; and for a short time, if only to impress the child with the need for care, he should be kept in bed, with the foot raised on a pillow. No counter-irritation or local application of any kind, beyond the dry compression just described, is required. If the child can be trusted, he may be allowed to go about in a Thomas's knee-splint, with a high boot or patten on the sound foot, as shown in Fig 114.

The general treatment will be upon the lines laid down on page 462, whilst "masterly inactivity" generally may characterise the successful treatment of the diseased tissues. It is surprising how much may be gained by complete rest in these cases, even if sinuses have already formed. Contemporary surgery has grown impatient. I feel sure that in the case of chronic disease of carpus and tarsus the desire to "do something" is often a mistake. Still, when prolonged and patient treatment has proved inefficient, free scraping, or partial excision of the tarsus may be resorted to. If this also fail, the sooner Syme's amputation is resorted to the better.

Central necrosis of the os calcis is a somewhat common disease. The acute osteitis, which determines the limited necrosis is often the sequel of one of the fevers or of injury, being, thus, the result of septic or tuberculous invasion (see page 364.) At first the redness and swelling are confined chiefly to the back of the foot, but in due course the neighbourhood of the ankle becomes swollen. If there be doubt as to the exact seat of the disease, an exploratory incision should unhesitatingly be made into the os calcis, when, a sequestrum having been extracted, the disease may clear away and the foot may be saved. The sequestrum is likely to be found loose in a bed of granulation-tissue. It is best reached from the outer side (Fig. 119).

Here is a typical report of septic necrosis of the os calcis:—A boy, $7\frac{1}{2}$ years of age, was admitted to the Children's Hospital, November, 1896. His mother said that he

had "rheumatic fever" in the previous December. After this so-called rheumatic fever—which was in all probability a severe attack of pyæmic osteitis—an abscess formed over the lower end of the left ulna; for fourteen weeks the child had been in a country hospital. The right leg was swollen, and there were sinuses leading down to the necrosed tibia, which was surrounded by an involucrum. Another sinus existed over the right os calcis, through which a probe could be passed to bare bone. The lower third of the left tibia and the left ulna were also necrosed. After the removal of the sequestra from the long bones, the opening into the os calcis was enlarged and a sequestrum the size of a pea was extracted from the interior. The boy's general condition greatly improved, all the wounds filling up with healthy tissue; but

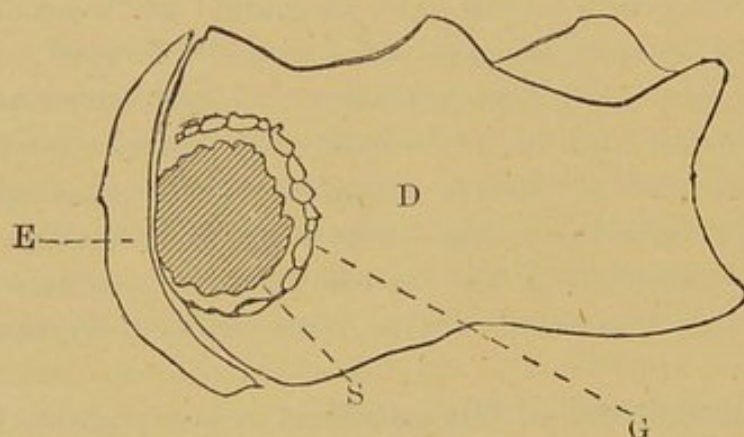


Fig. 119.—Diagrammatic enlargement to show central necrosis of os calcis. D, Diaphysis of os calcis; E, Epiphysis; G, Wall of granulation-tissue lining cavity; s, Sequestrum.

at the date of the last note (December 3rd, 1896) he was still in hospital.

Throughout childhood the os calcis consists of a diaphysis of spongy bone, with a cartilaginous epiphysis at the posterior surface. At the tenth year the epiphysis begins to ossify, and it becomes fused with the rest of the bone just after puberty. If the boy happen to have the heel struck, or otherwise hurt, the vitality of the delicate tissue at the growing end of the diaphysis is lowered. And if there are staphylococci circulating in the blood they may cause a localised thrombosis and necrosis. The heel then becomes

tender, red, and hot; after a time the acute symptoms subside. The dead portion of the diaphysis determines a growth of granulation-tissue in the surrounding bone, and in due course the pea-like sequestrum lies loose in a suppurating cavity walled in with granulations. If the case be allowed to drift on, nature may arrange for the extrusion of the sequestrum by forming an abscess on the inner or outer side of the calcaneum. But sometimes she clears an upward track for the evacuation through the astragalo-calcanean articulation, involving, maybe, a wreckage of the ankle joint itself.

If after the operation the case do not progress, the indolent tissue may be improved by scraping with a Volkmann spoon. Excision may prove extremely satisfactory. The excision is best performed by turning forwards all the soft parts from beneath the heel.

But if many tedious months of expectant treatment hold out no hope of recovery, the supervision having been thorough, and the surroundings the best obtainable in the circumstances; if the boy be going backwards rather than improving, the question of amputation must be considered. But, seeing what can be effected by time and rest, it is well that Syme's amputation be not hastily resorted to.

The **metatarsus** is often associated with the tarsus in tuberculous disease; sometimes one or more of these long bones are affected whilst the tarsus remains apparently sound. The remarks made concerning the treatment of tarsal disease apply also to the disease of the fore part of the foot.

Chilblains are inflamed patches of skin produced by cold. They are met with chiefly on the feet and hands, as these parts are far removed from the centre of circulation; they may also appear upon the ears or nose. They are less apt to occur in bright, frosty weather than in the thaw which follows. Girls suffer from them more than boys, as their circulation is less vigorous, and they are not generally accustomed to keep it brisk in cold weather by exercise. The local inflammation is caused by paralysis of the capillaries, exudation taking place into the substance of the cutis. Tuberculous children are very liable to chilblains, as their tissues are feeble and their circulation is languid.

Three stages mark the progress of a chilblain—first, the skin is a little swollen and red. This is associated with itching, which becomes intolerable when the child gets warm in bed, keeping her restless and awake. By day the warmth of the fire, or that produced by frictions or exercise, increases the irritability, and the child can hardly keep from rubbing or scratching the burning place. In the second stage serum oozes from the engorged vessels, throwing up the epidermis into vesicles or blebs. The adjoining skin is dusky on account of venous engorgement. In the third stage the blood-stained serum has escaped from the bleb, and the purple skin is ulcerated or gangrenous. The chilblain is then spoken of as “broken.”

Treatment.—Much care should be given to the maintenance of the general health, and for this purpose cod-liver oil, iron, and other tonics may be duly administered, such as a small glass of port wine at lunch or dinner.

Every day, and twice a day, if expedient, the child should go out of doors for a brisk walk. She should wear strong, easy boots, and thick worsted stockings; also a flannel vest up to the neck and long in the sleeves, and flannel drawers or “combinations,” and she should sleep in a flannel night-dress and bed-socks. Boots and stockings should be changed after the walk, and they should always be put on dry and warm. The boot should have an inner sole of cork. A tight boot is harmful in that it impedes the cutaneous circulation; and a high heel crowds the toes together into the front of the boot. The child should not be allowed to sit long with the feet hanging down.

The hands should be covered in loose gloves, which are enclosed in worsted mittens, or are lined with fur. When the hands or feet are benumbed with cold, their warmth should be restored by friction; they should not be warmed at the fire. The attempt to improve a child's languid circulation by cold or barely tepid washings, is absolutely wrong: chilly water depresses her feeble circulation. The hands and feet should be washed in quite warm water, and then carefully rubbed with a warm, dry towel.

In the first stage, friction with the hand may do good by restoring circulation in the reddened area, and liniments

may be tried. Probably it matters little as to what the ingredient of the stimulating embrocation may be: the linimentum camphoræ co. is much used, either alone or in combination. Rubbing the skin with snow is a favourite and efficient means of exciting the circulation of cold hands and feet.

In the later stages, frictions and liniments are out of place, but Friar's balsam may be painted over the raw surfaces. Cocaine, in solution, may give relief. As sloughs loosen, a small piece of lint soaked in dilute carbolic acid lotion may be applied under a rather larger piece of oil-silk. In these circumstances exercise cannot be taken, nor ordinary shoes worn.

When the heel is the seat of chilblain, it must be freed from pressure of the boot by cutting away the upper leather down to the level of the heel of the boot, the gap being filled in by a piece of soft black kid. The sores about the heel may give rise to much suffering. They may be dressed with Friar's balsam, vaseline and eucalyptus, or, as remarked above, with a solution of cocaine.

Juvenile gangrene, Raynaud's disease, is a symmetrical gangrene of the fingers, toes, or other parts, which is especially apt to occur during cold weather. The cause is probably spasmodic contraction of the arterioles, so that the distant tissues receive an insufficient supply of blood; the disease is, therefore, sometimes called *local asphyxia*. The gangrene is preceded by coldness, the skin being either blanched or dusky, and the tissues painful. It may be associated with hæmaturia. The affected part becomes livid, and then black; the epidermis is raised in blebs, from which ill-smelling serum oozes. There is much constitutional depression, from which, or from some form of septicæmia, the child may sink.

The part should be dusted with boracic acid, and wrapped in cotton-wool. There should be no rash interference in the way of cauterisation or amputation; a line of demarcation must be patiently awaited. In the meanwhile, everything must be done to improve the general health and vigour of the child. The temperature of the room must be kept up, warm clothes supplied, and iron and quinine prescribed. According

to Raynaud, the constant current should be applied along the spine.

In tuberculous and unhealthy children the vesicles of chicken-pox are apt to be attacked with localised mortification, the disease being termed **varicella gangrenosa**. The miserable children must be removed from their unhealthy surroundings and treated on general principles.

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