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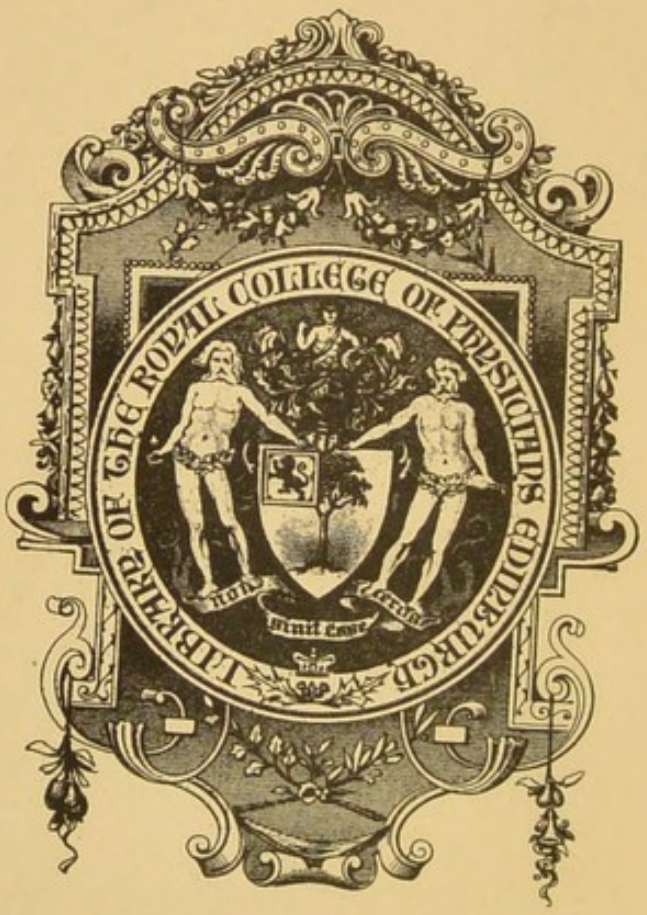
OPERATIONS OF GENERAL PRACTICE

EDRED M. CORNER
H. IRVING PINCHES

OXFORD MEDICAL PUBLICATIONS



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THE OPERATIONS OF GENERAL PRACTICE

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OXFORD MEDICAL PUBLICATIONS

THE OPERATIONS OF GENERAL PRACTICE

BY

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PREFACE

In this work we have attempted to meet a deficiency in professional education. It is a great misfortune that only a very small number of students have the opportunity of holding a postgraduate appointment in a hospital of the first rank; and even if they obtain such an appointment, it only covers a small part of the ground which is the routine of general practice. In consequence, the education of the vast majority of medical men is very deficient in the practice and performance of the many small operations which lie so largely on the borderland between Medicine and Surgery, and which are done by the house officers in an Institution. These very procedures all practitioners are called upon to perform frequently. The larger books omit to describe the steps of such humble operations. Therefore, we have endeavoured to supply the want in this work; which doubtless contains matter which might have been omitted and may not contain all which it should.

The ground covered by these elementary operations is a very important one; because the man who obtains a capable grasp of their technique will have laid a sure foundation for larger and more extended surgical work in the future. Most operative surgery is easy when the operator has mastered the technique

of surgical cleanliness and has some opportunity of practising the art. In describing these humble operations we have attempted to make clear the principles of the science of surgery which underlie the performance of its art. Thus, we hope that its perusal will assist those who have not had the opportunity of holding adequate house appointments, to make good the unavoidable deficiency in their education. To attain this end we have prepared a large number of illustrations of the various steps of the operations which have been taken for granted or overlooked amongst the greater details of textbooks and hospital life.

To keep the work within moderate bounds any discussion of alternative methods has been avoided, which must give a somewhat dictatorial character to the book.

EDRED M. CORNER.

H. IRVING PINCHES.

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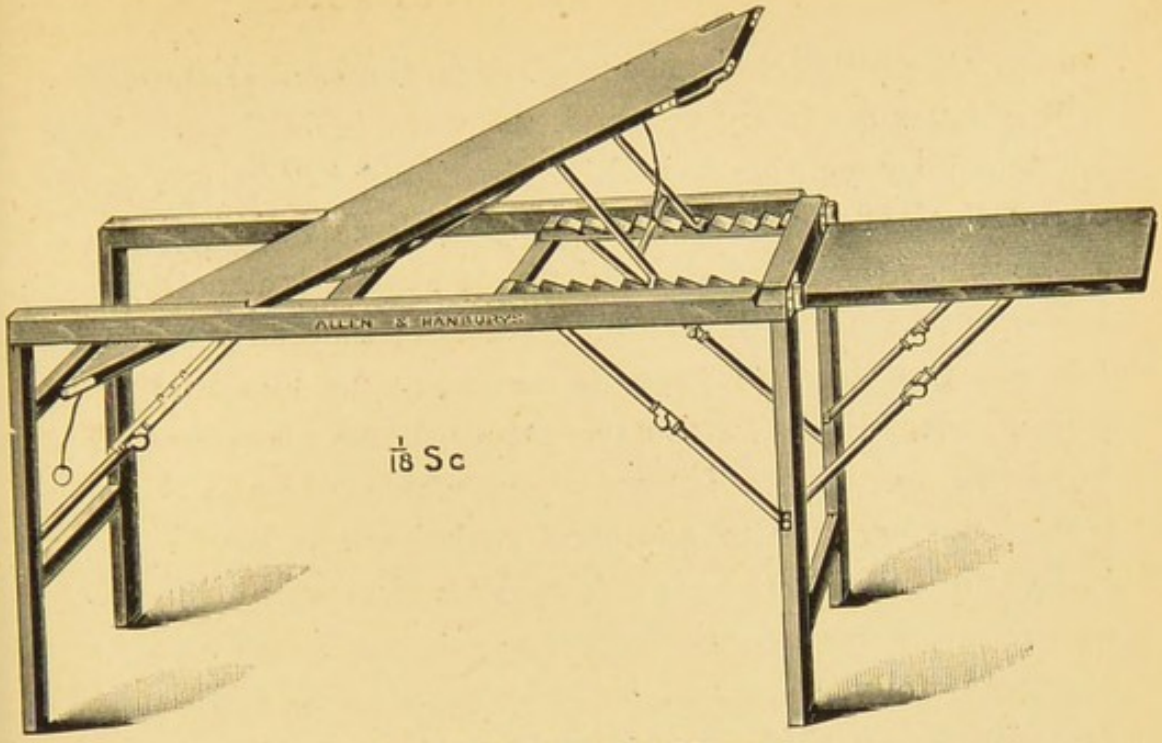


Fig. 1 *a*. Operation table, open.

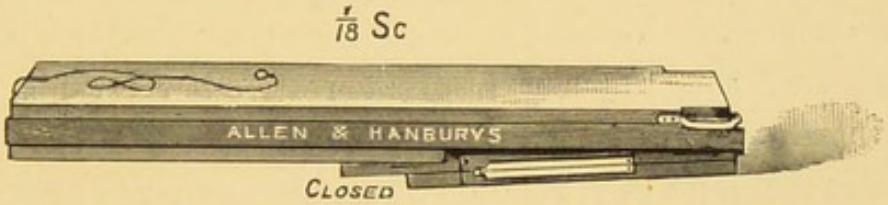


Fig. 1 *b*. Operation table, closed.

CHAPTER I

GENERAL

INTRODUCTION

It is not the intention of the authors to attempt in this small work a description of all the operations which the general practitioner may be called upon to perform. Such operations fall into two categories: the one, in which the practitioner elects to operate, such as for tonsils and adenoids; the other, in which circumstances compel him to operate, such as for the strangulation of a hernia. Only the former will be considered in this book; the operations of the latter class being described in works on operative surgery. In these

works little attention has been given to the smaller operations which are voluntarily undertaken by the practitioner. It is intended, by considering these, to place within his reach a practical book; and, in keeping with this character, the authors have avoided discussions on alternative methods, as being apt to leave the reader in doubt; especially when he has not the constant practice necessary for him to become a surgical expert. In the past, the general practitioner did but little operating. The principles which underlie the successful performance of an operation have now been brought to light so fully, that he is able to undertake, with every hope of success, measures which a few years ago it would have appeared folly to attempt. The chief factor which has brought about this change has been the preaching of the gospel of surgical cleanliness. A surgeon, in his art, differs from an artisan in dealing with living and not dead structures; and this imposes a great restriction on his work; for whereas the dirtiest artisan may produce the best results, the surgeon must be scrupulously clean, even when performing the most trifling operation, for a small error in aseptic technique may cause results disastrous either to his work or, more rarely, to his patient's life. It is now recognized that three postulates must be satisfied for the greatest possible measure of success to be obtained from an operation. Firstly, the patient must supply 'good' tissues to be sutured or manipulated, this is the patient's factor; secondly, the surgeon must do his work well and by the most approved method, this is the surgeon's factor; thirdly, the wound must heal by first intention, this is the aseptic factor and concerns every one who has had anything to do with the operation, but particularly the surgeon. If these three postulates are satisfied, a patient has been placed under the best conditions for speedy recovery, having had conferred on him the greatest benefit he was capable of receiving. He could not attain to more. If the first and third are fulfilled, nature is very kindly in improving the second. So, if a practitioner can

make certain of the technique required by the third postulate, he can undertake many operations; for example, an ordinary appendicectomy requires this technique with a little special knowledge and skill in addition. In fact, if one ventures to predict, it is in the direction of clean operations such as those of appendicectomy, ovariotomy, radical cure of a hernia, &c., in which the work of the general practitioner will extend, because he can for all practical purposes guarantee a good result. But in all probability he will abstain from operating on cases of malignant disease because successful results are so few and far between. The work undertaken by a doctor in general practice is not decided by what he is capable of doing but by what he is willing to undertake. It is not worth his while to undertake anything which will not yield a successful result. He is not before a jury of experts who can say whether his work has been done properly or not; but his efforts are judged, and his livelihood gained, by the verdict of people who do not and cannot understand the intricacies of his art. Personal experience alone can tell a man what to touch and what to leave, and this experience can be gained only after leaving a hospital. This book has been written to assist him to undertake with success many of the smaller operations which he will elect to perform; and possibly, at the same time, it may pave the way for him to undertake some of the procedures described in the works on operative surgery. The establishment of small and cottage hospitals in the midst of every self-respecting community is an outward sign of the progress which the general practitioner is making; and the good work done in these indicates that he should have further facilities to enable him to draw a line between his possibilities and his limitations.

MINOR AND MAJOR SURGERY

In the eighties there was a fairly well-defined line drawn between what were called major and minor operations; and at that time the practical work of surgery was done

only by a few. With the advance of medical and surgical knowledge a better educated and more highly skilled practitioner has come into existence. At the beginning of his career he is prepared to do much surgery, but experience teaches him what he may safely undertake and from what he should abstain. In other words, he has learnt that it is not so much the question of operation as the question of policy which must determine his professional action. The subdivision of surgical work into major and minor operations has broken down; a practitioner may refuse to do a so-called minor operation and the next day perform a major one. The terminology makes such an action appear illogical and the man untrustworthy; the sooner these misleading terms are abandoned the better.

ASEPSIS AND ANTISEPSIS

When we speak of an aseptic operation, we mean that everything in connection with that operation has been rendered absolutely sterile and is used as such. This is undoubtedly the ideal condition, but we know that it is not obtainable for any length of time. For instance, the instruments are bound to be contaminated by air-borne organisms, and the skins of those participating in the operation must become infective by means of unconscious perspiration. It is a well-known and easily demonstrated fact that when talking a large number of organisms are expelled from the mouth; so of necessity wounds which have been open for a short time must be full of organisms, which, as such wounds generally heal by first intention, we know are practically harmless. The knowledge of the presence of such organisms has caused many surgeons to use certain chemicals from time to time during the operation; these chemicals are termed *antiseptics*, as they interfere with the growth of and perhaps kill the organisms. But it is equally obvious that these chemicals must affect the cells and tissues laid bare in the wound at the same time as they are acting on the micro-organisms. When leucocytes are

exposed to the action of antiseptics their phagocytic action is destroyed; so that antiseptics remove a powerful factor in the healing process. It would, therefore, seem best to take a middle course; antiseptics being used *before* an operation on a clean case but never *during* an operation. Nothing should be put into a wound which will impair the resisting power of its tissues; it may be *mechanically* cleansed by flushing gently with sterilized water or saline solution, but should never be *chemically* treated. The frequent use of chemicals for the hands makes them so rough and coarse that it is difficult or impossible to clean them; and any one with such hands is unfit to undertake an operation. We would urge that much reliance be placed in the use of soap and water, and little in the use of chemicals.

STERILIZATION

By sterilization is to be understood the production, not so much of the ideal aseptic condition as of the more practical state of superlative cleanliness, the most important part of which being the avoidance of all possible chances of contamination by contact with anything doubtful or unclean. As it is not possible to sterilize everything by the same method, it will be best to consider the various ways under special heads.

1. The *patient's skin* should be shaved for some distance around the site of operation; the razor is useful, not only to remove hair, but also any sebaceous material, epithelial debris, &c., such as collects in all places not exposed to constant washing and friction. Then the part should be well soaped and rubbed with water, this being done very thoroughly. For twelve hours before the operation the affected part should be covered with either a wet antiseptic compress or an antiseptic powder under a dry dressing. The wet dressing has the disadvantage of making the skin sodden; the dry dressing is much better because it keeps the skin in good condition, and the powder inhibits the growth of any organisms which are exuded from the glands by

unconscious perspiration. The part should always be 'washed up' again immediately before the operation and then well rubbed with methylated spirit. If the nail-brush is employed to cleanse the part, it should not be used too vigorously; light scrubbing is just as effective and does not damage the skin; in fact, a gauze 'sponge' is much better for the purpose.

2. The *hands of the surgeon, assistant, &c.* Too much stress cannot be laid on the necessity of keeping the hands and nails in good condition and, especially, of keeping them free habitually from the risk of contamination, as by the use of rubber gloves and dressing forceps in all dirty or doubtful

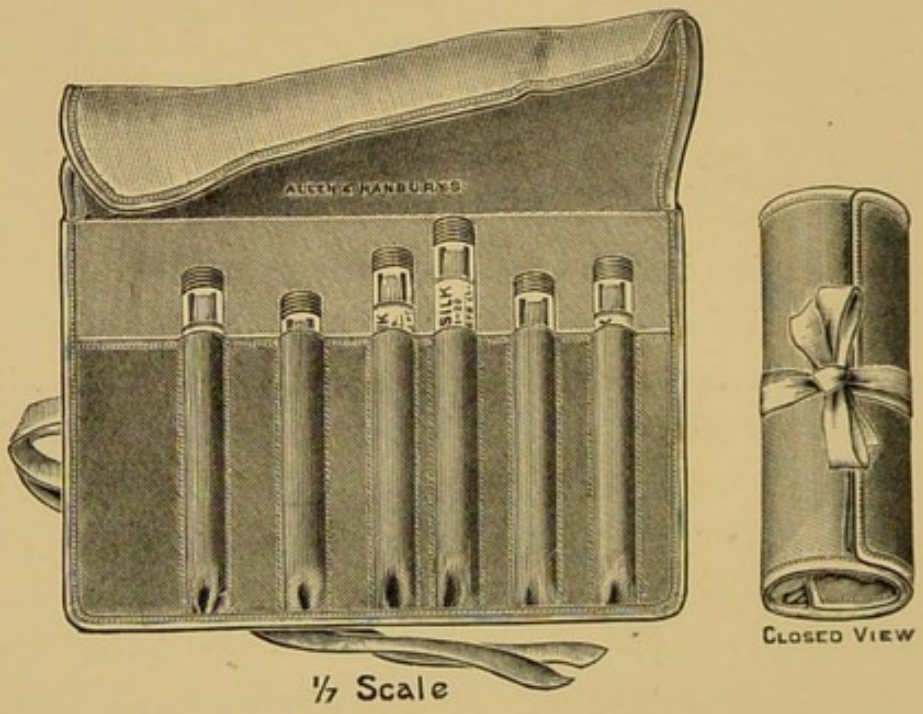


Fig. 2. Case for carrying stock of sutures.

cases. The hands (special attention being paid to the nails) and forearms must be well washed in soap and water; and then, if thought advisable, they can be soaked in an antiseptic solution. When the patient has been made ready, the hands must be washed again and rubbed with methylated spirit, immediately prior to making the incision.

3. *Ligatures and sutures.* Every one has his own method of preparing these. Most of the processes are laborious and, being wet, have the disadvantage of rotting the material, and rendering it unreliable. Silk is the material most frequently

used for ligatures and buried sutures; horsehair, silkworm gut or catgut for the skin. All of these, except the catgut, can be kept dry, wound on wooden slips like netting-needles, and boiled for a quarter of an hour or more with the instruments immediately prior to the operation. If there is any possibility of their having been contaminated during an operation, they must be thrown away. If the operation has been quite clean they can be dried and kept dry in glass tubes with metal tops. This method is perfectly satisfactory in private work; it secures cleanliness by the boiling immediately before use, and the dry storing prevents rotting.

4. *Instruments.* These should be boiled for between fifteen

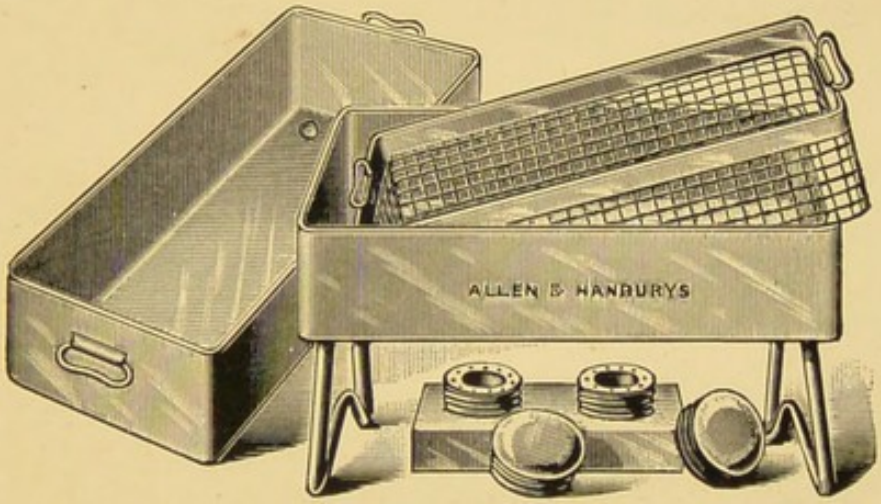


Fig. 3. Portable sterilizer.

minutes and half an hour in water to which a little soda has been added; they should then be placed on a dry, sterilized towel. In practice, it is best to start the sterilizer immediately on entering the house; the instruments will then be ready by the time that the patient is anaesthetized and prepared for the operation.

5. *Knives* when boiled lose their edge; so it is best to place them in a flat-bottomed dish and cover them, handles and all, with 'pure carbolic'. After a few minutes, water should be added to dilute it. The knives must be washed in sterilized water immediately before being used, to remove the carbolic.

6. *Towels, dressings, &c.* Ordinary clean towels do excellently, care being taken that they have never been contami-

nated since cleansed. For covering the operation area there is nothing better than a large sheet of sterilized cambric, in which a hole can be cut where required. Everything must be as clean as possible, and discarded the moment there is the slightest suspicion of its having touched a doubtful or unclean part. Lastly, neither the assistant nor the nurse should touch anything that has not been rendered absolutely clean or sterile, without washing again immediately. Sterilized sheets

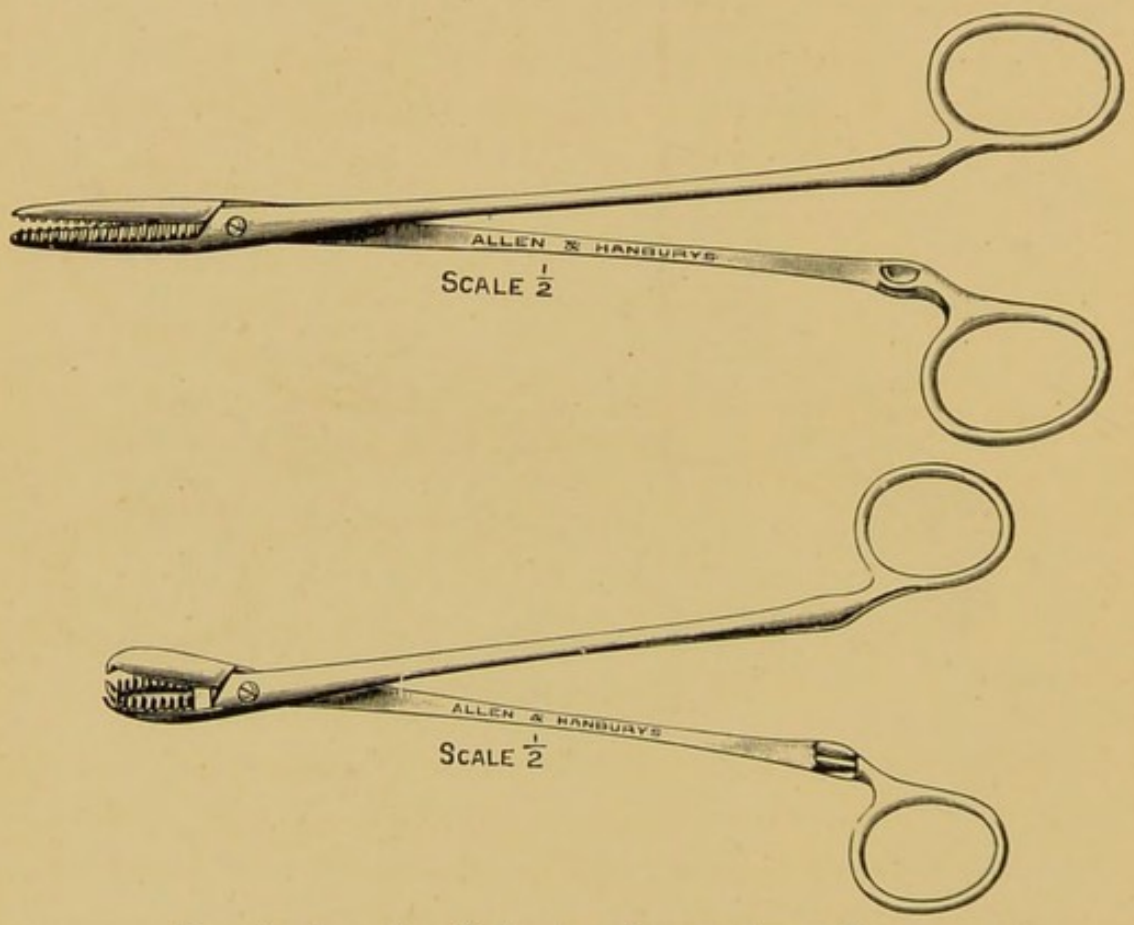


Fig. 4. Long-handled artery forceps, two patterns.

of cambric and dressings, &c., can now be obtained in most towns.

TECHNIQUE

There are a few points in technique to which it is desirable that reference should be made.

1. The fingers of the operator or assistant must not be put in the wound unless absolutely necessary. The use of the knife and fork have replaced our fingers at the dinner table; to use them would be considered dirty and a sign of bad

breeding. So at the operating table, the work must be done with instruments, the surgeon must not show himself badly educated and unmannerly. Instruments with specially long handles have been made to suit this style of surgery and for the retraction of tissues (Figs. 4 and 5).

2. The old-fashioned surgeon's-knot is bulky, clumsy, unnecessary, and should be used seldom if at all. The reef knot requires more skill, care, and precision in tying, but is safer and far less bulky.

3. Interrupted stitches are better for the skin than a continuous suture; the edges are better coapted, and any

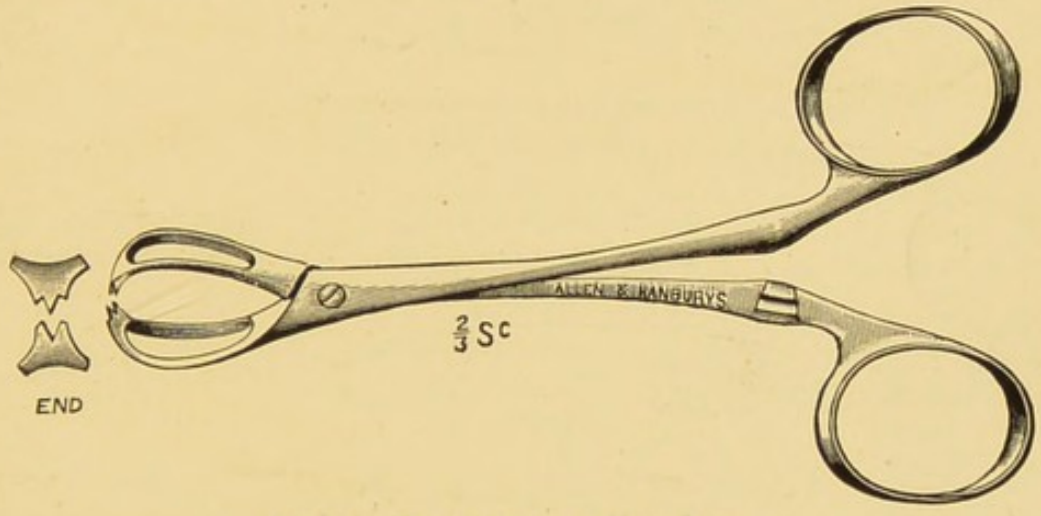


Fig. 5. Toothed retraction forceps.

blood or serum can escape from the wound between the stitches. The continuous suture can be used with advantage for the deeper structures. Its use for the skin is usually lazy or slovenly. To suture the skin neatly is an accomplishment which is acquired by no means easily. A continuous stitch can be inserted in the skin subcuticularly with the greatest advantage in some places where the scars of the stitch-holes will be exposed, e.g. breast, face, upper part of neck, &c.

4. Dr. Michel devised small metal clips which can be used for superficial sutures. The advantages gained by using these in certain situations are:—(*a*) Less pain is caused by their insertion. (*b*) The holes where the points of the clips enter leave no scars. (*c*) They are easy to remove. They are useful when superficial cuts have to be stitched without an anaes-

thetic and in situations where it is desirable that the scar should be as small as possible, but they are troublesome to use in all but straight, evenly cut wounds. Moreover, their removal is at times painful to the patient.

5. In most cases the use of an absorbable suture like catgut has no advantage, *provided that the wound is clean.* Silk can be rendered sterile with very much greater certainty and is, therefore, preferable for ligatures and buried sutures. Catgut can be used in situations where the surgeon does not

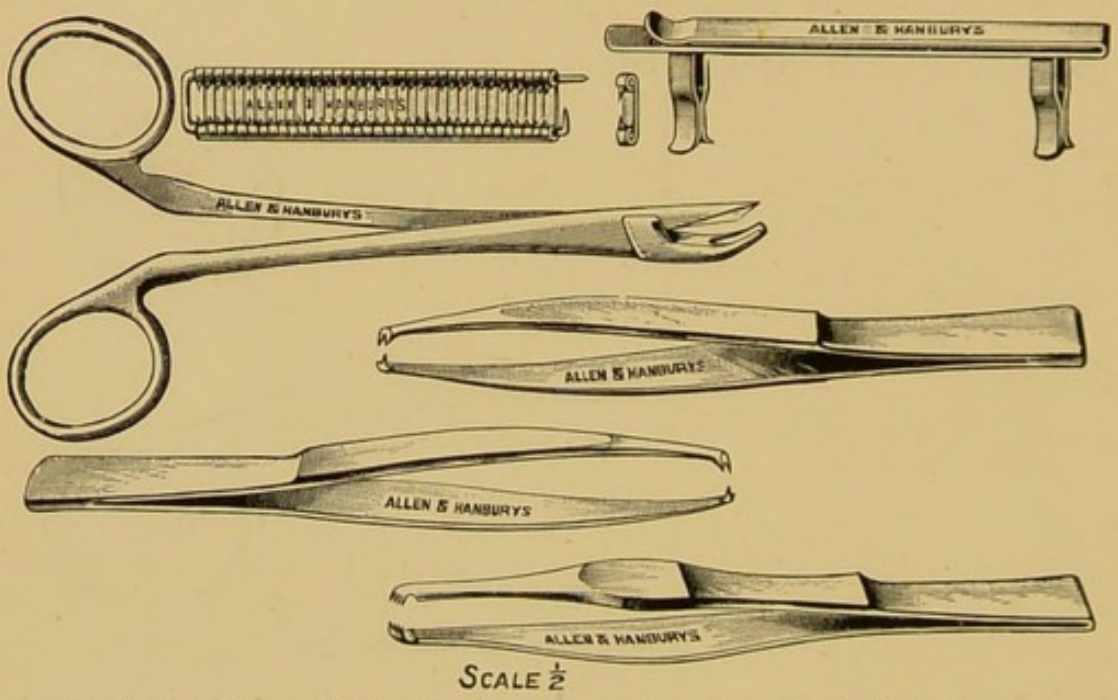


FIG. 6. Instruments for the insertion and removal of Michel's sutures. The upper forceps are used for removing the sutures. The lower blade is inserted under the suture and the forceps closed, when the suture is forced open. This method of extraction is superior to that with hooklets (Fig. 7).

desire to remove the stitches, such as in some operations for haemorrhoids, circumcision, some scrotal wounds, &c.; or for skin wounds in general.

6. The removal of sutures and dressings should be done by means of forceps and not fingers. Every suture should be divided before one is removed. The stitch should be cut at the point where it enters the skin, and traction applied to the long end, so that the exposed part is not pulled through the wound.

7. Instruments should be used wherever possible. Rubber gloves can be worn when the hands must touch the wound, and should always be used to save the hands from possible

infection. *A surgeon should spend as much care in avoiding contamination as in cleansing his hands.* In fact, the great

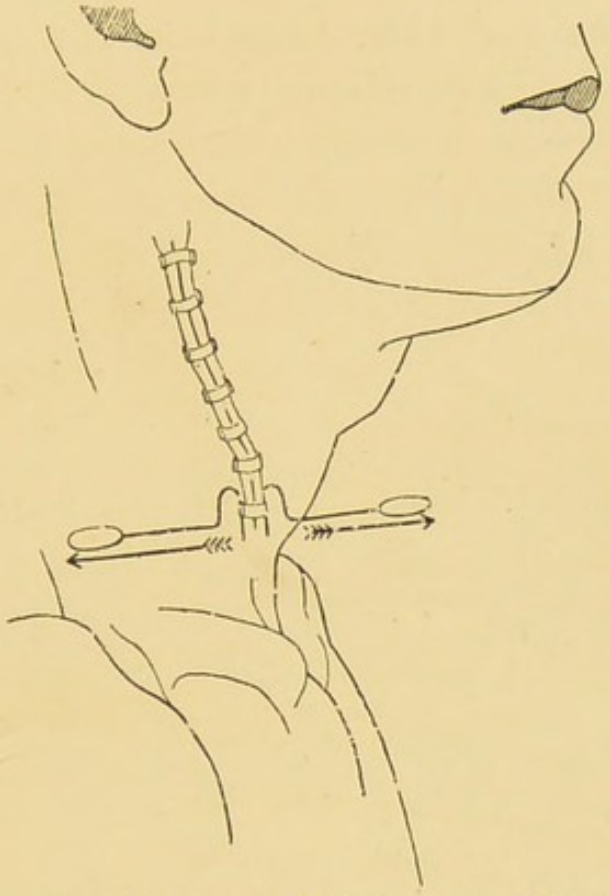


Fig. 7. Diagram of the use of Michel's sutures for closing a wound in neck. The lowest clip shows hooklets inserted for extraction.

value of rubber gloves lies in their preventing infectious material reaching the surgeon's hands.

THE REEF KNOT

Any one undertaking surgical work should learn to tie a reef knot surely and without mental effort. 'Grannies,' 'three half hitches,' and 'surgical knots', though bulky and clumsy, are generally quite safe; but one would much prefer to trust a radical cure or any other operation dependent on suturing to a surgeon who ties reef knots with certainty. It is, therefore, a matter of the first importance to acquire this art. Every one has

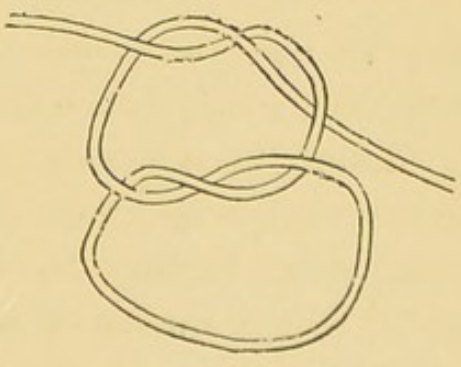


Fig. 8. Granny knot, loose.

his own method; and as five minutes' demonstration followed by ten of practice is worth more than pages of description, we have decided not to include an account of any particular way of tying the reef knot. But from the accompanying

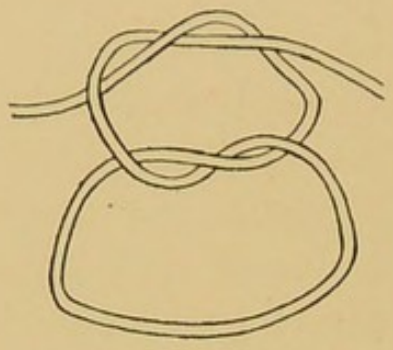
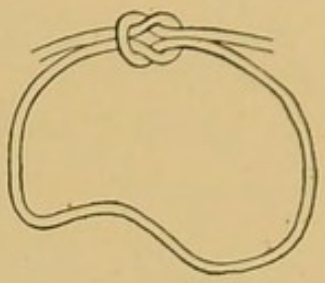


FIG. 9 *a*. Reef knot, loose.



b. Reef knot, tightened.

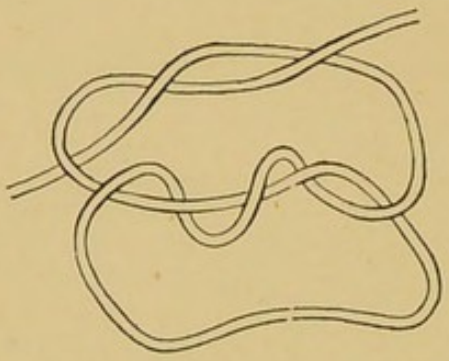
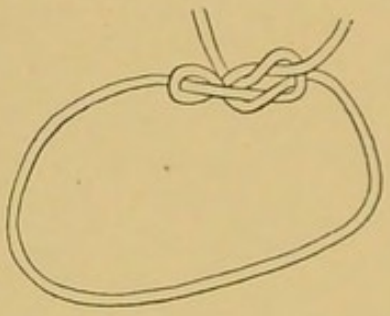


FIG .10 *a*. Surgical knot, loose.



b. Surgical knot, tightened: clumsy and bulky.

diagrams, indicating the method, any one, by practice, can acquire the power of doing it with facility, so adding a most important item to his armamentarium of surgical technique.

SUBCUTICULAR STITCHING

can be used with great advantage in clean wounds, in situations where it is undesirable to leave a larger scar than is absolutely necessary, such as in the upper part of the breast, face, neck, &c. It requires considerable practice to insert properly, but the resulting scar is merely a thin line, which in the course of a few weeks becomes almost imperceptible. It should never be employed in places where the scar will not be exposed, such as the abdomen, leg, buttock, &c., as interrupted sutures are better, being more certain in

their results. The best material to use is fine salmon-gut threaded on a sharp, round-bodied needle; an absorbable suture, such as catgut, can be used, but has very little advantage over the unabsorbable. The skin on one side of the wound is everted, and the needle passed longitudinally for about one-eighth to one-quarter of an inch through the subcuticular tissue, close to one end of the wound, and the gut is drawn well through. The next stitch is passed in the same way through the opposite side of the wound, a little further along, but it must overlap the first stitch; in this manner the stitching is continued on alternate sides for the whole length of the wound. No knots are tied, the wound being closed by

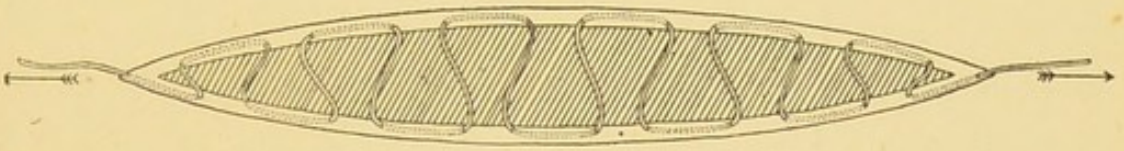


FIG. 11 *a*. Method of inserting subcuticular suture, wound open.

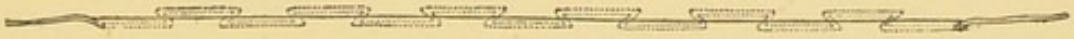


FIG. 11 *b*. Wound closed by subcuticular stitch.

traction on the two ends of the gut, which can then be fixed, if desirable, by a small piece of gauze and collodion at either end of the wound. In theory, the wound should present a thin straight line; but in practice, it is often wrinkled. The stitch can be removed one week after its insertion, this being done by stripping the collodion from both ends, cutting off one end of the stitch close to the wound and applying traction to the other end by means of forceps, and the whole piece of gut is pulled through; while doing this it is best to steady the area round the wound with the fingers of the other hand. This method of suturing should never be used when there is the slightest chance of suppuration taking place. The removal of the subcuticular stitch gives the patient less discomfort than the removal of a corresponding number of interrupted stitches.

THE MATTRESS SUTURE

The suture, usually called a mattress suture, is very useful for bringing subcutaneous structures into apposition. The needle, loaded with the suture material, is first passed through one side of the wound, then through the other; and then back again to the original side in the inverse order. The figure illustrates the stitch passed and also when tied. By its means the edges of the wound can be inverted or everted. In

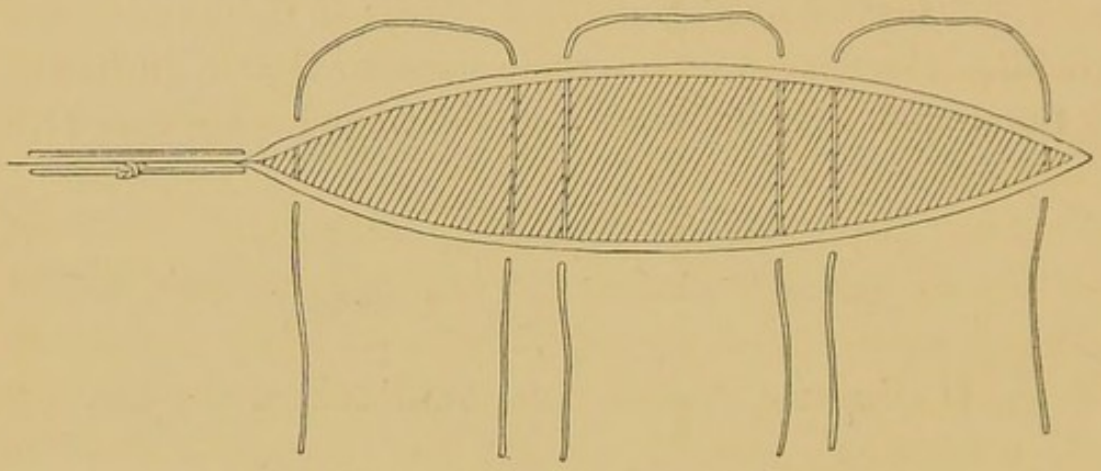


Fig. 12. Diagram of mattress suture, tied and untied.

consequence of the eversion of the edges, it is not used much for the skin. The stitch is represented in the figure as being passed in a rectangular fashion and consisting of two parts. It can be made with three, four or more limbs to it; in fact, approximating to the method of inserting the subcuticular stitch.

In order to obtain a firm scar, wounds united with this stitch must heal by first intention.

DRAINAGE

Drainage is chiefly required after abscesses have been opened, but it is occasionally necessary after other operations, to allow blood and serous fluid to escape, which would prevent the wound from healing. There are three main methods by which a wound may be drained, viz. by gauze, by india-rubber tubes, and by glass tubes:—

Gauze is very popular as a drain for wounds, but as a

matter of fact it is very inferior for this purpose. Owing its power of drainage to its capillary action, it drains ordinary fluids such as water or saline well; but as blood rapidly coagulates, covering the gauze with a film of clot, it destroys this action. Therefore a gauze wick keeps a wound open, but it acts more as a cork than as a course for drainage. It should be used for small shallow wounds that will not retain an india-rubber tube, but then only a thin, narrow piece should be employed, placed at one end of the wound, and not inserted with the idea of plugging but of keeping it open, so that discharges can escape from the wound alongside the wick. Gauze drains should be removed or changed within twenty-four hours.

India-rubber tubes are in nearly all instances the most satisfactory form of drainage. They should have lateral openings in the portion which is situated inside the wound. To prevent the tube slipping into the wound, the end outside is transfixed with a sterilized safety-pin, or united to the skin by one or two stitches. This tube in most cases can be dispensed with in four or five days; but if there is still much discharge it must be retained for a longer time. If the wound is a very deep one, the tube must be dealt with in the same manner as for a sinus (see p. 16).

Glass tubes are not so good as india-rubber, because they do not adapt themselves to the shape of the wound. Occasionally they are employed for draining abscesses in the abdominal cavity; and very small ones are sometimes inserted into

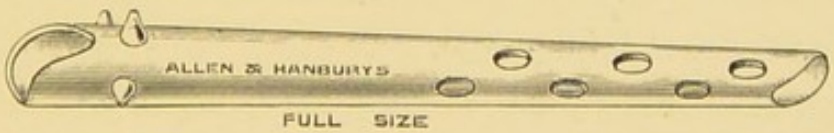


Fig. 13. Glass drainage tube.

wounds where a little haemorrhage is expected to occur, such as after an amputation of the breast; for this purpose they answer admirably, as they can be removed in twenty-four hours and leave practically no scar.

Drainage for deep wounds. Deep narrow wounds or sinuses often cause considerable trouble in healing, because in a long channel the more superficial layers are very apt to unite before the deep ones. A deep wound should be treated by inserting an india-rubber tube, which must be cleaned, boiled, and reintroduced daily, being gradually shortened; it will be necessary in all probability to use a tube of a smaller bore as the walls of the sinus contract. If the wound is too small to hold an india-rubber tube, a gauze wick must be inserted. If a large piece of gauze is pushed down the sinus it will act as a 'plug' or 'cork', preventing the discharges from escaping and doing considerable harm. To be done correctly a very thin, narrow strip of gauze is taken; a probe, which has been boiled previously, is fixed against the end of the strip, care being taken that there is not a lump of gauze at the end. The probe with the gauze running alongside it is gently pushed down to the bottom of the sinus, no plugging or packing being done; the probe is then withdrawn. By this method a thin, narrow strip of gauze runs from the top to the bottom of the wound, not acting as a cork, but allowing fluid to escape beside it. The wound should be replugged daily in this manner and it will gradually heal from the bottom upwards. It must be remembered that a sinus is caused in nearly all instances by the presence of some foreign body at the bottom of a deep, narrow wound, and this must always be removed before the sinus can heal up.

Counter openings may be required in large abscesses to provide efficient drainage, and these openings should be made at the most dependent points. A director is inserted through the original opening until it projects beneath the skin at the spot where the counter opening is required. An incision is made through the skin on to the director, and a large india-rubber tube with lateral openings is drawn through with artery forceps, so that its two ends project outside; where they are secured by means of sterilized safety-pins or by stitches.

COLLODION AND GAUZE DRESSING

Throughout this book will be found the expression 'dressed with gauze and collodion'. The dressing has many advantages. The collodion dries and fastens the gauze firmly to the skin. It prevents the patient fouling the wound, as in the inguinal region; it prevents him exploring the wound with his fingers; it allows the doctor to examine the patient freely without fear of infecting the wound; it cannot shift; and lastly, it is a very economical dressing. It can be applied properly and improperly. The following two methods are described to show how it should be employed:—

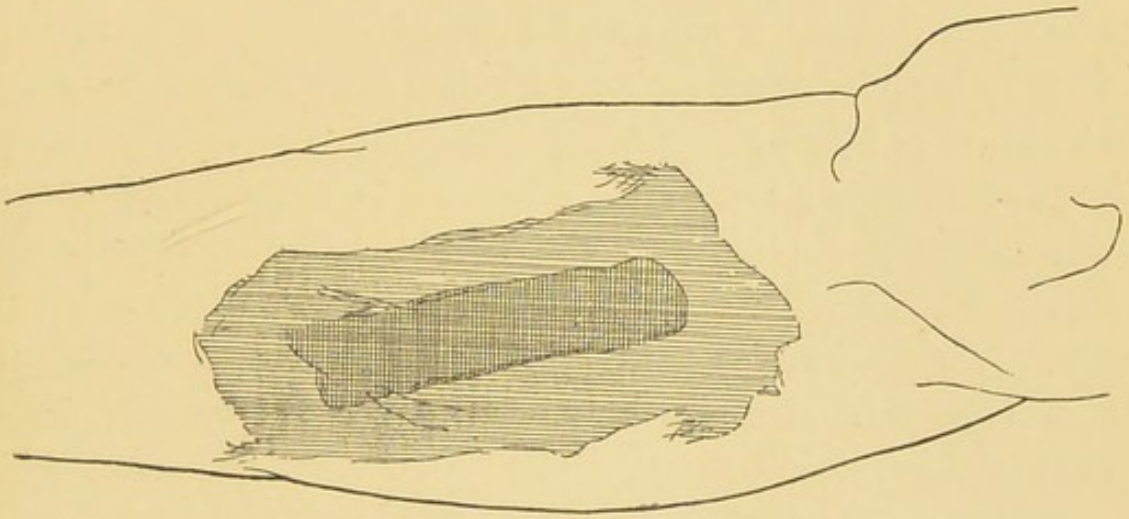


FIG. 14. Diagram of gauze and collodion dressing. Vertical shading indicates the strip of gauze next to the wound. Horizontal shading indicates the larger portion of gauze covering the whole and fastened with collodion.

(*a*) It is used to dress the wound after tapping a chest or a hydrocele, or after any exploratory puncture. In this case a thin piece of gauze cut in the shape of a circle or, better, a thin flake of wool, is wetted with collodion and placed over the aperture of the puncture. The wool forms an excellent dressing. This method of applying material saturated with collodion directly is applicable only when the wound is the size of a puncture, or after the 'first dressing'.

(*b*) Whenever the wound is larger than a puncture the above method of dressing is unsatisfactory, as there will be

some exudation imprisoned within the wound. If one takes the trouble to observe the first dressings removed from wounds which have healed by first intention, they are almost invariably soiled by the absorption of some of this exudation which has escaped. It is rare for the dressings to be unstained. If the skin wound is sutured with a continuous stitch, this 'aseptic' exudation is bottled up within the tissues, and certainly can do no good, whilst at times it may do much harm. In consequence, we have advised that the skin wounds be stitched with *interrupted*, not with *continuous*, sutures. Wherever interrupted sutures are used for the skin, the wound must be covered with some material to absorb the exudation which will escape between the stitches. In consequence, the dressing next the wound must not be saturated with collodion. We would advise that the collodion dressing be put on as follows:—

1. Place one or two layers of gauze, in the form of strips or sections of a plug, over the wound. Wool does as well. Figure 14.

2. Over these strips place a thin piece of gauze, consisting of a single thickness, which is both longer and broader than the strips previously used.

3. Paste down the *edges* with a brush saturated with collodion. The edges must be securely stuck by a film which extends for at least a quarter of an inch on to the surrounding skin.

4. When dry, cover with another piece of gauze, and if necessary a pad of wool, and apply a bandage for the first twenty-four hours.

We strongly advise that a large brush be used for putting on the collodion, as it can be done more accurately and expeditiously than with a spoon. The brush can be steeped in spirit for some time before use. In fact it can be left in spirit or ether whilst the operation is proceeding.

After the first dressing, the collodion and gauze (or wool) can be placed next the wound if it has healed by first intention.

This dressing is very convenient to the doctor and will save the patient much expense. It has been urged that the collodion occasionally blisters the skin round the wound. This is certainly true, but we believe it occurs mainly where the wound is septic; and therefore the fault lies rather with the surgeon and his accessories than with the collodion. At any rate, we can state that we have had no trouble from collodion made from the following formula:—

Collodion	12 fluid ounces.
Canada Balsam	½ ounce.
Castor oil	¼ ounce.

(Collodion Flexile. B.P.)

In certain situations, as on the leg or inguinal region, the collodion dressing adheres to the growing stumps of the shaved hairs. In consequence its removal may be rather painful to nervous patients. It can, however, be loosened by painting the edges with ether on a brush, liquefying the collodion again. Then the dressing is removed easily. Care must be taken not to use the ether too freely or it may reach the wound and smart severely. There is one other point in removing these dressings: the cut ends of the sutures may have become adherent to it, so that they may be unintentionally pulled as the dressing is being peeled off.

In using collodion on the inguinal region of a conscious patient, care must be taken that no excess of fluid runs down to the genital region or it will cause a very severe smarting or burning pain.

THE URINE

'It is well known that the urine is not examined as a routine in general practice. This is simply because there is not, for the purpose, a handy apparatus, which can be carried in the pocket.' These two sentences are selected from a criticism upon a urine-testing case, invented by Dr. A. E. Russell to meet the demand for a 'handy apparatus which

can be carried in the pocket'. It consists of two test-tubes, a bottle of acetic acid, a bottle of Fehling's solution, a spirit lamp, and a book of red and blue litmus-papers. At a trifling additional cost a small urinometer, for determining the specific gravity, is carried inside the test-tubes. Valuable information is to be gained as to the condition and outlook of a patient, whether or not to recommend an operation, from

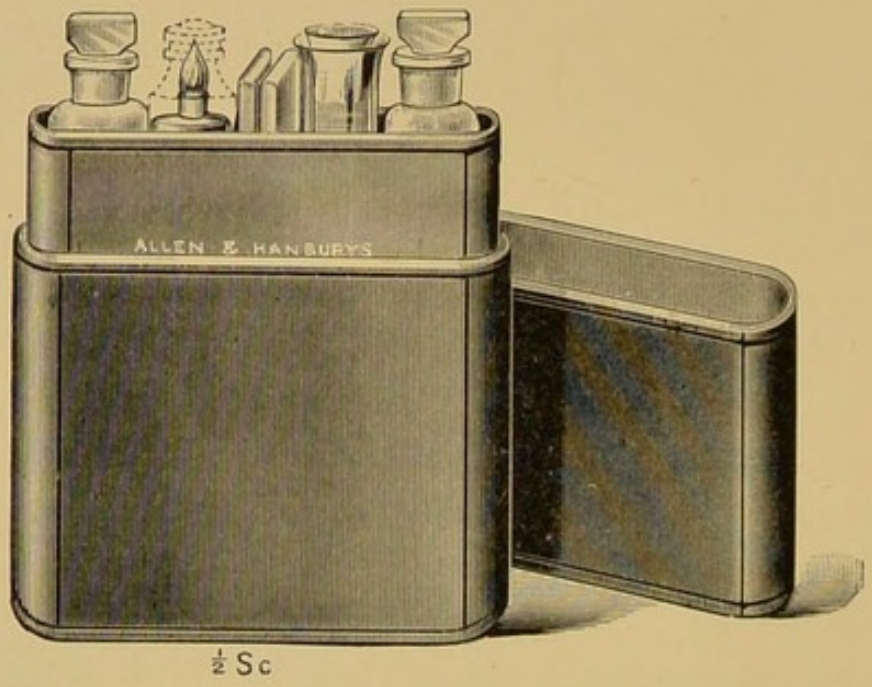


Fig. 15. Pocket case, containing the necessaries for testing urine.

examinations of the urine. In fact, if a medical man has any intentions of devoting himself to the operative part of his work, it is needful for him to examine and re-examine the urine. Otherwise, for example, in a case of carbuncles with diabetes, he will be treating the effect and not the cause. Since the introduction of Dr. Russell's apparatus there can be no reason for neglecting this important subject.

SUPPURATION

An operating surgeon, as a skilled man, differs from a carpenter or a cabinet maker in working with living instead of dead material. The fact that he does so enjoins on him the additional task of adopting a perfectly clean technique;

in fact, for a great deal of his work to be of value his wounds must heal by primary union. Whereas the least cleanly carpenter is not prevented by his lack of cleanliness from producing the best work, the surgeon who is wanting in this technique of his art can never produce good work. In fact, the situation may be summed up as follows:—to possess a sound technique is the prime justification for a man to become an operating surgeon. The suppuration of a surgeon's wound is equivalent to a carpenter splitting the board with which he is working. Thus, the prevention of suppuration is the first aim and object of conquest for every one who intends to become an operating surgeon. Lord Lister's pioneer work has done much to help us in this, but the day of chemical antiseptics is passing. The plenteous use of soap and water, and the habit of using the fingers no more at the operating table than at the dinner table, would seem to be the directions which the modern technique of surgical cleanliness is taking. But though we can do so much to prevent suppuration, it is beyond human power to be always perfect; and our technique must fail from time to time, suppuration being the regrettable result. There must always be a certain percentage of suppuration; we cannot hope to banish it entirely in the present state of our knowledge. But we must appreciate that its non-occurrence is our plenary justification for attempting an operation; its occurrence must, wholly or in part, undo any constructive work done, e.g. the suturing of the inguinal canal in the radical cure of a hernia. When suppuration does occur, as it will do from time to time, what should be done? When suppuration is diagnosed elsewhere than in an operation wound, the treatment to be adopted is classical; a free incision is made without delay, and also counter openings are made if necessary. With regard to operation wounds we are apt to take a pettifogging course of action, opening up the wound a little or leaving the pus to do so! Such action would be heartily condemned, were the pus elsewhere, by the veriest tyro in surgery.

No one would suggest such treatment for suppuration in the neck or under the periosteum. Therefore our advice for the treatment of a case of postoperative suppuration would be:—

1. Open up the skin wound sufficiently to expose fully the suppurating area. If the whole wound is suppurating, the whole skin wound must be opened up; if it is only suppurating in part, only part need be opened up.

2. Make no more delay in doing this than you would in incising an acute abscess or cellulitis elsewhere; and make counter openings if necessary.

3. Dress the suppurating wound with hot dry dressings which are changed frequently. Wet dressings make the part sodden; it is the heat that does good, not the wetness or the minute quantity of antiseptic present.

4. If more is required, place the part in a hot bath or wash it out with a syringe. That is to say, put your trust in mechanical flushing and not in chemical action.

5. As soon as the hardness and surrounding inflammation have subsided, discontinue the hot dressings.

6. If the suppuration is on a limb, employ Bier's congestion treatment, p. 220.

Lord Lister was the first great man to show how to *prevent* suppuration; Professor Bier is one of the first to tell us a good way of treating it *after it has occurred.*

7. Convalescence must be prolonged until the wound is soundly healed. Any sinuses must be opened up and any septic dead material, such as necrotic tissue or a stitch, removed.

8. Remember that some damage has always been done by the suppuration, but it is not known, and cannot be known at this stage what is its extent. The amount of damage done varies very much; sometimes it is practically none, and sometimes it is practically very great.

The danger of suppuration varies with the situations in which it occurs. It is most dangerous when associated with large veins which have been ligatured; such as after

operations for varicose veins, varicocele, or haemorrhoids. The clots within the veins become septic, from which the whole system may become infected, causing septicaemia or pyaemia; or in the case of haemorrhoids, the sepsis is at first confined to the liver and portal system, pylephlebitis and portal pyaemia. In such operations as the removal of cutaneous and subcutaneous bodies, suppuration is of little importance. It is more serious when it occurs amongst deeper structures, such as after an operation for glands of neck, and is practically fatal if it affects large serous membranes, such as the peritoneum. But apart from its danger it can create local *damage* by causing the sutures to give way, as after the operation for hare-lip, cleft palate, tendon-suturing, hernia, &c. *Thus, after operations for the destruction of a part, such as the removal of varicose veins or tuberculous glands, we are mainly concerned with the danger of suppuration; after operations for the construction of a part, such as the suturing of the inguinal canal in the radical cure of hernia, we are more interested in the damage which it can do than the actual danger it may cause.*

SOME USES OF SKIAGRAPHY

During the last few years the use of the X-rays has been introduced into surgery. But in spite of the fact that all medical men are familiar with them, yet there is a widely conceived fundamental misconception concerning them. A skiagraph is not a photograph. It is merely the record of the shadows cast by the structures, partly or perfectly impermeable to the rays, which are prevented in this way from reaching the sensitized plate. Now a walking-stick casts shadows of different sizes and shapes according to the position in space in which it is held. Similarly, a bone will cast all varieties of shadows according to the methods employed in taking the skiagraph. As a further example may be cited the childish game of making with the hands shadows on a screen, resembling animals, such as rabbits and ducks. Yet

no one urges that these are exact copies of rabbits and ducks. But the laity, such as compose a jury, is gravely asked and expected to understand and estimate at a glance the intricacies of skiagraphs. Until it is appreciated that skiagraphs are mere records of the shadows cast by structures to the X-rays, there must be much misconception about them. It is an obvious corollary from this that it is necessary to have an expert to interpret the meanings of the shadows seen. It is a common observation amongst those who see much of X-ray work, that an expert can detect signs in a plate which one

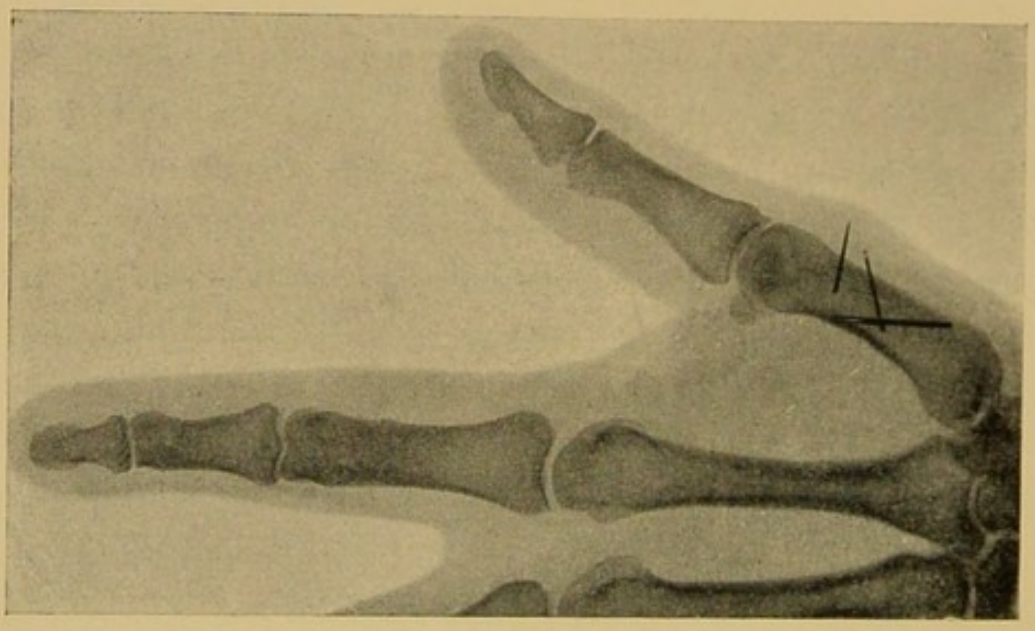


FIG. 16 *a*. Foreign bodies in thenar eminence of palm. Skiagraph of front view.

inexpert cannot. Hence the absolute necessity for an expert interpreter, not a local chemist or other untrained man.

Besides having such an interpreter, at least two or three skiagraphs should be taken in different positions, so that it is possible to localize points. In general practice, skiagraphs will be required most frequently for two classes of case, to indicate fractures and to localize foreign bodies. Always have two skiagraphs taken from different points of view and compare them closely; the one corrects any false impressions given by the other. In the latter class of case, it is extremely important to do this, because the exact localization of the foreign body will do much to enable the practitioner to

decide whether to undertake an operation for its extraction or not. Figures 16 *a* and *b* show a foreign body in the hand, which was localized by the X-rays and extracted. In the case of a sharp body like a needle the plates should be taken, at the most, twenty-four hours before the extraction, and, if thought desirable, the limb should be retained on a splint in the interval. The body cannot have been moved far by muscular contraction in such a case.

In theory, three plates, taken in different directions, are required to determine the exact situation of a foreign body in

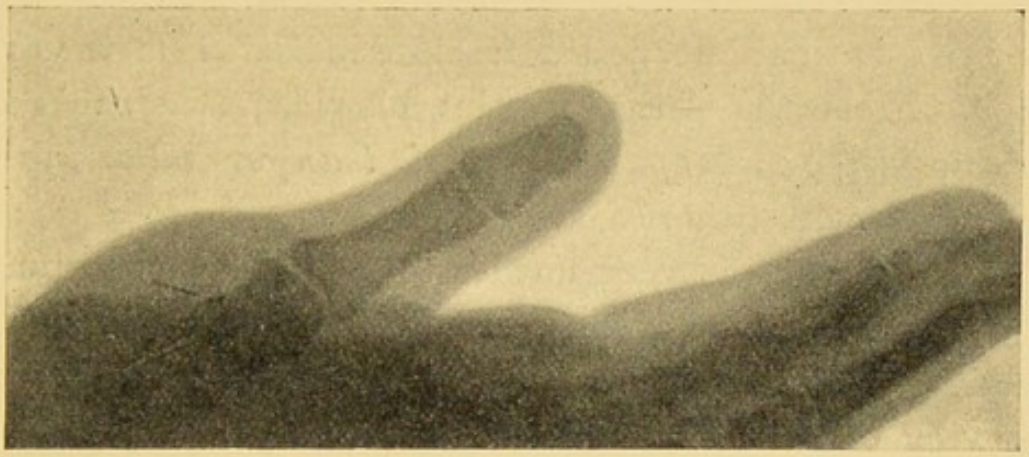


FIG. 16 *b*. Ditto. Skiagraph of side view.

the tissues, as anywhere else in space. In practice, it is possible to obtain two such plates but very rarely indeed a third. The two plates illustrated show needles in the thenar eminence, taken with the palm of the hand lying on the plate, and from the side. As a result of their examination an expert reports that 'Three pieces of needle are present: one immediately beneath the painful swelling in the palmar aspect of the thenar eminence; a second piece close to it but with the superficial end directed more toward the tip of the thumb; a third piece crossing the second and directed toward the tip of the thumb.' This was the report of Mr. A. H. Greg, Superintendent of the X-ray department of St. Thomas's Hospital.

With regard to dislocations uncomplicated by fracture; in general the diagnosis is easy, exceptions being found most

frequently in the cervical spine, subcoracoid and subglenoid dislocations of shoulder and rotatory dislocations of the astragalus. In these cases, the X-rays will help; but in the usual run of dislocations they will not be required. When used, an expert should take and interpret the skiagraph.

When the dislocation is accompanied by a fracture, a skiagraph forms the most delicate and exact means we possess of estimating the amount of the damage. In fact, a skiagraph should be taken in almost every case of fracture, and often when there is merely a suspicion of a fracture. There can be no surgeon who has not met cases in which he has been surprised to find a fracture indicated on the skiagraph. From the patient's point of view, *skiagraphs are more useful in making the diagnosis than for indicating the method of treatment to be adopted.*

At any rate, it is very unwise to neglect an opportunity of using the X-rays if they are available. It will do the practitioner no harm to use them in diagnosis. In fact the discovery of the exact nature of the injury or injuries will redound to his credit. But it is in diagnosis that they are most useful, not in treatment. As regards the results of treatment it is by no means clear that the use of the X-rays is a blessing to the public. By their aid the medical profession have learned that in a very large majority of cases, say ninety per cent., the bones remain deformed in consequence of the fractures. This subsequent deformity is more the result of the situation of the fracture and the action of the patient's muscles on it, than of the treatment employed. We know now that with the imperfect means at our disposal it is but very rarely that we can restore a fractured bone to its original form. But the public have yet to learn it. This has a very important result in skiagraphy. By means of varying its position, a *straight* stick can be made to take various forms as judged by its shadow. The forms taken by the shadow of a *bent* stick are much more various. In fact, the bend or deformity may be exaggerated and appear

grotesque. Thus, the interpretation to be based on the skiagraph of an old fracture is extremely difficult to appraise. Is it a bad result for a fracture of that kind and in that situation, or not? Is it the result of muscular action on that particular fracture or not? It is very hard to expect an X-ray expert to pronounce an opinion which can be regarded as authoritative, let alone a 'practical surgeon', who rarely sees the after-results of his treatment in a skiagraph.

To return to the practical side of the question, we have known patients who have recovered from a fracture with very considerable deformity, have perfectly useful limbs. *Anatomical accuracy is not necessary for good, if not very good, physiological value.* Operative treatment should be adopted in difficult cases in certain situations—we would especially mention a Pott's fracture; but, in general, it is yet to be proved necessary for the future usefulness that may reasonably be expected in the case of a broken limb. If a man or woman has the misfortune to break a bone, by that accident he will have robbed himself of an amount of usefulness in the limb of which the broken bone forms part; which amount will vary with the character and situation of that particular fracture. It is not known, and is very difficult to decide, how much of the resulting deformity is dependent upon the nature of the fracture or the treatment adopted. Skiagraphs are certainly of very doubtful assistance in forming an opinion, and their introduction into the law courts in the character of 'sure evidence' is an abuse of the method.

CHAPTER II

ANAESTHETICS

Anaesthetics can be divided into two main divisions, *Local* and *General*. For some small operations local anaesthetics are preferable from the patient's point of view. There is, as a rule, a great dread of a general anaesthetic, as it causes more discomfort and the patient takes a considerable time to recover. But on the other hand local anaesthetics are very uncertain in action, and generally some pain is felt. From the practitioner's point of view the general anaesthetic is the better; he does his work more thoroughly and is not hampered by the movement of the patient or by the fear of causing pain, and there is very much less shock. General anaesthetics make operations easier, and local anaesthetics make them more difficult. It can be laid down as a general rule that an operation involving dissection should not be performed under a local anaesthetic, unless, owing to the patient's condition, a general one is contraindicated.

Local Anaesthesia. There are three main methods of inducing local anaesthesia.

1. *Freezing.* This is done by spraying the part with ether, ethyl chloride, anaestile, &c., and so freezing it. The tube is held a few inches off the skin, so that the fluid falls as a fine spray on to the operation area; in a few minutes, when the skin has become white and frozen, the incision can be made. This method should be employed only when a simple incision is required, e.g. opening a superficial abscess, as the tissues become very hard, and it is impossible to perform any operation involving skill or dissection. The thawing causes considerable pain, and the frozen tissues may not heal well, being apt to slough.

2. *Drugs.* Cocaine should be used in solutions of from one to five per cent.; formerly solutions of greater strength than this were employed, but these are undoubtedly dangerous, causing in some instances severe toxic symptoms. Whatever strength is used, not more than half a grain in all should be given. It can be employed in several different ways. For the throat, a three per cent. solution is sprayed two or three times at short intervals on the part, and the operation can be commenced in about five minutes. One or two minims of a five per cent. solution can be dropped into the eye; this is repeated in a short time and the eye will be anaesthetic in ten minutes. A five per cent. solution can be painted on a mucous membrane, or, still better, a piece of cotton wool soaked in the solution can be laid on the part. When used hypodermically the drug should be injected where it is proposed to make the incision, one or two other injections being made round the operation area. In a few minutes the skin becomes anaesthetic and the operation can be commenced. If the operation is at all long, and the effect of the drug wears off, more can be injected directly into the wound.

Eucaine is almost as efficacious as cocaine, and is less likely to produce toxic symptoms. It can be used in from two to eight per cent. solutions, and as much as five to ten grains may be given. If a small quantity of active adrenalin is added, a one or two per cent. solution of eucaine is sufficient. It can be employed in the various ways described for cocaine, but is not satisfactory in ophthalmic work, owing to the irritation which it produces. With hypodermic injections, small lipomata, fibromata, sebaceous cysts, &c., can be removed satisfactorily.[1]

3. *Infiltration.* By this method the tissues round the operation area are infiltrated with a solution of neutral sodium chloride, sometimes combined with minute quantities

[1] The authors have used a solution made from the following formula:— Solution of adrenalin (1 in 1000), minims 10; β. eucaine, grains 3; sodium chloride, grains 12; water to 3½ ounces. This amount can be used without fear, and will suffice for an ordinary operation.

of such drugs as cocaine, morphia, &c. It is necessary to inject the solution so that a number of bubbles are raised round and over the operation area. For this means it is claimed that even severe and prolonged operations can be performed without causing any pain; the chief drawback is that the oedema caused by the infiltration of the tissues renders dissection almost impossible, consequently it has never come into general use.

GENERAL ANAESTHETICS

When determining what general anaesthetic to administer to a patient many factors have to be considered, but undoubtedly the first is the safety of the patient under the particular drug employed. Anaesthetics can be arranged as regards safety in the following order, the safest being given first:—Nitrous Oxide, Ethyl Chloride, Ether, A.C.E., Chloroform. Other factors to be considered are the age and general condition of the patient, the nature and length of the operation. Reference is made to these points under each separate anaesthetic.

Nitrous Oxide, generally referred to as 'gas', can be employed for operations which will not last more than from one to two minutes, e.g. avulsion of nail, incision of abscesses, breaking down adhesions, &c. It is by far the safest of all anaesthetics and can be given to nearly all patients, but should not be used in cases of advanced cardiac or lung disease. When the inhalation is pushed, muscular spasm occurs; the admixture of a small quantity of air will sometimes, but not always, cause relaxation; but owing to this fact it is not a satisfactory anaesthetic to employ for reducing dislocations. By administering small quantities of oxygen at the same time as nitrous oxide, anaesthesia can be prolonged, but this method requires considerable practice.

Ethyl Chloride. This drug can be given in the same manner as nitrous oxide; a few cubic centimetres of the liquid are placed in the bag, this evaporates and the patient

inhales the vapour. It is not nearly so safe as gas but is safer than ether; therefore it should be given in cases where slightly longer anaesthesia is required than can be obtained by gas. It is often useful to employ it instead of gas in alcoholic, very muscular, or thick-necked patients, who as a rule take gas badly. In this type of patient ethyl chloride is very useful to induce a preliminary anaesthesia before going on with ether. Its chief disadvantage is that it often causes vomiting, but this can be prevented frequently by the patient's abstaining from food for some time before the administration. Recently, it has been suspected as the cause of some cases of post-operative pulmonary embolism and cardiac failure.

Ether, or ether preceded by gas, is the best and safest anaesthetic for most cases where longer anaesthesia is necessary than can be obtained by gas or ethyl chloride; but it requires more skill to administer than chloroform. It is contraindicated in the extremes of age, when advanced bronchitis or arterial disease is present, and in prolonged operations on the mouth, nose, and throat. As a rule, stout, short, thick-necked patients take ether badly; in this class it is as well to commence with ethyl chloride, follow with ether, and, if necessary, change later to chloroform. Ether should never be employed near a naked light or when the actual cautery is in use near the face. It should never be given when the patient is suffering from urgent dyspnoea, as it will tend to increase the condition. There are many forms of apparatus for administering it, and as all are alike in principle, i.e. by the 'closed' method; it makes very little difference which form of apparatus the anaesthetist selects; but having chosen one, he should use that only. In children, it can be dropped on a mask by the 'open' method with great advantage; and when during chloroform administration considerable shock is present, ether poured on the open mask acts as a powerful cardiac stimulant.

Chloroform is especially indicated in the extremes of life,

and when lung disease or urgent dyspnoea is present; and in operations on the nose and throat it is used for continuing the anaesthesia which has been induced by gas and ether. It is the most satisfactory anaesthetic to employ for operations on the abdomen or brain. Usually, it is reckoned as the least safe of all anaesthetics, but it is one of the easiest to administer, and should always be given by the open method. Junker's inhaler is an instrument for administering chloroform in operations on the nose, throat, tongue, &c. In this apparatus, air is pumped through chloroform to a mask placed over the patient's mouth or through a tube placed in the nose or throat. When using it, always ascertain that the bottle is not too full and that the india-rubber tubes are fixed to the proper nozzles; if this precaution is not taken, liquid chloroform might be pumped down the patient's throat. When giving chloroform, always have the patient in the recumbent position. In midwifery this drug is especially useful for relieving the pain of strong uterine contractions, a very slight degree of anaesthesia is required, and it can be given with advantage by means of a Junker's inhaler.

A.C.E. is a mixture of absolute alcohol, chloroform and ether, and is used for anaesthetizing children of from three to twelve years old and the aged. It is the best anaesthetic to employ in cases of uncompensated cardiac lesions, and is generally used as a substitute for chloroform, the ether present causing a certain amount of stimulation. The patient is anaesthetized by the open method, the mixture being poured on the mask. As the alcohol does not evaporate as quickly as the chloroform and ether, it keeps the mask wet, and in consequence the patient's face is very apt to be blistered by the chloroform subsequently poured on. A little vaseline put on the face round the area to be covered by the mask will protect the skin. The alcohol can be omitted in making the mixture.

ADMINISTRATION OF NITROUS OXIDE

The gas is stored in an iron cylinder which is connected to a large india-rubber bag; this bag is joined to a face piece, and is fitted with a stopcock which can be turned so as to admit either air, or gas, or a mixture of both. The patient can be sitting up, in the recumbent position, or, for practical purposes, in any position in which it is possible to fit the mask over the face. The bag is filled with gas, care being taken not to distend the bag to such an extent that as soon as the stopcock is turned the gas rushes out forcibly, as this tends to choke the patient. The patient having been directed to take deep breaths, the mask is held firmly over the face and the stopcock so turned that the patient takes in gas from the bag and breathes it out into the air. After a few breaths the face becomes a little blue, and in a short time the breathing becomes stertorous; in a few more breaths it will be noticed that the fingers and eyelids twitch, and if the administration is continued this will go on to jactitation of the limbs; the pupil will be dilated and as a rule the conjunctival reflex will be absent. If the operation is on the nose, throat, or mouth, the face piece should be removed as soon as the breathing becomes stertorous, and the operation done; but if not on one of these situations, the operator can begin, and the anaesthetist turns the stopcock so that the patient obtains one breath of pure air, and then it is turned back so that the patient breathes gas again. If long anaesthesia is required, a better plan is to administer air with the nitrous oxide from the commencement. After about six breaths of gas, one of air is given, then six more of gas, one more of air, and so on; by regulating the amount of air and gas in this way the breathing can be prevented from becoming stertorous and the patient can be kept under for five or six minutes or even longer. If the colour becomes bad or jactitation occurs, the administration must be stopped at once. Special attention should be paid to the following points:—

1. Always see that the mask fits the face closely, a badly-fitting face piece admits air round the edges, and in consequence the patient does not go under easily.

2. Always make certain that the cylinder contains sufficient gas for the administration; it is a good plan to keep two cylinders, one of which is always full; if one runs out the other can be used. If during the administration both cylinders are found to have become empty, allow the patient to breathe in and out of the gas bag; anaesthesia can be induced by this means, but the method is not very satisfactory.

3. When refilling the bag, never let the gas rush in; it should be allowed to enter slowly.

METHOD OF ADMINISTRATION OF ETHER PRECEDED BY NITROUS OXIDE

Many different forms of apparatus have been devised for the administration of gas and ether; but the practitioner should select one particular form and make himself thoroughly acquainted with it. A description of the method of administration with a Clover's inhaler fitted for nitrous oxide and ether is now given. The apparatus consists of a face piece fitting on to a metal receptacle for the ether, and at the other end of this receptacle is a large bag for holding the gas. At the entrance to the gas bag is a stopcock which is so arranged that the patient can breathe air alone, gas alone, or a mixture of both. When air is inspired it passes through the metal receptacle over the surface of the ether, the proportion of air passing over being indicated by a pointer outside the apparatus. When this pointer stands at 0, no air enters the ether chamber; when at 2, one-half of the air inspired is passing over the ether; when at 4 (full), all the air is passing over the ether. When the patient has been thoroughly prepared (see p. 274) and examined, he is laid on the table in the dorsal recumbent position, the head being slightly raised and turned to one side. Having seen that there are no tight

clothes round the neck, no false teeth in the mouth, and that the patient is as comfortable as possible, try, before the apparatus is put together, if the face piece fits the patient, and if it does not, select another. The gas bag having been filled, 2 ounces of ether placed in the inhaler, and the stopcock turned so that the patient breathes air alone, the patient is instructed to breathe quietly in and out, and the mask placed firmly on the face. After a few breaths the gas is turned on fully, so that the patient inspires gas from the bag and expires it into the air; after three or four breaths the valve is turned so that the patient breathes in and out of the gas bag, and then after a few more respirations and while the patient is expiring, the ether is turned on till the pointer stands half way between the marks 0 and 1. If this causes coughing, the ether is turned off and a few more breaths of gas given by itself; if the ether is tolerated, it is after a few respirations turned on a little more, and in this manner the percentage of ether is gradually increased till the pointer stands at about $3\frac{1}{2}$ or at 4. The amount of ether should always be increased during an expiration, and the pointer must not be continually turned on but should be moved by a series of small jerks. During this time the patient is breathing gas as well as ether, but when respiration becomes stertorous, the gas bag is removed and the air bag put in its place, giving the patient one or two breaths of air, and soon the colour improves. The point to be secured is, that when the administration of gas is stopped the patient is taking nearly a full dose of ether. If, during the stage of gas administration, the blueness becomes very marked, a few breaths of air must be allowed; but it must be remembered that if much air is given in the early stages the patient will tend to come round. After the gas bag has been removed, nearly a full dose of ether should be given for some time, and when the patient is fully under and well saturated with ether, it will be found that the pointer can be turned back to about 2, or 1, or even less. During this period and for

the remainder of the administration the mask should be removed from time to time to allow the patient to obtain one or two breaths of pure air; if this is not done the air in the air bag very soon becomes saturated with ether. As the operation proceeds it will be found that the amount of air can be increased and the ether decreased, the patient still being kept under. No rule can be laid down as to the amount of ether required to keep a patient under, but generally men require more than women, and women more than children; muscular, alcoholic men requiring most. The process of anaesthetization can be divided arbitrarily into four stages:—

1. The stage in which the ideas are confused, slight dizziness, and tingling of extremities; rapidly merging into—

2. Stage of excitement, struggling, conjunctival reflex present, pupil dilated.

3. Stage of surgical anaesthesia. The conjunctival and superficial reflexes absent, the deep reflexes present, the pupils of a medium size, reacting to light.

4. Stage of overdose of the drug. Both superficial and deep reflexes absent, pupils dilated and insensitive to light, breathing shallow.

The anaesthetic should never be pushed beyond the third stage. The following is the ideal condition for the patient to be in: The face of a good colour, not at all dusky or cyanosed, the respirations deep and regular, the pupil of medium size and reacting to light, the conjunctiva insensitive.

Special attention must be paid to the following points:—

1. Ether causes an increase in the flow of mucus which accumulates in the mouth; if the head is kept turned over to one side and a sand bag is placed well under the other shoulder, it will tend to run out, but from time to time the mucus should be swept out with a finger, or the end of a towel can be kept in the angle of the mouth to act as a drain. If a large quantity collects in the throat and lungs it may be advisable to change the anaesthetic and to continue with chloroform.

2. Blueness of the patient throughout the operation is a sign of either bad administration or of a subject unfit for ether. Blueness is due to insufficiency of air, so the mask must be removed from the face to allow the patient to obtain a little. If the patient cannot be kept under without becoming cyanosed, change to chloroform at once, or a little oxygen can be administered at the same time as the ether.

3. A widely dilated pupil may mean one of two things: either that the patient is coming round, when the pupil in all probability will react to light; or that an overdose has been given, when the pupil will not react to light. When in doubt, treat the condition as if it were due to an overdose.

4. Always listen to the respirations and note any change; rapid and shallow breathing usually indicates an overdose, in which case remove the inhaler and allow the patient to breathe pure air until the respirations return to the normal. If the breathing becomes slow and quiet, and the pupil is contracted, reacting to light, it means that the patient is coming round and the dose should be increased; if this causes coughing, switch the pointer back to $\frac{1}{2}$ and then slowly work up to about $3\frac{1}{2}$ in a manner exactly similar to that employed at the commencement.

5. The pulse should be felt if there is the slightest suspicion that the patient is suffering from shock, and this will be indicated by a weak, thready, irregular pulse. It should be remembered that just before a patient's coming to from an anaesthetic and when he is about to vomit, the pulse generally becomes very small in volume.

6. During the operation, if the patient tends to come to and the anaesthetic is being pushed, see that the inhaler contains ether; the original two ounces last on an average about ten to twenty minutes, but this time is very variable.

7. If at any time the breathing becomes noisy, it can usually be rectified by slightly changing the position of the head, or by pushing forward the base of the tongue, either by pressing forward on the angles of the inferior maxilla

or by tilting the chin upwards. The tongue forceps should be used as seldom as possible, and should be used lightly; for if employed often or carelessly, the tongue is subsequently very painful.

8. For the successful administration of an anaesthetic it is necessary to *watch the patient and not the operation.* If the anaesthetist does not give his whole attention to his subject, the first indication that he may have that the patient is in a bad condition may be the cessation of breathing; whereas a careful anaesthetist would have noted a change in the respiratory rhythm and facial aspect and would have warded off the danger by early action.

THE ADMINISTRATION OF ETHYL CHLORIDE

All that is needed to give ethyl chloride is a well-fitting face piece, a bag to contain the drug, and a stopcock of a similar nature to that used for the administration of nitrous oxide. The recumbent position is preferable, but the anaesthetic can be administered sitting up. The quantity of the drug required varies with the age of the patient, being approximately in children 2·5 cubic centimetres, in women 4, in men 5, which amount should be squirted into the bag and the administration proceeded with as for nitrous oxide without delay. If necessary, during the administration, a second dose of 2 or 3 cubic centimetres may be given. The drug is very much more powerful than nitrous oxide, and a patient tends to go under sooner, in some cases three or four breaths being sufficient, and if care is not taken an overdose may be given very easily to these patients. Before commencing the administration always place a dental prop between the teeth, as frequently a considerable amount of muscular spasm occurs. Ethyl chloride can be used as a preliminary to ether anaesthetization in almost the same way as nitrous oxide, only the ether is turned on and the ethyl chloride turned off a little sooner.

METHOD OF ADMINISTERING CHLOROFORM

Chloroform should always be given by the open method ; it is best to have some form of wire frame large enough to cover the mouth and nose (Skinner's mask answers the purpose admirably), over which a piece of flannel is stretched. A graduated drop bottle should be employed for administering the chloroform and a finger should always be held on the stopper to prevent it falling out. The position of the patient is very important: he should be recumbent, with the head slightly turned to one side ; and never in the upright position. He should be directed to breathe gently and to keep the eyes closed, as the vapour is very irritating. A few drops of chloroform are put on the mask, which is held 2 or 3 inches off the patient's face and gradually lowered, chloroform being dropped on it from time to time ; the great essential is to commence slowly, coughing being usually an indication of too rapid induction. If retching occurs in the early stages press the anaesthetic ; if vomiting occurs remove the mask, open the mouth and see that all vomited matter is cleared out before continuing the anaesthetic. The administrator continues to drop chloroform on the mask, this being done more frequently than at the start, and the patient rapidly passes into the stage of excitement, the pupils being dilated and the conjunctival reflex present. This is the dangerous period ; an increasing amount of the drug must be given, but at the same time more air should be admitted by lifting the mask from the face every now and then. The patient soon quiets down and passes into the third stage, with contracted pupils, quiet respiration and the superficial reflexes absent. If the drug is pressed much further the patient will pass into the fourth stage, with dilated, insensitive pupils and both, deep and superficial, reflexes absent ; this is a dangerous condition, for very little more of the drug will cause death. The patient, to be in an ideal condition should have a good colour, quiet, regular, rather deep respira-

tions, the eyeballs fixed, the pupil moderately contracted and sensitive to light, the pulse regular and strong. In chloroform anaesthesia special attention must be paid to the colour of the patient's face and to the breathing; sudden paleness is often a sign of cardiac failure and the anaesthetic must be stopped; quick, shallow respirations may mean an overdose. The remarks made under the heading of ether administration (see pp. 37 and 38) on the pulse, respirations, pupil, &c., apply with equal force to chloroform. In children, anaesthesia must be induced very slowly as it is easy to give an overdose. Occasionally a condition of so-called 'false anaesthesia' occurs, the child in reality going to sleep; the superficial reflexes are absent, the pupils contracted, and the patient may appear to be well under. When the skin incision is made the child struggles and coughs; at this stage the anaesthetic must not be pushed, as after a fit of coughing the child will take a deep breath and, if much chloroform is given, may get an overdose; the drug should be freely administered but plenty of air admitted at the same time.

CHAPTER III

THE HEAD

NAEVI

NAEVI are tumours of blood-vessels and, for practical purposes, can be divided into two classes, cutaneous and subcutaneous. These two divisions are not distinct from one another, one tumour often combining characteristics of both. Yet the division is useful in directing attention to those points which indicate special lines of treatment. Wherever it is possible, naevi should be removed by excision; of all methods of treatment it is the one which leaves the least scar, the least deformity, and is the most certain in its results. When excising naevi, it should be borne in mind that the subcutaneous variety is more or less encapsulated, whilst the cutaneous is not; and in consequence the former can be excised easily whilst the latter must be removed together with a margin of healthy tissue. In the cutaneous form, if the cases of recurrence after electrolysis or other non-operative treatment are examined, it will be seen that frequently the failure is due to the fact that the growing margin was not destroyed, and consequently, a new ring of naevoid tissue has appeared round the site of the scar. The zone of apparently healthy skin round the edge of a naevus must always be destroyed. The excision of a cutaneous naevus is limited by its size and situation. After the removal of large tumours, if the skin edges will not meet, the raw surface can be covered by means of skin grafts. A subcutaneous encapsulated naevus can be removed through a straight incision, the wound being opened up by undercutting its edges; the haemorrhage is not severe provided that the surrounding

tissues, and not the tumour, are incised. When the *subcutaneous naevus* is too large for excision, there is practically nothing to be done but to protect it. When the *cutaneous naevus* is too large for excision, consideration will have to be given to repeated partial electrolysis, scarification, treatment by X-rays, &c.; or, perhaps, to repeated partial excisions with skin grafting. A certain number of naevi become cured spontaneously, so that if a naevus shows no sign of increasing, or even fades, and is in a situation that does no harm, it can be watched safely; but if it shows signs of increase, and particularly if it is soft, protuberant and bright red, or is situated on the scalp, face, genitals, &c, where it will be exposed to irritation or injury, it should be removed as soon as possible. There are certain situations in which it is particularly important to make no delay in treatment, because of the possibility of disastrous consequences. Naevi over a fontanelle may extend to the dura mater; by the eye, they may extend deeply into the orbital fat; over the parotid region, they may extend deeply into the parotid gland, around the branches of the facial nerve.

For excising large naevi it is best to administer a general anaesthetic, but small ones can be removed without any, or under a local anaesthetic such as eucaine. It must be remembered, however, that the young are bad subjects for local anaesthesia.

ELECTROLYSIS OF NAEVI

In situations where excision is impracticable, such as the lip, eyelid, &c., or where the naevus is too large for excision, the most satisfactory method of treatment is by means of electrolysis, a constant current being used and the needles attached to both poles inserted into the naevus; if small, however, only the positive pole should be used, the negative pole being attached to a flat pad moistened with salt solution, which is placed on any convenient part of the body, spine, buttock, arm, &c., its position being altered from time to time. The

positive pole is connected to one or more platinum needles, insulated to within a short distance of the points. A current of from 50 to 100 milliampères should be used for from ten to fifteen minutes; in order to produce this amount of current, from ten to twenty cells will be required. An ordinary cell, such as a Leclanché, when used for electrolysis can be reckoned on as producing from 5 to 7 milliampères. If the naevus is on the scalp not more than 50 milliampères should be employed. It is better to give a general anaesthetic as there is a considerable amount of shock, especially in children when the naevus is over a fontanelle. The skin over the naevus is thoroughly cleansed and the needle, which has been boiled, is inserted into the edge of the tumour, care being

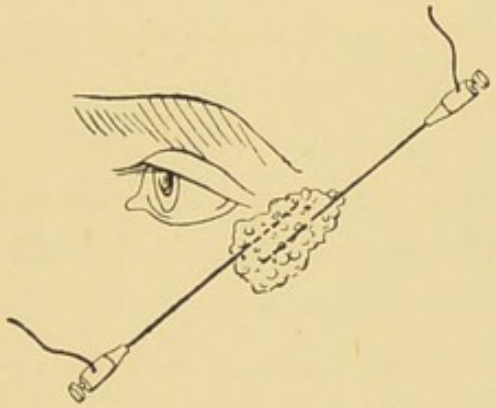


Fig. 17. Position of needles introduced for electrolysis of a naevus.

taken that the point is not too near the surface or sloughing may ensue. If more than one needle is used, see that the separate needles are kept parallel, otherwise the current is not evenly distributed. The current is turned on gradually, the position of the needles being changed from time to time. It will be noticed that the naevus becomes white in colour and that there is a little bubbling of gas round the point of the needle. The current should be reversed for a few seconds before withdrawing the needle, thus preventing any further haemorrhage. A little gauze and collodion should be used as a dressing; the collodion being put *round* the naevus and not *on* it. The immediate result is that the naevus becomes firmer, but this disappears in three or four days; in a few

weeks, it is possible to determine if further treatment will be required. If the naevus is at all large, it is usually necessary to repeat the operation several times before the tumour is completely destroyed. Special attention should be paid to the growing margin of the naevus. In employing electrolysis, great care must be taken not to do too much at one sitting, or sloughing may occur. It is better to do too little than to risk doing too much.

SEBACEOUS CYSTS

Sebaceous cysts are situated most commonly on the scalp, then on the cheek and neck. As with dermoid cysts, excision is the proper treatment. For practical purposes it should be recognized that a sebaceous cyst cannot be removed without breaking it, but, unless suppurating, little harm is likely to result from the sebaceous material touching the wound during the operation. The hair for some distance round the cyst must be removed and the scalp cleansed; inject eucaine hypodermically round the base of the cyst; when the skin is anaesthetized, transfix the cyst with a thin-bladed knife, then cut upwards, the knife coming out on the surface of the skin; wipe away the sebaceous material and then, with forceps, pull away the cyst wall entire. The wound is closed, if necessary, with a few horsehair or catgut stitches, and a firm dressing put on to prevent the accumulation of blood in the wound. If the cyst is on the face, it is sometimes better, instead of one straight incision, to make two curved ones enclosing a portion of skin between them if it is adherent to the tumour, then shell out the cyst entire. When the cyst has been subject to inflammatory mischief, the wall is often thickened and adherent, requiring to be dissected out; none must be left behind. When suppuration is present, the cyst wall should if possible be removed, and a gauze drain left in the wound. Sometimes horns develop, due to slow leakage and drying of the sebaceous material; these when present

must be enclosed in an oval incision and removed with the cyst from which they spring.

MOLLUSCUM CONTAGIOSUM

Small glandular tumours usually found on the face, neck, chest, &c. They can be removed easily by cutting across the base with scissors, and touching the scar with caustic; or by transfixing and dividing them, as described under the section on sebaceous cysts, and squeezing out the molluscum bodies. A dry powder soon forms a cake and is the most efficient dressing. Boracic powder is excellent, and can be washed off in two or three days.

DERMOID CYSTS

are most frequently seen at the outer angles of the eyes, the root of the nose, and on the scalp. Excision is the only proper method of treatment and can be done easily and safely. A straight incision should be made over the tumour, the edges of the skin undercut, and the tumour removed by means of forceps and knife.

It is advisable not to open the cyst as its contents might infect the wound. The skin edges are united by a few stitches, and the wound dressed with gauze. If small, these tumours can be removed under local anaesthesia; but, if at. all large or in a child, it is better to give a general anaesthetic Those situated on the scalp frequently lie in depressions in the bone, and if large may reach the interior of the skull, but they never communicate with the dura mater. Special care must be taken with those at the root of the nose, owing to the very great difficulty of distinguishing meningoceles from dermoids, before operation. The only danger in excising a meningocele is that of meningitis arising from suppuration in the wound.

RODENT ULCER

is an obscure form of malignant disease, the course of which may extend over many years, the patient finally

succumbing to some other affection. In some cases, beyond the presence of the scabbed sore on the face there may be little trouble; in others, the growth invades the eye, nose, mouth, pharynx, &c., or may form a large tumour on the scalp. If these ulcers or tumours are small they can be excised with safety; in undertaking this responsibility, however, it must be remembered that rodent ulcers show very varying pictures of malignancy. The free removal of a 'mild' rodent ulcer will in all probability be successful; in the more virulent forms 'recurrences' take place again and again.

Rodent ulcers have responded to treatment with X-rays and radium. In the present state of our knowledge, however, it is better to treat them by early and free excision; should these measures fail, X-rays and radium can be tried. When removing small rodent ulcers, an anaesthetic must be given: and the incisions must be made wide of the growth, always cutting through healthy tissues, great care being taken to remove the base of the tumour; unless this is done, recurrence is certain to take place. When it is found that the skin edges will not meet, grafting must be used to cover the deficiency (see p. 207). When operating on these cases, the practitioner must not belittle his work on account of the small size of the tumour. His incisions must be made wide of the edges and continued well below the base of the tumour. Before making his incisions he had better consult Fig. 18, p. 48.

SUBCUTANEOUS TUBERCULOUS NODULES

These are most frequently found in children, a favourite situation being the cheek near the angle of the mouth, where they appear as raised patches of a purple or bluish colour, being generally soft, seeming almost diffluent to the touch. As a rule they subside under general treatment; if they do not, an anaesthetic should be given and the nodules excised; or freely opened, any unhealthy skin cut away, and the granulations thoroughly curetted. The wound may or may not be closed with a few stitches. The scarring is not

necessarily unsightly, and on the cheek it sometimes makes a dimple, which is fortunately in the most approved situation. The distribution of the nodules is often very wide; for instance, the face, trunk, and limbs may be affected, but the prognosis is by no means as bad as the general distribution of the disease would imply, the children usually recovering completely. General treatment should be carried on for a considerable period, and the child watched carefully for the appearance of some such lesion as a tubercular joint.

LUPUS VULGARIS

At the present time lupus is being treated by means of the Finsen lamp, concentrated light from which the heat rays have been removed; this method certainly produces excellent results, and should be employed when excision is impracticable or when recurrence has taken place after excision.

Excision. This is the most satisfactory method of dealing with small patches of lupus. An anaesthetic is given and an oval incision made enclosing the diseased area, the cuts being made through healthy skin. All the diseased tissues within this area must be removed, care being taken that the incision at the base is made below the diseased area. If the skin edges will not meet, skin grafts should be used; and these should be applied at once before any contraction has occurred (see p. 207).

Scraping is the method of dealing with scattered areas of lupus, where excision is impossible owing to the large amount of skin affected, or where light treatment is not available. The surface is thoroughly scraped with a sharp spoon, and any small pockets due to the extension of the disease should be eradicated with a smaller spoon. The wound is dressed with an ointment containing 10 to 20 minims of creosote and 15 to 30 grains of salicylic acid, to the ounce; it is advisable to commence with a weak ointment, strengthening it from time to time. The essential point in the whole operation is thoroughness; lupus is very apt to recur, and

if one small nodule is overlooked recurrence is almost sure to take place, necessitating further operations.

These two methods can be combined, the growing edge of a large patch being excised and the centre scraped.

INCISIONS FOR ABSCESSES AND CELLULITIS

of the head and face must always be made in directions that will avoid injury to important structures. In the scalp, incisions should radiate from the vertex. It must be carefully borne

Fig. 18. Face showing various incisions used.

in mind that collections of pus between the skin and the epicranial aponeurosis are localized, whilst those between the epicranial aponeurosis and the bone may present over the eyebrows and at the occiput. When incisions have to be made through the aponeurosis, that structure can with advantage be divided transversely to the long axis of its fibres, so that the incision gapes. On the face, owing to the looseness of the connective tissue, swelling and oedema are very great; thus things may appear worse than they really

are. On the forehead a vertical incision can be made in the middle line, and horizontal ones along the lines of the shaved eyebrows; care must be taken not to divide the supraorbital nerve. By the side of the nose incisions are made parallel to the infraorbital fold. On the cheek they are made horizontally, parallel with the fibres of the facial nerve. In the upper lip they should be horizontal; in the lower lip, vertical in the middle line, and obliquely downwards from the angle of the mouth, avoiding the facial artery. In cases of severe cellulitis of the face and neck (Ludwig's angina), many and large incisions are necessary, and it is far better to make too many and too free incisions rather than too few. In some instances, not common on the head and face, it is best, after the primary incision, to open up the wound by means of artery forceps, as less damage is then done. As a rule no drainage is required, but if necessary a small gauze wick, at one end of the wound, will prevent its closing too soon. Small abscesses can be opened under local anaesthesia by freezing, though considerable pain is felt; it is more satisfactory, if the abscess is at all large, to administer gas. In cases of Ludwig's angina a general anaesthetic should always be given.

FIBROMATA

There are two varieties of fibromata: the hard and the soft.

Hard fibromata, occasionally found on the face, scalp, &c., consist of dense, exceedingly vascular, fibrous tissue; sometimes they are encapsulated. Wherever possible they should be excised: if a capsule is present, the tumour can be shelled out through a straight incision; if there is no capsule, it must be dissected out, care being taken not to cut into the substance of the tumour lest troublesome bleeding follow. The whole of the fibroma must be removed, otherwise recurrence is almost certain to take place. Fibromata can be excised under local anaesthetics, but general ones are preferable, as there is sometimes considerable trouble in removing the

tumour. Should it be pedunculated, the base must be taken away with the tumour.

Soft fibromata. (1) *Molluscum fibrosum,* small pedunculated tumours which can be snipped off with a pair of scissors. (2) *Moles,* generally found on the face; these should, if possible, be excised, being a source of danger, as they may become the starting-point for melanotic sarcoma. They often occupy large areas, and after excision it may be found that the skin edges will not meet; if this is so the raw surface must be grafted. When excision is impracticable owing either to their size or situation, treatment must be carried out by electrolysis. Operation should not be delayed if the mole is increasing in area or thickness, becoming more deeply pigmented, ulcerated, or bleeding.

DESTRUCTION OF SUPERFLUOUS HAIRS

Superfluous hairs, especially on the chins and upper lips of females, or on facial moles, can be removed by electrolysis. The negative electrode should be made of a very fine platino-iridium needle, bent at an angle of 45° one-third of an inch from the point. The positive electrode should consist of a flat pad moistened with salt solution; this is placed on the patient's lap. For hairs on the upper lip, a current of 1 milliampère will be sufficient; on the chin, or for hairs on moles, about 3 milliampères. Small currents such as these should be used to start with, and, if the hair is not destroyed, the current can be increased. The needle is introduced into the hair follicle in a direction parallel to the hair, and, as it must not penetrate the skin, the introduction of the needle is facilitated by working with a lens. When the needle has been inserted, the patient grasps the electrode on her lap; almost immediately small bubbles of gas appear at the mouth of the follicle, and, in from ten to fifteen seconds, a yellowish area appears round the hair. As soon as this is seen, the patient is told to drop the electrode, for if this area of necrosis is allowed to increase, the scar will be per-

manent. The needle is withdrawn, and the hair, which should offer no resistance, is gently pulled away with epilation forceps. In this manner many hairs can be destroyed, but those close together should never be removed at the same sitting, as the necrosed areas might join and the scar become permanent. A cooling lotion should be applied to the part, which will look red and be covered with a scab; in a week, however, it will have the appearance of normal skin. This little operation should be spread over many sittings, a few hairs being done at each.

ADENOMATA OF THE LIP

The tumours previously described under this title are now known to possess, in many cases, the pathological character of the 'mixed tumours', or endotheliomata. They are hard and movable, usually situated in the lower lip, and can be readily removed through an incision in the mucous membrane. The cut edges of the lip should be united by means of silk stitches. No dressing should be employed, but the patient should frequently wash out his mouth with an antiseptic solution.

HARE-LIP

Hare-lip, uncomplicated by cleft palate, can be operated upon easily and safely, especially if the cleft of the hare-lip does not extend into the nasal cavity. If the infant is healthy, strong, and there are no septic conditions about the nose and throat, the operation should be done, when possible, before the occurrence of dentition, that is to say, within the first few months of life. Chloroform is the best anaesthetic to employ. There are numerous operations described for this condition, but the secret of success lies in adapting modifications of them to the case in hand. Roughly, the art consists in making the edges of the cleft raw, and sewing those raw surfaces together. Particular care must be taken to avoid the formation of a notch in the lip, at the lower end of the line of sutures. With

this object, the flaps must be fashioned and adapted to the exigencies of the case. Never perform a textbook operation by 'rule of thumb' and unintelligently. The accompanying sketches show the lines used for the incisions in the most general form of operation. It can easily be adapted to any particular case by shortening or lengthening the various limbs of the incisions. The coronary arteries do not give rise to troublesome haemorrhage. The best suture material is fine silkworm gut threaded on the finest needle that will take it: these stitches may be left in for a week. For dressing, there is none better than gauze and collodion or Whitehead's varnish and strapping. It is a good plan to put a streak of collodion at

Fig. 19. Incision of operation for hare-lip.

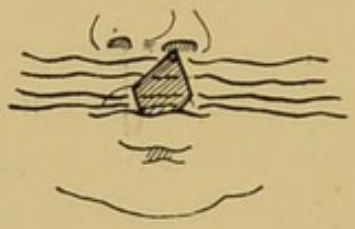


Fig. 20. Method of suture in operation for hare-lip.

right angles to the centre portion of the lower lip; so that, as it dries, the lip curls outwards and opens the mouth. Care must be taken with the feeding, and, if necessary, the infant's hands must be restrained. The immediate result of this operation is always disappointing to the parents and relations, so that it is necessary to warn them of this point beforehand. Immediately after the operation there should be a projection on the lip, at the end of the line of sutures; this will, to a great extent, prevent the formation of a notch later, in this situation.

When the hare-lip is accompanied by a cleft palate, no operation should be performed on the hare-lip until the surgeon, who is to deal with the cleft palate, has been consulted; he may prefer to operate on the cleft palate before the hare-lip is touched.

It should be remembered that a child with a hare-lip is a

mouth breather; so that when the lip is sutured, if he cannot breathe through his nose, he may be partially suffocated. The use of the collodion on the lower lip is to draw it down and open the mouth. A warning should always be given to the nurse in charge.

EPULIS

An epulis is a tumour of the gums. There are two forms, the benign and the malignant, the former being by far the more common. The benign or fibrous epulis takes its origin from the exuberant granulations round a bad tooth, the stump of a tooth, or a piece of necrosed bone. When operating, it is of no use merely to remove the tumour, but the cause of the growth must be looked for and removed as well. For a few days before operating the patient should rinse his mouth with an antiseptic solution, and the teeth should be frequently and thoroughly cleaned. An anaesthetic having been given, the tooth or necrosed bone, in connection with which the growth arises, is extracted, and the tumour, with the mucous membrane and periosteum over which it is situated, removed. Smart haemorrhage sometimes occurs, but it can be controlled easily by means of a gauze plug, which, if necessary, can be soaked in adrenalin. No attempt should be made by the practitioner to deal with a malignant epulis, or with a case of recurrence after removal of a simple one, as these require extensive operations.

THE MAXILLARY ANTRUM

can be opened easily to relieve an empyema. The upper teeth, on the same side as the diseased antrum, should be examined, and treated when necessary. The old practice was to drain the antrum by boring upwards through the socket of a tooth; now it is opened through the canine fossa, the depression on the anterior surface of the superior maxilla just above the canine tooth. The upper lip is retracted, the

mucous membrane incised over this fossa and then stripped up with an elevator. The antrum is opened by removing with a gouge the thin layer of bone which is over it. Then the communication with the nose is dilated by means of artery forceps passed into the nostril from the antrum; when this opening has been enlarged sufficiently, a rubber tube should be drawn through the nostril into the antrum. Special self-retaining rubber tubes can be worn later, as the opening into the mouth tends to close before the antral trouble has healed. A useful plan is to make the patient dilate this opening night and morning with the terminal phalanx of his little finger.

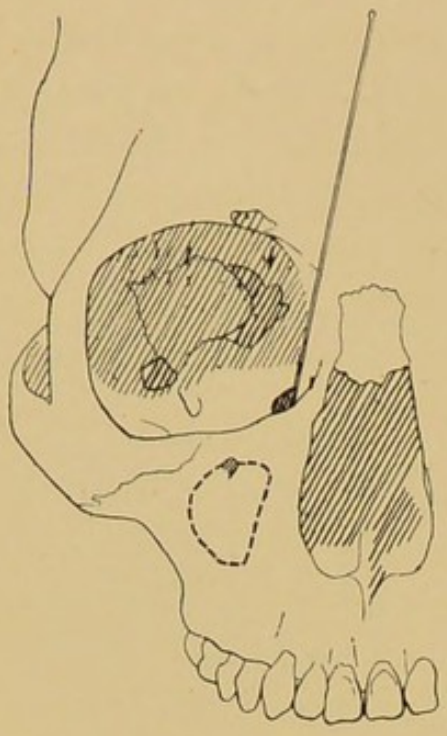


Fig. 21. Bones of one side of face, showing position of maxillary antrum and probe in the lachrymal duct.

TRANSILLUMINATION OF THE ANTRUM AND FRONTAL SINUS

The method of transillumination is very useful in assisting to decide if an antrum or a frontal sinus is healthy. The method of examining the former is as follows:—The room must be capable of being completely darkened. A small guarded electric light fitted to a special handle is placed in the patient's mouth, and all light is completely shut out from the room. Then the key in the handle is pressed, completing the circuit and lighting the lamp in the patient's mouth. If both antra are healthy, the cheeks will be illuminated. If one antrum is diseased, that part of the cheek will be darkened, which can be readily detected by comparing the illuminations of the two sides. The lamp should not be kept lighted long, as it becomes hot. The test is of value in deciding between

a healthy and an unhealthy antrum, but is of no use in distinguishing between an unhealthy antrum filled with pus or growth. By its means many a patient can be reassured and others advised to undergo an exploratory operation.

The condition of the *frontal sinuses* can be tested in a somewhat similar way. But in this case, the electric lamp, specially constructed, is pressed into the nasal side of the orbit and one frontal sinus illuminated at a time. As in the case of the maxillary sinus, the test is useful in indicating the healthy, but valueless for distinguishing the various unhealthy conditions from each other.

It is necessary to have a special instalment of electric current in order to use this test.

CHAPTER IV

THE HEAD (CONTINUED)

TONSILS AND ADENOIDS

THERE is no doubt that the operation for tonsils and adenoids is one which is done far more frequently than is required. In suitable cases, it confers a great benefit on the child; at times the result seeming almost magical to the parents. Adenoids in children are most frequently produced by the same factors

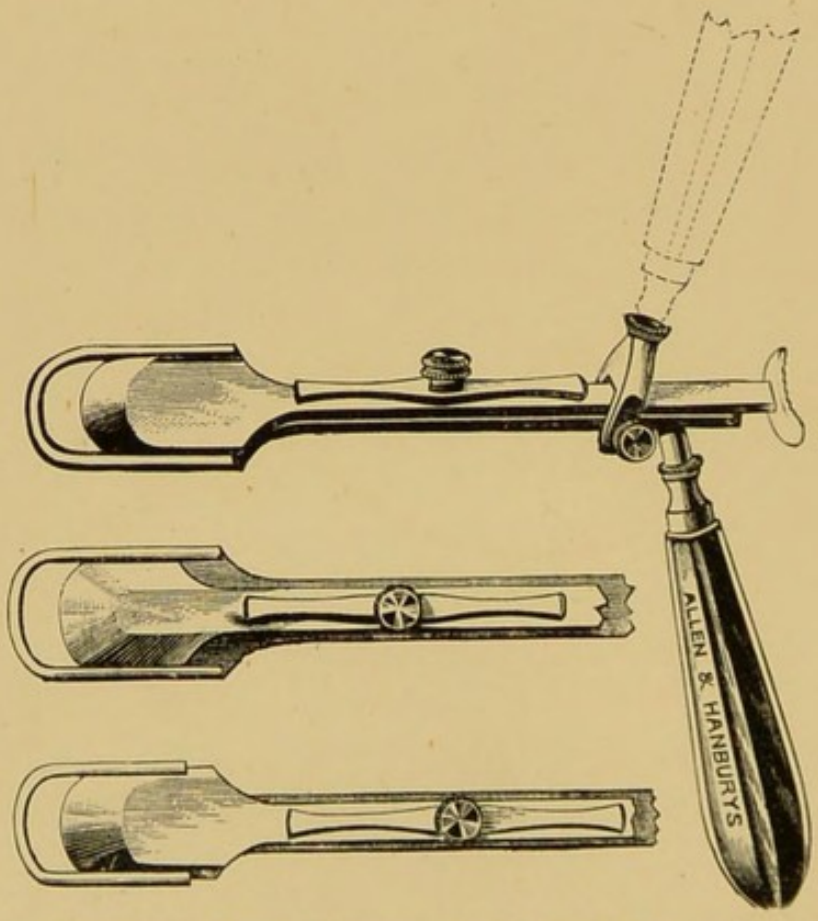


FIG. 22. Mackenzie's tonsillotome, with three blades to fit one handle.

which give rise to rickets. In rickety children, the soft bones of the nose tend to fall in, and the unventilated nasal cavity teems with organisms, thus causing the lymphoid tissue there to increase. Owing to these two factors, the falling in of the

bones and the hypertrophy of the lymphoid tissues, nasal respiration is impeded and rendered uncomfortable, the child becoming a mouth breather. The nasal cavity is now no longer aerated; the organisms multiply and the lymphoid tissue continues to hypertrophy, so rendering the obstruction worse. Directly mouth breathing starts, the tonsils become

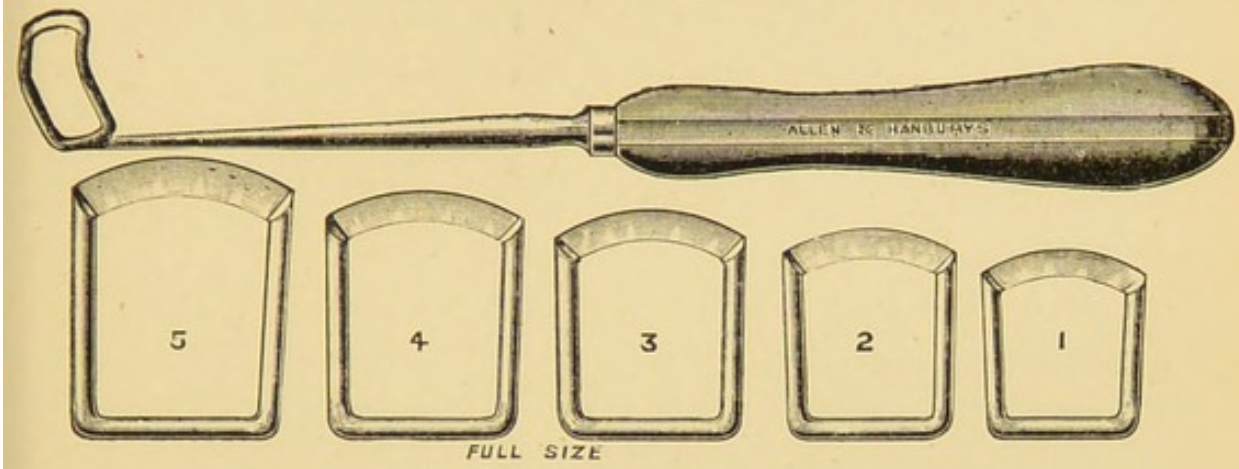


Fig. 23. Adenoid curette.

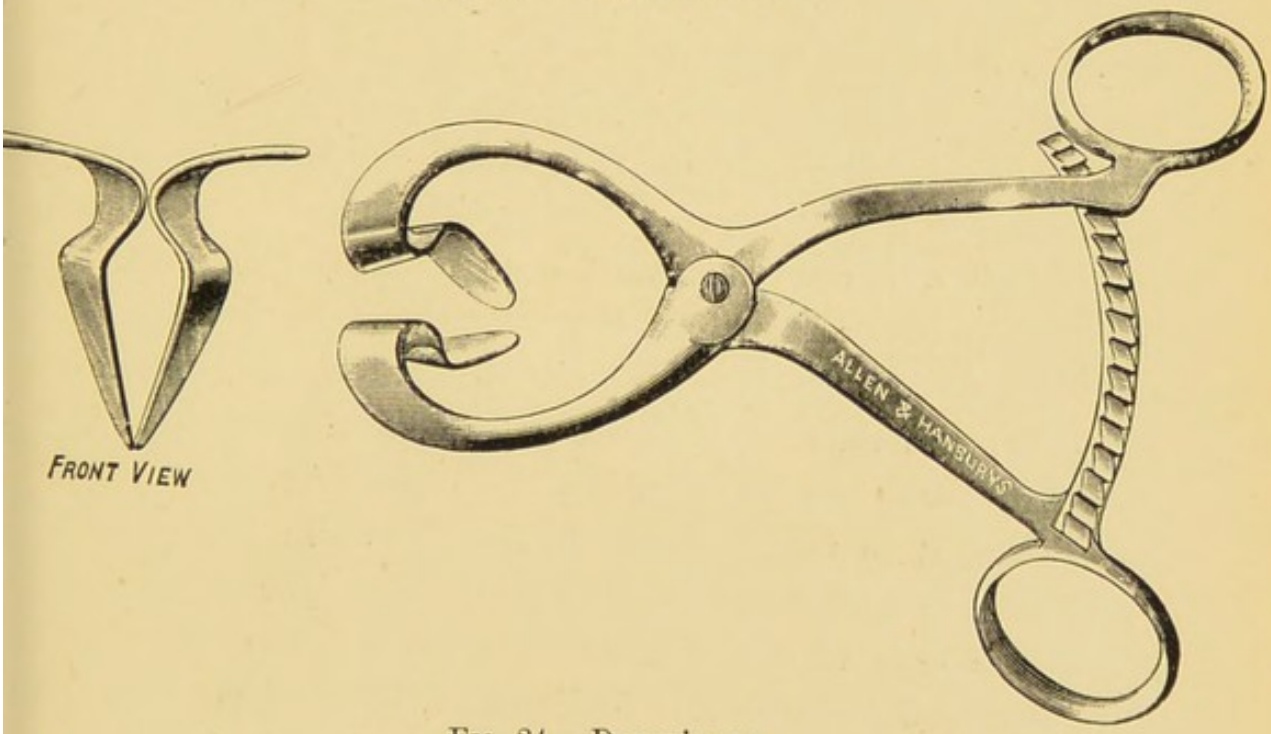


Fig. 24. Doyen's gag.

irritated and enlarged, and in this way the concurrence of enlarged tonsils and of adenoids is explained.

The object of the operation for adenoids is to remove the unhealthy tissues from the nasopharynx. There are two points that have to be dealt with before an operation is performed; firstly, the rickety tendency must be overcome;

secondly, nasal respiration must be taught. The great criterion of the success of any operation is that the resulting condition should be useful, that is to say, physiological. If it is not useful, the operation is not a success. *After every operation for adenoids the children must be taught to become habitual nose breathers and to cease to be habitual mouth breathers.* If the child still goes about with its mouth open and does not breathe through its nose, the lymphoid tissue will again hypertrophy, reproducing the obstacle to nasal respiration which was present before the operation. If the child is taught to breathe through the nose, the aeration and the expulsion of discharges through the nose will prevent the organisms multiplying; stopping the growth and leading to the atrophy of the lymphoid tissue. Further, when the nose is acting physiologically, the bones entering into its formation will grow properly. The lesson which all this teaches is that the object of the operation is to establish habitual nasal respiration, without which treatment is not concluded. The failure to establish habitual nose breathing is equivalent to the failure of the operation. Seeing the importance of nasal respiration, it is always advisable to make a trial of nasal respiratory exercises before the operation. If these can be carried out thoroughly, in all probability no operation will be required; the natural, healthy, physiological growth of the nose and nasopharynx effecting the cure. As a matter of experience, it is found that not all children in whom nasal respiration is established improve markedly. The chief reason for this is easy to see, if the tonsils are much enlarged and show enlarged follicles, the condition of the children will not show much improvement until these are removed. The above advice may be summed up dogmatically as follows:—

1. Instruct the child in nasal respiration.

2. If habitual nasal respiration can be established, and the tonsils are small, no operation will be required.

3. If the tonsils are large an operation should be performed.

4. If satisfactory nasal respiration cannot be established, operation is necessary.

5. After operation, treatment must be persisted in until nasal respiration has been established as a habit.

6. It must be remembered that adenoids may be merely a symptom of a rickety condition.

There is a point in the examination of a child's throat which is usually overlooked. When the back of the tongue is depressed by a spatula, the patient strains and opens his throat, retracting the tonsils, which may seem quite small. If the same case is examined without a spatula, the patient

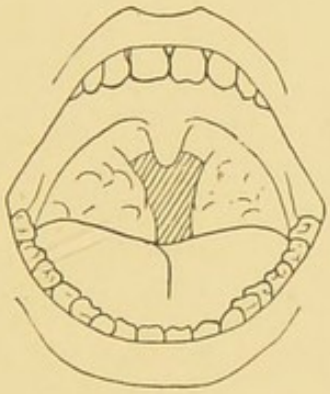


Fig. 25. View of enlarged tonsils as seen in the resting position; no spatula used.

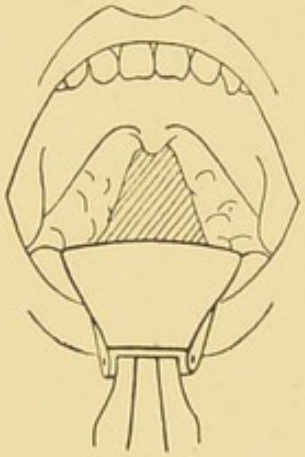


Fig. 26. View of enlarged tonsils as seen in active position; spatula used.

leaning back over the doctor's knee, the tonsils may be seen almost to meet the uvula when the throat is in the 'resting' position. When a sufficient view has not been obtained the patient must be taught to say 'ah' slowly and in a low voice. If these means fail, a spatula must be used. (Figs. 25 and 26.)

The method of operating on a child differs in one important particular from that of operating on an adult. In the former, the operation consists of removing the tonsils and clearing the nasopharynx; in the latter, besides these two steps it is advisable to remove the thickened posterior ends of the inferior turbinate bones. Unless this last step is taken, the

deafness from which the patient has been suffering may not be improved. In some cases it may be necessary only to remove the thickened mucous membrane; in others, bone must be removed as well. A variety of anaesthetics may be employed; those who specialize in anaesthetics show marked differences of opinion. Ethyl chloride, or nitrous oxide fol-

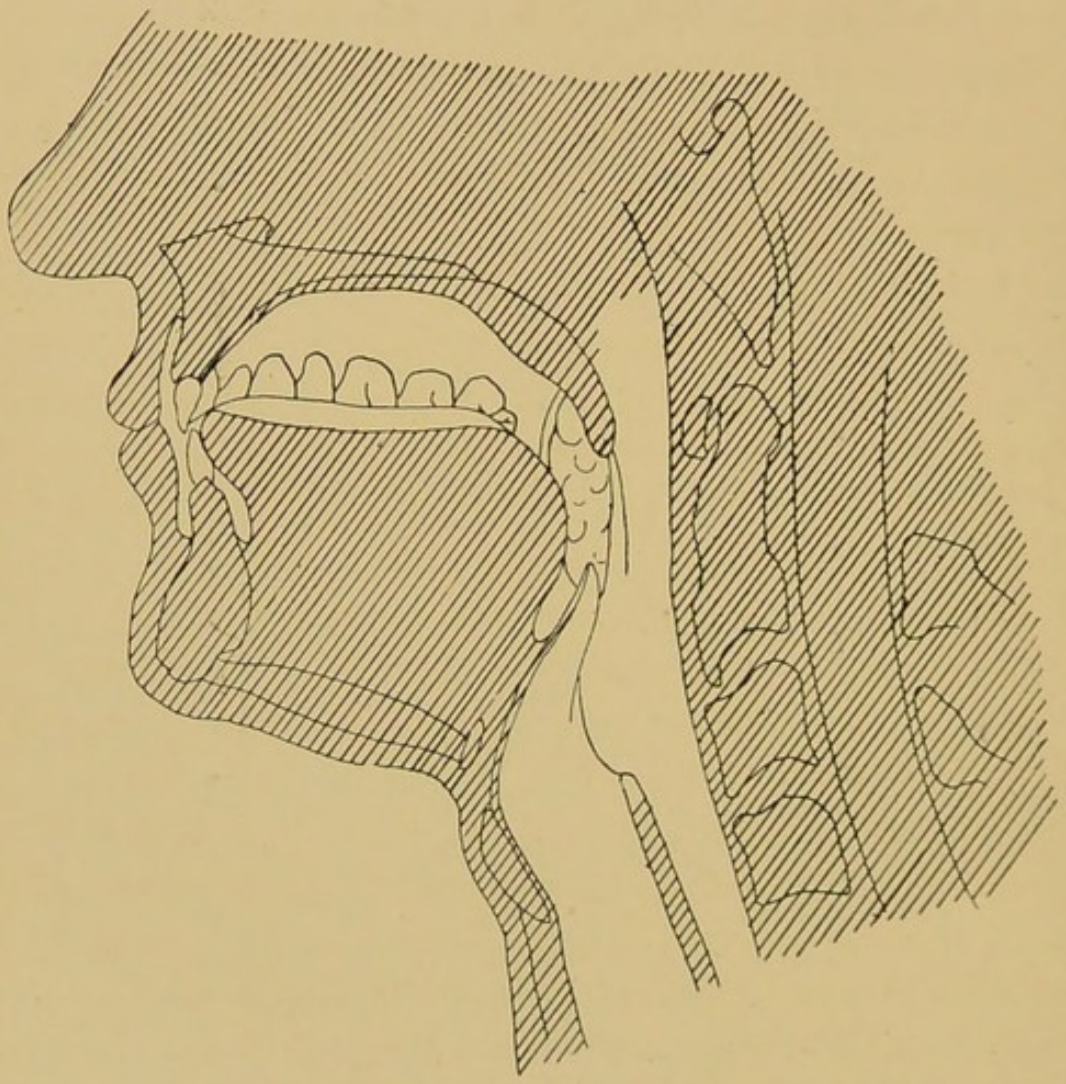


Fig. 27. Sagittal section of neck showing downward enlargement of tonsil.

lowed by ether are both excellent, but chloroform is the anaesthetic most generally used. It should be given slowly, and the operation commenced before the corneal reflex has disappeared. Of recent years a school has grown up, the members of which prefer to give no anaesthetic; holding the opinion that the child is less frightened, that the operation is as easily done, and that there is less bleeding. With chloro-

form anaesthesia, at the commencement of the operation the patient should lie on his back, the head being drawn over the end of the table; and should this make the patient 'come round', a little more of the anaesthetic must be administered. A gag is placed in the mouth, and the projecting portion of one tonsil and then of the other is removed with the guillotine; it is necessary to remove the top of the tonsil with the greater part of the crypts. It is a bad habit to exert pressure behind the angle of the jaw; for by this method a larger piece of tonsil is removed than is necessary, and there is a risk of troublesome haemorrhage. When the projecting portions have been removed, it will be noticed that the tonsils often extend down the lateral walls of the pharynx, and are much more enlarged than the first inspection had led one to believe; a condition which cannot be ascertained easily before operation. Having removed the tonsils, the adenoid curette is introduced round the soft palate, and the vegetations broken up and removed. Manipulation must be gentle, and care exercised to avoid damage to the Eustachian tubes. This step in the operation can be concluded, if necessary, by means of a straight curette passed first through one nostril and then through the other, guided by a finger in the nasopharynx. It should be remembered that *the object of the operation is to establish nasal respiration*, so that it is necessary to make plenty of space by removing the larger masses; but there is no need, however, to expend energy in trying to remove every trace of adenoid tissue, as the subsequent cicatrization and the future establishment of nasal breathing will cause any which may be left behind to atrophy. At the end of the operation the child should be turned over on to its side, and the face sponged with cold water; the bleeding will soon cease.

A few further words must be added about this operation in adults. It will often confer great benefits upon them: relief from deafness, headaches, colds, sore throats, bronchitis, &c. It will not, however, greatly improve their power of nose breathing; or alter, in the slightest degree their facial

expression, as growth has ceased. In those who have had adenoids removed, subsequently the inferior turbinates may hypertrophy and require removal.

TONSILLAR ABSCESS

A tonsillar abscess can be opened under local anaesthesia, the surface of the tonsil being swabbed with a ten per cent. solution of cocaine. A tenotome should be used, or a narrow-bladed knife with only about half an inch of the blade exposed, the rest being guarded by strapping wound round it. The knife is thrust into the abscess at a level with the last molar tooth; a common mistake is to enter the knife too high up and miss the abscess. The incision can be made by cutting vertically or inwards, never outwards; and enlarged by a pair of long artery or sinus forceps. In some cases of suppurative tonsillitis, the abscess is situated above the tonsil, in the soft palate; if this is so, the mucous membrane over the most prominent part of the swelling should be incised carefully with a guarded knife and the incision deepened with artery forceps. Even if pus is not found the haemorrhage will be beneficial, and a track will be left for the pus, when formed, to find its way to the surface. An antiseptic spray or gargle should be used for a few days after the abscess has been opened.

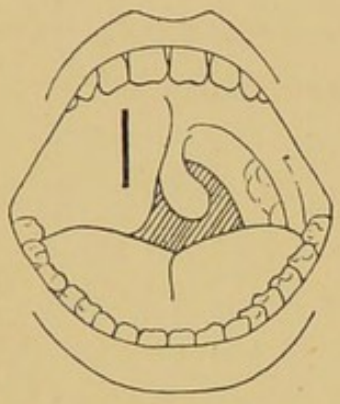


Fig. 28. Incision for right peritonsillar abscess.

AMPUTATION OF THE UVULA

Care should be taken before operating to ascertain that the symptoms are not due to a chronic pharyngitis or laryngitis, or in part due to one of these conditions; if the latter is the case it is best to warn the patient's relatives that the symptoms will not be entirely relieved by the operation. The uvula

should be anaesthetized with cocaine, and then seized at the tip with a pair of long artery forceps, the redundant tissue being cut off obliquely with blunt-pointed scissors. If the haemorrhage is at all troublesome a stitch will stop it.

UVULOTOMY

In sore throats, the uvula may become swollen and cause the sensation of a foreign body in the pharynx. Under such circumstances the uvula should be incised. The part is painted with a five per cent. cocaine solution, and as soon as it is insensitive it is seized with forceps, and one or two longitudinal incisions are made with a sharp tenotome; or several 'snips' may be made with scissors. The oedema soon goes down; and if the incisions are not deep, there need be no fear of haemorrhage.

NECROSIS OF THE JAW

Necrosis of the jaw commonly occurs in connection with septic teeth, and an abscess usually forms; this may point externally on the cheek or inside the mouth. If possible the

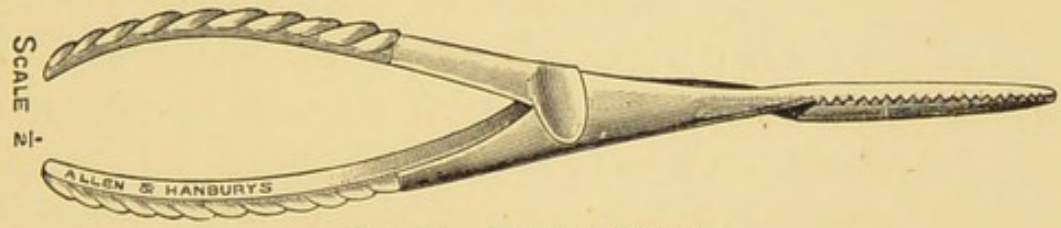


Fig. 29. Necrosis forceps.

abscess should be incised inside the mouth, and the opening well dilated. Should dead bone be present, a sinus will persist, which should be treated with antiseptic mouth washes. From time to time the sinus should be probed in order to discover if the sequestrum is loose. When free, an incision should be made (if possible within the mouth). It is better not to cut across the sinus. The incision should be made down to the periosteum, which is stripped up with an elevator. If necessary the opening in the bone is enlarged, and the sequestrum removed, but if the sequestrum is very large, it

may have to be broken up first. The cavity in the bone should be thoroughly scraped, all granulations being removed; it should then be rinsed with sterilized water, and plugged with gauze, which can be removed within twenty-four hours. It depends on the size and the shape of the cavity whether it should be replugged or not, but syringing should be continued, and antiseptic mouth washes used frequently.

ALVEOLAR ABSCESS

In nearly all cases an alveolar abscess can be relieved by removing the offending tooth, but in many instances it is not advisable to extract a tooth which can be made perfectly sound by subsequent treatment at the hands of a dentist. By opening the abscess, pus is allowed to escape and relief is obtained. An incision is made in the fluctuating swelling inside the mouth, the edge of the knife being directed towards the alveolus. As a rule no plug is required. The mouth should be washed out frequently with hydrogen peroxide (Liquor Hydrogenii Peroxidi, one part: water, ten parts). These abscesses have a tendency to make their way outwards through the cheek; if possible, this must be prevented by early incision within the mouth, a common mistake is to apply hot fomentations externally. If the abscess is on the gum or the outer side of the jaw, it is easily seen. But when on the inner side of the jaw, and particularly by the posterior molars, it is apt to be overlooked and may extend into the neck; where it may be necessary to make an incision.

TONGUE TIE

is a condition which is said to be very common, but the cases requiring treatment are very few. Cutting the frenum linguae is an operation that has been done far too frequently in the past, and the result in cases where it is not necessary is to cause cicatrization, and consequently an increase in the very condition which the operation was supposed to relieve. If

the frenum is extremely short, and the child unable to suckle (the mother's nipples being healthy), it should be divided. A small transverse cut should be made near the symphysis and the tongue pulled up, so as to enlarge the incision.

A RANULA

is a mucous cyst in the floor of the mouth, and, if small, can be easily removed. The surface of the tumour is painted with eucaine, steadied with forceps, and cut into with sharp-pointed scissors; the cyst wall is then grasped with forceps, and pulled away entire. The essential point in the operation is that the whole of the cyst wall should be removed. If the cyst wall cannot be wholly removed, as much as possible must be cut away, and any left behind curetted and painted with silver nitrate (4 grains to the ounce) to destroy it. It is useless to plug the wound. Mouth washes are to be used frequently in the after-treatment. If the tumour is large it will require an extensive operation to remove it thoroughly, and it would be best to take further advice.

NASAL RESPIRATORY EXERCISES

After operations for enlarged tonsils and adenoids, it is of great importance to ensure the patient's becoming an habitual nose breather. The best way to accomplish this is by nasal respiratory exercises. At least three times a day the child should be put on its back, for about half an hour at a time, and made to breathe in and out as deeply as possible, through its nose, the mouth being kept tightly shut. This exercise should be continued daily, until the child becomes an habitual nose breather. It is sometimes difficult to get young children to do this exercise properly, and in such a case, a piece of oil silk should be tied over the mouth, thus compelling the child to breathe through the nose; this should be done for not less than half an hour at a time. Whenever the child is found to be breathing through the mouth or going about with the

mouth open, he should be corrected. One of the most difficult habits to get rid of, is sleeping with the mouth open; attempts should be made to overcome this by fixing a bandage round the lower jaw and tying it over the head, as this tends to prevent the lower jaw dropping. Nasal respiration should always be taught as a part of the routine of drill, and should be combined with ordinary calisthenic exercises.

FOREIGN BODIES IN THE NOSE

It is astonishing how long foreign bodies may remain unnoticed in the nose. Children insert them, and say nothing about it, so that in cases of unilateral nasal discharge in children, foreign bodies must always be looked for. Usually the body is easily removed by syringing up one nostril, the mouth being held open. With a mirror and a good light the body can generally be seen through the anterior nares, and, if syringing fails, can be removed with forceps. In some instances, the body is pushed far back, and must be removed through the posterior nares. In young children it is often advisable to give a little chloroform before attempting to do more than simple syringing.

NASAL POLYPI

Polypi of the nose is a common condition, and from the practitioner's point of view has the disadvantage of not being cured at 'one sitting'. A general anaesthetic can be given, and the polypi twisted off with polypus forceps, or they can be removed with a snare, under cocaine or under a general anaesthetic.

1. *Removal by polypus forceps.* The patient's head is turned to one side, so that the blood can run out of the side of the mouth; a finger is then passed into the nasopharynx, and the polypi felt. Polypus forceps are passed first up one nostril and then up the other, guided by the finger in the nasopharynx, and the growths twisted off. When the nasopharynx and

nose feel clear, the operation can be completed by passing a curette through the nostril.

2. *Snaring polypi.* The operator should sit in front of the patient, and work with a frontal mirror and a good light; the most essential point is to have strong illumination. The nostrils are plugged with small pieces of wool soaked in cocaine; after a few minutes all the plugs are removed, and a nasal speculum introduced. A polypus is then carefully defined, and the snare introduced and guided over the tumour, on to its pedicle; it is then tightened up, and the pedicle cut through. It is a good plan to make the patient blow strongly down his nostril from time to time, in order to bring more polypi from behind into view. All the

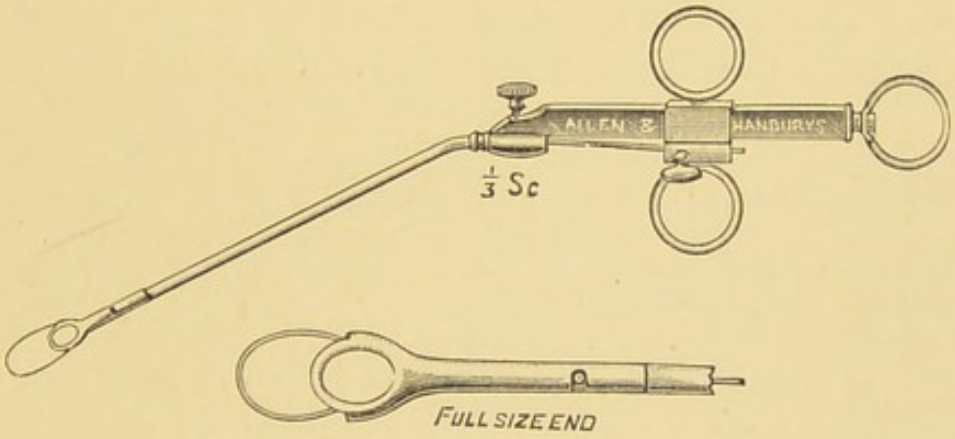


Fig. 30. Nasal polypus snare.

polypi that can be seen are treated in the same manner; a few small ones generally escape observation; and after a little time they grow, when they can be removed.

In either operation, if the haemorrhage is severe, it can be stopped by plugging the nostrils with gauze, or with gauze soaked in adrenalin; this plug, however, should never be left in position for more than twenty-four hours, as it gets intensely foul, and will lead to septic mischief, perhaps to infection of the ears via the Eustachian tubes. All manipulations must be carefully done, meningitis being sometimes set up as a result of injury to the roof of the nose. After either operation, the nose should be washed out frequently with some bland and unirritating solution, such as sterilized water

or normal saline. This is done by directing the patient to lean forward over a basin while keeping the mouth wide open; then, whatever is syringed up one nostril will return down the other.

The patient should be taught to acquire the habit of nasal respiration, in order to keep the nose and nasopharynx clean and well-ventilated, so lessening the chances of a recurrence of the condition.

FURUNCLES IN THE EXTERNAL AUDITORY MEATUS

Furuncles in the external auditory meatus require incision under gas; after operation the ear should be lightly packed with gauze soaked in boracic lotion, and this should be changed daily. Hot fomentations are very comforting. The patient must be warned that the condition is apt to recur.

PASSAGE OF THE EUSTACHIAN CATHETER

There are several ways of doing this, but the following is the method recommended. The catheter, having been sterilized, is held lightly between the thumb and first finger and is passed, with its concavity turned downwards, directly up one nostril until the end of the catheter impinges on the posterior pharyngeal wall. It is then turned inwards, and

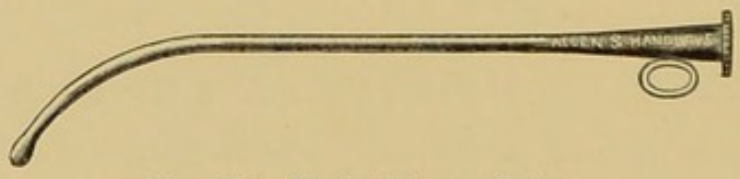


Fig. 31. Eustachian catheter.

withdrawn, until it catches against the posterior edge of the nasal septum. If it is now held firmly and rotated through a right angle, i.e. until the end is directed upwards and outwards, it will enter the mouth of the Eustachian tube, where its presence may be confirmed, if necessary, by means of the 'diagnostic tube'.

FOREIGN BODIES IN THE EAR

Foreign bodies in the ear are sometimes very difficult to remove, a common cause for this being the inflammation and tumefaction of the external auditory meatus, excited by the foreign body; if possible it is better to defer treatment until this swelling has disappeared. An attempt should be made to syringe out the foreign body, the stream of warm water being directed along the roof of the meatus, the ear at the same time being pulled upwards and backwards to straighten the meatus; if this treatment is patiently and skilfully carried out it is successful in almost all cases. If the body is a bean, pea, or any substance belonging to the vegetable kingdom, water will cause it to swell, although not necessarily at once, and to become more firmly impacted. Under these circumstances attempts can be made to remove the body with special instruments, such as wires, hooks, &c., aided by judicious syringing. For heavy bodies, such as stones, shot, &c., it is advisable, when syringing, to have the patient lying down with the affected side lowest; thus allowing gravity to aid extraction. In the case of children it is best to give an anaesthetic before attempts at extraction are made. The greatest care must be employed in using instruments. Should these measures fail to remove the body, it is unwise to proceed further without taking special advice.

CERUMEN

Cerumen accumulates in the ear, and causes deafness and giddiness. Very hard plugs form, which cannot always be removed by syringing with warm water. A tepid solution of bicarbonate of soda (10 grains or more to the ounce) softens these plugs, but a better method is to insert a few drops of warm hydrogen peroxide in the ear for a few minutes; the peroxide is warmed by placing it in a test-tube standing in hot water (100° Fahrenheit). After softening the wax can be easily removed by syringing with warm water.

OTORRHOEA

Otorrhoea, a chronic discharge from the ear, may be attributed to any one of three main causes: a dirty septic condition of the middle ear, the presence of a foreign body or sequestrum, or bone disease. The first can be relieved by the practitioner, and the second may possibly be relieved by him. If, on examining the ear, a foreign body is detected it should be dealt with (see p. 69). If the discharge is due merely to a septic condition of the middle ear it should be carefully syringed, and then packed, through a speculum, with boracic powder, aristol, or some other similar substance; if necessary, being redressed several times daily. Should there be any polypi in the ear, these must first be removed under an anaesthetic, all granulations present being destroyed by a curette; whilst using the instrument great care must be taken to avoid injuring the facial nerve. This is done in order that the cleansing powder may obtain free access to all parts. There are two points, however, to note in performing this little operation: first, removal of all polypi is apt to promote free haemorrhage which must be restrained by means of a gauze plug, hydroxyl, adrenalin, &c.; secondly, the curette must be used gently to prevent injuring the facial nerve, which may be easily done. The ear is then well syringed out and packed. If the discharge is stopped, well and good; but if not, it indicates that a sequestrum is present or that the bone is diseased. No one has any hesitation in recommending an operation to a patient who has a discharging sinus over the tibia. In persistent otorrhoea there is similar bone disease but in an infinitely more dangerous situation; therefore, should the discharge continue after the above treatment, an operation should be strongly recommended.

METHOD OF INFLATION OF THE TYMPANUM

This is a method of inflating the middle ear by forcing air through the Eustachian tubes, and so opening up this passage

when blocked, such as by serous secretion. The apparatus consists of an india-rubber bag holding about 10 ounces of air, connected by tubing to plugs which fit into the nostrils. The patient being seated in a chair, the plugs are held tightly in the nostrils with a finger and thumb; the patient is then directed to swallow, and whilst doing so the bag is compressed, thus driving air into the nasopharynx, which is closed below by the soft palate during deglutition; the air is thus forced through the Eustachian tubes to the middle ear. Instead of swallowing, it is quite satisfactory if the patient distends his

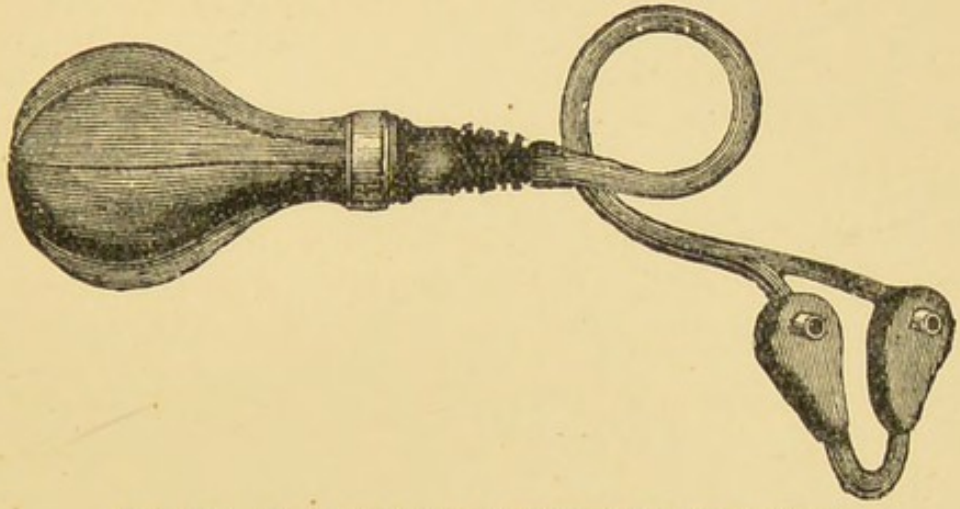


Fig. 32. Rubber bag for inflating the tympanum.

cheeks with air. When this method has been demonstrated to a patient, it is quite possible for him to do it himself.

The tympanum can be inflated if the mouth is shut, the nostrils closed tightly, and the patient swallows; but this method would overcome only slight obstructions.

EXCISION OF THE EYE

This operation can be done under local anaesthesia, but a general anaesthetic is preferable. The conjunctival sac having been washed thoroughly with sterilized water, the speculum is inserted to hold the lids well apart. With blunt-pointed scissors the conjunctiva is cut through close to the cornea all the way round. Tenon's capsule is opened by snipping round with the scissors once again. With the strabismus hook, the ocular muscles (four recti and two obliques) are hooked and brought up one by one, when they are divided

with the scissors. The globe having been well freed in this way, the eye is made to start forward, either by pressing the speculum backwards or by traction with forceps on the sclerotic. The optic nerve is then cut through with a pair of curved, blunt-pointed scissors, pushed in on the nasal side. The nerve itself should be cut as far back as can be managed,

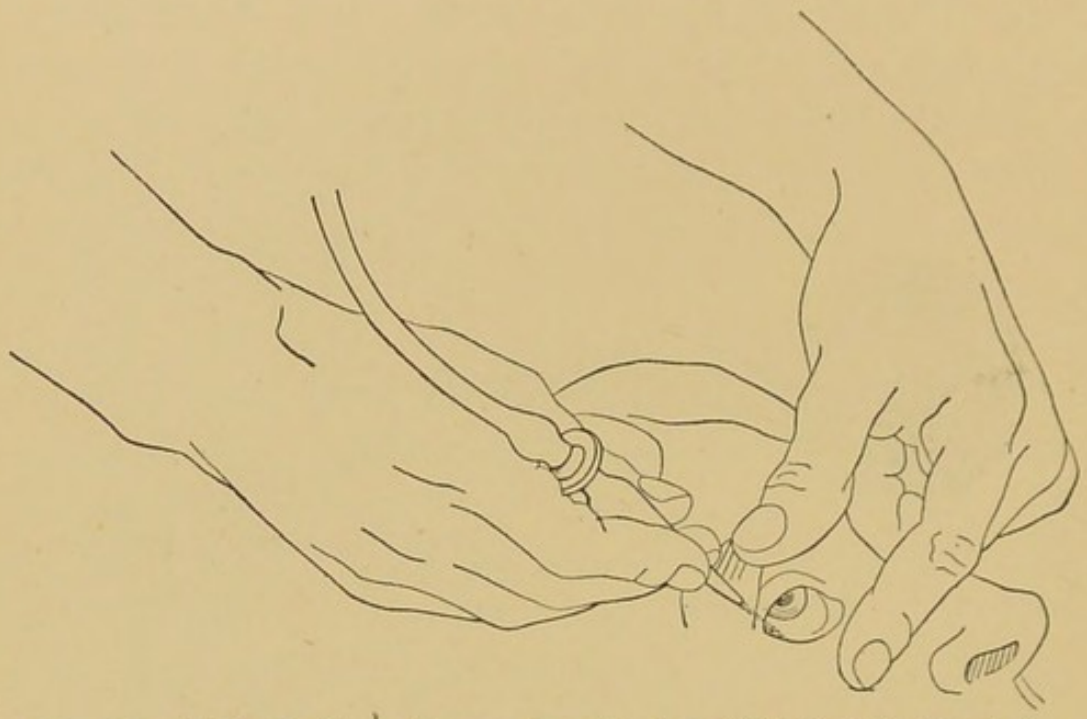


Fig. 33. Method of irrigating conjunctival sac (Ophthalmic douche).

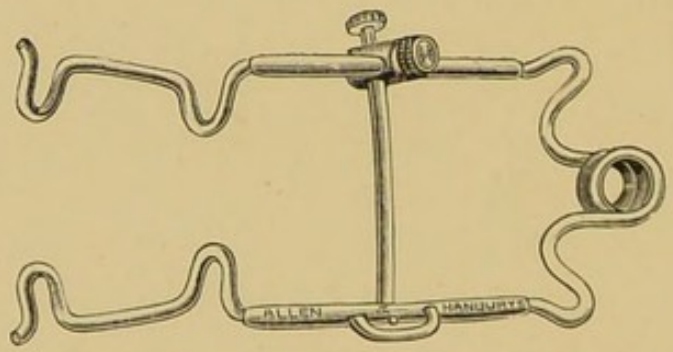


Fig. 34. Ophthalmic speculum.

i.e. with as much of the nerve as possible left attached to the excised eye; this is of particular importance in septic cases as a safeguard from sympathetic ophthalmia. The eye is now removed. Usually there is no haemorrhage that requires treatment, though occasionally it may be desirable to plug the orbit with gauze for a few minutes. It is unnecessary to ligature anything, or to use any stitches. The eye is

covered with a pad and bandage; it adds much to the comfort of the patient if this dressing is changed on the second day.

ARTIFICIAL EYE

An artificial eye can, as a rule, be used in about six weeks after operation. The first essential is that it should fit well and comfortably; the next that it should, as nearly as possible, match the other eye in colour and size. It should be removed every night, and replaced in the morning. In time a glass eye becomes rough on the surface, and when this occurs, a new one must be obtained.

TO INSERT MEDICAMENTS IN AN EYE

The patient is directed to look to the side opposite to that of the eye which is to have the drops put in. Thus, to put drops in the right eye, the patient is directed to look to the left. The lids are held open with the fingers of the left hand, and with the right a drop or two of the fluid or a small particle of the ointment is placed in the upper part of the external canthus so that the upper lid slides over it when freed. The eyelashes must not be soiled. By directing the patient to blink, the medicament is diffused over the surface of the conjunctival sac.

FOREIGN BODIES IN THE EYE

A foreign body in the eye is a condition with which the practitioner has frequently to deal. The usual case is easily relieved by everting the eyelid, with or without cocaine, and removing the particle with a camel-hair brush. Sometimes, however, sharp fragments become embedded in the cornea, and frequently these can be dug out with a spud or fine needle under cocaine (two per cent. solution). Often foreign bodies in the cornea can be seen more easily by means of a lens and artificial illumination. If Bowman's membrane, the connective tissue lamina on which the corneal epithelium lies, is perforated, an opacity will remain, but otherwise there will be no opacity. A perforating wound of the eye is a very grave accident; it often results, should suppuration occur, in

the loss of sight in that eye, and sometimes in the other eye also by sympathetic ophthalmia. In consequence, great care should be exercised to avoid perforating the cornea.

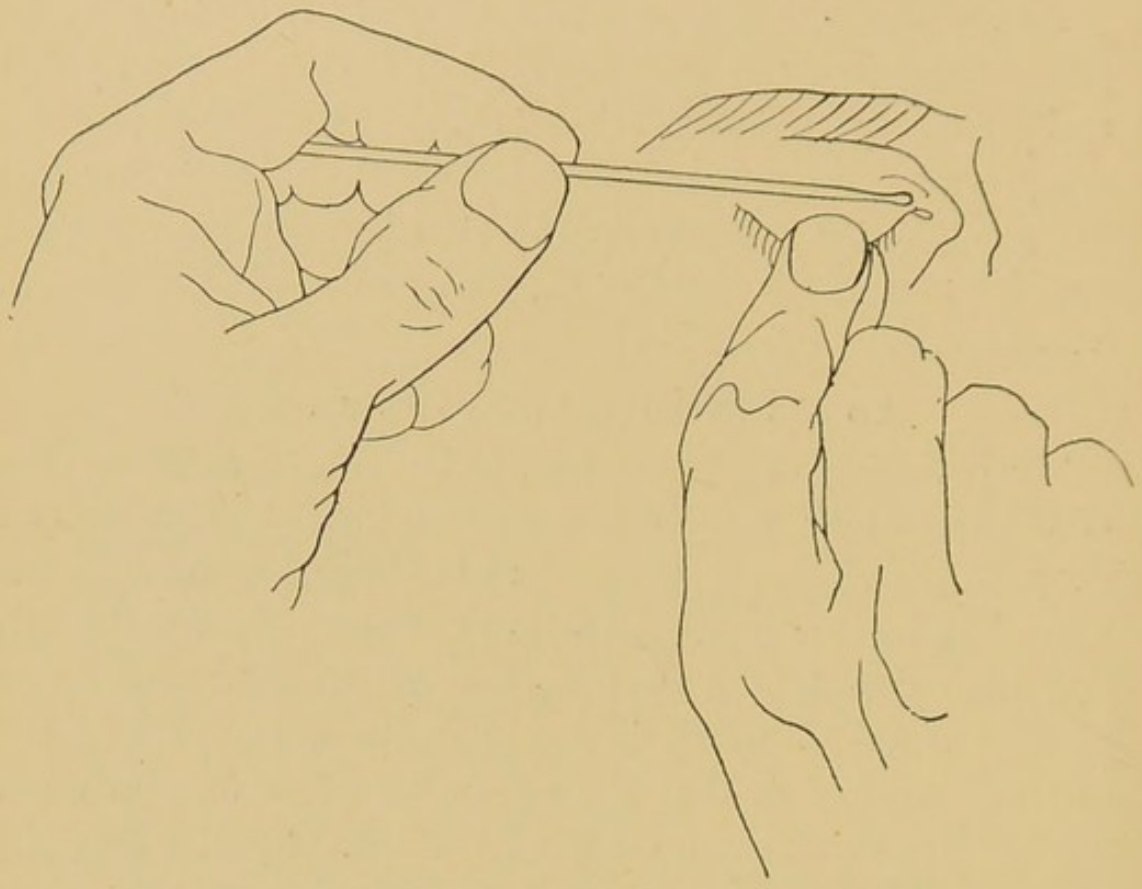


Fig. 35. First stage in method of eversion of upper lid.

EVERSION OF LIDS

To evert the upper eyelid; direct the patient to look down, seize the lashes and at the same time place a probe horizontally across the upper lid. By pulling on the lashes the lid is everted over the probe, which acts as a fulcrum. A local anaesthetic is unnecessary for this little operation. Afterwards, the patient will be much more comfortable if a drop of oil, such as castor oil, is placed in the outer canthus. Great

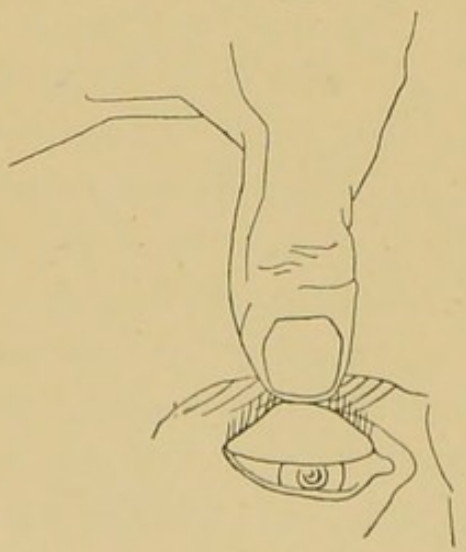


Fig. 36. Second stage of eversion of upper lid.

care must be taken not to soil the lashes in doing this, as it is most uncomfortable.

The lower eyelid can be everted in a similar manner, directing the patient to look upward. Generally it is unnecessary, as the lid can be pulled down sufficiently for the lower part of the conjunctival sac to be examined.

CHAPTER V

THE NECK

ABSCESSES, CELLULITIS

ABSCESSES which are superficial to the deep fascia of the neck are best opened by incisions which are parallel to the long axis of the neck. When they are situated below the deep fascia, they should be opened, if in the middle line, by a

FIG. 37. Black lines indicate the situations of incisions for cellulitis and abscess of head and neck.

longitudinal incision; if at the side of the neck, by one parallel to the anterior or posterior border of the sterno-mastoid muscle. The same remarks apply to cellulitis, but, in this case, the incisions must be larger, and it is as well, when the inflammatory condition extends deeply, to open up the wound with artery forceps, after the method attributed to Hilton (see p. 194). There is no need to drain a superficial abscess, and no stitches should be inserted. In the case

of a deep abscess or cellulitis, it is best to insert an india-rubber tube into the wound to act as a drain and to ensure its being kept open. Reference must be made here to Ludwig's angina, a severe and dangerous form of submaxillary cellulitis which may complicate apparently ordinary sore throats, but especially those accompanying the specific fevers. The spread of the infection is very rapid, rendering necessary numerous and free incisions, such as from the tip of the lower jaw, vertically down the middle line of the neck, and from the angles of the lower jaw, forward, parallel to the rami. In dealing with these cases no question of the amount of the subsequent scarring must enter into consideration. The incisions will appear deep, owing to the large amount of swelling present; the skin should not be stripped up, as, if this is done, there is a risk of its sloughing. Too many rather than too few incisions must be made. As a rule little or no pus or blood will escape from the incisions, which should be left open and dressed with hot fomentations. These should be changed every four hours. As the patient improves the wounds will become redder and discharge more.

CARBUNCLES

Carbuncles are most frequently situated about the back of the neck, at the edge of the hair-covered area, and in nearly all cases require surgical treatment. When operating, the common mistake is to make the incision far too small. The skin must be shaved for some little distance round the carbuncle, which should be freely opened by two incisions crossing each other at right angles, care being taken that all the area of hardness is opened up by the incisions. If the inflammatory condition has shown a tendency to spread, the quadrants of skin marked out by the incisions must be raised, and the septic focus beneath them thoroughly opened up. A blunt curette and forceps can be used to remove the slough, but care should be taken not to destroy the wall of granulation tissue

which protects the rest of the system from infection. No stitches are inserted, the wound being dressed with hot fomentations; these are changed frequently, and will speedily cause the carbuncle to heal, if it has been thoroughly opened. As the inflammation extends under the skin, superficially rather than deeply, any spreading of the septic process can be recognized by an extending area of tenderness and hardness. If the septic process is not extending, and the carbuncle does not improve rapidly, examine carefully for diabetes, kidney disease, and cirrhosis of the liver, any of which may be responsible for the delay in healing. The simple crucial incision can be made under gas, but if more than this is necessary it is better to give chloroform, or gas followed by ether.

Boils in the neck require much the same treatment as carbuncles; the condition is, as a rule, milder, and consequently does not require such severe measures. One incision is usually sufficient. Older surgeons had a method of dealing with carbuncles or boils not requiring incision, which is at times satisfactory. The affected area is covered with an irritant ointment (unguentum sabinae, B.P.), which helped the boil or carbuncle to open and shed the slough.

Sebaceous cysts, dermoids and similar tumours can be removed by the methods already described (see pp. 44–47).

LIPOMATA

There are two varieties, the circumscribed and the diffuse.

A *circumscribed lipoma* is easily removed, owing to the fact that it is surrounded by a capsule. An anaesthetic should be administered, and the part thoroughly cleansed; the skin over the tumour is made tense by pressing with the finger and thumb on each side of it, but, at the same time, care must be taken not to contaminate the skin over the site of incision. A cut is then made through the skin and superficial fascia down to the capsule; this is incised, and the lipoma can be easily shelled out. A blunt dissector may be used, but never

the handle of the knife. There are often outlying lobules which must be removed, or recurrence will be certain to take place. The skin is united with interrupted stitches, and the wound dressed with gauze. If the tumour is in a situation where it has been subjected to pressure, as at the back of the neck, it may be firmly adherent to the skin, and to remove it careful dissection may be required.

The *diffuse lipoma*, if at all large, is exceedingly difficult to remove entirely, and unless all is taken away it will recur. Further advice should, therefore, be taken before operating.

TUBERCULOUS GLANDS OF THE NECK

Pathologically, these glands are generally a combination of inflammatory products and tuberculous disease. They may be regarded as being in one of two conditions, solid or fluid. By the term 'fluid' is understood a state of advanced caseation, or the suppuration of the gland. When solid, the glands are excised and, provided that they are not firmly adherent to surrounding structures owing to perilymphadenitis, this is done easily. If they are firmly adherent however, the operation may be converted into one of the most difficult in surgery. The movability of the glands is a very important clinical sign in helping a practitioner to decide whether to operate himself or not. A sound precept to remember is that there is always more trouble than is apparent, or in other words, although only one gland may be felt on external palpation, yet on operating more, perhaps even four or five glands, will be found. Should an adherent gland be met with in the course of an operation, and it is decided not to persevere in the attempt to remove it whole, the capsule should be incised, and the gland itself shelled out with a spoon. By adopting this method, such unpleasant accidents as tearing the internal jugular vein, dividing the spinal accessory nerve, &c., are avoided. Another practical point is never to attempt to operate on glands of the neck through a small incision, as there is nothing which so readily makes an otherwise easy operation

difficult as trying to do it through too small an incision. Another precept to be remembered is, that veins are emptied of blood when traction is put on them, and that they look like fibrous tissue, for which they may be easily mistaken, and therefore special care must be exercised not to divide them. Finally, always work as close to the gland as possible, and in difficult cases remove the mass piecemeal and not as a whole. Enlarged glands are most frequently found in the submaxillary region, where they overlie three large veins, the internal jugular, the temporofacial, and the trunk formed by their

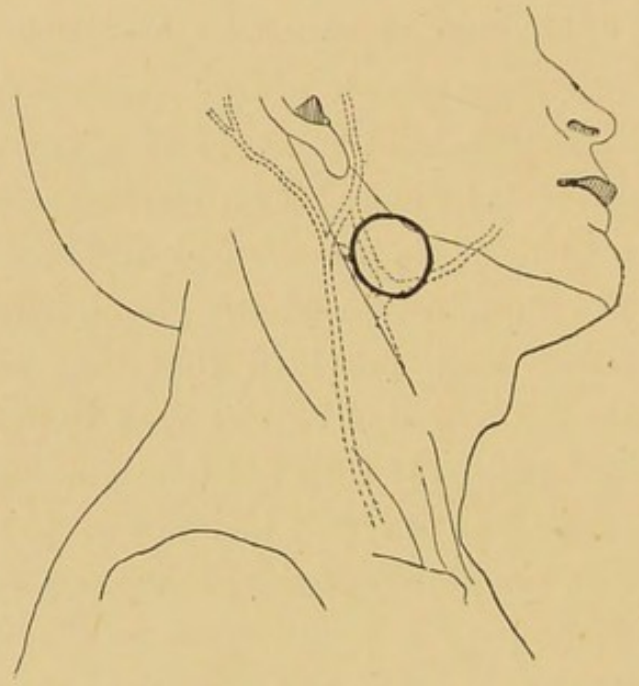


FIG. 38. Black circle indicates common situation of enlarged lymphatic glands, showing their relation to underlying veins.

union. A finger can be used with advantage in shelling these glands out; a higher percentage of suppuration, however, will always be present when this is done. If the glands are fluid, they must be opened and the cavities cleared with a spoon. Should any necrotic tissue or gland be left behind, the cavity will not heal and a sinus will result. The opening of these glandular abscesses is, not uncommonly, merely a prelude to the larger operation of removing the diseased gland. This is especially the case when it can be felt that the glandular mass is in parts cystic, and in parts solid, or when solid enlarged

glands can be felt beneath the fluid. These solid parts may clear up under general treatment after the abscess has been opened and drained, but it is not always so; if they do not disappear, they must be removed as soon as the abscess has healed soundly, or when a sinus is present which shows no tendency to heal. The operation of opening and curetting a broken-down tuberculous gland must be done through an adequate incision, and the wound must not be sewn up, lest there should ensue the development of a condition known as 'local tuberculous infection'.[1] In this condition, the cellular tissues, and sometimes other structures of the neck, become invaded by tubercles. The most frequent cause of sinus formation after an operation, is that the incision has been too small to allow the practitioner to remove properly the diseased tissues. A larger incision is usually required for the removal of a soft than for a hard gland.

Should one of the big veins be wounded, it should be clamped, and a lateral ligature applied; or the vein itself can be ligatured above and below the wound. When the gland is surrounded by much fibrous tissue it may be impossible to ligature the vein: artery forceps must then be left on for thirty-six to forty-eight hours.

TRACHEOTOMY

The operation of tracheotomy is one that is usually associated with the idea of the utmost speed and a suffocating patient. At times, however, it is done quietly and at ease, for such conditions as papillomata, malignant, tuberculous or syphilitic disease, cicatricial contraction, &c., of the larynx. In general, under such circumstances the operation is an easy one to perform. It is usual to discuss a high and a low tracheotomy according as the operation is done above or below the isthmus of the thyroid; in practice this is rather a needless distinction, as during the operation little attention is paid to the isthmus. The higher up the trachea is opened,

[1] *Clinical Journal*, xxvi. pp. 206–8. July 12, 1905.

the easier is the operation. The low operation is the more difficult to perform, is fraught with more possible accidents, and opinions are divided as to whether it has compensatory advantages.

The patient lies in the dorsal position with his arms placed close to his sides; in the case of a child a towel is wrapped round the body to retain them in that position. The shoulders are raised by a hard pillow or sand bag, so that the neck is stretched, thereby bringing the trachea as near as possible to the surface. After the instruments have been boiled and are ready for immediate use, the anaesthetic is administered.

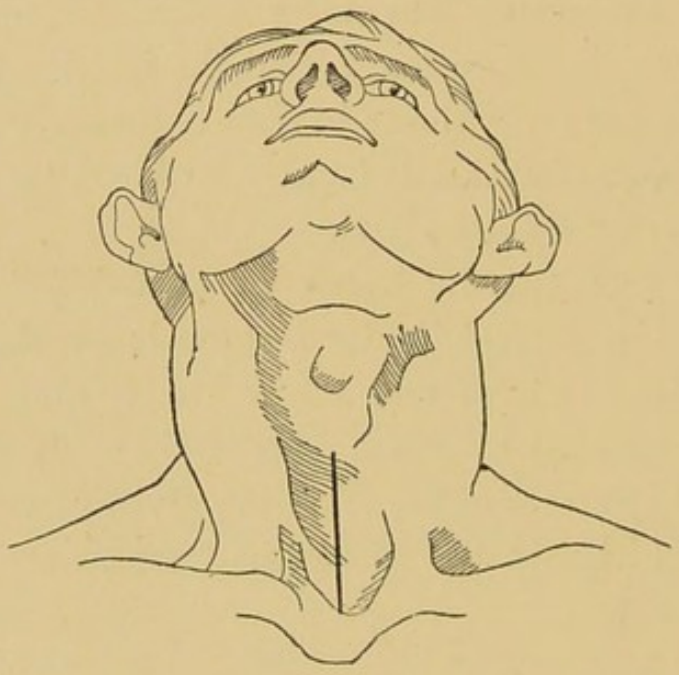


Fig. 39. Neck indicating incision for tracheotomy.

Chloroform is the best to employ, and it should be given slowly and with great caution, the patient never being deeply under. After the skin incision, very little more anaesthetic will be required. When the neck has been cleansed, and the patient's chin held in the middle line, an incision is made from the thyroid, or in adults the cricoid, cartilage, to just above the sternum. It is as well to make the incision as long as this, especially when the practitioner has not frequently performed this operation. The incision is then deepened, and the muscles over the trachea separated and held apart by retractors; care should be taken that the two

sides are retracted to an equal extent. Retractors must be used gently or dispensed with altogether, as unfortunately they pull tight the undivided tissues at the bottom of the wound, rendering it difficult or impossible to feel the trachea. The isthmus of the thyroid gland can be pulled up or down, or it can be divided, in which case, however, there will be a little additional haemorrhage, giving more trouble in an adult than in a child. All vessels are clamped, and then divided and ligatured: in some cases where great rapidity is essential this may not be possible, they must then be dealt with at the earliest opportunity. The haemorrhage is mainly venous and is most troublesome when there is much cyanosis; the bleeding ceases to a large extent when the blood has been well aerated. The rings of the trachea can be felt

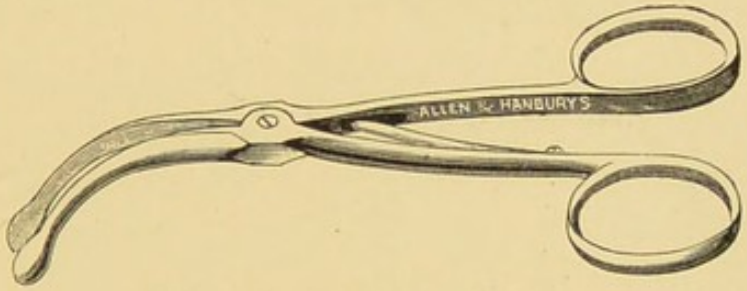


Fig. 40. Tracheal dilator.

easily and, when the fascia over them is divided, their white colour can be seen. It should always be both definitely seen and felt when doing the operation without hurry. It is opened by stabbing it with the point of the guarded knife, when two or three of the rings are divided in an upward direction. The knife should be guarded with the finger held about a quarter of an inch from the point, this is done in order to avoid wounding the posterior wall of the trachea, an accident which may easily happen in the case of children. The dilators are then inserted and the incision opened. Care should be taken to stop all haemorrhage before the trachea is opened, as it is much more difficult to do afterwards. At first there is much coughing, but when the operation has been done for urgent dyspnoea, the patient soon passes into the opposite physiological condition of apnoea,

and ceases to breathe for some seconds. At this time or when the respiration has become normal, the tube is inserted on its pilot and tied with tapes round the neck in a manner which appears to be rather tight. The 'inner tube' is placed inside the tracheotomy tube, being so arranged that it can be taken out, cleaned, &c., without removing the external tube; this is of more use in diphtheritic than in other cases. The skin is sutured in such a manner as to leave an opening all round the tube, in order to allow any air which gets exit from the trachea, to escape round the tube. Otherwise

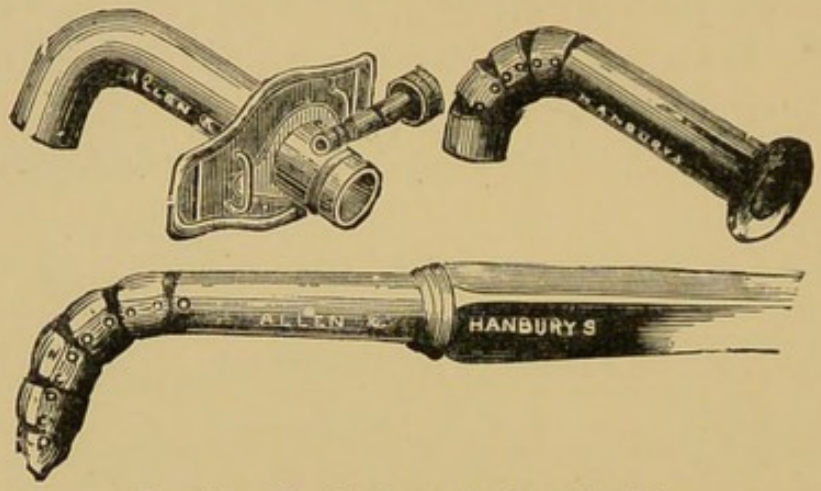


Fig. 41. Tracheotomy tube and pilot.

the air is blown into the tissues of the neck, causing surgical emphysema.

The points in the operation to which particular attention should be paid are:—

1. The light must be good.
2. The head must be held straight.
3. The skin incision must be free.
4. All haemorrhage should be checked; except the capillary oozing in cyanosed cases, which nothing but oxygenation will effect.
5. All incisions should be made directly under each other, i. e. in the middle line.
6. The trachea should be identified before attempting to open it.

The best dressing is a little boracic acid powder over the

wound, and a layer of boracic lint inserted under the shield of the tube; the lint being changed as often as necessary. A thin layer of gauze may be tied over the mouth of the tube and round the neck; if this is done care must be taken that the patient does not cough up anything, for instance a clot, which would, unless removed, block the tube and cause suffocation. It is better to use this gauze only for the first few days. The room should be warm and airy; sometimes it is desirable to place a vessel of water in it to moisten the air: a steam kettle and tent bed are not often required. The patient has to learn to swallow with the tube in, and this at first may cause some trouble. At the commencement the patient is fed on liquids, with a feeder and tube if necessary; the diet is steadily increased, as the wound and power of swallowing allow.

If the operation has been done for permanent purposes the silver tube can be exchanged for a rubber one on the third or fourth day. If done as a temporary measure, the silver tube should be removed as soon as possible, usually at the end of forty-eight hours. This should always be done in the morning, as at night the patient, especially if a child, is apt to be frightened and the tube will have to be replaced.

LARYNGOTOMY

This operation consists of opening the larynx in front, through the space between the thyroid and cricoid cartilages. It can be done only in adults, as in children the larynx has not developed sufficiently. Its great advantage is that it can be performed more quickly and more easily than tracheotomy, but, owing to the proximity of the vocal cords, it is not suitable for cases in which it is necessary to wear a tube for any length of time. The position of the patient is the same as for tracheotomy.

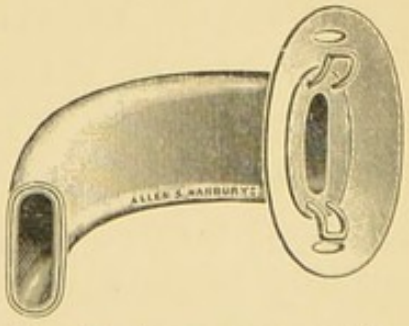


Fig. 42. Laryngotomy tube.

An anaesthetic is administered, for preference chloroform, and a vertical incision made in the middle line about 1½ inches in length, beginning over the thyroid cartilage; the muscles are retracted on either side, and all haemorrhage stopped. The cricothyroid membrane is exposed, and punctured by a stab with the guarded knife, and then divided transversely, a laryngotomy tube being introduced. This tube differs from a tracheotomy tube in being flattened whilst the latter is round. In an emergency this operation can be done in two cuts. As a laryngotomy is only done as a temporary measure, the tube must be discarded in a few days. The dressings, &c., are the same as those recommended for tracheotomy.

INTUBATION OF THE LARYNX

Intubation of the larynx is done as an alternative in cases of laryngeal obstruction in children. It certainly appears to give better results than tracheotomy, in children under five; it is not so severe an operation, and no anaesthetic is needed, but it requires a considerable amount of practice and skill to be performed with dexterity. The instruments required for this operation are a set of O'Dwyer's tubes, an introducer, an extractor, and a gag, but tracheotomy instruments should always be ready. The tube is cylindrical, from 1½ to 2½ inches long, with an expanded end which rests on the vocal cords, and having in the head a small hole to which a silk thread is attached. The tube bulges in the centre to prevent its being coughed up. The introducer is a rigid bar bent at a right angle at the end, and is provided with separate jointed extremities which fit into each tube, from which it can be detached by pressing a button in the handle. The extractor is shaped like the introducer except that at the end are two blades which can be opened out when the extractor is in the tube, by this means holding it firmly.

The operation. The child is held in the sitting position with a towel wrapped round it to keep its arms to its sides. The head is held in the middle line by an assistant, and a gag is placed in the mouth. The left index finger of the operator is then passed into the mouth until it touches the epiglottis and rests on the laryngeal opening. The tube, with silk thread attached, having been previously fitted to the introducer, is held in the right hand with the thread wound round the finger, and is passed along the left index finger until

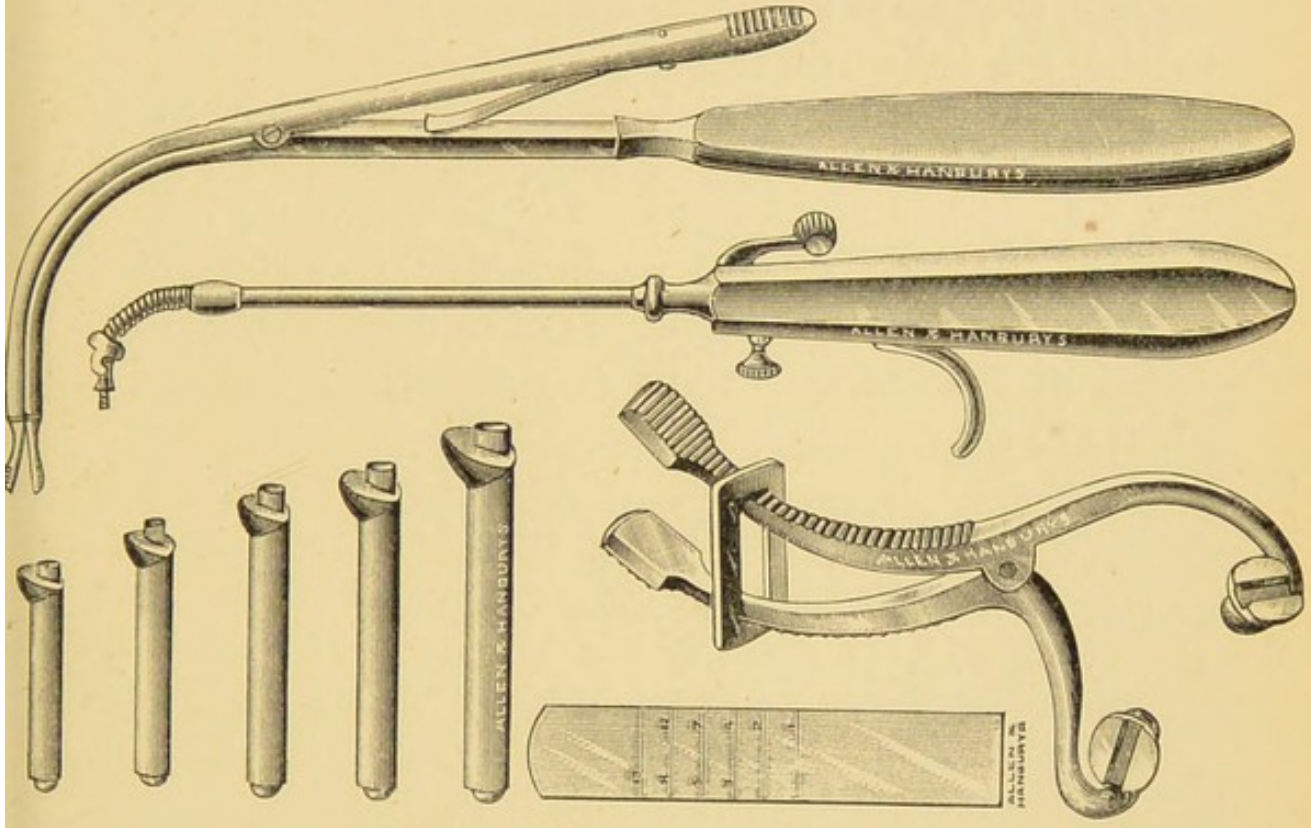


Fig. 43. O'Dwyer's intubation set.

its tip is over the laryngeal opening; the handle is then raised, and the tube passed vertically downwards, slipping between the vocal cords. The tube is held in position by the left forefinger, and the introducer released. The thread should be brought out by one corner of the mouth, and fixed to the cheek with strapping. The introduction of the tube should not take more than a few seconds; if it does not at once enter the larynx it should be withdrawn, and a short time allowed to elapse before making a fresh attempt, as otherwise the child will tend to become asphyxiated. It

is a very common mistake to slip the tube into the oesophagus.

Removal. If the silk thread is present, slight traction on it will succeed in removing the tube. If the silk is not present, a gag is introduced, and the left index finger is placed on the upper end of the tube; the extractor with the blades closed is passed down the side of the finger, and its end introduced into the aperture at the top of the tube; the blades are then opened and the tube withdrawn.

The drawbacks to intubation are that the tube is frequently coughed out and requires reintroducing; and that it interferes with deglutition, allowing fluids to enter the trachea, to prevent which it is best to give only semisolid food or, if this fails, to feed through the nose. In fact, whilst intubation is a proceeding of much use in institutions and hospitals where plenty of skilled assistance can be quickly obtained, it is not likely to be of use to a busy practitioner who cannot always be within call.

FOREIGN BODIES IN THE LARYNX

When a foreign body has become impacted in the larynx, it may or may not cause urgent dyspnoea. If there is no dyspnoea, attempts should be made to remove the foreign body via the mouth with laryngeal forceps aided by a laryngoscope. If the dyspnoea is urgent the practitioner may be forced to do a tracheotomy or laryngotomy. But having done this he will have to decide whether it is advisable for him to attempt to remove the foreign body. If he determines to proceed further, a probe or director is passed through the wound in the trachea, up the larynx. A gag is placed in the mouth, and a finger inserted to catch the body as it is pushed up with the probe into the pharynx. If this fails it may be necessary to divide the thyroid cartilage in the middle line, thyrotomy, subsequently divaricating its alae and examining the interior of the larynx. Having removed the foreign body, the thyroid cartilage is united by silk

stitches, and a tracheotomy or laryngotomy tube used for a few days. The skin is sewn up in a similar manner to that used for a tracheotomy wound.

RETROPHARYNGEAL ABSCESS

A retropharyngeal abscess occurs usually in children. It forms a swelling on the posterior pharyngeal wall, and should be treated by an early operation: for if the pus is not evacuated it will either escape into the throat or find exit in the neck in front of or behind the sternomastoid. The abscess can be opened from the neck or from the mouth; in

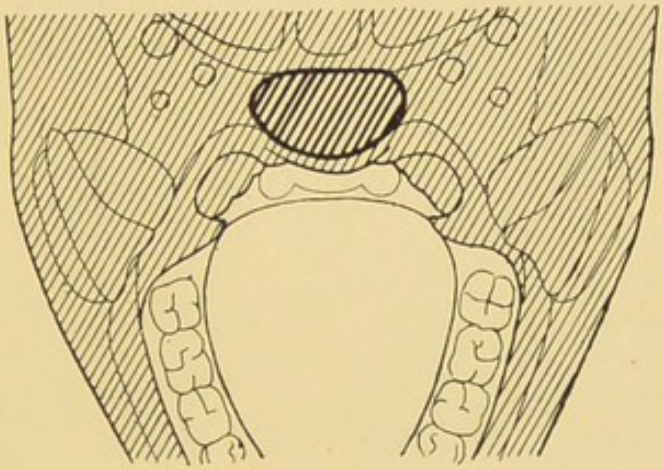


FIG. 44. Diagram of cross-section of pharynx, showing position of median retropharyngeal abscess (*a*) pushing forwards posterior pharyngeal wall, and partly obliterating the cavity of the pharynx.

the latter method the pus is apt to escape down the throat. When operating on the neck the patient is anaesthetized, the skin cleansed, and an incision about 2 inches in length made parallel to and along the posterior border of the sternomastoid, commencing above and behind the tip of the mastoid process. The edge of the muscle is defined and pulled forwards with a retractor. Having carefully noted the position of the transverse processes of the cervical vertebrae, a director is passed between the anterior surfaces of these processes and the sheath enclosing the great vessels of the neck, until it enters the abscess cavity. This manœuvre is much simplified by placing a finger against the abscess wall in the mouth,

as, in this way, it is possible to guide the director and at the same time protect the anterior wall of the abscess. The opening is enlarged with a pair of artery forceps passed along the director, and a small drainage tube introduced. The ends of the incision are sewn up and the wound dressed. It will be found that the tube can be removed in a few days, and that the wound then heals rapidly. It is an operation that requires considerable care in its performance. The only abscesses to be opened through the mouth are the acute.

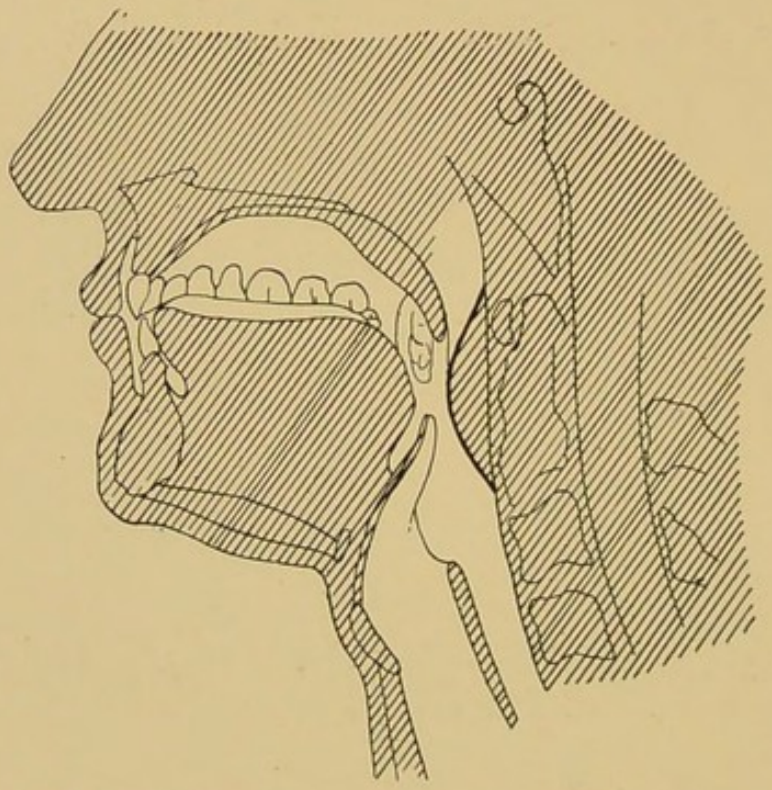


Fig. 45. Sagittal section of head and neck showing retropharyngeal abscess.

The child, at the most, needs only partial anaesthesia. It is then placed on its side and a gag inserted in its mouth. The abscess is incised with a guarded knife, the patient's head being turned quickly to let the pus run out of its mouth. Antiseptic mouth washes are subsequently used.

These abscesses are very often overlooked; a very useful indication is to find multiple small glands in the neck of a child who is ill. It is particularly suggestive if the glands on both sides are affected. The hint should be taken and the

pharynx examined with the finger. It is more frequent to find these abscesses extending round to one side of the pharynx than directly symmetrical behind it. The abscess should be opened on the side to which it extends; if it is symmetrical it can be opened on the side which is most convenient to the operator, generally the patient's right.

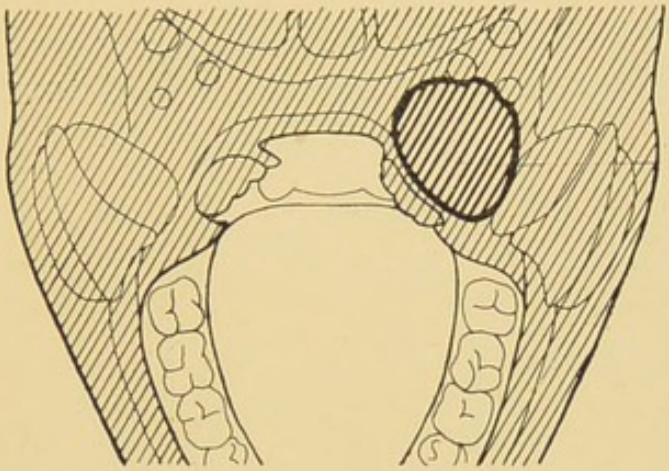


FIG. 46. Diagram of cross-section of pharynx, showing position of lateral pharyngeal abscess, a tonsil displaced forwards and inwards, and vessels backwards and outwards.

TENOTOMY AND MYOTOMY OF THE STERNOMASTOID

Owing to a partial rupture of the sternomastoid during birth, the muscle undergoes a certain amount of local cicatrization, which by its contraction and its interference with the growth of the part causes torticollis in many of the cases. As with tonsils and adenoids, the mere operation is not enough for success, the part which has been operated upon having to be made functional by means of nasal respiratory exercises. Similarly, in a case of torticollis, division of the sternomastoid is insufficient for success; the operation having to be followed by a course of exercises and massage, to render the divided muscle strong and useful. Moreover, time has to elapse before the vertebrae grow straight again; because, whilst the torticollis has existed, the bodies of the vertebrae have grown misshapen and wedge-shaped. Thus the operation *must* be followed by exercises and massage, which must be persevered

in for some months at least before success is obtained. This should be pointed out to the parents and guardians of the child to avoid disappointment on their part.

The operation should be done when the child is old enough to be taught drill and exercises: not before, because this very necessary part of the treatment cannot be carried out; not later, because the longer the patient is left, the greater the deformities of face, vertebrae, and soft parts. Naturally, the age varies very much with each child, and can only be stated very roughly as being between two and five years.

Fig. 47. Incision for division of sternomastoid for the relief of torticollis.

The open operation is better than the subcutaneous, because it is safer, and not because of the usual reasons given, such as 'other structures may need division'. If a surgeon is watched whilst performing the operation, it will be seen that he very rarely divides anything of importance except the sternomastoid. A general anaesthetic is required. The child's shoulders are supported by a pillow, so as to allow the weight of the head to put the contracted sterno-mastoid on the stretch, defining it and bringing it up close to the skin. The head is turned so that the chin is away

from the side of the contracted muscle. The operation area is cleansed and an incision made across the lower part of the sternomastoid, parallel to the clavicle. The muscle is exposed and divided carefully by a series of cuts. There is no risk in doing this if it is done with ordinary care; but, when the neck is stretched, the large veins are pulled up from the superior mediastinum and lie immediately under the field of operation. So that as the ends of the divided muscle separate, the surgeon sometimes sees two large veins with their junction,

Fig. 48. Wound after division and retraction of sternomastoid for relief of torticollis, showing junction of subclavian and internal jugular veins to form commencement of the innominate vein.

rising, filling, falling and collapsing with each breath, just under where his knife has been! It looks much worse than in reality it is. A surgeon who is less confident in his skill, can insert a blunt director close under the sternomastoid and cut down on it. Personally, we think the danger very small indeed in the hands of a careful man, whilst the insertion of the director is as likely to damage the veins, in the hands of a careless one as is the knife.

The head is then rotated to the side of the contracted muscle and the chin raised and depressed to render the retrac-

tion of the divided muscle complete. It is of very little value, if any, to use force. Any obvious tight bands can be divided. But we would not advise the practitioner to spend much time on these details as 'they come within the errors of the experiment', and the tightest structures are often the cords of the brachial plexus which cannot be divided! After all haemorrhage is checked, the wound is closed with interrupted sutures and the head rotated and bandaged in position, with the chin raised and turned to the side of the divided sterno-mastoid. After a week or ten days, massage and passive movements are begun; active movements following as soon as the patient can perform them. We do not think it necessary to place the head and neck in plaster of Paris or in a poroplastic carapace or collar. In course of time the patient will get quite well.

When too young for operation, by means of massage and movements, perseveringly carried out, it may be rendered unnecessary.

The older the patient the less the chance of cure. All that operation does is to put the parts in a position to grow naturally and straight. *It is the subsequent growth of the parts, and not the operation, which effects the cure.* Hence the older the patient, the less the future growth and the less the chance of cure. This is a very general principle which underlies the treatment of all the deformities of children.[1]

[1] *System of Medicine*, by Professor Clifford Allbutt and Dr. Rolleston, 1905, pp. 395–7.

CHAPTER VI

THE CHEST

EXPLORATION OR TAPPING THE PLEURAL CAVITY

EXPLORATION is undertaken in order to determine whether fluid is present in the pleural cavity or not; and if present, to demonstrate its nature. The instrument required is a strong perforated needle fitting on to a syringe with a glass barrel. This can be sterilized by boiling, when an extra

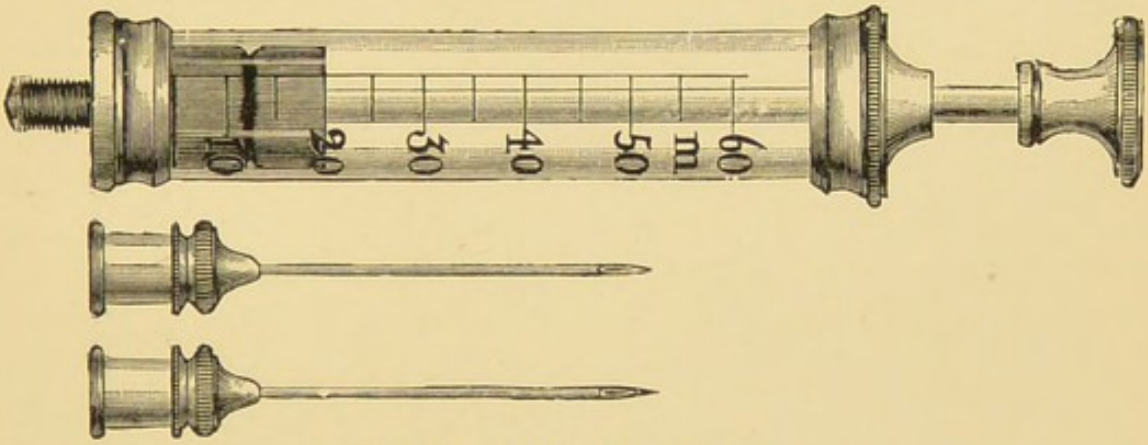


FIG. 49. Exploring syringe.

glass barrel to the syringe should be handy, in case of breakage, or by means of soaking in methylated spirit. A hypodermic needle is too fine, being apt to break, and the barrel of the syringe is small. The site for exploration, which should be the place where the physical signs suggest the presence of fluid, is selected, and the surface cleansed. The skin is drawn up and steadied by the forefinger and thumb of the left hand. The exploring needle is thrust in sharply, *just above the upper border of the rib, below the point selected.* On withdrawing the piston of the syringe, any fluid present in the pleural cavity will flow into the barrel. Care must be taken that the needle is thrust through the structures of the chest wall, and does not push them in front of it.

On withdrawing the syringe the skin is allowed to slip down again, making the track of the puncture oblique; the external wound is covered with a piece of gauze and collodion.

This little operation should be practised more often than it is, particularly in children; the risk attendant on it is practically nil[1], and as the ultimate prognosis depends to a great extent on the length of time which the lung has been compressed by the fluid, it should not be deferred. In children,

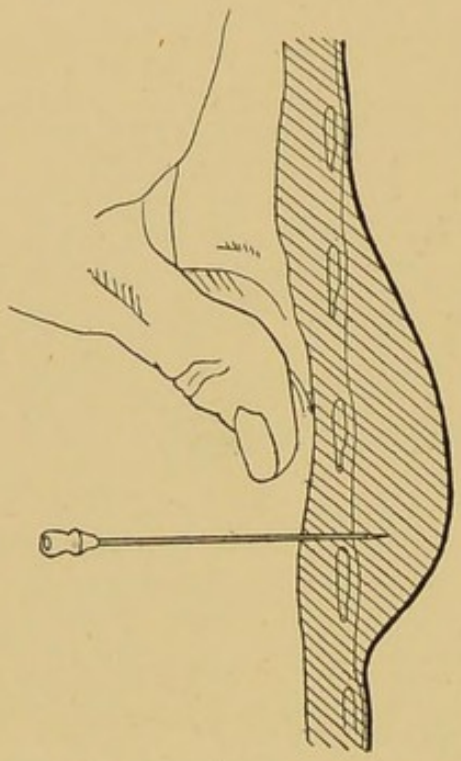


FIG. 50. Diagrammatic representation of vertical section of chest wall and localized collection of fluid. Method of drawing up the skin and introducing exploring needle.

FIG. 51. Diagrammatic representation of vertical section of chest wall, showing oblique curved track left by needle used in exploration.

to detect by physical signs alone the presence of fluid in the pleural cavity is exceedingly difficult.

ASPIRATION OF THE PLEURAL CAVITY

If it is decided to extract the fluid, this is done by means of 'tapping'. The apparatus required is a stout perforated needle and a rubber tube connecting it with a receiver from

[1] Cases of sudden death occur very rarely. *St. Thomas's Hospital Reports*, 1899, pp. 465-84, paper by Dr. A. E. Russell.

which the air can be exhausted by a pump. If the collection is localized, it is best to tap close to the exploration puncture; otherwise the place of election is either the sixth intercostal space in the midaxillary line, or immediately below the inferior angle of the scapula. Having sterilized the exploring needle and a small sharp knife, the site of the operation is selected and cleansed. The skin being drawn up in the manner described above, a small incision, a quarter of an inch long, is made at the upper border of the lower rib, the needle being then thrust sharply through this puncture into the pleural cavity. It is connected by the junction with the receiver,

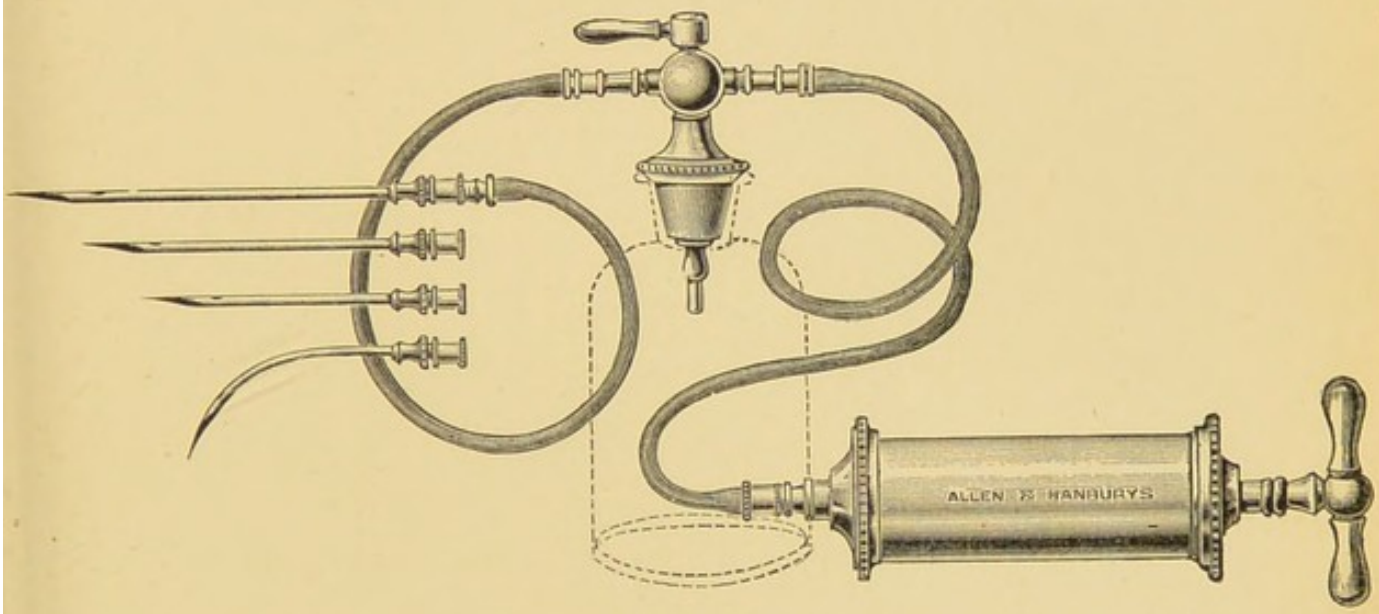


Fig. 52. Aspirator.

which previously has been exhausted, and the fluid runs into the bottle. It should be drawn off slowly, particularly towards the end. Spasmodic coughing indicates that the flow must be stopped for a time; and if the fluid becomes bloodstained it had better be stopped altogether. When sufficient fluid has been extracted, the needle is withdrawn and a finger placed over the opening, which is then sealed with gauze and collodion. It is always desirable to use a knife, particularly when no anaesthetic is given, on account of the toughness of the skin and the difficulty of piercing it with a needle or trocar and cannula. As a rule no anaesthetic is needed, but

occasionally it is better to inject a little eucaine near the site of puncture.

EMPYEMA

If the exploration reveals the presence of pus, or it is decided to drain the serous effusion, a further operation is desirable. For this the patient must have a general anaesthetic, chloroform being as a rule the best to employ; it can be done under local anaesthesia, but is seldom satisfactory to either patient or surgeon. If the amount of fluid is very great, part of it should be drawn off by aspiration previous to the operation. The best site for the incision is over the

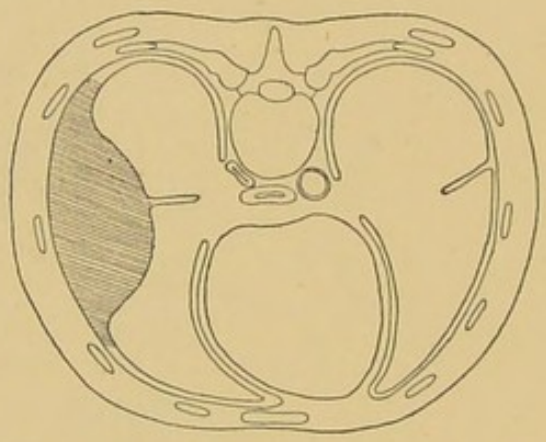


Fig. 53. Transverse section of chest showing localized empyema.

eighth or ninth rib, just outside the inferior angle of the scapula, the centre of the incision being in the posterior axillary line. The position of the patient is of importance; from the operator's point of view alone the best arrangement would be for the patient to lie on the sound side, but this hampers the already embarrassed heart and lungs; from the anaesthetist's point of view, therefore, it will be better when operating to have the patient lying almost on his face, most of the pressure being on the affected side; this position allows the surgeon free access to the point of operation. The patient is arranged so that the face is just on the edge of the table, thus allowing the anaesthetic to be administered. The skin being cleansed, an incision 3 inches long is made over and

down to the rib, the periosteum of which is incised and stripped off both the superficial and deep surfaces with a raspatory. This is done for two reasons: to avoid injury to the intercostal nerves and vessels, and to allow the periosteum to regenerate the piece of rib to be removed. It is the practice of some surgeons to remove the periosteum with the rib, but the method described above is certainly the easier and the more satisfactory. In order to protect the pleura a raspatory is placed at one end of the incision under the rib, which is divided with bone forceps; the other end of the rib is divided in a similar manner, and the piece of bone, which should be at least 2 inches in length, is removed. The parietal pleura is then carefully incised. In the majority of cases this step is easy, but on more than one occasion the authors have seen the diaphragm incised and the abdominal cavity opened: although this is serious, it need not necessarily be fatal. The danger of this mistake is greatest when some of the pus has been removed by aspiration recently; the lung being contracted, with the removal of the fluid the diaphragm rises. The pus should be allowed to escape slowly. A finger should always be inserted into the cavity for two reasons: firstly, to see if the lung expands; secondly, to remove any clotted masses that may be in the pus, which might subsequently block the tube. It is not necessary to sew the pleura to the skin. A large rubber empyema tube is inserted and attached to the skin by a stitch or two; and the ends of the incision are closed by a few stitches. On no account should the pleura be washed out: sudden death by cardiac inhibition or by drowning, owing to the fluid entering the lung through a hole, has resulted from this procedure. The patient should be turned over to empty the pleural cavity before putting on the dressings, which should be large and thick. The wound will want dressing frequently during the first twenty-four hours; after this, daily dressings will usually suffice; in all dressings great cleanliness must be observed in order to avoid introducing fresh infection. The cavity heals by the expan-

sion of the lung; not by granulation. The stitches holding the drainage tube should be removed on the fourth or fifth day, and a simple rubber tube substituted for the empyema tube: a safety-pin is inserted across the top of the tube to prevent it slipping into the wound. The tube should be removed daily, cleaned, boiled, and reinserted; it should also be shortened from time to time. As soon as the discharge ceases or becomes serous, the tube can be dispensed with altogether. If at the end of a fortnight the temperature is normal, and the general condition has improved, the patient should be allowed to get up and walk.

If the empyema has not healed in from four to six weeks, it is due to either one of two causes. Firstly, the drainage may be faulty, in which case it will be necessary to make

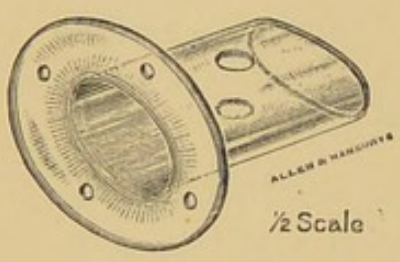


Fig. 54. Empyema glass tube.

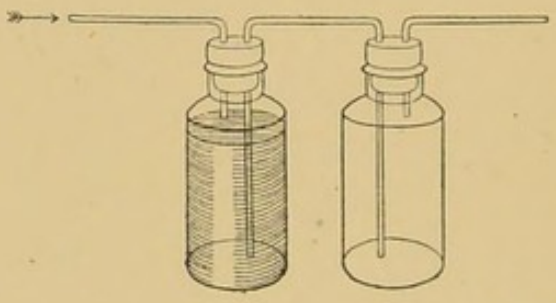


Fig. 55. Full and empty bottles used for respiratory exercises.

a counter opening; secondly, it may be caused by the lung not expanding sufficiently, the diaphragm not rising far enough, and the ribs preventing the skin from falling in: the cavity therefore is unable to heal up. Under these circumstances, the only prospect of healing is by an extensive removal of the ribs, a thoracoplasty, to allow the chest wall to fall in and close the cavity; and for this it is best to take further advice.

Of late the old practice of incising the intercostal space to drain an empyema has been revived. It is certainly successful in children of from ten to fifteen years of age, the ribs soon falling together, and so closing the opening. Instead of an empyema tube it is better, for this operation, to use one of the glass tubes made for the purpose.

It is possible, while there is still an opening in the chest, to aid the expansion of the lung on the affected side, by making the patient expire forcibly against resistance. An efficient apparatus consists of two bottles, one containing water, joined together by tubing so arranged that by blowing into one bottle the water is forced into the other (Fig. 55). In children it is necessary to provide amusement with the exercise, and a trumpet or whistle that will not make a noise unless blown hard, answers the purpose. After the opening has closed, ordinary respiratory exercises should be used, the object being to expand the lung; any exercise that will force the patient to take a deep breath into the affected lung will answer satisfactorily.

A FOREIGN BODY IN THE OESOPHAGUS

A foreign body in the oesophagus may give rise to little in the way of symptoms, but there are sometimes complaints of

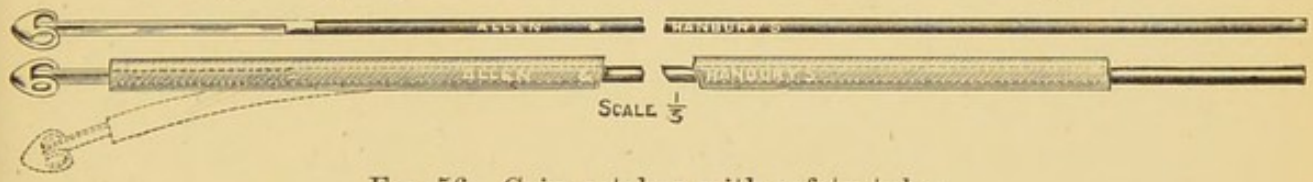


FIG. 56. Coin-catcher with safety tube.

pain, discomfort, dysphagia, and regurgitation of food. The situation of the body is ascertained by means of a bougie and, when possible, a skiagraph: the common situation for a body to be impacted is about the level of the sternal notch. Attempts can be made under an anaesthetic to remove the body by the mouth with forceps, probang, coin-catcher, &c. A coin-catcher should never be used without the surrounding safety tube as, in withdrawing, the 'catcher' is apt to hook against the cricoid cartilage of the larynx. Such an accident will cause considerable trouble and anxiety, besides frightening the patient; whilst, with the safety tube, the instrument is easily unhooked from the cricoid cartilage by merely passing the tube along the handle of the catcher. Time should not be wasted or too strenuous attempts made before taking further advice with regard to the advisability of

performing an oesophagotomy. This operation is robbed of half its dangers if proceeded with before septic ulceration of the oesophagus has occurred.

A fish-bone lodged in the oesophagus is an occurrence with which the practitioner has to deal occasionally. It is always situated higher than the patient imagines, consequently the pharynx must be thoroughly examined by the aid of a strong light and a head mirror, before resorting to the passage of the probang, or to more serious measures. It should also be remembered that if a small fish-bone has wounded the wall of the oesophagus and subsequently been dislodged, it will give rise to pain, leading the patient to imagine that it is still present. The more carefully the pharynx is examined the more often is a fish-bone found. There is much to be said for anaesthetizing the pharynx by swabbing it with a five per cent. cocaine solution; the patient's uneasy sensations are relieved and the pharynx can be examined with ease.

CARIES OF THE RIBS

Fluctuating swellings on the ribs of children and young adults are almost always due to caries of the ribs. The condition is not infrequent and it is unusual for other signs of tuberculosis to be present. Operation must be combined with general treatment, and then very satisfactory results are obtained. After the patient has been anaesthetized, and the skin prepared, the swelling is incised in a direction parallel to the rib affected. When the pus has been evacuated, the diseased bone is thoroughly scraped away with a sharp spoon, and the walls of the cavity curetted; it is then washed out with sterilized water, and the wound completely sewn up. If the incision heals by first intention, there will probably be no return of the trouble. On the other hand, if the wound is infected by other organisms, which is almost bound to happen unless the wound is completely sewn up, in all probability there will be some necrosis of the rib. In some cases it is advisable to resect the rib and remove the

diseased part at the primary operation. For details of this, reference must be made to the operation for empyema, p. 98.

ABSCESSES AND CELLULITIS OF THE BREAST

There are three main varieties of abscesses which may occur in connection with the breast: supramammary, intramammary, and submammary; it is important to distinguish between these three as the treatment varies in each case.

A supramammary abscess is situated in the subcutaneous tissue on the superficial aspect of the breast substance; it may be totally unconnected with the breast tissue, or may arise from one of the superficial lobules. An incision, radiating from the nipple, should be made at the point where the abscess is nearest to the surface. As the pus is quite superficial the wound heals rapidly.

Intramammary abscess. This is the true breast abscess, the pus being situated within and about the lobules of the gland, and is by far the most common of the three varieties. It should be opened under gas, unless it is at all large, when it will be advisable to give ether or chloroform. The skin having been cleansed, a free incision should be made in a line radiating from the nipple; this incision should be sufficiently large to open up the abscess thoroughly. A finger should then be introduced in order to break down any fibrous bands which may be found crossing the abscess cavity. If the incision is situated above the nipple, or if the abscess is large, it may be advisable to make a counter opening for drainage in the lower and outer portion of the breast, the upper incision being closed. An india-rubber tube should be inserted and the breast dressed with hot fomentations. This tube should be cleaned, boiled, and reintroduced daily; it can be shortened from time to time, and then left out altogether. In some instances, it will be found that the breast is riddled with pus, the abscesses being numerous and widely distributed throughout the substance of the gland. When this is so, many large

incisions must be made, all the abscesses being thoroughly opened and drainage tubes inserted. The breast has a wonderful recuperative power, and as a rule, in these cases very little permanent deformity results, the contour of the gland being restored. If the abscess has not been satisfactorily opened the patient will develop one or more sinuses and the condition will become chronic. The treatment then consists in opening up and scraping all such sinuses, and introducing drainage tubes in order to prevent the accumulation of pus. In severe cases it may be necessary to amputate the breast.

A *submammary abscess* is situated in the cellular tissue beneath the breast; it usually arises from cellulitis or caries of a rib, but may develop from the deeper lobules of the breast. A fluctuating swelling is formed, on which the breast rests as on a water-bed, the pus pointing in the lower and outer quadrant. The treatment consists in making a free incision in the situation where the pus points, which is usually along the axillary margin, exploring the cavity with a finger, making another opening if necessary, and introducing drainage tubes. The after-treatment will be similar to that for an intramammary abscess.

The practitioner, if possible, should not wait for the formation of the abscess, but should incise the breast beforehand in the cellulitis stage, so that he opens no definite abscess. With this practice his patients will have shorter convalescences and be saved an infinity of pain, extra incisions for drainage, dressings, worry, and expense.

SUBPECTORAL ABSCESS

A *subpectoral abscess* is one situated beneath the pectoral muscles and the ribs. It has no connection with the breast, and is only mentioned in this place because it presents some features like a submammary abscess. It is usually due to caries or necrosis of the subjacent ribs, and presents in the anterior and lower part of the axilla. It is opened by an

incision behind and parallel to the anterior fold of the axilla.

FIBROADENOMATA OF THE BREAST

Fibroadenomata of the breast occur as small, rounded, movable, encapsulated tumours in the breast substance; usually only one is present, but there may be several. The best treatment is to remove them; for although the tumours

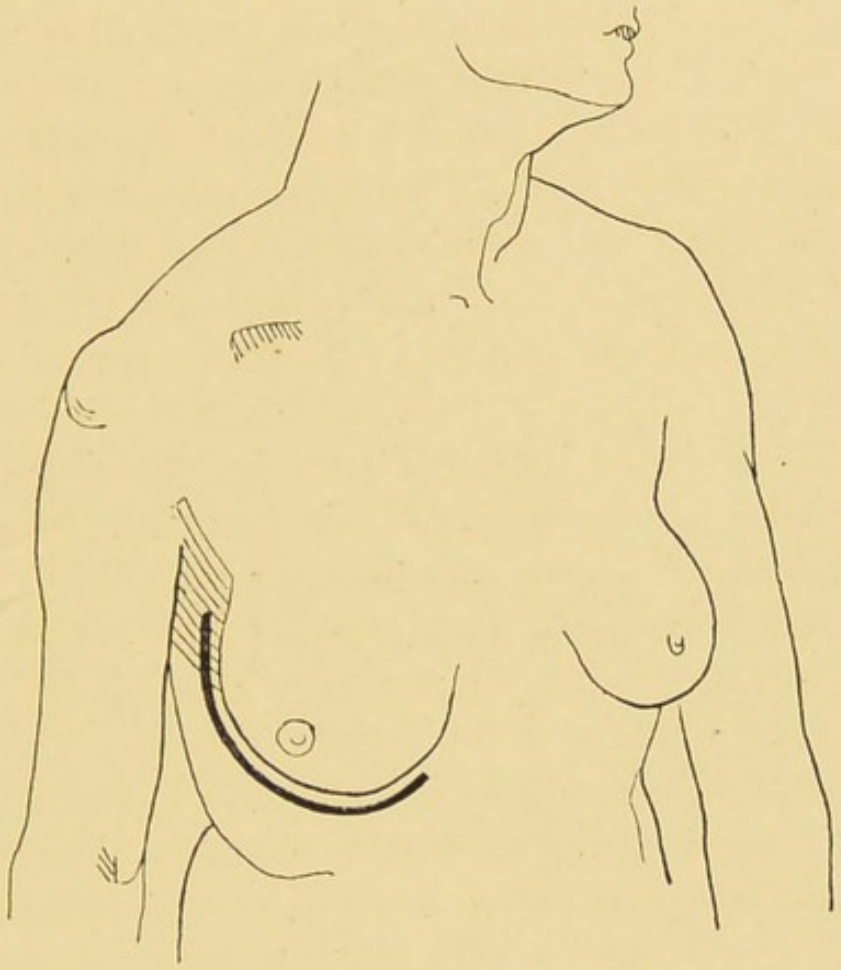


Fig. 57. The black line indicates the position of the semilunar incision for raising the skin in subcutaneous amputation of the breast.

in themselves seldom give rise to any symptoms, yet they are a source of worry to the patient. Another reason for their removal is that the diagnosis between a commencing sarcoma and a fibroadenomata is by no means easy. An anaesthetic is given, the skin cleansed, and an incision made over the tumour, radiating from the nipple; with a little dissection, it is defined. The capsule should be removed as well as the

tumour. All bleeding points are ligatured and the wound stitched up and dressed. The great practical point in removing these tumours is that an assistant must fix the tumour between his thumb and forefinger immediately before the incision and never move them until the tumour has been taken away. If this is not done, the operator will have a tedious search to find the tumour, which will lead to much

Fig. 58 *a*. Side view showing contour of breast before subcutaneous removal.

injury of the surrounding tissues and very likely to their infection, as he may have to use his fingers.

AMPUTATION OF THE BREAST

The breast will sometimes require removal in cases of interstitial mastitis. This disease is often a great worry to the patient, and it seems possible that there is a tendency for malignant disease to develop in these cases. When the

anaesthetic has been administered and the skin cleansed, a curved incision is made round the lower and outer margins of the breast, because, in this situation, the scar will not be apparent afterwards (Fig. 57) The skin and connective tissue are then carefully dissected off the breast substance and the flap turned back, exposing the whole of the organ. This reflection of the skin is easy to do, but great care must be taken not to

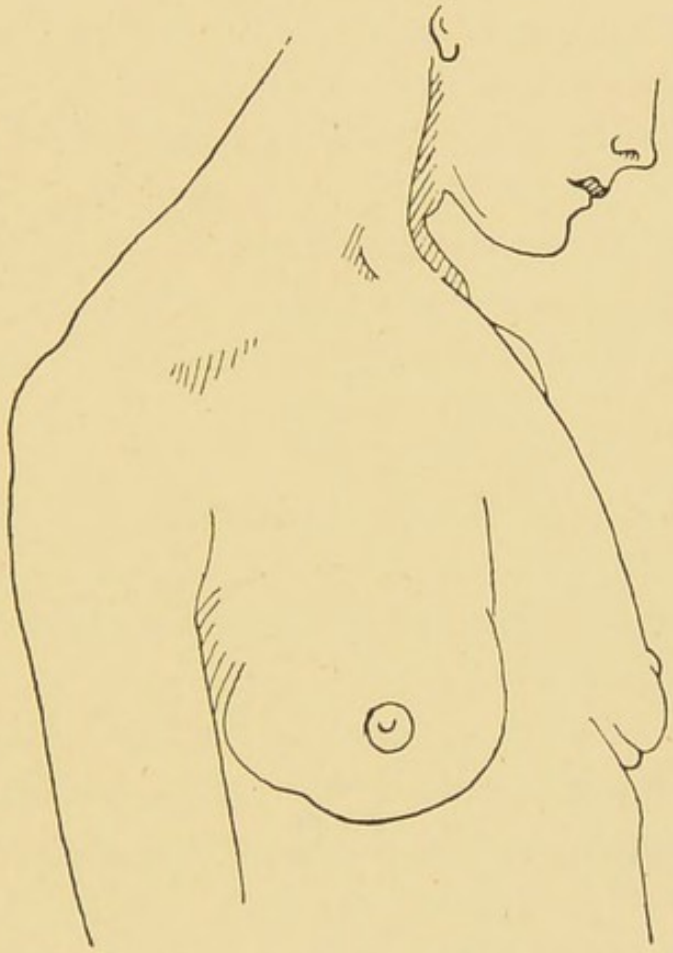


Fig. 58 *b*. Side view showing contour of breast after subcutaneous removal. As much fat as possible should be retained in the flap.

'buttonhole' it. The nipple is the most difficult point to deal with, as here there are several fibrous bands passing with the ducts from the mamma to the nipple, which will require to be divided. The great thing is to keep close to the skin and not to reflect part of the breast substance with it. When the mamma is exposed, it is gripped with a large pair of tongue or pile forceps, in order to steady it, and cut away from the connective tissue on which it lies, the pectoralis major being

left intact. All bleeding points must be ligatured; this is especially important, as blood will tend to collect in the 'dead' space left by the removal of the breast. The skin edges are carefully united by interrupted sutures. It is sometimes advisable to leave a very small glass drainage tube in one end of the wound, or to leave one suture at the end of the wound untied, in order to allow any blood which accumulates to escape. The tube is removed or the stitch tied within twenty-four hours. The wound must be dressed with a firm pad in order to obliterate the cavity left behind; the arm should be only bandaged to the side for two days. The stitches are removed a week after the operation. This operation should never be done when there is any question of malignant disease of the breast. For reasons explained in the earlier part of this book, operations for malignant disease are not discussed.

CYSTS OF THE BREAST

are of many kinds. Except when they are merely localized signs of a widespread mastitis they should be dissected out and removed. To do this little need be added to what has already been said when describing the removal of adenomata of the breast. At times an area of mastitis containing two or more cysts can be removed with great benefit. The older method of tapping and injecting these cysts is much inferior to the more modern one of excision; moreover, there is the possibility of there being present some intracystic growth, probably a duct carcinoma, and this would not be discovered by tapping and injecting.

CHAPTER VII

THE ABDOMEN

PARACENTESIS ABDOMINIS

It is necessary in certain conditions to tap the abdomen in order to withdraw fluid which has accumulated there, and this is usually done by means of a special trocar and cannula. A small knife, the trocar, cannula, india-rubber tubing, and the patient's skin are all carefully sterilized. The site for tapping is selected where the percussion note is absolutely dull; the usual spot being in the middle line, half-way between the umbilicus and pubes. To ensure the bladder being quite safe from injury it should be emptied immediately before the

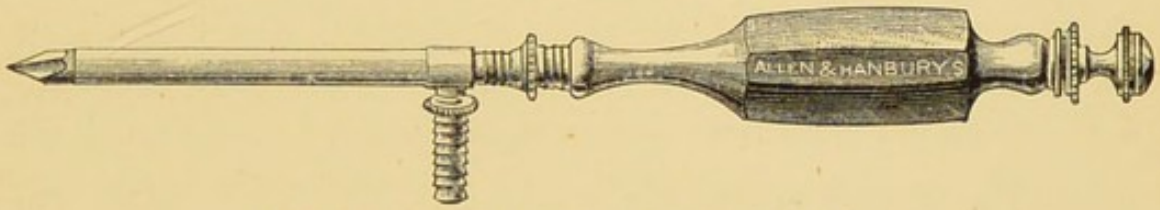


Fig. 59. Trocar for paracentesis abdominis.

operation, if necessary a catheter being passed. The patient being in the semirecumbent position, and the skin having been cleansed and rendered insensitive either by freezing or by injecting eucaine, a small puncture about one-third of an inch long is made with the knife at the spot selected. The trocar and cannula to which the rubber tubing is attached, are then thrust through the abdominal wall into the peritoneal cavity; there need be little or no fear of injuring the bowel, as the quantity of fluid present will prevent this. The fluid is drained into any large, clean vessel; as many pints may be present, plenty of vessels should be at hand. A jack towel or broad bandage should previously have been passed round the abdomen, in such a manner that it can be tightened from time

to time, and thus by compression the intra-abdominal pressure is maintained as the fluid is evacuated. The tapping should be done through a medium-sized cannula and the fluid withdrawn slowly, the patient's pulse being carefully watched all the time, and stimulants given if necessary. It will be found impossible to draw off all the fluid, but as soon as it stops running, the cannula is withdrawn, and the wound dressed with a small piece of gauze and collodion; a firm bandage should be worn round the abdomen for a few days.

SUPRAPUBIC PUNCTURE OF THE BLADDER

The operation of tapping the bladder suprapubically is useful as a temporary measure for relieving retention of urine, whilst preparations are being made for the permanent relief of the patient by the removal or the relief of the cause of the retention; after all, it is only a means of giving temporary relief to the patient, and is not a cure for the condition. As a rule this small operation is perfectly safe, it being very unusual for any urine to escape from the puncture in the bladder into the cellular tissue of the cavum Retzii, a complication which will, should the urine be septic, set up cellulitis, probably giving rise to the formation of a local abscess, and possibly even to extravasation of urine. These complications, however, are so rare, and the demand for relief so urgent, that fear of them should not deter the practitioner from resorting in suitable cases to suprapubic puncture. The risk of setting up extravasation of urine is much increased if a large trocar and cannula is used. For the safe performance of this operation the bladder must be well distended, so that the peritoneum is lifted up, well away from the site of puncture. The hair on the lower part of the abdomen must be shaved, the skin washed, and all the instruments sterilized. With a small, sharp knife, a puncture one-third of an inch in length is made in the middle line just above the pubes; this can be done under local anaesthesia if necessary. A trocar with cannula attached is thrust through the skin opening, backwards

and a little downwards, until it enters the bladder; the operator can easily tell when this happens by the sudden cessation of all resistance. When the trocar is withdrawn, the urine escapes from the cannula or through a rubber tube attached to it; in feeble and old patients, it should be allowed to escape slowly. A medium-sized cannula should always be employed, and it must be of sufficient length to prevent the bladder slipping off the end as it contracts. After a short time the flow ceases; some more urine can be drawn off by changing the position of the patient, such as turning on to his side, half on to his face, or on to 'all fours'. The instrument is withdrawn, the skin dried, and the wound sealed with cyanide gauze and collodion. It is better to tap a second time, if required, rather than to leave the cannula as a 'permanent' drain.

SUPRAPUBIC CYSTOTOMY

Instead of simply puncturing the bladder, the practitioner can perform a suprapubic cystotomy, an operation which also affords a ready means of extracting calculi or other foreign bodies; it is not difficult to perform when the bladder is distended, and does not require as much technical knowledge or skill as do the various perineal operations. A general anaesthetic is necessary, and the patient should be in the recumbent position, with the pelvis raised. If the bladder is not full it is best to introduce some warm boracic lotion by a catheter until the organ is fully distended. The pubes having been shaved and washed, an incision is made in the middle line from an inch or two below the umbilicus to the symphysis, its length being about 3 inches. The skin and fat are divided, laying bare the aponeurosis of the rectus sheath; this is divided in the middle line in the direction of the wound, exposing the lower portions of the recti and perhaps the pyramidales muscles. The fibres of these muscles are carefully separated in the median line with a blunt-pointed instrument and retractors. It must be remem-

bered that the recti have no posterior aponeurotic sheath in their lower parts, so that when the muscular fibres are separated, the fat in the cavum Retzii is exposed, just in front of the bladder. This fat is divided with a blunt-pointed instrument at the place where it is in contact with the symphysis pubis, and is retracted well upwards with the peritoneum to avoid all risk of injury to that part. This manœuvre should expose the bladder, which presents a wall of a brown colour with large tortuous veins running over it, more or less parallel to the incision. If the operator has any doubt as to the identification of the bladder, a sound can be passed down the penis, and by depressing the handle the point will be pushed against the anterior wall of the bladder. The edges of the wound are held apart by retractors, and a stitch of stout silk is passed through the bladder wall on either side of the middle line, the needle taking a good grip; these guide stitches should penetrate the whole thickness of the bladder wall, and should be left long and each clamped with a pair of artery forceps. They are then held taut, gently pulling the bladder to the surface of the wound, and a puncture made between them with the knife; the opening should be sufficiently large to admit the finger. The fore-finger of the left hand is inserted, and the interior of the organ examined before much urine has escaped, otherwise the walls will be thrown into folds; any calculi, foreign bodies, &c., which are found can be removed with the aid of forceps. If the opening in the bladder is merely to be *temporary*, the edges of the incision in the wall are united to the rectus muscle on either side by a few silk stitches, the ends of these being left long; the guide stitches which were inserted first of all are then removed. An india-rubber tube, with lateral openings in the lower part, is introduced into the bladder, and a gauze plug is wound round the upper part of the tube making the opening as nearly airtight as possible in order to establish a siphonage action, when it is connected by a glass junction to a long rubber tube, which is led to a

receptacle beneath the bed. The aponeurosis of the recti is closed with silk stitches, and the skin edges united with silkworm gut, except immediately around the tube, which is fixed to the skin by two silkworm-gut stitches which pass through the shield of the tube. The wound must be dressed with gauze, and a large amount of absorbent wool and Robinson's tissue packed round the drainage tube, the whole being maintained in position by a manytail bandage. The skin sutures should be removed in a week, and the stitches uniting the bladder to the muscle removed by traction at the end of ten days or a fortnight; none should be left in the bladder wall as they might form the nucleus for the future development of a calculus.

In simple cases the time required for a suprapubic fistula to close is about twenty-four days. If the method of siphon action is effective, it may be allowed to continue for eight days, so that the closed part of the wound may heal soundly. The drainage may be aided by a White's pump or a Cathcart's apparatus. If the siphonage is imperfect, which is often the case, it may be better to detach the flexible tube and to rely on the dressings to absorb the urine. Under such circumstances the drainage tube should be removed from the bladder on the fourth day, as the longer it is retained the longer does the fistula take to heal. Careful attention must be paid to the patient every three hours, night and day, the dressings and draw-sheet being changed, and sometimes his shirt also.

The 'Suprapubic Dressing' devised by Mr. G. H. Colt secures the greater comfort of the patient, as it ensures his being kept dry and at the same time allows him to sleep undisturbed; incidentally, it has the advantage of saving expense. The principle of this dressing is that a sheet of rubber is attached to the skin by means of a solution of rubber in naphtha, so that the whole of the urine flowing through the fistula can be collected and allowed to escape merely by its own pressure. So close is the connection

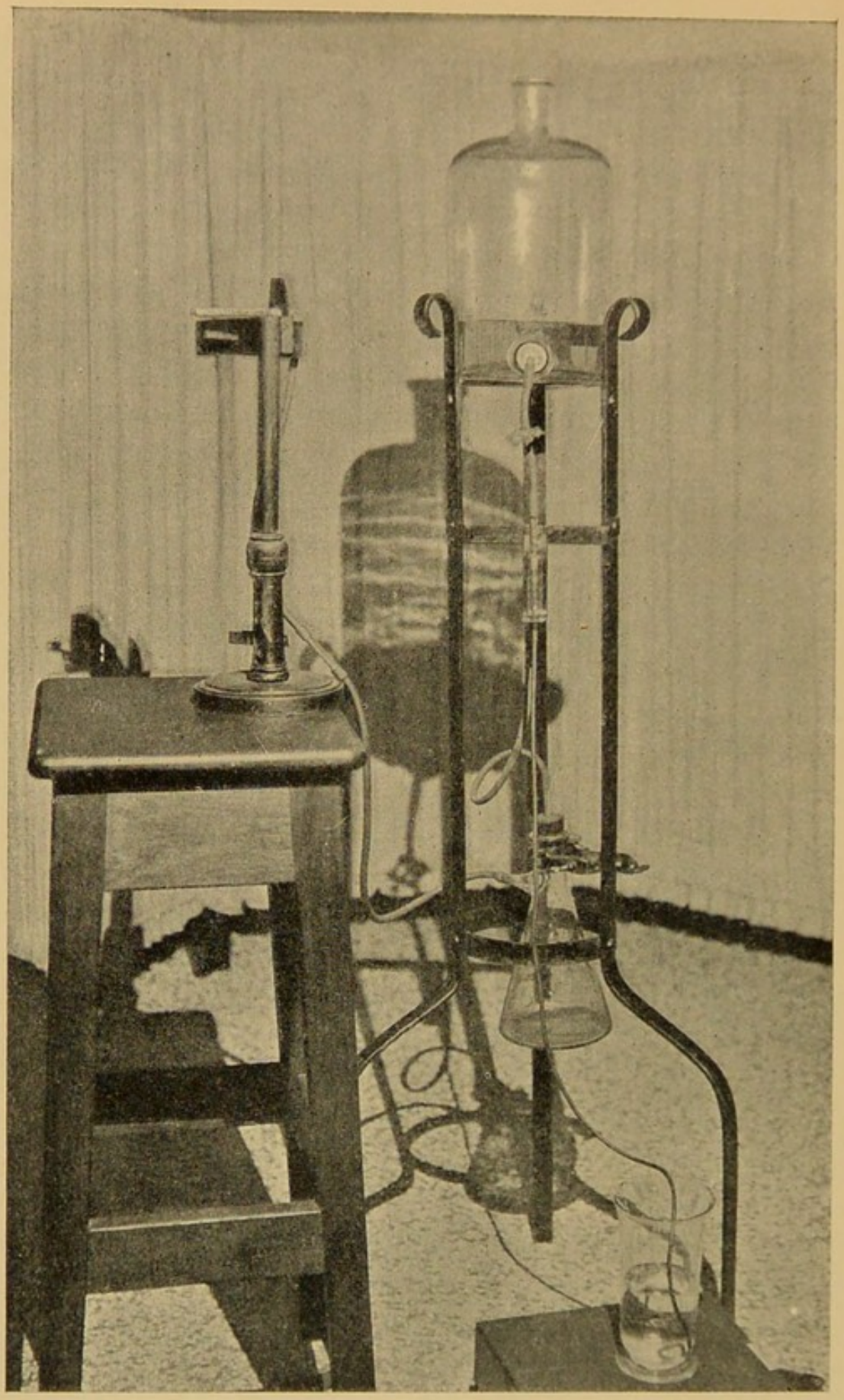


Fig. 60. Apparatus for suprapubic drainage by suction. A. Tube to be inserted in the bladder after suprapubic cystotomy. It is held on the stool by a stand, and is connected with the apparatus by rubber tubing. B. Detachable reservoir for collecting the urine. C. Vessel, connected with apparatus by tubing, for collecting the water dropping from D. D. Reservoir of fluid, drops from which fall down a tube into C, displacing the air in front of them, and causing a vacuum or negative pressure in B, which aspirates the urine.

between the skin and the rubber that if any siphonage action, however slight, should occur, it would suck out the edges of the fistula, and retard healing. To abolish all siphonage, an opening is made in the top of the dressing, as shown in the figure, to admit air. The apparatus consists of a clear glass vessel of special construction: at its base is attached a disc of sheet rubber and to the exit tube at its side is fixed a piece of flexible rubber tubing, both the joints being watertight. The method of applying the dressing is as follows: The various parts of the dressing, having been sterilized and dried, are fitted together; the patient's skin around the fistula is shaved, and any urine appearing on the surface is removed by placing small swabs in the fistula and changing them frequently.

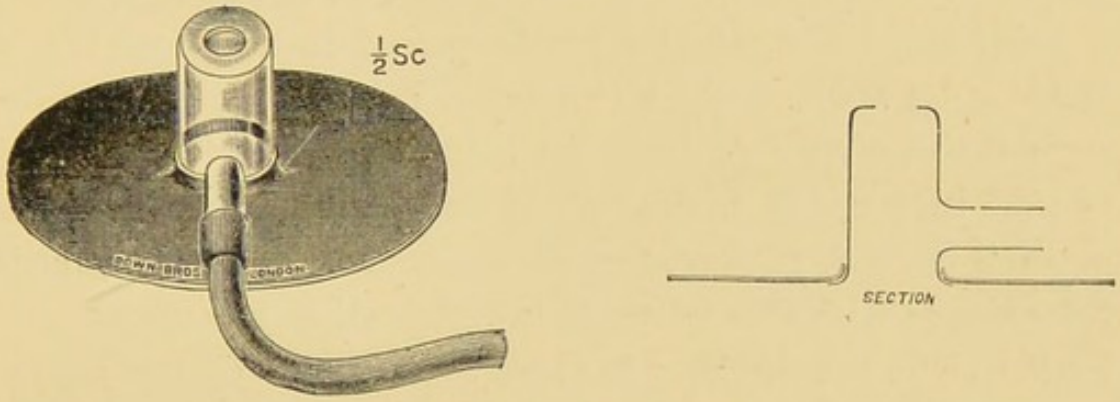


Fig. 61. Colt's suprapubic apparatus.

The skin is then freed from grease by means of ether, *on no account use turpentine*, and coated with the thinnest possible layer of the rubber solution. If this cannot be done owing to the skin being painful, this dressing cannot be applied effectively. The under-surface of the rubber disc is coated in the same way, and it will be found that the solution is more easily applied if put on rapidly: both surfaces so coated are allowed to become nearly dry and quite 'tacky'. The base of the glass is applied over the centre of the fistula, care being taken that the exit tube points either towards the pubes or to the side on which the patient prefers to lie, and the disc is pressed down evenly and gently all round. If the solution on the skin is too thickly spread, the disc curls back and does not

adhere; if properly spread, however, the disc adheres firmly, until either epithelial desquamation, the growth of the hair, or the secretions and movements of the skin, loosen it. The flexible tube is curled round, fixed to the abdominal wall with plaster, and its end placed in the receptacle beneath the bed. The patient is instructed to see that the tube does not become kinked, and that he only turns on to the side on which it is led off. The tube must be without a joint, uncoiled, and just long enough to reach the receptacle. Inattention to these points is a common cause of overflow through the top of the glass. The average time for this dressing to remain effective is five days, the longest time recorded being fourteen days. Through the hole at the top of the glass the bladder can be irrigated, the excess of lotion being allowed to run off through the side tube, or a catheter can be passed down the penis and the bladder washed right through. Patients sometimes take their baths, after detaching the side tube, while the dressing is still in place, but this is apt to loosen the rubber disc. With this form of dressing the appearance of the wound is the same as with those dressed in the usual way; several have healed while the dressing has been in position. By this simple means, a patient who before was wet, exceedingly uncomfortable, and liable to bed sores, can be kept dry, odourless, and comfortable. Large, oval glasses are made which will cover the longest incision.

In some cases, but very rarely now, the suprapubic opening is used as a *permanent* drain; in which case the bladder wall is sewn to the skin, or in fat people to the aponeurosis of the recti, with silk sutures, which are left long so that they can be pulled away later. The tube is retained until a definite sinus has formed, when an instrument is worn permanently over this opening. In these cases the 'suprapubic dressing' described above acts well; it is fitted and a piece of rubber tubing with lateral holes is inserted into the bladder through the top of the glass, so preventing the opening from closing. The side tube is joined to a portable urinal.

When a suprapubic cystotomy is done for the second time on the same patient, special care must be exercised, as, in all probability, the peritoneum will have become adherent to the old scar and be easily opened, as it cannot be retracted until separated with the knife.

INGUINAL HERNIA

The practitioner may elect to undertake the operation of 'radical cure' of an inguinal hernia, either as the sequel to an operation for strangulated hernia or as a primary operation. Although not difficult, this operation requires considerable practice before it can be done quickly and well. Let it be remembered that three factors are necessary, in order to obtain the best result possible in any particular person: there must be good structures to suture, the operation must be correctly done, and the wound must heal by first intention.

The inguinal region is shaved and thoroughly cleansed, and a piece of gauze is placed over the penis, which is held to one side by a towel, great care being taken that the wound is not contaminated. An incision, about 3 inches or more long, is made above and parallel to Poupart's ligament, in the direction of the inguinal canal, starting below over the external abdominal ring. In very stout patients the incision must be made longer. The skin and fat are divided, exposing the external oblique muscle; the external abdominal ring is defined by passing the end of a pair of artery forceps into it, —a finger must not be used. The aponeurosis of the external oblique is split in the direction of its fibres from the external abdominal ring upwards, and the cut edges clipped with artery forceps and held apart. The cord is lifted from the canal with forceps and placed on a retractor, its contents spread out, and the sac of the hernia defined with two pairs of dissecting forceps. If the sac contains adherent gut or omentum it is easily identified; but if thin and empty, there may be some difficulty in finding it. If it cannot be discovered, the patient should be allowed to come round from the

anaesthetic sufficiently to cough or strain, when gut or omentum will be driven down into the sac, which can then be identified. The hernial sac is then opened, artery forceps put on each side of the opening, and any gut or omentum present reduced into the abdomen. When omentum is present, and especially when adherent, part of it should be removed; this is done by ligaturing small pieces, one at a time, and cutting off the distal portions. Not more than two or three vessels should be included in one ligature, or it may slip and the stump bleed. When sufficient has been removed the stump is inspected to see that there is no haemorrhage, before it is returned into the abdomen. The sac is held firmly by the artery forceps and isolated from the surrounding structures; this is done most conveniently with the aid of dissecting forceps and perhaps a blunt-pointed dissector, with an occasional touch with the knife. Care must be taken while doing this not to wound the vas deferens, which should be identified and held on one side by a retractor. When the sac is freed as far as the internal ring, it is transfixed with a needle threaded with silk; the needle is withdrawn leaving the silk behind, and one-half of the sac is securely tied. The thread is then tied again round the whole sac, which is cut away on the distal side of the ligature, sufficient being left to ensure that it will not slip. The cut end of the stump should be examined to see that there is no haemorrhage, the ligature is then cut off short, the sac retracting into the abdomen. The thorough removal of the sac is probably the most important part of the operation, certainly in children. The cord is held up and well out of the way by means of two retractors, and the edge of the conjoined tendon and Poupart's ligament defined. This can be easily done by a little dissection with a blunt-pointed instrument, aided by traction on the artery forceps holding the aponeurosis of the external oblique. A series of interrupted silk stitches is then inserted, joining the edge of the conjoined tendon to Poupart's ligament beneath the cord; it is necessary that these stitches obtain a

firm hold of the tissues. Four or five in all will be required, and it is a good plan to insert them from below upwards, and not to tie any until all are in position. The edges of the external oblique are then united by interrupted silk sutures.

There are two main methods of dealing with the cord; the best is to suture the conjoined tendon to Poupart's ligament *below* the spermatic cord, and the external oblique above it as described; this is called Bassini's operation. The easiest way, but not the best, is to suture both layers *above* the cord, Foster's, or, in America, Fergusson's operation. But the method of suturing the canal is of secondary importance to the perfect removal of the sac.

The vessels are then ligatured with fine silk and the skin closed with interrupted sutures of fine silkworm-gut or horse-hair. The wound should be dressed with gauze, the edges of which are fixed by collodion, a firm layer of wool and over this a double spica, the hip and knee of that side being flexed and adducted whilst the bandage is being applied. Outside the bandage a piece of jaconet, with a hole in it for the penis, is fixed in order to save the dressings from being soiled. In children the wound should be dressed with gauze and collodion, the other dressings being as above. The stitches are removed in a week; but the patient should not be allowed to get up until at least a fortnight after the operation. No truss need be worn subsequently, but heavy lifting work must not be undertaken for about six months. The above description is brief and quite inadequate to teach a practitioner to perform it who has not seen the operation recently. The practitioner will in that case be well advised to see it performed several times, until, in fact, he has become thoroughly familiar with the various steps. Then the above description will serve to remind him of the stages of the operation and their sequence, full accounts of which are given in the large textbooks of operative surgery. It is not a difficult operation; in adults it requires little special skill in the ordinary cases, and can be confidently undertaken by any surgeon who

can rely on his technique. The fingers need not and should not be put into the wound.

LUMBAR PUNCTURE

Lumbar puncture is useful both for therapeutic and diagnostic purposes. It enables us to examine the cerebro-spinal fluid, and, if necessary, to inject reagents into the spinal canal. As from the nature of the operation it is obvious that if any septic matter is introduced, in all probability the patient will die, special care must be taken with the sterilizing. The needle should be longer and stouter than the ordinary hypodermic needle, which is very liable to be broken by any sudden movement of the patient. The patient should either be seated with the body bent forward or lie curled up on his side with the back flexed in order to

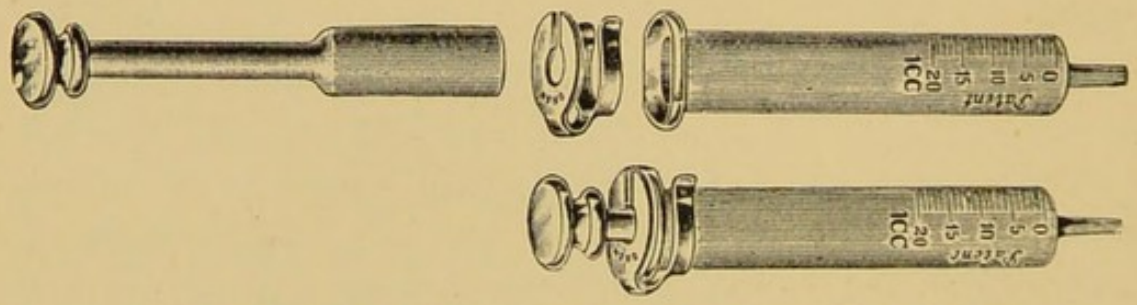


Fig. 62. Syringe for lumbar puncture. The needle is not shown.

separate the spines and laminae of the vertebrae as much as possible. The lumbar region is selected for the puncture, as the spinal cord reaches only as far as the first lumbar vertebra, whilst the membranes run down into the sacrum. A local injection of eucaine or of eucaine and adrenalin can be given with advantage, but in the case of children it is better to administer a little chloroform. The position of the spine of the fourth lumbar vertebra must be determined; a straight line drawn between the highest points of the iliac crests touches the spinous process of the fourth lumbar vertebra. When the syringe has been boiled and the patient's skin cleansed, the needle is entered just below the third lumbar spine, about a third of an inch to one side of the middle line; then gently pushed straight in. If the point strikes against

bone, the direction of the needle must be changed, following the hard bone until a soft place is reached, when it is pushed through the spinal theca and is distinctly felt to enter a cavity. In children the needle will travel about 1 inch, in adults from 2 to 2½, before it enters the spinal canal. Some pale yellow cerebrospinal fluid wells up the canal of the needle in normal cases, such as in those where the operation is done for the induction of spinal anaesthesia. A little fluid can be withdrawn into the barrel of the syringe if required for examination, or for the purpose of temporarily relieving pressure, or a reagent can be introduced into the spinal canal with the syringe. On withdrawing the needle, the wound is sealed with gauze and collodion.

The puncture is usually made between the third and fourth, but it can be made between any of the lumbar vertebrae.

STITCH SINUS

Some considerable time after abdominal operations, especially operations on the gall-bladder, kidney, or for strangulated hernia, &c., a sinus forms. In spite of ordinary treatment this sinus does not heal; the reason being that the discharge is maintained by the presence of a septic foreign body at the bottom of the wound. In a large proportion of cases this foreign body is either a silk or a silkworm-gut stitch, which was either not sterilized properly before use or which became contaminated during use. The removal of the cause will usually bring about a rapid cure. It is better to administer a general anaesthetic, but it is sometimes a satisfactory plan to prepare the patient for an anaesthetic, and then to commence the operation without one; if much pain is felt, it can then be given. The best instrument to use is a long, thin probe, the last portion, about one-third of an inch, being turned up at an angle of sixty degrees like a crochet hook. The patient's skin being cleaned and the instrument boiled, it is inserted into the sinus and attempts made to hook

the stitch, which can often be felt with the end of the probe. When the stitch is caught it is gently pulled, which will often succeed in dislodging it; otherwise, it must be caught with forceps and divided. The walls of the sinus should be scraped gently, and a gauze wick introduced (see p. 16). If the stitch cannot be extracted in this manner, the sinus must be laid open and the stitch extracted; when possible the

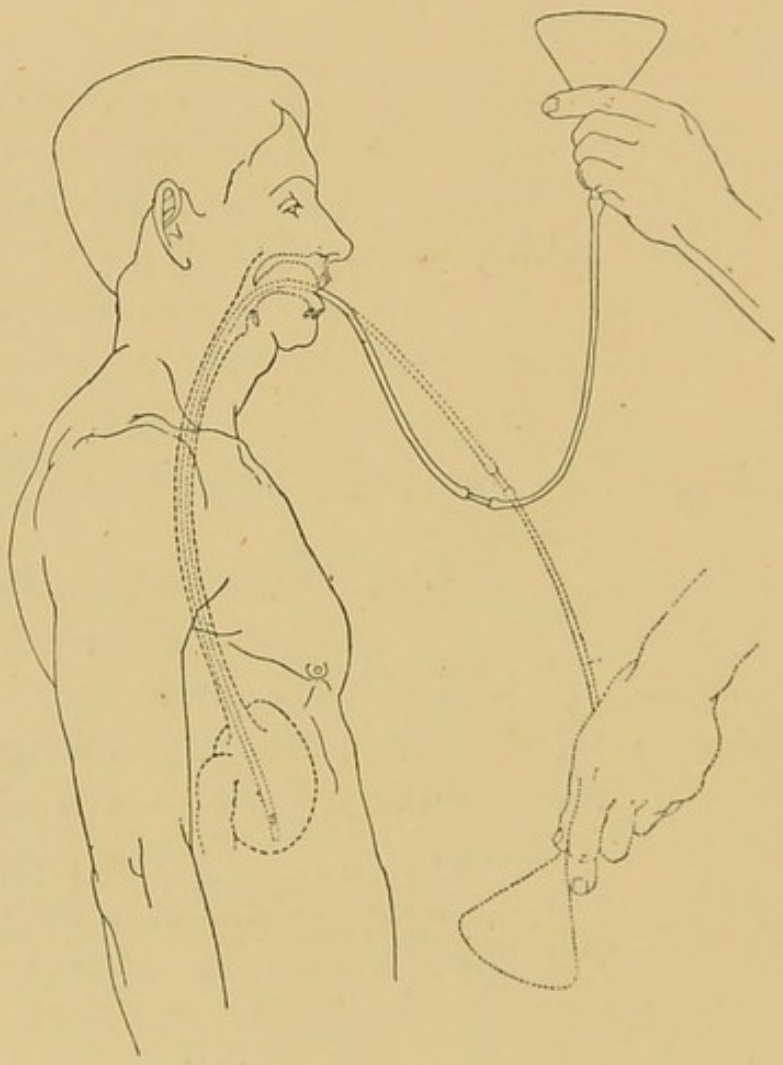


Fig. 63. Method of stomach washing.

unhealthy walls of the sinus should be cut away, and the wound allowed to heal from the bottom by granulation.

Because of the annoyance of these sinuses, some surgeons always use a suture, such as catgut, which will become absorbed. With regard to the formation of sinuses, it is not a question of the absorbability or non-absorbability, but of the septicity and asepticity of the suture.

WASHING OUT THE STOMACH. GASTRIC LAVAGE

Formerly the contents of the stomach were removed by a pump or syringe, but this method should never be employed now, as the removal by siphonage is a much simpler and a safer plan. The apparatus employed consists of a medium-sized oesophageal tube about 20 inches in length, connected by a glass junction with a piece of india-rubber tubing from 2 to 3 feet long, to the end of which a funnel holding about

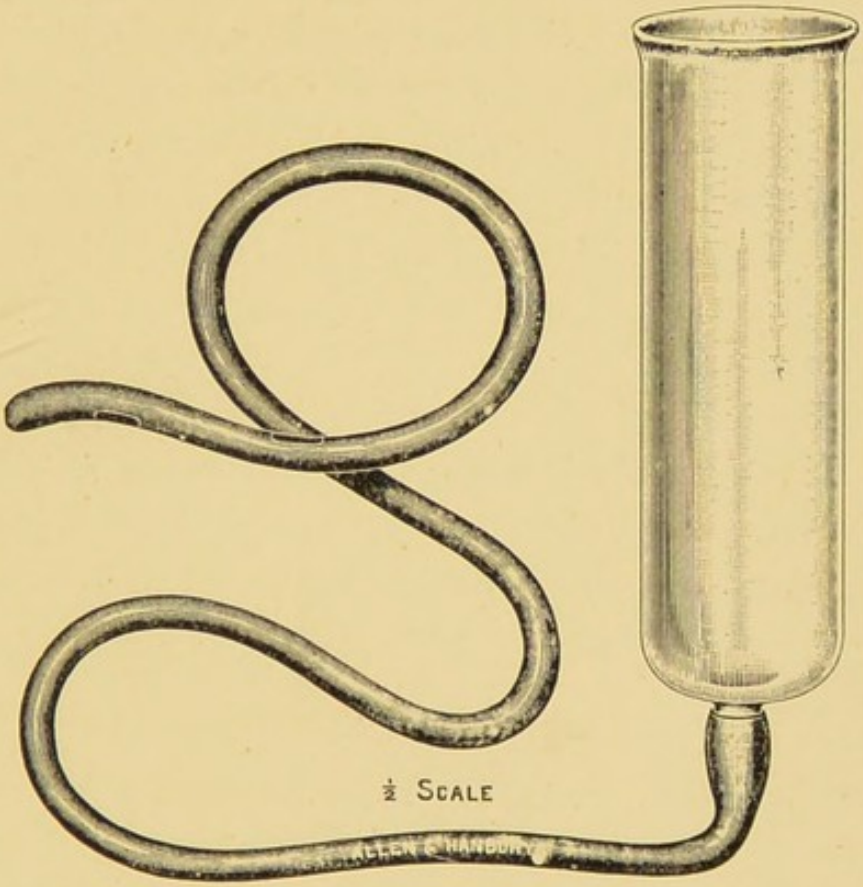


Fig. 64. Funnel and oesophageal tube for stomach washing in babies.

10 ounces is attached. The tip of the oesophageal tube is bent slightly downwards and lubricated with a mixture of glycerine and water. The most convenient position for the patient is sitting up with the head a little flexed. The tip of the tube is passed over the dorsum of the tongue, until it impinges against the posterior pharyngeal wall, when it is gently pushed into the pharynx; as the tube passes the glottis, coughing usually takes place, but it is only momentary and is relieved by the patient taking deep inspirations. The

tube is pushed on, the patient being directed to swallow from time to time; as soon as the tube enters the stomach, gas escapes with a gurgling noise through the funnel, which is held at a lower level than the stomach. By the contraction of the stomach the contents fill the tube and are siphoned out; if necessary they can be kept for analysis. The funnel is then raised above the level of the mouth and filled with warm saline solution or sterilized water; the fluid runs through the funnel into the stomach, but before it has all disappeared the funnel is lowered and the stomach contents, mixed with the lotion, well up and are poured away. This process of siphonage is repeated until the fluid returned is quite clear, when the tube is withdrawn. In certain cases the stomach requires to be washed out very frequently, and it will be found that some patients can be taught to do this for themselves.

Stomach washing has been strongly recommended by Dr. Robert Hutchison for the gastric disturbances of children. The smallest oesophageal bougie can be passed down the oesophagus of a baby. Warm water, with a drachm of bicarbonate of soda to the pint, is used.

SUBPERITONEAL LIPOMATA

Subperitoneal lipomata are most frequently met with in the course of operations in the hernial regions. Apart from this, one or more are occasionally encountered as small, circumscribed, fatty tumours, which have perforated the aponeurosis of the linea alba above the umbilicus. They are often the cause of dragging pains in the abdomen, associated with sickness, so that it is best to remove them. When an anaesthetic has been administered and the part cleansed, an incision is made over and down to the tumour, extending at least an inch above and an inch below the swelling. The skin edges are undercut, the lipoma is exposed and the margins of the opening in the aponeurosis defined. The tumour is then removed: it will require a few touches with the knife

to free it, special care being taken to avoid wounding a small process of peritoneum which is found accompanying it. The opening in the linea alba is then closed with a few stitches, the line of sutures being buried by a second row which unites the aponeurosis over it. This second row must be continued at least half an inch above and continued for half an inch below the first row of stitches; and sometimes it must be continued from close to the ensiform cartilage to the umbilicus. The skin edges are united by interrupted sutures, and the wound dressed with gauze and collodion.

CHAPTER VIII

MALE GENITOURINARY

ENLARGEMENT OF THE MEATUS URINARIUS

From time immemorial this operation has been done by means of a simple incision made from the meatus towards the frenum preputii. In the adult this procedure generally fails owing to the difficulty of keeping the incision open, the frequent passage of dilators causing the patient considerable discomfort. Moreover, the wound heals insidiously from the end nearest to the frenum, in a somewhat similar way to the web of the finger growing up again after simple incision; and the result of the operation is that the patient is often left in a worse state after operation than before, the cicatrization having diminished yet further the size of the meatus. If the patient is a baby, or a young child, simple incision, meatotomy, is usually perfectly successful, in fact, it is more likely to be successful as a primary than as a secondary measure.

Simple Incision, Meatotomy. This operation can be done under local anaesthesia, but it is better to give a general anaesthetic. The part is cleaned, a fine tenotome passed into the meatus, and a cut made towards the frenum until the constriction is divided sufficiently to allow the passage of a full-sized sound. While the cut is healing a sound should be passed from time to time; No. 4 or 5 will do for children of three.

Plastic Operation. In the case of an adult, particularly when the stenosis is cicatricial and acquired, a small plastic operation is necessary. Two incisions are made by the side of the frenum, extending from the centre of the contracted

meatus to the edges of the groove in the glans. They are deepened as far as the mucous membrane, which is not incised. The free ends of the incisions are joined by a

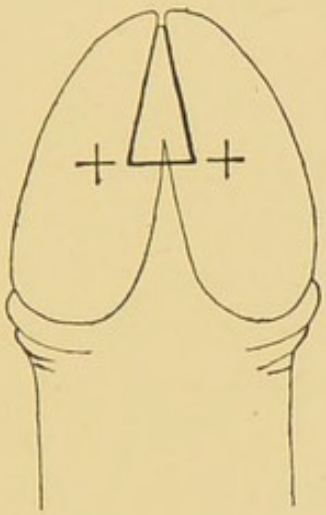


Fig. 65. Under-surface of penis. Lines indicate incisions for meatorrhaphy.

Fig. 66. Diagram of side view of penis. Black lines indicate incisions for meatorrhaphy.

horizontal cut until a small triangular portion is cut away, as in the diagram. The meatus and mucous membrane are divided in the mid-ventral line and the edges attached to the

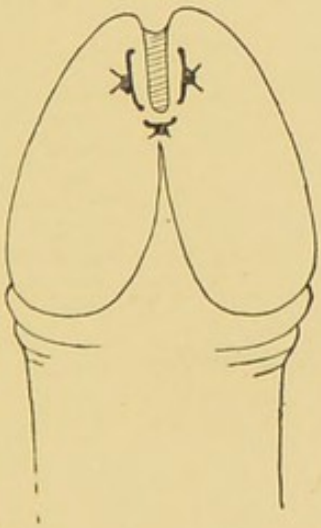


Fig. 67. Under-surface of penis, showing size of new meatus, with sutures uniting mucous membrane and skin after meatorrhaphy.

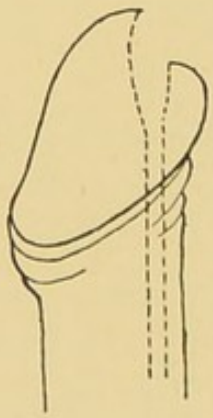


Fig. 68. Diagram of side view of penis, showing meatus enlarged after meatorrhaphy.

sides of the groove at the angles marked + in the diagram. Catgut, as mattress sutures, is the best material for these stitches; because it is undesirable that attempts should be

made to remove them, the local swelling making this difficult and consequently painful. A sound should not be passed for at least a week, and then only once or twice. The best form of dressing is some boracic ointment on lint. If there is much pain on micturition, the urine can be passed while the patient is lying in a hot bath. It facilitates the operation if the edges are undercut in removing the little triangular lump of tissue, and if the mucous membrane of the fossa navicularis is freed before inserting the stitches, three rectangular mattress sutures are sufficient.

The dilatation of the urethra to form the fossa navicularis, and the looseness of the urethra in that situation, aid considerably in the performance of this little plastic operation.

PHIMOSIS

Circumcision and Phimosis. Phimosis is a very common, condition and consequently the practitioner will frequently have the opportunity of performing the operation of circumcision. The technique differs considerably in the baby and the adult. In a healthy baby the operation can be performed at any age, and the pain is so small that it is unjustifiable to submit the patient to the risk of chloroform anaesthesia. It is as well to remember that a baby of one month is less sensitive to pain than one of twelve months, so for preference the operation should be done during the first few months of a child's life. A clean towel is wrapped round the body so that the infant cannot move its arms; its legs, covered by another towel, are held round the ankles by an assistant; the baby resents this less than fixing the legs by a bandage. The part is then carefully washed. The prepuce is now freed from the glans, to which it is often adherent, with a probe or director, care being taken not to pass the instrument into the urethra. This step is important because unless the adhesions are separated the foreskin cannot be drawn forward without the glans, which might be injured. The tip of the prepuce is held with forceps, care being taken not to pull it too far

forward or too much will be removed, and the superfluous tissue cut away with a sharp pair of scissors; this cut should be made parallel to the oblique line of the corona, so that less skin is removed near the frenum than opposite to it. When doing this a pair of sinus forceps can be used to grip the skin on the side proximal to the cut, pressing the glans back and preventing its being wounded, but this is not necessary in experienced hands. The mucous membrane is divided with scissors along the dorsum as far back as its

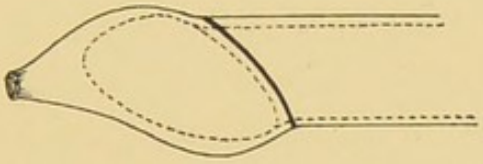


FIG. 69.

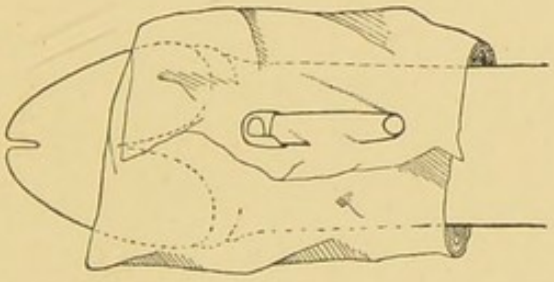


FIG. 71.

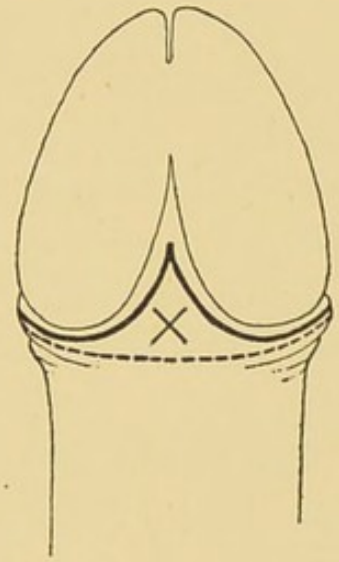


FIG. 70.

FIG. 69. Oblique line for circumferential incision of skin for phimosis.
FIG. 70. View of under-surface of the glans penis, showing oblique incisions for removal of mucous membrane in circumcision (black line). Dotted line indicates the ordinary method, which leads to the formation of an oedematous mass of mucous membrane. The cross indicates the situation of the triangular piece of mucous membrane left behind which becomes oedematous.
FIG. 71. Dressing after adult circumcision.

attachment to the penis, and then cut away close to the edge of the corona glandis all the way round. If the operation has been done artistically the edges of the skin and mucous membrane will be practically in apposition, and no stitches, or but one or two, will be required. All ligatures and stitches should be of fine catgut; the best form of dressing is to dust the part with boracic powder, placing a pad of wool over it. This dressing will be kept in position by the diaper, and should be changed every time the patient micturates. One

of the most frequent causes of disappointment to the parents is that an oedematous mass or 'blob' appears under the frenum, which is the result of leaving too much mucous membrane and submucous areolar tissue in this situation (Fig. 70). The mistake arises either from fear of the haemorrhage which might result from cutting the frenal artery, or from forgetting that by the frenum the line of attachment of the mucous membrane is *vertical and not horizontal.* The bleeding artery must be ligatured, but the haemorrhage is not severe. The mucous membrane and areolar tissue should always be carefully cut away in this situation, and it is here that a stitch can sometimes be inserted with advantage.

The circumcision of an adult differs from that of a baby, as, owing to the greater size of the part, all inaccuracies are greater and more apparent. Full anaesthesia is the most satisfactory from both the surgeon's and the patient's point of view. After thoroughly cleansing the area, an elliptical incision is made with a sharp knife, dividing the skin round the edge of the corona glandis, the direction of the corona being carefully borne in mind (see Fig. 69). In making this cut, always see that the penis is held exactly in the middle line, and that the skin is not twisted. With a few touches of the knife the areolar tissue is divided down to the mucous membrane, which is then removed all the way round at about an eighth of an inch from its coronal attachment, after splitting up the prepuce along the dorsum and laying it open. All bleeding points are ligatured with fine catgut; it is important that all haemorrhage should be stopped, as any blood escaping later will collect beneath the skin, causing great pain and giving considerable trouble to arrest. The skin edge is united by means of catgut to the mucous membrane at the coronal edge; the rectangular, so-called 'mattress' sutures are very useful for this, as they bring about excellent apposition. The wound should be dusted with boracic powder, and a strip of lint smeared with boracic ointment wound round the penis and fastened with a safety-pin. A pad of

wool and a T-bandage finish the dressing, which is changed from time to time as required.

Circumcision in the adult can also be performed by another, but less skilful, method: the prepuce is split up on the dorsum with scissors, and the skin and mucous membrane removed afterwards in one piece.

After twenty-four hours or so, the patient can get up in a dressing-gown, he will sleep much better; but had better not attempt to wear trousers. If perfectly clean, the wound is sealed in ten to twenty hours, so that there is no harm in the patient having a warm bath if he desires it.

CATHETERISM

For ordinary practical purposes catheters may be regarded as made of three materials, viz. rubber, metal, and gum-

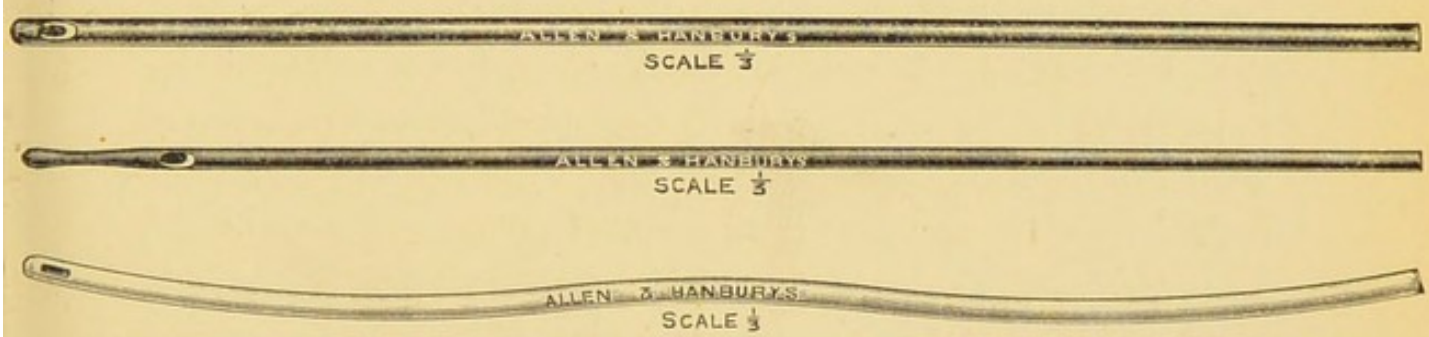


Fig. 72. Catheters.

elastic; the first two can be sterilized by boiling, the last is destroyed; yet the last is the one which both practitioner and patient generally employ. Carbolic acid, perchloride of mercury and other antiseptics slowly corrode and roughen the surface of gum-elastic catheters; therefore it is obvious that they can have but a short life if stored in antiseptic solutions. They should be kept dry in a clean case, care being taken that they are never contaminated by anything dirty; then they need merely to be washed in clear running water immediately before use. If they are contaminated, as they would be in a case of retention of urine complicating acute gonorrhoea, or when any urethral discharge is present, they must be washed carefully inside and outside, backwards and

forwards, with running water from the tap, then immersed for half an hour in methylated spirit, dried, and stored dry. The value of dry storing can be seen in the everyday life of old men who lead a 'catheter life', they keep their catheters in an old cigarette or tobacco case in their pocket, and go on from month to month using the same catheter many times daily, no antiseptics are employed, yet they seldom get cystitis; it is the dry storing which saves them. Hence the importance of dry storing, rather than the use of carbolic acid or other antiseptics, should be impressed on all those who lead a catheter life; the catheters will last far longer and the patients run far less risk of contracting cystitis. The following rules should be observed :—

1. The catheter should be kept dry in a special, dry, clean case; these can be obtained from any surgical instrument maker.

2. Before use the instrument should be softened by immersing it in warm water, and if necessary lubricated with vaseline.

3. After using the instrument the grease should be removed and the catheter well washed, both inside and outside, and backwards and forwards, under running water, dried, and returned to its case.

4. If there is any difficulty in removing the grease, it should be done with methylated spirit.

5. Above all, the patient should avoid soiling the catheter or his fingers with as much care as he courts cleanliness. Dry unclean hands do far less harm than wet imperfectly clean ones.

6. The hands and the penis should always be washed immediately before using the catheter.

7. The catheter should be discarded as soon as it begins to wear.

The actual passing of a catheter needs practice rather than written precept, yet a few suggestions may not be out of place. The rubber catheters (Jacques') are the best for

ordinary use, and have the advantage that they can be sterilized by boiling. Before a catheter is passed it is a good practice to inject about a drachm of warm oil into the urethra; vaseline is of no use as a lubricant for this form of catheter; sterilized paraffin is excellent, though more difficult to obtain. In nervous patients spasm of the urethra may impede the passage of the catheter; but this can be overcome if 10 minims of a five per cent. solution of cocaine, with 10 minims of a ten per cent. solution of adrenalin, are first injected into the urethra. This injection is extremely useful, as it diminishes the hyperaemia and swelling of the urethral mucous membrane, which is present in the retention of acute gonorrhoea, or has caused the closure of the passage in an old tortuous stricture. If a stricture is present, it is best to pass a catheter down to the stricture and inject the cocaine and adrenalin through the catheter on to the obstruction; in a few minutes it may be possible to pass a catheter through a stricture which previously could not be overcome. Suprarenal extract does not answer as well as adrenalin.

Gum-elastic catheters are stiffer and more tapering than the rubber, and are consequently more easily passed, but in the practice of men who use urethral instruments frequently, it will be found that if they cannot use a rubber catheter they prefer a metal one; the curve is useful and the rigidity renders them easier to guide, and they can be sterilized by boiling. They can be passed in the same manner as sounds (see p. 134), but in using the smaller sizes great care must be taken to avoid making a false passage.

DILATATION OF A STRICTURE

Experience with sounds teaches us that the instruments best adapted for narrow strictures do not make the best models for completing the dilatation to a large size; the most satisfactory sounds to employ are, however, those with the use of which the operator is most familiar. For those who

have no prejudice, we would suggest for smaller sizes Lister's sounds, which have a blunt end and a long curve; for larger sizes, Clutton's, with a shorter, sharper curve. As a rule, it is not necessary for the patient to have a general anaesthetic, but a local injection of cocaine and adrenalin, or cocaine and resorcin, should be made in the manner already described (see p. 133). The sounds should be boiled, and placed in

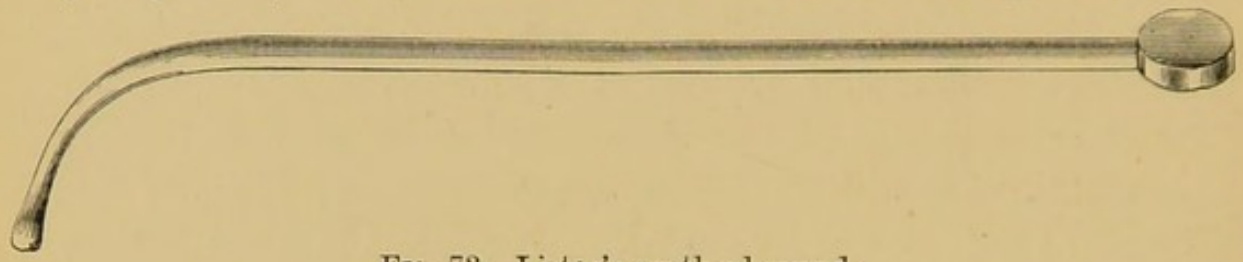


Fig. 73. Lister's urethral sound.

order on a sterilized or clean towel and allowed to cool; the penis must be cleansed, special attention being paid to the folds of the prepuce. The sound must be lubricated before use, and this can be done by pouring some glycerine or sterilized paraffin into a long glass vessel, and dipping the sound in this; or vaseline can be used, but the objection to

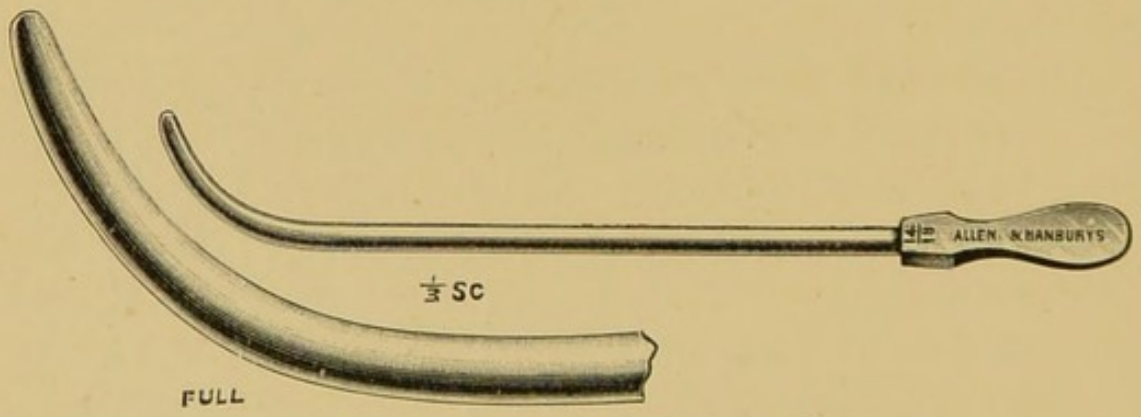


Fig. 74. Clutton's urethral sound.

this is that it requires to be spread over the sound with the finger, and sepsis is liable to be introduced. It is a good plan to inject oil into the urethra (see p. 133), as well as to lubricate the end of the sound. Many and various are the methods described for passing a sound, but the following is as satisfactory and as simple as any: The patient lies on his back with the legs parted, and the tip of the sound is introduced into the urethra, the instrument lying at right

angles to the long axis of the body, the handle being over one thigh, usually the left. The prepuce having been retracted, the penis should be fixed by holding it between the finger and thumb of one hand, and the instrument gently pushed down the urethra until the perineum is reached, then the handle is brought round to the mid-line of the body, not quite touching the abdomen; at this moment the point of the sound should be entering the membranous urethra. The handle is raised to the vertical position, and by gently depressing it between the thighs the instrument slips into the bladder. The point where a mistake usually occurs is that the handle is raised to the vertical position too soon, i.e. before the tip has reached the opening of the membranous urethra in the triangular ligament, and consequently the sound tends to make a false passage. The introduction of the sound as far as the stricture is usually simple, but when the stricture is reached it is more difficult; the handle must be held lightly between the finger and thumb and the tip moved and rotated until it enters and is gripped by the stricture, then it is firmly and gently pushed on. In some cases considerable assistance is obtained by placing a finger in the rectum and pressing the urethra upwards; it is also possible to ascertain if the instrument has left the urethra. A medium-sized sound should always be passed first. If it will not enter the stricture, try smaller sizes until a sound passes the stricture, then pass the next larger size, and so on, dilating it. If two or more strictures are present, first of all attempts should be made to dilate only the one nearest to the meatus; when that is done, the second can be attacked. Too much should not be attempted at one sitting; if the stricture is tight, and it is difficult to pass even the smaller instruments, the dilatation should only be carried a little way, and a second attempt made later; if too much is done at one sitting, splitting of the mucous membrane will occur, which, followed by cicatrization, may increase the very condition for which treatment has been sought. After sounds have been passed,

the patient should be put to bed for twenty-four hours; and, if the stricture has not been fully dilated, another attempt is made in a few days, commencing with the largest sound but one which previously entered the stricture, and working upwards from that. When the stricture has been fully dilated, the patient must still have instruments passed at short intervals of time, to prevent contraction; but as time elapses these intervals can be longer and longer, provided all goes well.

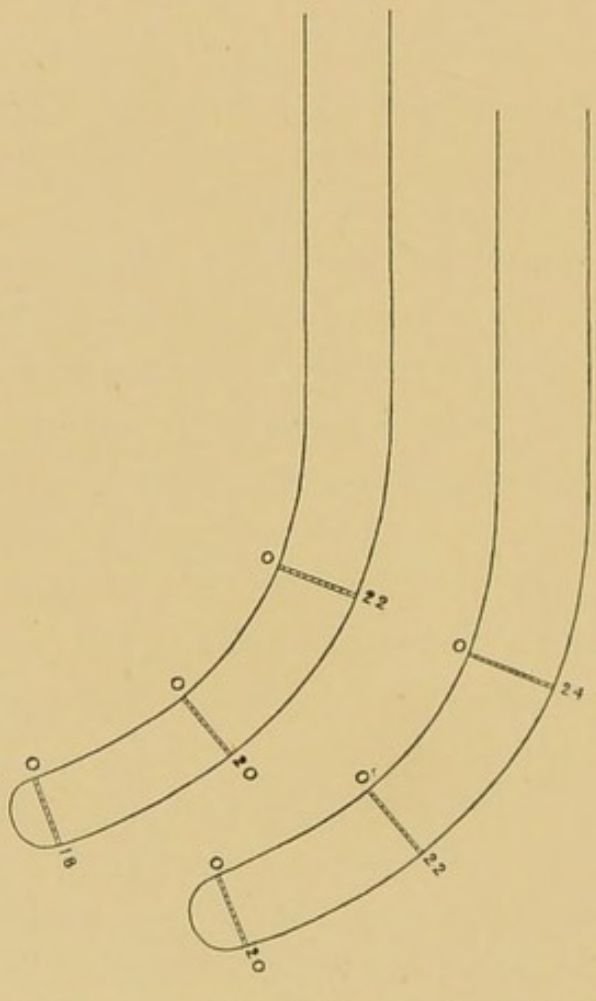


Fig. 75. Conical sounds, indicating method of graduation with increase of size.

There is one great disadvantage in dilating a stricture which has been rendered anaesthetic by cocaine or a similar drug. The dilatation is done rapidly, and a large-sized sound is quickly reached before the effect of the anaesthetic wears off; the result is that the stricture is not so much *dilated as ruptured*, the patient running the risk of developing a perineal abscess, and perhaps a fistula at a later date. Firstly, the local

anaesthetic abolishes the warning which would be given by the patient's feelings; and secondly, the urethral haemorrhage is diminished by the action of the cocaine and adrenalin. Hence two important guides are taken away from the surgeon, who should, when dilating under a local anaesthetic, proceed the more cautiously.

A word must be added about the graduation figures of the various sounds. For instance, one of Clutton's is 18–22, which means that the tip is of a size '18', and as the sound is passed more and more into the stricture, it becomes dilated from size 18 to size 22. The sound is conical. The next larger size is 20–24, 20 being the size of the tip, which easily enters the stricture which has already been dilated to size 22, which it dilates from 20 to 24. All the sounds are graduated on this principle. Lister's sounds are graduated on a similar principle, the tip always being a little smaller than the size to which the stricture has been dilated already. (See Fig. 75.)

GOULEY'S TUNNEL CATHETER

In cases of stricture with retention of urine, when the operator is unable to penetrate the stricture with ordinary catheters or sounds, and where resort will have to be made to a suprapubic or perineal operation, it is always advisable, before doing so, to endeavour to pass the stricture by means of a Gouley's tunnel catheter. The apparatus consists of several very fine whalebone bougies, and a fine silver catheter with stylet; at the end of the catheter is an opening which admits a whalebone bougie. It is used in the following manner: One of the fine bougies is passed gently down the urethra and, as attempts have already been made, it will probably fail to penetrate the stricture; a second is then passed down the urethra alongside the first, and first one and then the other are gently pushed up and down. If neither gets through the stricture, a third is inserted and the manipulations repeated; if this fails, a fourth and even a fifth are passed. In all probability, on gently pushing these up and

down, one will penetrate the stricture and enter the bladder, in which case it is retained in position and the others withdrawn. Then the metal catheter with the terminal eye is passed over the bougie, which guides it into the bladder, and the urine escapes. In passing the bougies the essential point is never to use force; in introducing the catheter along the bougie more force can be used, because one is sure that, so long as it follows the bougie it will be in the urethra, and therefore there is little fear of making a false passage. This method should always be tried before resorting to a suprapubic or perineal operation. Retention of urine is relieved frequently by this procedure when all attempts with ordinary catheters and sounds have failed. The method succeeds

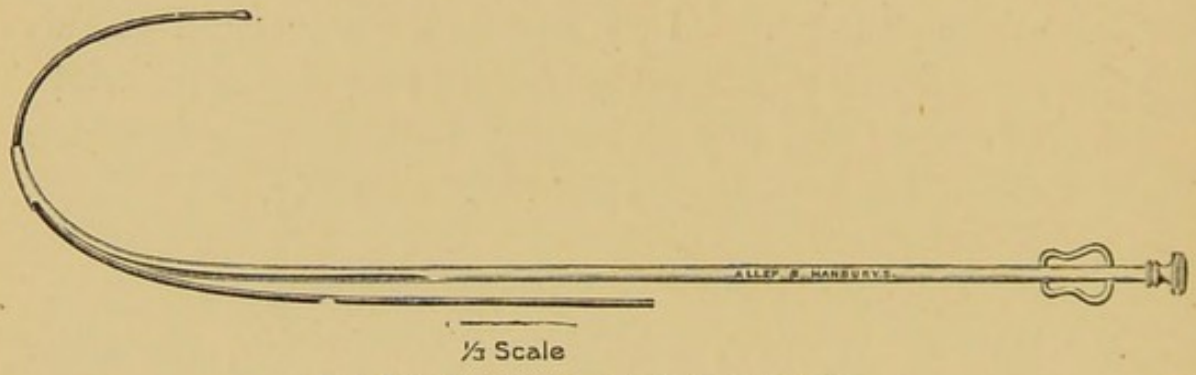


Fig. 76. Gouley's catheter and guide.

because the difficulty in passing a stricture is due to the fact that the urethra is not only narrow but tortuous; the different bougies fill up the channel until one of them is pushed by the others over the opening, and passes through the stricture.

TYING-IN A CATHETER

It is occasionally necessary to retain a catheter for some considerable time, and this can be done either by means of a special winged catheter or by tying-in an ordinary catheter. The first method is not satisfactory, particularly in males, and cannot be relied on, the catheter frequently coming out. The second is the better plan, and there are numerous ways of carrying it out, one of the best being to pass a loop of tape round each thigh, fastening both securely to an abdominal belt or bandage. Pieces of narrow tape are tied round the

end of the catheter and are fixed to the loops round the thighs at the groins. For additional security tapes can be fixed between the catheter and the abdominal belt.

A simpler method is to fasten a piece of strapping round the catheter just outside the meatus, bring the two ends down alongside the penis, and fix these by encircling the penis, just below the corona, by another piece of strapping. A strip of lint should be wrapped round the catheter, between the meatus and the strapping, to prevent rubbing. The catheter is either blocked with a stylet or a piece of cork, or a rubber tube can be fitted to it, which leads to a receptacle for holding the

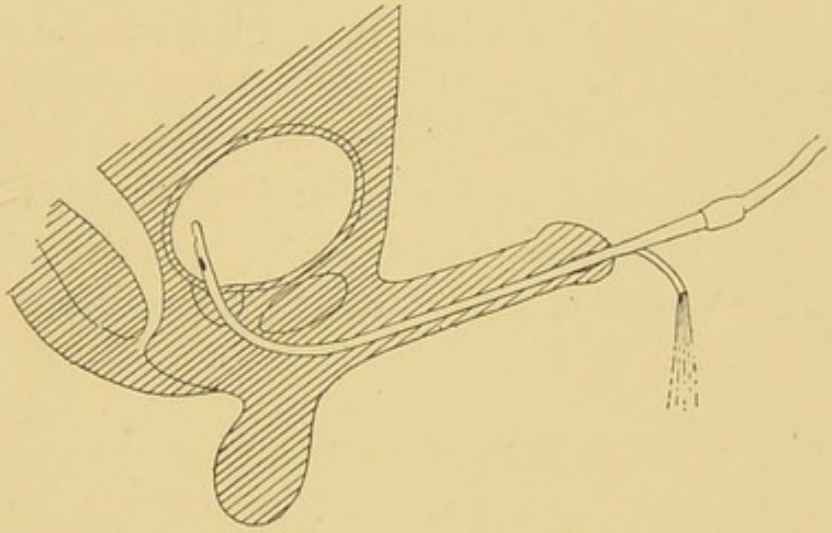


FIG. 77. Diagram indicating the method of bladder washing with double-channelled metal catheter.

urine. Whenever a catheter is tied in, always ascertain that the end does not project far into the bladder. It might lead to ulceration should the point be kept in contact with the bladder wall. In any case the presence of a catheter is apt to set up a urethritis which necessitates discontinuing the practice.

WASHING OUT THE BLADDER

Washing out the bladder is a proceeding occasionally called for in cases of chronic cystitis, haemorrhage, &c., and is usually done by means of siphonage. After cleansing the penis, a soft rubber catheter, of the largest size that is feasible

is passed, the end of which is connected by a glass junction to a long india-rubber tube with a funnel. The tube and funnel should be filled with the water or lotion before being joined to the catheter and the tubing 'pinched'; otherwise air will be introduced into the bladder. Various substances are employed for washing out: sterilized water, normal saline solution, boracic acid (20 grains to the ounce), a neutral solution of quinine (2 grains to the ounce), &c., and the fluid should be at about the body temperature. The funnel is filled with the solution and lifted up above the level of the bladder, but never more than 1 or 2 feet, when the solution will flow into the bladder. On lowering the funnel a mixture of urine and lotion runs back into it, and is poured away; this manœuvre should be repeated until the returning fluid is clear. The amount which should be run into the bladder at one time depends on the patient's sensations; as soon as discomfort is felt, causing straining, sufficient has been introduced. A patient can be taught to wash out his own bladder.

A FOREIGN BODY IN THE URETHRA

Foreign bodies impacted in the male urethra either come from the bladder, such as calculi, or have been introduced from outside, either from some perverted sexual idea or for the relief of a real or imaginary stricture. The treatment will depend upon whether the body is lodged in the penile or in the deep urethra. When in the penile portion, the lips of the meatus should be compressed, and attempts made by the patient to micturate; if the body is smooth and rounded it will be driven forwards towards the meatus, and can then be extracted with sinus or urethral forceps. Calculi are frequently lodged in the fossa navicularis, especially in children; the meatal opening can be enlarged when necessary by a simple incision and the body removed. If it is firmly impacted, and the above methods fail, an incision should be made, the urethra incised and the body extracted. In suturing the wound the

edges of the urethra are united by catgut stitches, and the skin edges with horsehair, leaving a space for drainage should the urethra leak. Pins, and they are usually long ones, are pushed into the urethra head foremost. In order to extract them their position must be reversed. The head of the pin is fixed with the fingers on the outside, and by bending the penis back the point is made to protrude through the skin; this

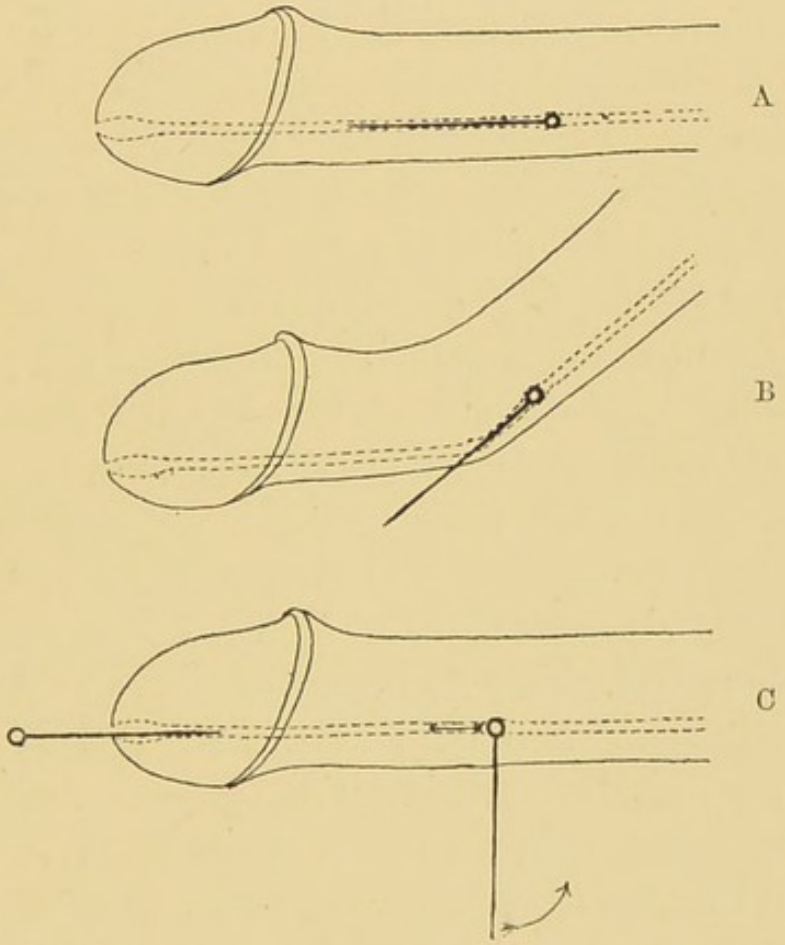


Fig. 78. A. Pin in urethra. B. The point of pin made to perforate the urethra and skin. C. Version and extraction of pin.

is seized and withdrawn until only the head of the pin is in the urethra; the point is circumducted, as in the figure (78 C), and the head pushed upwards and out through the meatus. If the body is in the deep urethra the question has to be decided whether to cut down upon it in the perineal region and remove it, or to push it on into the bladder and extract it suprapubically; before attempting either, further advice should be taken.

PARAPHIMOSIS

In paraphimosis the prepuce is retracted over the glans penis, has become oedematous, and cannot be drawn forward, the glans being partially strangulated. When a case presents itself, ascertain exactly where and what the constricting band is, generally the meatal opening of the prepuce is responsible, but sometimes in children the swelling is due to a tight rubber band or metal ring placed round the penis, which has become hidden by the oedematous tissues. Even previous to the examination, in view of the painful nature of the condition, inject a few minims of eucaine and adrenalin under the skin on the dorsum of the penis above the constriction. This will paralyse the dorsal nerves. As soon as the part is sufficiently anaesthetic, make numerous small punctures with a knife in the oedematous mucous membrane, in order to let the fluid out. When the swelling has decreased, hold the penis firmly, immediately behind the constriction, between the first and second fingers of both hands, the palms being turned upwards; steady downward pressure should then be exerted by the two thumbs on the glans; this will expel some of the oedematous fluid. After pressure has been maintained for a few minutes the enlarged glans will, in many cases, slip through the constricting prepuce. If this plan does not succeed, the constricting band must be divided on the dorsum by a sharp-pointed bistoury; when doing this an anaesthetic may be required, gas usually being sufficient. As soon as the constricting band is divided the prepuce will slip forward, the part should then be bathed in warm water and wrapped in gauze and wool, or dressed with hot lead lotion. The dressing should be changed every two hours for the first twelve or twenty-four hours, the inner surface of the prepuce being syringed with warm water at each dressing. The swelling will subside in a few days, and circumcision should be advised as soon as the part has healed. If there is any

discharge present, circumcision must not be done until this has all disappeared.

VARICOCELE

The operation for varicocele is easy and can be done with safety by any medical man who is reasonably confident of his ability to keep the wound clean. In former times, the veins were removed through a scrotal incision; in the present day, it is done through an inguinal one. The patient is prepared and the part shaved and cleansed, special attention being paid to the penis, to prevent its touching the wound. An incision, 1½ inches in length, is made from just above the external abdominal ring downwards in the direction of the cord; in the hands of the less experienced this incision should be slightly extended both downwards and upwards; one of the most common mistakes in this operation is that the incision, though long enough, is made too high up on the abdomen, and the cord is not exposed sufficiently. The fat is divided until the aponeurosis of the external oblique is seen in the upper part of the wound; then the external abdominal ring is identified, by *sight* and *not by touch*, with the cord and the enlarged veins of the varicocele issuing from it. By means of two pairs of forceps the cord is freed from the surrounding structures, brought out of the wound, and a retractor passed under it. Search is now made for the vas deferens and its vessels, which should be separated from the varicocele with forceps and perhaps a blunt dissector, always leaving a few veins with the vas, for if all are removed some atrophy of the testicle on that side is certain to follow. The mass of veins, which it has been decided to remove, is isolated throughout the length of the wound, the upper and lower ends carefully ligatured and the intervening mass of veins excised. These ligatures should be tied very carefully, and the veins must not be cut off so closely to the ligature that this may slip off, an accident which is very liable to occur. After the veins have been cut always see that there is no haemorrhage

from the stump. If the testis on the affected side hangs very much lower than the other, the two stumps can be united by passing a stitch through them on the distal sides of the ligatures, which should not be tied together. The two stumps should not be united in a candidate for the public services, as the subsequent continuity of the structures of the cord has been known to give rise to the idea that the operation has been 'unsuccessful' and the candidate has been rejected after all. It is sometimes desirable to close part of the external abdominal ring, and this can be done with one or two silk stitches. All bleeding points are ligatured and the wound closed with interrupted stitches, and dressed with gauze and collodion. The stitches are removed in a week, and the patient allowed up ten days after the operation if the wound has healed. A suspensory bandage should be worn for a few weeks to support the scrotum. In certain cases of pendulous scrotum, some of the skin can be excised with advantage.

This operation should only be done when the patient complains of symptoms which are due directly to the varicocele; in which case over ninety per cent. will be relieved if not cured. For reference to some of the consequences and after-results of this operation, the reader is referred to a paper on 'The Immediate and Remote Results of the High Operation for Varicocele', in the *British Medical Journal*, January 27, 1906.

HYDROCELE

The simple tapping of a hydrocele will relieve it temporarily, but the fluid usually re-forms; if, however, the tapping is followed by the injection of an irritant, there is no doubt that a large percentage of cases will be cured. The best substance to inject is carbolic acid liquefied with glycerine, in the proportion of 10 parts of the acid to 1 of glycerine. Iodine is sometimes used, but the above mixture causes less pain and is more certain. When tapping a hydrocele the patient should

be sitting up in a chair, standing against a wall, or in such a position that he is unable to draw back as the puncture is made. The exact position of the testis must always be determined by means of the translucency test and by palpation, it being found usually below and behind the hydrocele. The scrotum, having been cleansed, is grasped from behind by the left hand, pushing the hydrocele forwards, and at the same time making the skin tense. A spot, free from any large veins, is selected on the anterior and lower part of the swelling, and the trocar and cannula introduced with a sharp stabbing movement; the instrument should be guarded by the finger, which is held about 1 inch from the end, to prevent its penetrating too far and perhaps wounding the testis. On withdrawing the trocar the fluid escapes; when all has been drawn off the cannula is removed and the puncture covered with a small piece of gauze and collodion. If an irritant is to be injected, an exploratory syringe will be required capable of holding one drachm, and the cannula must be of such a size that it will fit the syringe. The hydrocele is tapped in the manner described above; the cannula, however, is not withdrawn, but the syringe, containing 1 drachm of carbolic, is fitted on to it. As the carbolic is injected the patient experiences a feeling of warmth, followed by one of numbness, but has practically no pain. The cannula is withdrawn and the puncture closed as above; the scrotum is then manipulated to bring the injection into contact with the whole surface of the tunica vaginalis. It is best when possible for the patient to remain in bed for a day afterwards.

In certain cases, especially in young adults who can spare the time to lay up, or when there is a question of the possibility of the hydrocele being dependent on any pathological condition of the testis, it is better to recommend an 'open' operation. A general anaesthetic should be given, the pubes and scrotum shaved and thoroughly cleansed. The penis is wrapped in gauze and covered with a towel to keep it away from the site of incision. The swelling is rendered tense by grasping it from

behind, and an incision made from the top to the bottom of the hydrocele, only cutting through the skin. The dartos muscle and fascia are then divided carefully throughout the whole length of the incision, until the tunica vaginalis is seen as a white layer; the tumour is then separated from the surrounding structures with a blunt dissector, aided by an occasional touch with the knife; whilst the hand holding the scrotum projects the hydrocele more and more until it is delivered outside the wound. It is then incised and the fluid contents allowed to escape; the sac is completely freed from the surrounding tissues and cut away a third of an inch from the testicle all round, care being taken to avoid injuring the structures of the spermatic cord, which should be identified before the tunica vaginalis is removed. All bleeding points must be clamped and ligatured very carefully and thoroughly, or a haematoma may form; the part is then washed with hot saline solution or warm water and the testis replaced in the scrotum. No attempt should be made to suture the remains of the tunica vaginalis round the testis. Retractors are placed at each end of the wound and pulled in opposite directions in order to stretch the skin, which is then united by means of interrupted catgut stitches. Catgut can be used with advantage in this situation with a view to save the patient the discomfort of having the stitches removed. The wound is dressed with gauze and collodion, over which is placed a pad of wool, kept in position by a T-bandage. The patient is allowed up in ten days; a suspensory bandage should be worn for another two weeks.

PERIURETHRAL ABSCESS

A periurethral abscess occurs occasionally in the course of an attack of gonorrhoea, as a complication of urethral stricture, &c. If left to itself, the pus usually finds its way into the urethra, and sometimes also externally through the skin. The resulting urinary fistula may prove exceedingly difficult to cure. If the swelling is increasing in size or pus can be

detected by fluctuation, the abscess should be opened from outside. The part is shaved, cleansed, and an incision made, under gas or local anaesthesia, over the swelling and the pus evacuated. The part should be dressed with hot fomentations, and the patient can sit in a warm bath twice daily. When a stricture is present, it must be dilated or the condition will recur. The acute abscesses which may complicate acute gonorrhoea are more likely to lead to a urethral fistula, on account of the sloughing of the tissues, than are the more subacute abscesses secondary to a stricture, provided that the stricture is treated.

URETHRAL IRRIGATION

This is an excellent method of treating urethral discharges. It is employed in two ways: for the anterior urethra and for the posterior or deep urethra. The patient should micturate immediately before irrigation.

1. *Irrigation of the anterior urethra.* An ordinary douche tin capable of holding one or more pints is connected by a rubber tube to a glass nozzle. The injection is diluted with warm water and put in the douche tin, and is prevented from flowing down the tube by a pinchcock. The patient can stand, in which case the contraction of the compressor urethrae prevents the injection entering the deep urethra. But in subjects who have had urethritis before, particularly a long gleet, this contraction is untrustworthy, and it is better for the patient to sit on the angle or arm of a chair, or on a firm cushion, with his legs apart. He holds a kidney porringer, and there is a pail at his feet. The douche tin should only be at the height of the patient's pelvis. The glass nozzle has two lateral flanges to facilitate the return of the injection. The pinchcock is released and the tube and nozzle emptied of air, the latter is then insinuated between the lips of the meatus and turned through a right angle to ensure that the flanges open up the urethra, so allowing the fluid to return. The injection is run in slowly, care being taken to ascertain that

it is returning properly. This should be done for five to ten minutes or longer once or twice daily.

2. *Irrigation of the deep urethra.* The patient and the apparatus are prepared as for anterior irrigation except that the subject stands with legs apart, and the douche tin is placed 1–2 feet higher than the penis. The injection flows into the deep urethra and may even enter the bladder. It is done in the method described under section 1.

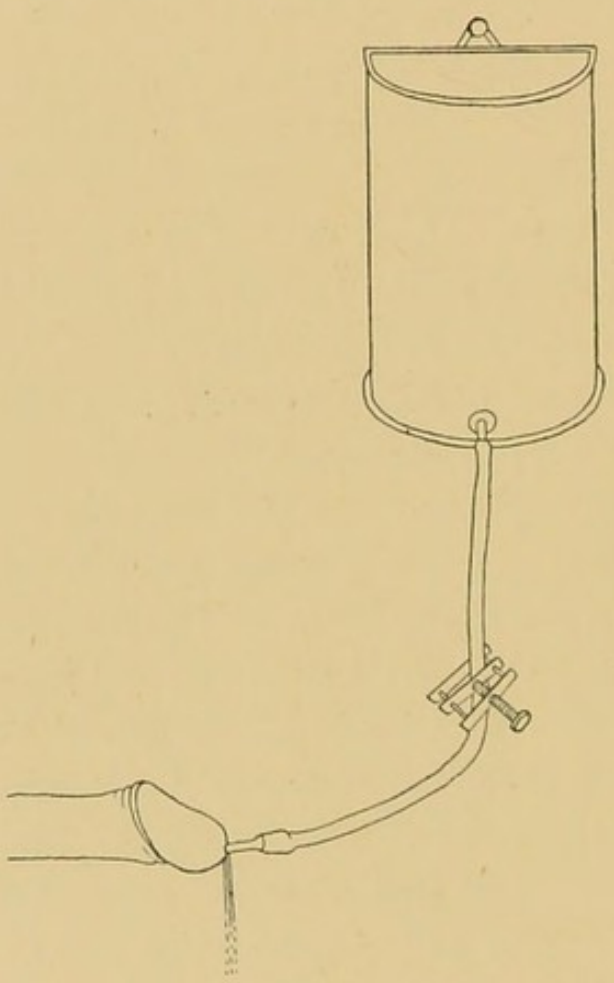


Fig. 79. Diagram indicating method of urethral irrigation.

In order to irrigate the deep urethra some surgeons fill the bladder with a pint or more of the diluted injection, which after a few minutes the patient passes. This is the only way of disinfecting the unhealed cavity of a prostatic abscess.

Urethral irrigation requires more care and time, but gives better results, than injections. From a pathological aspect the reason for this is not clear. All injections and irrigations diminish the amount of the discharge by their action on the

granulations and the organisms associated with the gonococci ; but these they leave practically unharmed, except that, by affecting their surroundings, the injections may have rendered the habitat of the gonococci untenable. Thus all injections accomplish their object in a roundabout and indirect way. All solutions should be used weak; such as, permanganate of potash 2 grains to the ounce, or protargol ½ per cent.; and raised to the body temperature by means of hot water.

SOUNDS AND URETHRAL DISCHARGE

It is well known that by passing full-sized sounds an old

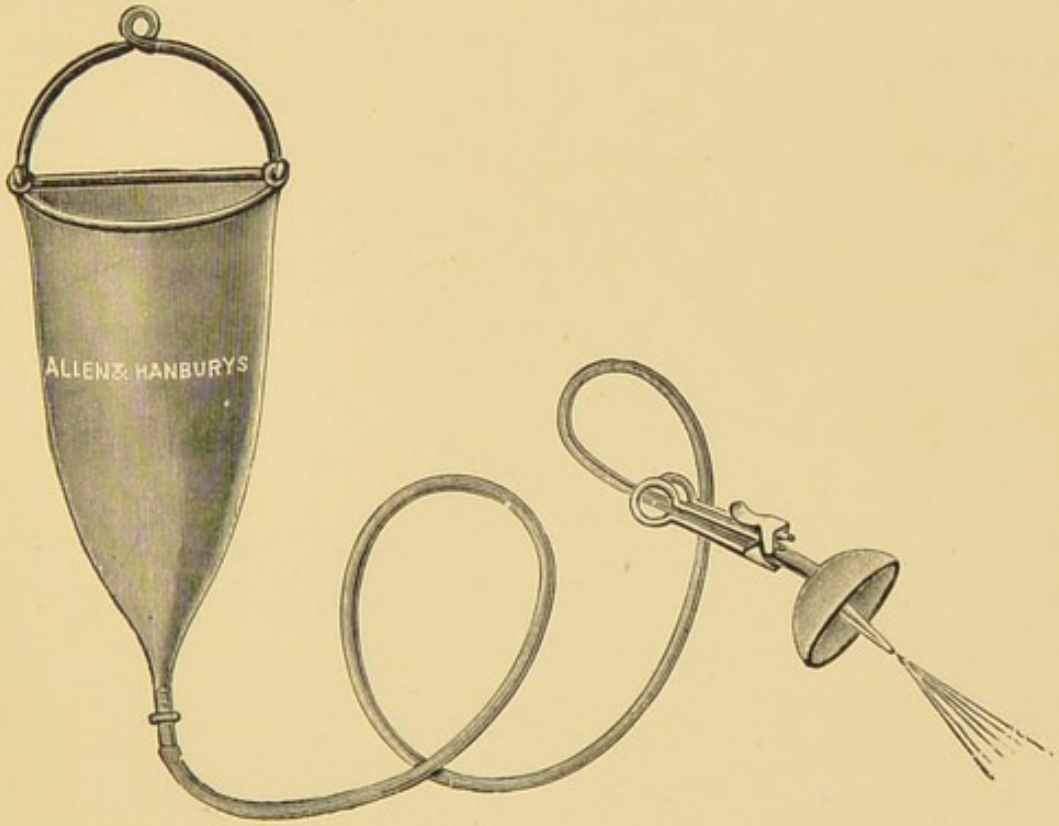


Fig. 80. Apparatus for urethral irrigation.

gleet can often be cured. But in this section we wish to recommend this procedure for another reason. Even when a gonorrhoeal discharge has ceased, perhaps for a year or more, the passage of large sounds may cause it to reappear. For instance, in one case we have known it reappear from passing sounds, five years after an attack of gonorrhoea. The clinical significance seems to be that in the urethra or the prostate there is an incompletely healed abscess cavity, in which gonococci and other organisms multiply continually. This cavity is in part

broken up by the passage of sounds, and the discharge reappears. But though a coverslip preparation of the discharge may be identical with that of a fresh infection, yet it is unaccompanied by urethritis. We cannot but think that the cases of pelvic inflammation which are so often found in virtuous women, sometimes have their origin in one of these imperfectly healed cavities being awakened by frequent sexual intercourse. The possible presence of this cavity is unknown to the man, who may not have seen any discharge for months or years. Thus it becomes highly important that men, who have had gonorrhoea, and particularly those who have had a long gleet, and contemplate matrimony, should have large sounds passed, and any subsequent discharge examined by a competent bacteriologist.

When gonococci reappear in a discharge after the passage of large sounds, although bacteriologically there may be every appearance of an acute gonorrhoea, yet there are no symptoms of any inflammation accompanying it. Such a fact is suggestive that the organisms have lost much of their virulence and may not be so harmful as their presence would suggest. But such a surmise must be supported by experimental work before the practitioner should alter his advice against such a patient marrying.

URETHRAL INJECTIONS

The practitioner will frequently be called upon either to inject solutions into the male urethra or to instruct patients as to the best method of doing it. Two points must be noted; firstly, that the solution injected does not reach the bladder and so carry the infection there; secondly, that the solution comes in contact with all the folds of mucous membrane in the urethra. Before injecting, the patient should micturate, by this means removing as much of the discharge as possible. The syringe should be of glass, capable of holding about 2 drachms and having a nozzle that will fit the external meatus. The syringe, which is kept clean, is filled

with the solution to be injected at the body temperature, and the nozzle is inserted in the external meatus, the lips of which are held firmly around it. The urethra is compressed in the perineal region by the patient sitting astride the arm of a chair, and the fluid is slowly injected; the syringe is withdrawn and the lips of the meatus are closed with the fingers, after a few minutes the fluid is allowed to escape. When the injection is done in this manner the urethra is distended with the solution, which comes in contact with all the folds of the mucous membrane, but none of it reaches the bladder or prostatic urethra. Various solutions are employed for injecting, and whatever one is selected it should be used weak, and if desirable its strength increased later; the following are frequently used: Zinc sulphate (2 grains to the ounce), protargol, permanganate of potash (1 part in 4,000), silver nitrate ($\frac{1}{4}$ grain to 1 ounce), &c. At first the injection should be done four times daily; but as the discharge decreases, less often. When using injections containing silver salts, always warn the patient that the fluid will stain his linen, and that these stains are exceedingly difficult to remove.

As there is much difference of opinion about the value of injections, it will be as well if a few remarks are offered. Clinically, there is no doubt whatever of two facts. Firstly, suitable injections do diminish the amount of the discharge and alter its character; secondly, there is a higher percentage of patients who suffer from epididymitis and orchitis amongst those who use injections than amongst those who do not. Pathologically, it is known that these injections have little or no effect upon the prime cause of the infection, namely, the gonococci. Injections affect the organisms which may be associated with it. So that by helping to destroy them and by affecting the granulations, injections may render the locality unsuitable to the growth and even to the existence of the gonococci. Thus *indirectly* they are of value. On the other hand it is only fair to state that gonococci have been found in the urethra, as long as five years after the infection,

of a man who during that period had used nearly every variety of injection known. To sum up, urethral injections by diminishing and decolorizing the discharge conduce to the patient's comfort at a slightly increased risk of epididymo-orchitis; but they only have an indirect effect on the gonococci, which may persist in spite of them.

BALANITIS AND BALANOPOSTHITIS. POSTHOTOMY

Balanitis means inflammation of the glans penis, and balanoposthitis inflammation of the prepuce as well. Both are particularly prone to occur in subjects with a long prepuce. They are usually combined with gonorrhoea, but can occur without it or with other organisms. The inflammatory condition frequently subsides with measures directed towards local cleanliness, baths, syringing, insufflation of antiseptic powders, hot dressings, &c., but in the acute stage an operation may be required; firstly, to prevent the discharges being pent up; and secondly, to ascertain if there is under the swollen prepuce any such condition as soft sores, a hard chancre, carcinoma, &c. The operation, posthotomy, consists of splitting up the prepuce on the dorsum. A general anaesthetic is required. After the usual preparations, the preputial cavity is syringed out and a director passed along the dorsal side of the glans penis, between it and the prepuce. The oedematous prepuce is divided with a knife on the dorsum until the director is exposed. Scissors are useful to complete the operation, which can be done with them alone if the prepuce is not much swollen. No stitches are required. The incision is carried far enough back to expose the situation where the mucous membrane is reflected on to the neck of the penis. The after-treatment consists of hot dressings, baths, and general cleanliness, combined with the treatment of any specific sore found. The swelling soon subsides; indeed, in the loose tissues of the prepuce a little oedema causes a great deal of swelling. When all has healed, the patient should be circumcised, the operation of posthec-

tomy; but it is not advisable to do so in the acute septic condition.

PENILE WART

Penile warts are small, sessile or pedunculated, and often confluent tumours which arise in the course of an attack of gonorrhoea or when any irritant discharge is present, balano-posthitis. They disappear under cleanliness and such local applications as calomel or a mixture of equal parts of starch and boracic acid; but if not, they should be cut off by a pair of scissors and the stump touched with caustic, silver nitrate or nitric acid. The part must be kept clean and dry. They are more frequent and troublesome in those who have long foreskins, so that it is always wise to place before the patient the expediency of undergoing the operation of circumcision, when all discharge, &c., has disappeared. The warts are infective and can spread along the penis or to the vulva from sexual intercourse.

CHAPTER IX

FEMALE GENITOURINARY

PASSING THE FEMALE CATHETER

Formerly it was the custom to pass a catheter without exposing the patient; this should never be done, as the catheter is bound to become infected, so introducing organisms into the bladder, which may set up cystitis. The best form of catheter to use is a glass one; it should be boiled or placed in a strong antiseptic solution, which is afterwards washed away in sterilized water. The external parts are cleansed and the vulva washed with a 1 in 2,000 solution of perchloride of mercury. The labia minora are separated with the fingers

Fig. 81. Glass female catheter.

of the left hand, and the end of the catheter, which is held in the right hand with the thumb over the other end, is introduced into the meatus. The instrument is gently pushed on until it enters the bladder. The thumb is removed from the end and the urine caught in a receptacle. When passed in this way, there is very little fear of introducing septic infection. The patient may be either in the dorsal or the left lateral position. In either case there should be satisfactory exposure with a good light. A very good way is to attach a piece of rubber tubing to the external end of the catheter, before inserting it, so that urine is conveyed safely to a receptacle. In passing a catheter in acute gonorrhoea, all discharge should be wiped away and the meatus

urinarius painted with a solution of five per cent. cocaine and ten per cent. adrenalin.

INTRODUCTION OF A SPECULUM

The introduction of a speculum is called for as an aid to diagnosis, or for the application of medicaments to the cervix, the two forms most commonly employed being Fergusson's and Sim's.

Fergusson's speculum is a hollow cylinder, one end being bevelled, the other trumpet-shaped. It is made in three different sizes, of metal or of silvered glass. The patient should be in the left lateral or dorsal position. The speculum is sterilized, warmed, and lubricated outside with vaseline. The labia are separated with the left finger and thumb, and the bevelled end of the speculum, with its longest side directed towards the perineum, is slipped between the labia. The perineum is hooked down with the finger and the speculum pushed into the vagina. When introduced for its full length, the cervix should lie in the lumen at the end; but if not, the speculum should be partially withdrawn and again passed upwards in a slightly different direction. The interior of the speculum can be cleaned with wool on the end of a long pair of forceps.

Sim's speculum consists of two different-sized concave blades placed at right angles at either end of a rigid handle. The instrument is usually made of metal. The patient should be in the left lateral position; and the speculum warmed and oiled on the convex surface only. Either blade can be inserted, but unless the vagina is very patulous the smaller one should be used. The index finger of the right hand is laid, flexor surface downwards, in the concavity of the smaller blade, the other blade being held in the left hand. The right index finger, with the blade, is then passed into the vagina in an exactly similar manner to that employed in making a vaginal examination. The finger is withdrawn and the blade pushed into the posterior fornix; on pulling

the lower blade directly backwards the cervix and anterior vaginal wall will come into view. It is often helpful if a broadish retractor is used to keep the anterior vaginal wall from obscuring the field of vision.

THE PASSAGE OF THE UTERINE SOUND

The uterine sound is usually employed as an aid to diagnosis, but before using it the practitioner should make certain that the patient is not pregnant, for the introduction of the sound during pregnancy will cause abortion. The sound should always be boiled before use. The patient is placed in the left lateral position, and, when a vaginal douche has been given, the anterior lip of the cervix is gripped with a volsellum, the left index finger held against the external os, and the tip of the sound with its concavity looking forwards is gently introduced between the lips of the cervix. The end is usually arrested at the internal os, but by slowly depressing the handle towards the perineum at the same time that the sound is pressed onwards, the tip will slip through the internal os and enter the uterus. If marked retroversion is present, the sound is introduced with its concavity directed backwards; when the handle is moved forwards towards the pubes the tip enters the uterus. Once the sound is in the cervical canal it must never be rotated on its long axis, but should be withdrawn and again introduced. Before removing it, the finger is placed against the cervix, touching the sound, then the instrument and the finger are withdrawn together; the position of the finger on the sound will indicate the length of the uterus and cervical canal. The essential points in passing the sound are, never to use force and never to jerk the instrument suddenly.

REPOSITION OF THE UTERUS WITH A SOUND AND THE INTRODUCTION OF HODGE'S PESSARY

These pessaries are usually inserted for cases of retroversion and retroflexion; they are made of various materials, vul-

canite, metal, india-rubber covering a watch-spring, and celluloid, and it is impossible to say which is the most satisfactory to use; the india-rubber would be the best but they are apt to set up a foul discharge; vulcanite is the most frequently used. Before inserting a pessary, it is necessary to place the uterus in its normal position: this can usually be managed by bimanual manipulation; but if not, it can be done by the sound. The patient being in the left lateral position, the sound when in position will have its concavity directed backwards; the handle is then rotated through the arc of a circle, so that the concavity looks forwards, and is then gently depressed towards the perineum. As the handle moves backwards, so the uterus moves forwards, from a retroverted to an anteverted position; no force must be used or considerable damage may be done. If any discharge is present, the vagina is douched; the external parts are cleansed, and the pessary, having either been boiled or placed in an antiseptic solution, according to the material of which it is made, is lubricated. The perineum is retracted with a finger of the left hand, the labia are held apart, and the broad end of the pessary is slipped into the vulval opening. In doing this remember that the largest diameter of the vulval opening is antero-posterior, that of the vagina transverse; so that, directly the pessary enters the vagina, rotate it through a right angle. The finger is pressed against the upper end and the instrument pushed up into the posterior fornix. It is so placed that the superior concavity is directed forwards and upwards, the inferior concavity backwards and downwards, the cervix projecting through the instrument. When a pessary is worn there are several points to note:—

1. The instrument must fit well: not so tightly that ulceration of the vaginal walls occurs; not so loosely that it will fall out. It should be comfortable, and fit so accurately that the patient is unaware of its presence.

2. When wearing a pessary the vagina must be douched daily with an antiseptic solution.

3. The pessary must be changed every two or three months, india-rubber ones every month. When a pessary has been worn for some time, in many instances it will be found to be too big, a smaller size is then fitted in its place.

A *ring pessary* is inserted in very much the same manner, by depressing the perineum and gently insinuating the pessary between the lips of the vulval opening, which is antero-posterior. As soon as the pessary is in the vagina, it is rotated through a right angle and carried up into the fornices, where it lies surrounding the cervix. In introducing these pessaries, steady pressure is far better than a sudden effort.

ADHERENT LABIA

This condition is sometimes found in the young. In general the amount of adherence is slight, the labia being easily separated with a probe, no anaesthetic being required; but in more severe cases both an anaesthetic and a knife or scissors are necessary. The region is well washed with soap and water; methylated spirit should not be used when no anaesthetic is given. The probe or director is passed between the labia and cut down on in the middle line with a knife. Only rarely will any stitches be required, when they should be rectangular and of catgut. The region is then douched with sterilized water, dried with wool, and powdered with boracic or other antiseptic. A piece of gauze or lint, smeared on both sides with some bland ointment such as unguentum boracis, is placed between the labia and maintained in position by a pad of wool and a T-bandage. It is foolish to imagine that this pad remains in position any length of time; and it is better, after the first twenty-four hours, to apply the ointment direct to the labia. If there is any inflammatory swelling, the child must be placed in a warm hip-bath two or three times daily. In fact, it may be better that it should pass its urine in a hot bath, the region being dried, anointed and powdered after each time.

IMPERFORATE HYMEN

When the hymen is imperforate, the condition is generally overlooked until puberty; from which time the menses are retained, distending the vagina until it may form an abdominal tumour. The operation for its relief is simple, easy, and certain. We strongly recommend the bolder measure to be described, instead of the more pettifogging ones usually advised.

The patient is anaesthetized and placed in the lithotomy position. The vulval and anal regions are then washed with

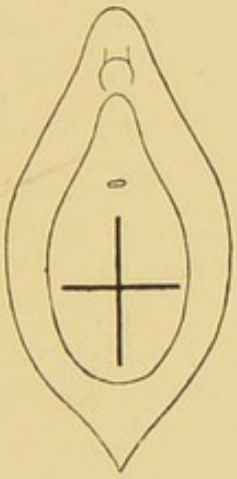


Fig. 82. Crucial incision for imperforate hymen.

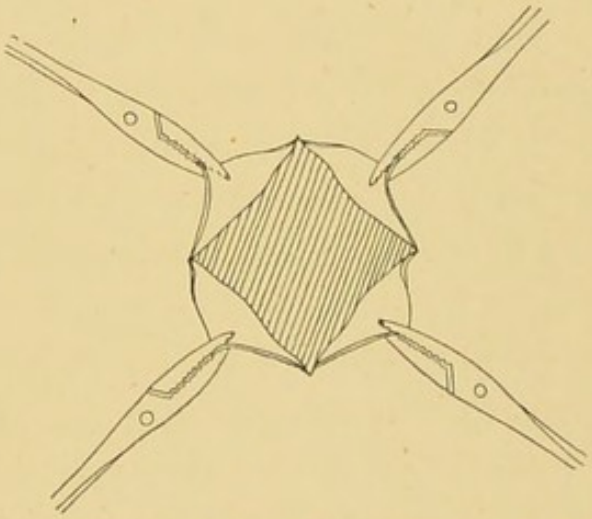


Fig. 83. Imperforate hymen after crucial incision, the four flaps being held apart by artery forceps.

soap and water, aided by rubbing with a pad of wool or gauze. The soap is removed with water and the region bathed with methylated spirit. The site of the vaginal opening is occupied by a purple swelling, which becomes more tense with straining or inspiration. As the long axis of the vaginal opening is antero-posterior, the swelling is incised in this direction. The contents of the vagina are part liquid and part semisolid. The forefinger of one hand is inserted in the opening made, to guide the knife or scissors in making the lateral cuts. The vertical and the two lateral cuts form a crucial incision demarcating four triangular flaps, as shown in Fig. 82. These flaps are then seized with artery forceps

and held apart whilst, with a large blunt spoon and a douche of sterilized water, the tarry material is removed from the vagina. When this has been done, the canal is lightly packed with gauze. The four flaps at the vaginal opening are removed with scissors and, if desirable, the edges of the mucous membrane and skin united by one or two rectangular or mattress sutures of catgut, the ends of which are cut short. If the vaginal plug has become soiled, it must be changed, the vagina being douched again if necessary, and the plug replaced by a strip of gauze sprinkled with some antiseptic powder, such as iodoform or aristol. Part of the plug is left outside to aid its removal. The whole is covered with some antiseptic pads of wool, maintained in position by a T-bandage. The wool must be changed directly it has become soiled. If much material is left to come away from the dilated uterine cavity, it should be allowed to do so slowly, being removed from time to time by a vaginal douche. The gauze must be changed in from twelve to twenty-four hours and, if desirable, replaced by some more. It can be done with the patient in the left lateral position. A douche should be given whenever this is required. After two or three days the vaginal packing can be discontinued. If there should be any local inflammation, the gauze is best removed after soaking in a warm bath, and the packing discontinued.

The catgut stitches, if used, require no attention, but the new vaginal orifice should be inspected when the edges have healed.

INFLAMED CARUNCULAE MYRTIFORMES

Carunculae myrtiformes are the portions of the hymen which remain after its complete laceration, as after child-birth. In by far the majority of women their presence is unnoticed; but should they become inflamed, the seat of a haemorrhage or thrombosis, their removal is required.

The patient is anaesthetized, placed in the lithotomy position, the vagina douched, and the vulval region shaved, washed,

and rubbed with spirit. The carunculae are seized with forceps and snipped away with blunt-pointed scissors. All haemorrhage is controlled and the cut edges are coapted by a few rectangular catgut stitches. All the carunculae which require treatment are dealt with in a similar manner. The vagina is then douched and lightly packed with gauze besprinkled with some antiseptic powder. The vulva is powdered and covered with a pad of antiseptic wool, maintained in position by a T-bandage. If there is any inflammation the patient must use a warm hip-bath for removing the plug and for micturition. The vaginal plug should be changed daily at first and discontinued after a few days.

VULVAL WARTS

Vulval warts usually disappear under local applications; if, however, this method fails, or if the warts are large, they should be removed. An anaesthetic is administered, the part shaved and cleansed, and the warts cut off with scissors curved on the flat, as close to the skin as possible. All bleeding points are ligatured and the wound dressed with iodoform gauze, over this a firm pad of wool is placed, and the whole kept in position with a T-bandage. Vaginal douches are given daily until the part heals. A useful adjunct to the convalescence is for the patient to sit for some time in a warm bath night and morning.

CYSTS OF BARTHOLIN'S GLAND

Cysts of Bartholin's gland form small, tense or fluctuating tumours in the posterior part of the labia majora, and are caused by an obstruction in the duct of the gland. When small, they should be removed by excision. When the patient has been anaesthetized, the labia shaved, the vagina washed out, and the external parts thoroughly cleansed, an incision is made through the skin over the cyst, and parallel to the labium. A few touches with the knife will expose the surface of the cyst, which should be shelled out entire by

means of a blunt dissector; the knife may be required to divide a few fibrous bands with which the cyst is held. All bleeding points are ligatured and the skin edges accurately united with interrupted catgut stitches. If the cyst is large it may be exceedingly difficult to dissect out entire; under these circumstances it is better to incise it, remove the contents and as much of the cyst wall as possible, the wound being made to heal from the bottom by packing the cavity daily with gauze. The vagina should be douched once or twice daily until the wound has closed.

ABSCESS OF BARTHOLIN'S GLAND

An abscess of Bartholin's gland should be opened under general anaesthesia, after shaving and cleaning the parts, by an incision on the inner surface of the labium majus. This incision must be free or the condition will recur. There is no need to insert any stitches, but a small gauze plug should be placed in the wound to prevent it closing; this plug should be removed and a fresh one inserted every day, mild antiseptic douches being given twice daily, or if necessary more often. If there is any doubt about its healing, or if the abscess has recurred, it should be opened by a triradite incision such as is employed often for an ischiorectal abscess. This is easier than attempting to excise the inflammatory mass.

FOREIGN BODIES IN THE VAGINA

The presence of a foreign body in the vagina may be due to a variety of causes; in young children, such objects as stones, hairpins, &c., are introduced from curiosity; in adults, various bodies are inserted with the idea of preventing pregnancy, procuring abortion, or from perverted sexual instincts; in older women, bodies are introduced to relieve a prolapse, or pessaries are inserted and forgotten. The last variety is the one with which the practitioner will most frequently have to deal. A pessary is introduced for a prolapse, the patient wearing it for years without ever having

it removed; while still in position the climacteric may occur and the vaginal orifice atrophy; finally the patient consults the doctor for a foul and often bloodstained discharge, suggestive of a carcinoma. If the pessary is of the collapsible variety, it is easily removed; but hard ones made of vulcanite, celluloid, &c., are more troublesome. The perineum is pulled backwards with the fingers of the left hand, and attempts made to extract the pessary with forceps in the right. If this is not successful, the vagina must be douched several times daily in order to render it less septic. An anaesthetic is given, and attempts made to extract it as before, the patient being in the dorsal position. If, however, these fail, the perineum is shaved and cleansed, and an incision made in the middle line from the posterior part of the vagina for a short distance backward. The foreign body is extracted, it is sometimes necessary to divide it with bone forceps, and the perineum stitched up with interrupted silkworm-gut stitches; if necessary, the vaginal mucous membrane is united with catgut. The wound is dressed with gauze. Vaginal douches must be given three or four times daily until the wound has healed and all discharge ceased. The silkworm-gut stitches are removed in a week. If a healthy young woman or child complains of a foul vaginal discharge, the presence of a foreign body in the vagina as its cause should be excluded.

URETHRAL CARUNCLES

Urethral caruncles, angiomata of the urethra, are small, tender tumours which grow around the urethral orifice. The only treatment for them is operative; they are, however, very apt to recur, and consequently it is as well to warn the patient of this before operating. They can be removed under a local anaesthetic, but a general one is more satisfactory. The patient is placed in the lithotomy position, the vagina douched, and the external parts cleansed; the labia are then held apart, and the growth destroyed by the red-hot blade of a Paquelin's cautery. The portion of the urethral wall from which the

caruncles spring should also be cauterized, and it is advisable whilst doing so to introduce some instrument into the urethra to protect it. The growth can also be dealt with by excision. The bladder should be emptied and the urethra dilated; the growth is then dissected off the floor of the urethra with fine forceps and scissors, care being taken to remove the base of the tumour. Free haemorrhage generally occurs, but this can be controlled by passing a few fine catgut stitches through the cut surface of the urethral mucous membrane. Iodoform is dusted on the wound and a firm dressing applied. The operation may cause retention of urine for a few days, necessitating the use of a catheter, when scrupulous cleanliness must be observed or septic trouble may ensue.

FOREIGN BODIES IN THE FEMALE BLADDER

Foreign bodies are sometimes introduced into the female bladder through curiosity or sexual aberration. Whatever the motive of introduction, they require to be removed. The patient is anaesthetized, the vagina douched, the vulva shaved and cleansed. The patient should be placed in the lithotomy position. The labia are held apart and the urethra dilated with sounds. It is a refinement to have special instruments for this purpose. Though not so conveniently shaped, ordinary male urethral sounds can be used to begin with, and followed by uterine dilators. When the orifice is large enough, the finger should be introduced and the foreign body felt and examined. Forceps are then introduced, alongside the finger if possible, and the body seized and extracted. It is very frequent to find a hairpin, in which case care must be taken that the sharp ends inflict no harm on the soft structures as the pin is withdrawn. This is best accomplished by seizing the blunt curved end. At the conclusion of the operation the bladder is well washed out. Afterwards the patient is given 15 grains of citrate of potash four times, and some urinary antiseptic such as urotropin, 3 grains, three times a day. If necessary the bladder must be washed out. Often the patients

only declare their trouble when the consequent cystitis has compelled them.

VAGINISMUS

Vaginismus is a painful condition, found in young and nervous women, frequently having its origin in some local cause. Treatment must be carried out along three lines: mental rest, sexual rest, and the removal of the local cause. The last is often very insignificant, being exaggerated and glorified by the patient's neurotic condition of mind. She must be separated from her husband, and, after a few days' rest, anaesthetized, placed in the lithotomy position, the vagina douched, and the vulva shaved, washed, and rubbed with

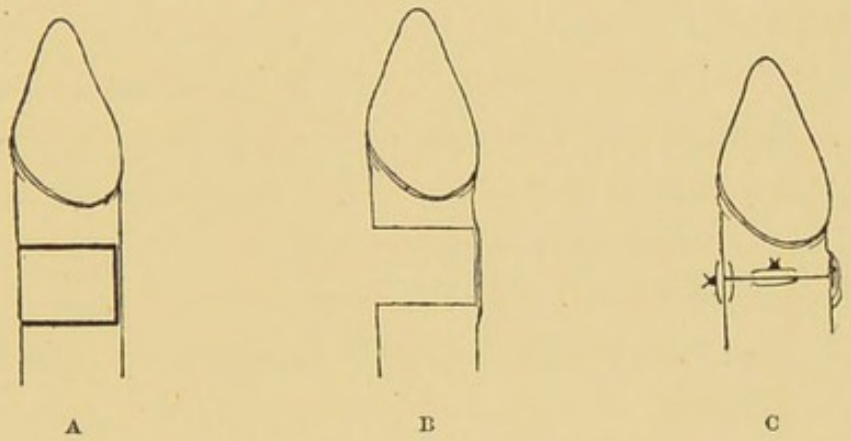


FIG. 84. A. Clitoris. Black lines indicate method of resection without dividing the dorsal nerves. B. Clitoris, with portion resected, with dorsal structures undivided. C. Clitoris sutured after resection

spirit. The whole region must then be inspected part by part. It is well to begin in front.

1. The clitoris may be abnormally developed and hypersensitive. It should not be removed; but, if desirable, it can be resected in such a way as to reduce its size, whilst the important structures on the dorsum are not divided, both the sensory nerves and the glans being left (Fig. 84).

2. The labia minora and majora are then inspected for such conditions as painful sores, &c.; then the regions of the orifices of Bartholin's glands, in the groove between the attached border of the hymen and the labia minora. It may be possible to express some pus from the gland if it is inflamed.

3. The urethral orifice is then inspected for caruncles, painful tags of mucous membrane, urethritis, ulcers, &c.

4. The vaginal orifice is examined for inflamed caruncles, tags of mucous membrane, ulcers, &c. Let it be borne in mind that there is a condition which can be called *fissure in vagina*, which corresponds to the well-known *fissure in ano*. There is also a similar, but naturally less common, condition in the urethra, *fissure in urethra*.

5. The perineum is then inspected.

6. Finally the anus is inspected for fissures, fistulae, or piles.

Each region is inspected on a regular and orderly plan, so that nothing is missed.

Each possible cause is treated as is required. Finally, both the anal and vaginal orifices are stretched with the fingers and thumbs. Deep anaesthesia is required. In severe or recurrent cases, it is sometimes desirable to divide the sphincter vaginae muscle with a knife. This can be done either by one incision made backwards in the middle line; or a lateral one made backwards and outwards on either side of the middle line.

When all has healed soundly, the parts should again be inspected under anaesthesia to ascertain if all is as it should be, and that nothing has been overlooked. The patient should be sent on a holiday before returning to her husband. It is very disastrous for the patient's mental condition to send her back improperly cured.

CERVICAL POLYPI

Polypi are occasionally found springing from the cervix; they usually give rise to a discharge, and, wherever possible, should be removed. There are several varieties: the mucous polypus, which is often cystic, the placental, and the fibroid. As a rule, in dealing with these tumours no anaesthetic is required. The vagina is douched, the external parts washed, and the cervix pulled down with a volsellum, when the small

pedunculated tumour, if fibroid in nature, is twisted off with polypus forceps. If the haemorrhage is at all severe the stump can be ligatured or the base touched with the cautery, but usually the twisting stops all haemorrhage. If the polypus is of the mucoid variety, the pedicle should always be ligatured before the tumour is removed, as the stump is very apt to bleed. No dressing will be needed, but the vagina should be douched once or twice daily for the next fortnight.

DILATATION OF THE CERVIX

Dilatation of the cervix may be required for purposes of diagnosis, as a preliminary to curetting, for haemorrhage,

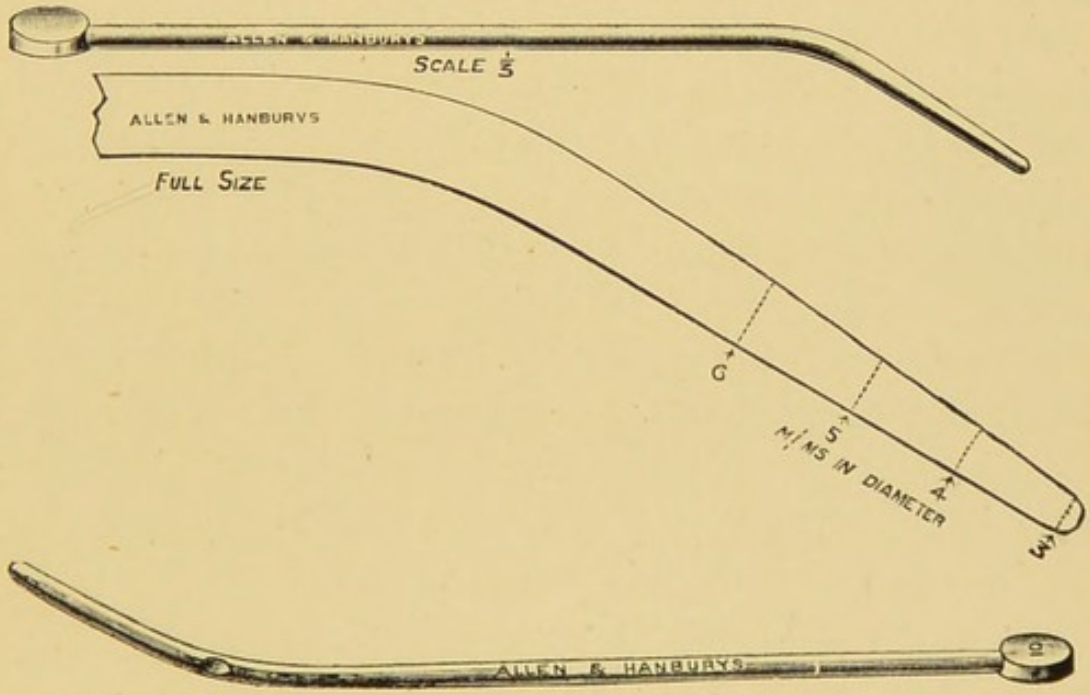


Fig. 85. Uterine dilators.

spasmodic dysmenorrhoea, sterility, &c. It can be done either by means of Hegar's dilators or by tents; the former is the more rapid method, and can be done at one operation; but owing to its rapidity, the cervix is liable to be torn. If there is no necessity to dilate rapidly, the slower method with tents is the better, provided that care is taken to avoid introducing sepsis.

Uterine dilators consist of a set of twenty-six solid bougies, the pattern made of steel and having long handles is recommended, such as Matthews Duncan's. They are slightly

curved, the cylindrical end having a blunted extremity, and are numbered from one to twenty-six, gradually increasing in size. Before use they should be sterilized by boiling, and laid in order on a sterilized towel. The patient is anaesthetized and placed in the lithotomy position, an antiseptic vaginal douche given, and the external parts thoroughly cleansed. The anterior and posterior lips of the cervix are each seized with a volsellum; when traction is put on them, the uterine canal is straightened and the cervix fixed. A sound is passed in order to determine the length and direction of the uterine canal. There is no need to commence the dilatation with the smallest sized bougie, as the normal cervix will usually admit No. 6; this is held by the handle, dipped into sterilized paraffin or glycerine in an upright vessel, and passed up the cervix in the direction of the canal, as indicated by the uterine sound. If this passes in easily it is withdrawn and the next size inserted, and so on until the internal os offers resistance to the passage of one of them, which is gripped on attempting to withdraw it. When this occurs the instrument is left in the canal, and after a few minutes it will be found that the resistance has passed off. The instrument is withdrawn and the next size introduced. The bougies are passed in this manner, with occasional pauses to allow the resistance to be overcome, until the required dilatation is obtained. If it is desired to use the curette, the dilatation will have to be carried up to No. 10; if the interior of the uterus is to be explored with the finger, up to No. 20.

TENTS

There are two varieties which are commonly used, the sponge and the laminaria; the latter are the slower, the more powerful in action, and the more frequently employed. Laminaria tents when placed in water become enlarged and useless as dilators. Therefore they must be stored dry in a dustproof box, and, before use, placed in a 1 in 2,000

solution of perchloride of mercury, in glycerine. The patient should be in the left lateral position. When a vaginal douche has been given, the sound is introduced to determine the length and direction of the cervico-uterine canal; the laminaria tent is then cut to this length. The anterior lip of the cervix is gripped by a volsellum and pulled down. The labia being separated, the tent, held by a pair of speculum forceps, is passed into the cervical canal. The forceps are removed and the tent pressed home with the finger. If possible the uterus should be anteverted, as in that position there is not so great a tendency for the tent to come out; should this, however, not keep the tent in position, the vagina should be lightly packed with cyanide gauze. The plug and the tent must be removed in twenty-four hours, if they have not already come out; by which time the canal will be dilated sufficiently to admit the curette. If it is necessary to introduce the finger, dilatation can be continued by means of Hegar's or some other form of dilators; or, after one tent has been in for twelve hours, two more can be introduced beside it and the canal dilated sufficiently to admit the finger. When removing a tent, first give a douche, then seize the tent with forceps and withdraw it.

THE GRADUATION OF UTERINE DILATORS

As has been said already, dilatation of the cervix uteri by the quick method is very apt to result in the tearing of the tissues. We cannot but think that the *cylindrical* shape of the dilating ends of the sounds must be largely responsible for this. To meet the difficulty we have suggested the graduation of the dilating ends in conical shape; and have so arranged them that each succeeding sound is smaller at its end than the size to which the internal os has been dilated by the previous one passed. To illustrate this, the accompanying figure shows two successive sounds which have been drawn to scale. They are numbered 4–7 and 5–8, the figures representing the diameters at the different parts of the cervical end in millimetres. Thus the diameters of the sounds

are 4 and 5 millimetres respectively at the ends of the cones, expanding regularly to diameters of 7 and 8 respectively, $1\frac{1}{4}$ inches from the end. This has been done so that the internal os is dilated to the full capacity of the sound, the cavity of the nulliparous uterus being only $1\frac{1}{2}$ inches in length. By passing the first dilator, 4–7, the internal os has been dilated to 7 millimetres diameter. In passing the next dilator, 5–8, the first two diameters of the conical end, 5 and 6 millimetres, easily pass through the os, which is then dilated so as to have a diameter of 8 millimetres; and so on through the series until the largest, 18–21, is reached.

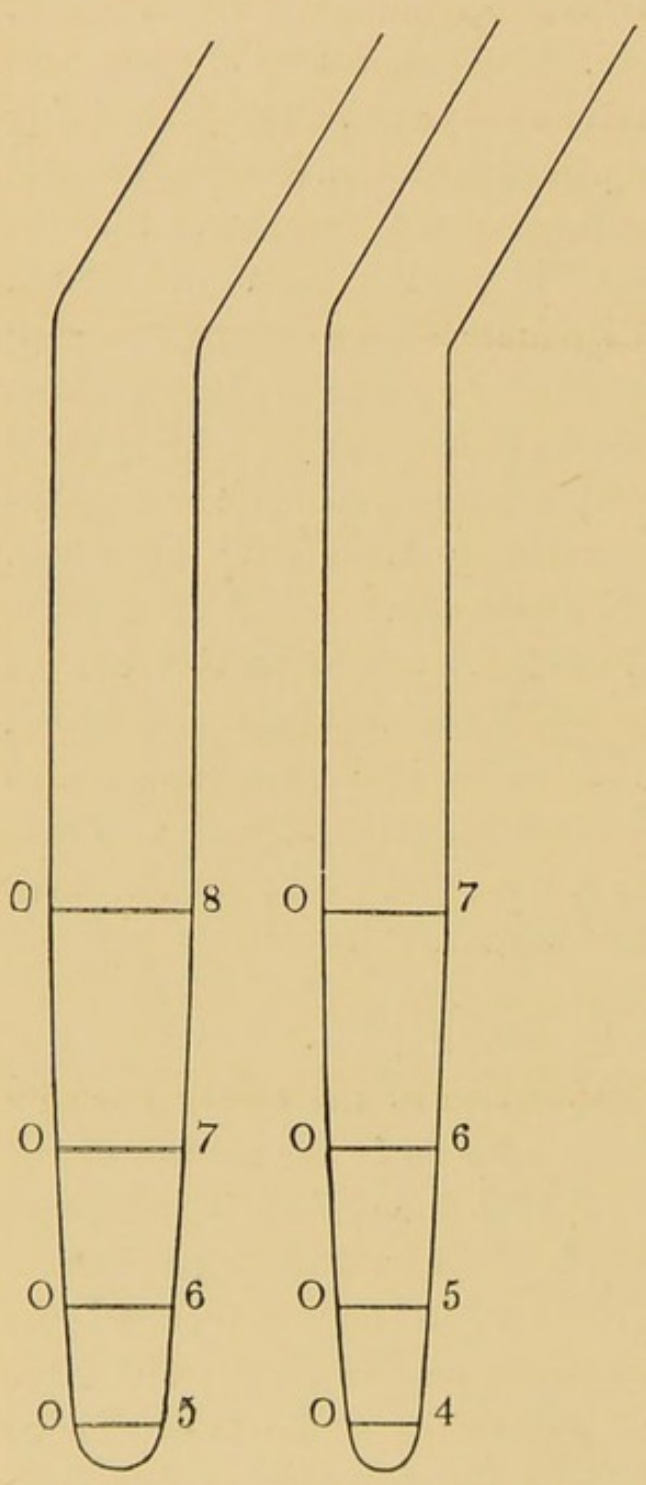


Fig. 86. Diagram of method of graduation advised for uterine dilators.

It is possible to omit a sound in the smaller sizes and pass first 4–7 and then 6–9, but the dilatation is then more forcible than if the dilators are passed *seriatim*, without any omissions.

CURETTING

Curetting the interior of the uterus is usually done for disease of the endometrium or for the removal of retained

products after childbirth. As a preliminary to the operation, the cervical canal must be dilated, either by means of laminaria tents or with dilators. An anaesthetic should always be given, and all the instruments sterilized. For curetting, many different forms of instruments have been devised, but the most satisfactory to use is the *blunt* curette fitted with a firm handle; a *sharp* curette is apt to do considerable damage to the uterine wall, especially when curetting

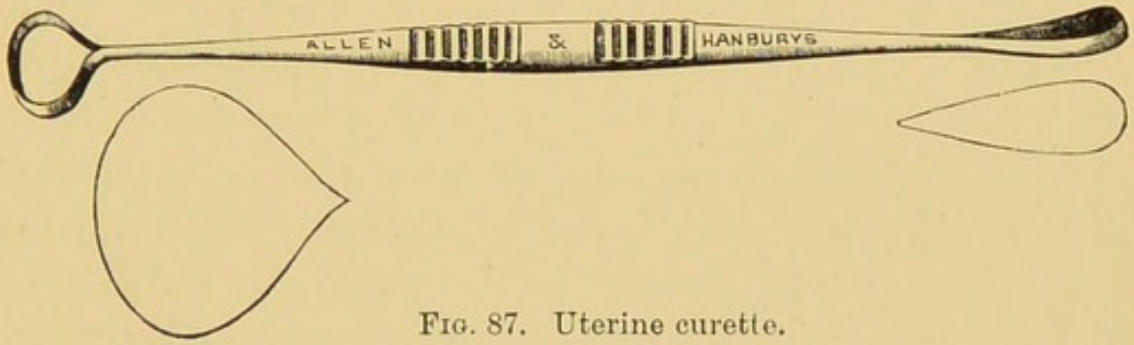


Fig. 87. Uterine curette.

for retained products. When the cervical canal has been dilated, the vagina is douched, the external parts washed, and the cervix firmly held by means of a volsellum attached to its anterior lip. The curette is passed up the cervical canal into the uterus, the anterior surface of which is gently scraped; this will cause a rough, rasping noise, and blood mixed with tissue will escape from the cervix. It should be

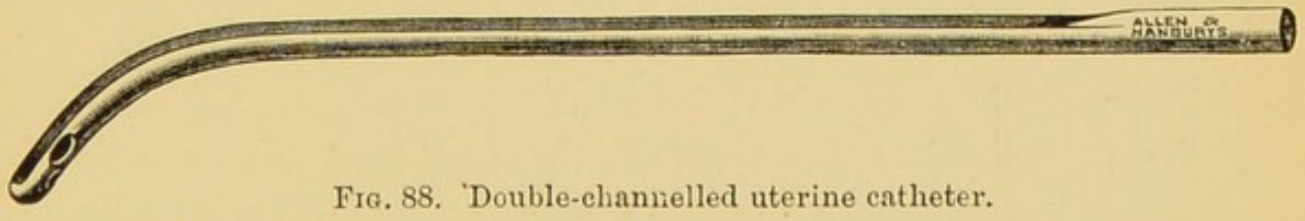


Fig. 88. Double-channelled uterine catheter.

caught in a porringer and, if there is any question as to the nature of the growth, be examined microscopically. The posterior surface and sides are scraped in the same manner, particular care being taken to scrape the angles where the Fallopian tubes enter, as these situations are apt to be overlooked. When the whole of the internal surface of the uterus has been scraped, it should be washed out with a hot douche (110° Fahrenheit) by means of a double-channelled catheter. This must be done very thoroughly, especially when the

uterus is being curetted for retained products. When the douching is finished the hand should be placed on the abdomen, and the uterus compressed to expel all fluid from its interior. The inside of the uterus is then dried by means of cotton wool fixed on to the end of a Playfair's probe. It is best to swab the interior of the uterus with an antiseptic solution such as tincture of iodine or iodized phenol, consisting of iodine 4 parts, carbolic acid 1 part. When using these solutions care must be taken not to touch surrounding structures with them; introduce a Sim's speculum posteriorly, pull the cervix down with the volsellum, place some gauze in the vagina, and then, having dipped the probe covered with wool into the solution, pass it up the cervical canal into the interior of the uterus, pressing it against the walls; then withdraw it. As a rule very little haemorrhage occurs. If, however, it is at all severe a plug of gauze inserted into the vagina, by pressing on the cervix, will usually stop it; severe haemorrhage generally comes from a tear in the cervix. If this fails to stop the bleeding, or if it is copious, the cervix must be exposed and any bleeding point ligatured or controlled by means of a stitch. If the blood comes from the interior of the uterus, a strip of gauze soaked in adrenalin must be introduced; this will usually stop it at once, but it must be removed within twenty-four hours. After curetting, the patient must remain in bed for three or four days, the vagina being douched once or twice daily. The chief dangers of the operation are: (1) Perforation of the uterine wall with the curette, but if care is taken this occurs very rarely; in many instances no harm results from this accident, but in some a septic peritonitis is set up. (2) Sepsis, and this danger can be greatly reduced by careful attention to technique.

SUTURE OF RUPTURED PERINEUM

The practitioner is certain sooner or later to meet with a ruptured perineum, however carefully it is protected during labour. It should always be sutured immediately after the

delivery of the placenta, for the patient is as a rule already partly under the influence of a general anaesthetic, and the parts are partially anaesthetic through stretching; even if the suturing fails, which is very unlikely, the condition is no worse than before. The patient should be lying on her back across the bed, the buttocks resting on the edge; when lying on her side it is extremely difficult to gauge the amount of the tear, and also to insert the stitches accurately. If desirable an anaesthetic may be given, chloroform being the most satisfactory in nearly all cases. The thighs should be flexed and held apart. If there is no assistant to do this, tie a bandage to each knee, and fasten each to either end of the bed; this will hold the knees in position. Thoroughly douche the vagina, removing all blood clots, and then carefully examine the tear and determine its extent. The method of stitching varies according to whether the rupture is complete, i.e. extends into the rectum, or incomplete.

INCOMPLETE RUPTURE

Various methods of stitching up these tears are described; the method we recommend is to use a large curved needle mounted on a firm handle, Cullingworth's perineum needle is a good pattern, and silkworm-gut for the perineal stitches; as, when these are removed the result of the operation will be seen. The left forefinger, the flexor surface being turned upwards, is introduced into the rectum, and the point of the needle made to pierce the skin close to the raw edge on one side, at the end of the tear farthest away from the anus. The point is made to travel across the perineum, beneath the raw surface, between it and the rectal mucous membrane, until it emerges on the other side close to the raw surface. The finger in the rectum feels the position of the needle, and prevents it piercing the mucous membrane. The eye is then threaded with silkworm gut, one end of the gut secured, and the needle with the other end withdrawn. As many stitches as necessary are inserted in this manner, all being left untied,

and clamped with artery forceps. If the vaginal mucous membrane is badly torn, it should be closed with a few interrupted catgut stitches, these being cut short. The raw perineal surface is sponged with hot water (110° Fahrenheit), to stop all haemorrhage. The legs are then brought down, thus taking all strain off the wound, and the perineal stitches are tied one by one, commencing with the uppermost. If the skin edges gape, a few superficial catgut stitches should be

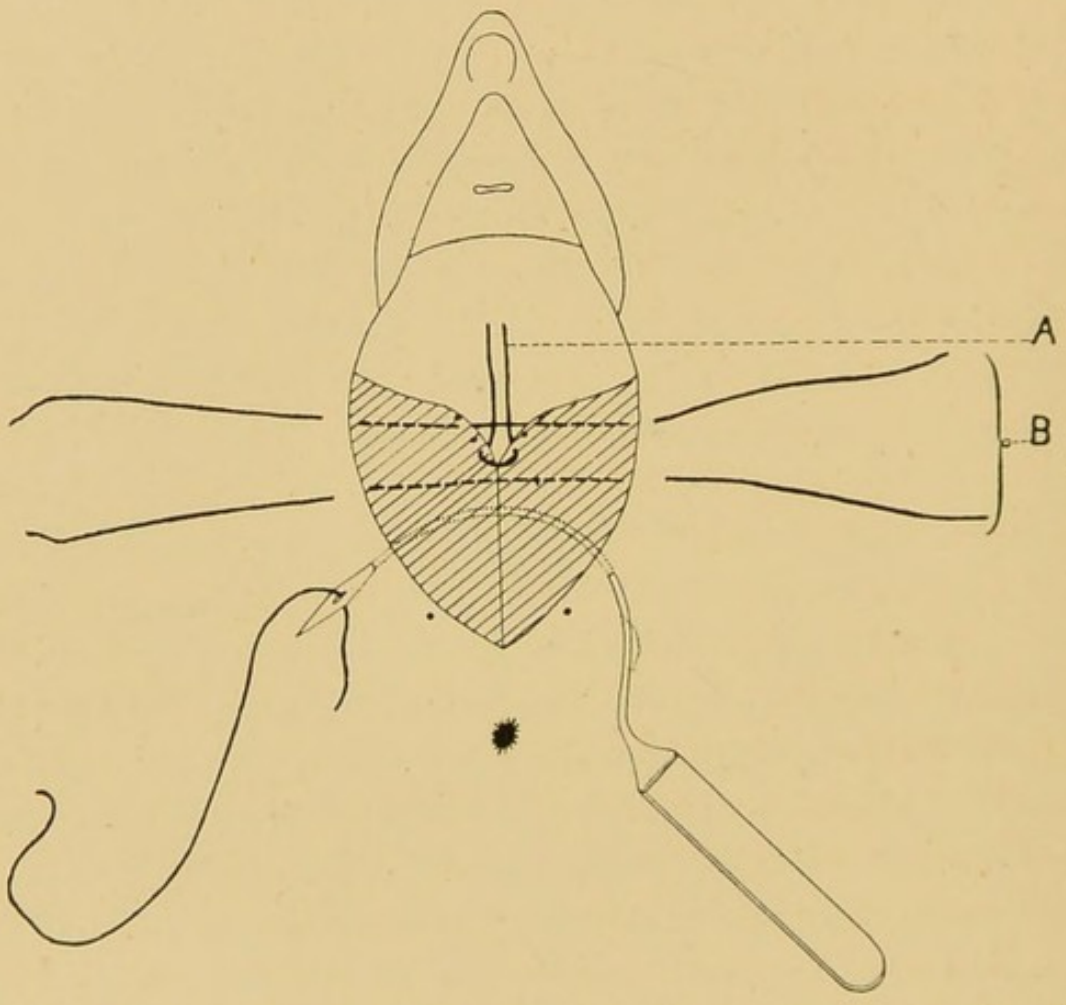


FIG. 89. Diagram of operation for incomplete rupture of perineum, showing vaginal (A) and perineal (B) sutures, and method of inserting the latter.

inserted between the others. The silkworm-gut stitches are left long and tied together in a bunch; if cut short they are troublesome to remove, and are apt to hurt the patient. The wound should be dressed with a pad of cyanide gauze, some wool and a T-bandage, the legs being restrained rather than bandaged together. The vagina should be douched twice daily, the dressing being changed whenever soiled. The

bowels should be opened on the third day by an aperient, 2–4 ounces of olive oil being injected into the rectum by means of a tube and a funnel, just before an action is expected. The stitches should be removed about one week from the operation.

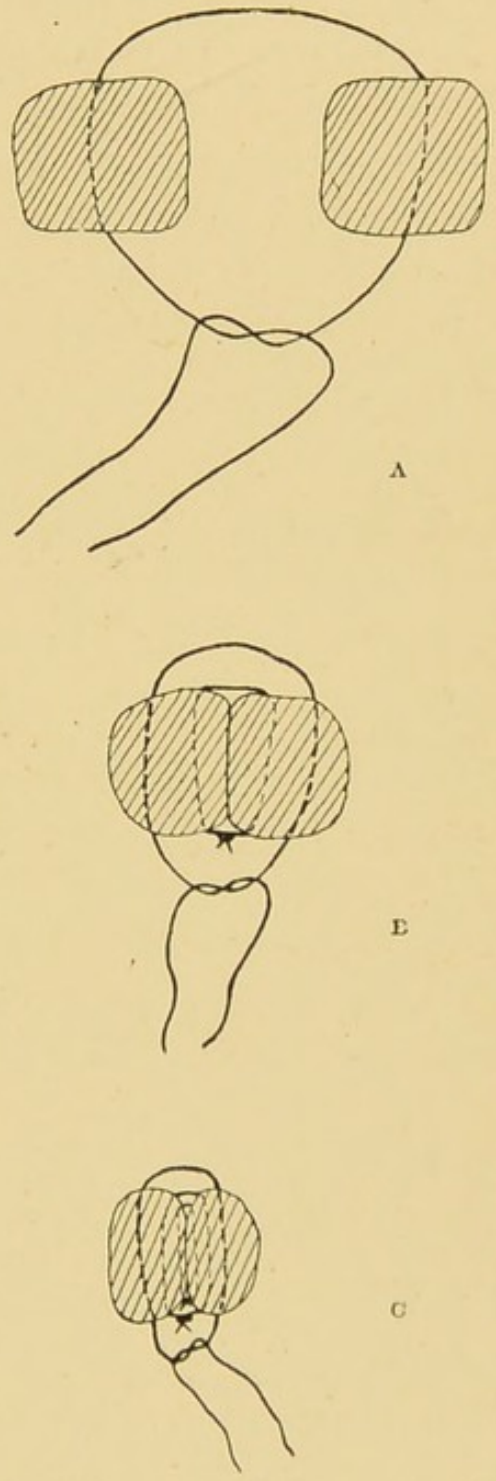


FIG. 90. A. Method of inserting suture to approximate the torn ends of sphincter ani muscle. B. First suture tied, second inserted, in uniting torn ends of sphincter ani. C. First and second tied, and third stitch inserted, for approximating divided ends of sphincter ani.

COMPLETE RUPTURE

The preparations are similar to those mentioned in the description of the operation for incomplete rupture and will not be repeated. The rectal tear must be sewn up first; catgut stitches, threaded on a medium-sized curved needle, are passed through the recto-vaginal septum, commencing at the extreme end of the tear. The needle is passed from below, through the rectal wall, then over the laceration and through the rectal wall on the other side; so that, when the stitch is tied, the knot is situated within the rectum. As each stitch is passed, it is tied, and the ends cut off short. This suturing of the rectal mucous membrane must be done very thoroughly, or a recto-vaginal fistula will result. The last stitch is not tied until the sphincter has been united. The two ends of the torn sphincter will be found at the two

extreme angles of the tear, and should be united by catgut stitches passed through them. It is, as a rule, very difficult to define the two torn ends of the muscle; but if the needle is passed through the masses of tissue at the angles of the wound it will, in all probability, include the torn ends of the muscle. Insert a finger in the rectum; if the sphincter has been united, it can be felt as a tight constricting band round the finger. If it has not been joined, insert rectangular catgut stitches between the angles of the wound until the

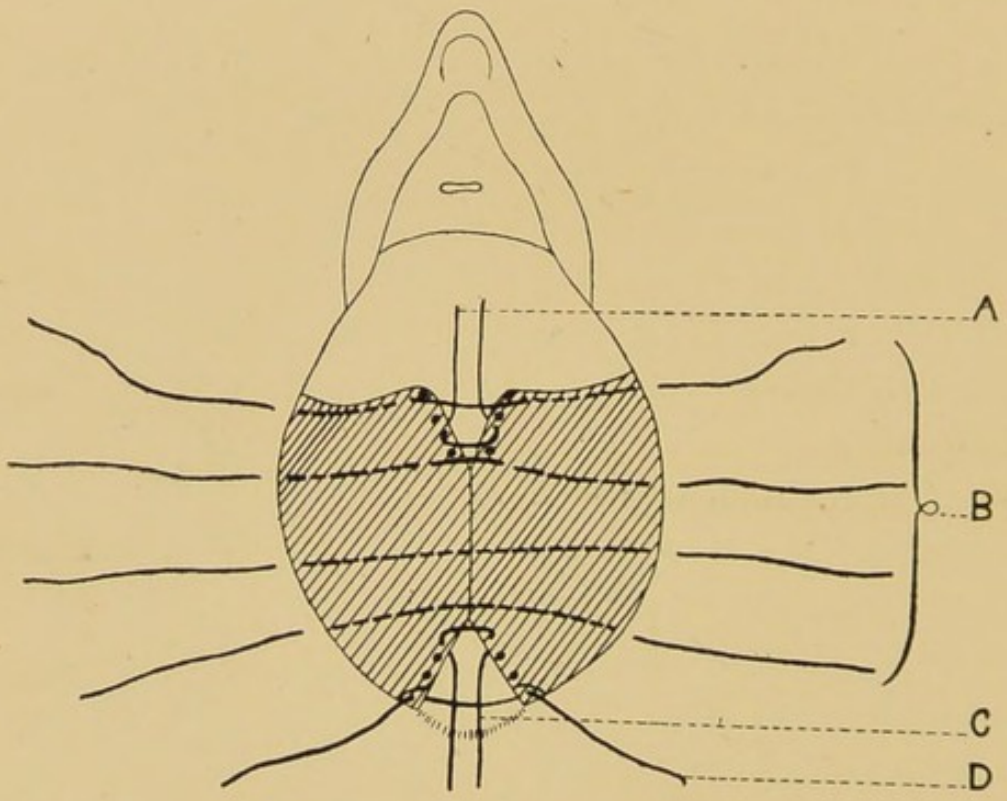


FIG. 91. Perineum, indicating operation for the immediate suture of a complete rupture. Note vaginal (A), perineal (B), rectal (C), and sphincter ani (D) stitches.

finger is firmly gripped. When the sphincter has been united, tie the last stitch in the rectal mucous membrane; and, after suturing the vaginal mucous membrane, proceed as for incomplete rupture.

In either case, if the operation is a failure no attempts should be made at further operation for at least two months; when a more complicated, flapsplitting proceeding has to be performed.

CHAPTER X

THE RECTAL REGION

HAEMORRHOIDS

With haemorrhoids, a practitioner is amply rewarded for all the care and trouble he takes in preparing the patient, in doing the operation, and in attending to the convalescence. In fact, he gains generally more gratitude from this operation

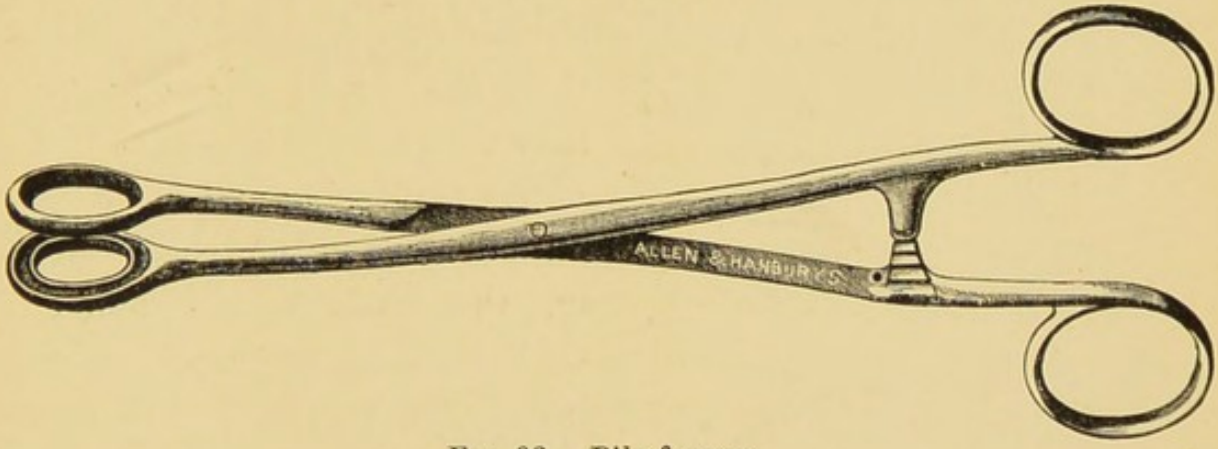


Fig. 92. Pile forceps.

than from almost any other procedure in surgery. Before operating, the preparation should extend over some days; the diet should be simple, all foods being avoided which leave a large residue to be excreted. Each night, a sure but mild laxative should be taken, preferably the one which the patient usually employs and on whose action he can rely; if this does not succeed in opening the bowels, the rectum should be emptied by a soap and water enema. An emollient ointment should be used locally.[1] No purgative should be taken the night before the operation but the rectum emptied by two enemata in the morning, the nurse being careful to see that

[1] The following ointment is an excellent one: zinc oxide, 45 grains; oil of eucalyptus, 5 minims; lard, ¼ of an ounce; and soft paraffin to the ounce.

all fluid has come away, and to make certain of this a rectal tube should be passed. Much inconvenience during and after the operation can be saved by careful preparation beforehand. The patient, after being anaesthetized, should be placed in the lithotomy position, the legs being held by means of a Clover's or some other crutch. The perineal and anal regions are shaved, and the sphincters thoroughly stretched and paralysed. This is done by introducing, per anum, first the forefingers, then the first two fingers of each hand, and pulling gently but firmly in opposite directions. The sphincter must not be split or the patient may suffer from incontinence. If the paralysing and stretching is done slowly and thoroughly, the patient will suffer far less pain afterwards. The immediate result is that the internal piles are prolapsed, and can be washed with soap and water with the rest of the region; finally, the parts are rubbed with methylated spirit. Until he has dilated the sphincter, no one can form any exact idea of the extent of the work before him. The surgeon selects the two, three, or more piles which are to be removed, and, taking them one by one, seizes them with forceps; each is treated separately. Traction is put upon the forceps, putting the pile on the stretch, when the mucous membrane at its lower

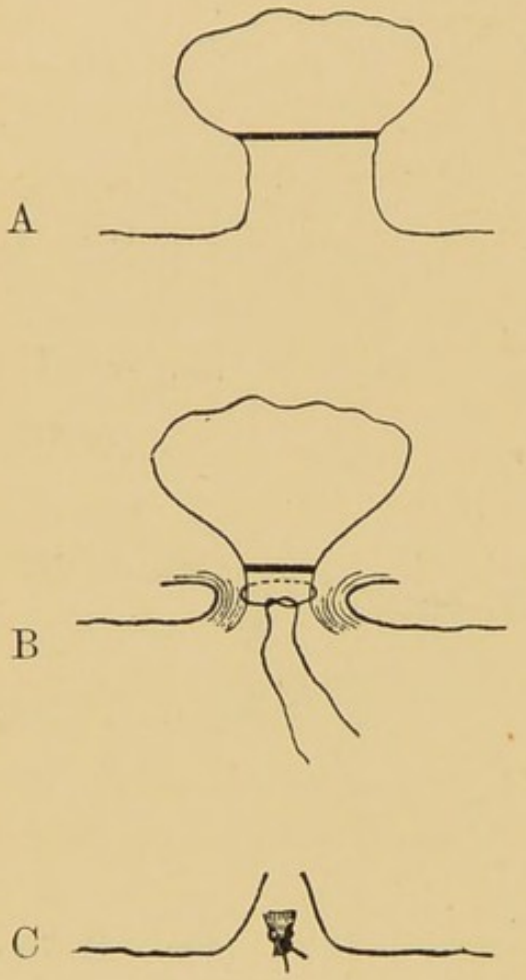


FIG. 93. A. Pedunculated pile, showing line of incision for mucous membrane. B. Pedunculated pile, with mucous membrane stripped from pedicle, ligatured loosely in position. Black line indicates level at which the pile is amputated, after tightening the ligature. C. Stump of pile after amputation.

part is cut through with scissors all the way round. Then the edges of the mucous membrane are separated by means of scissors or a blunt dissector, and the base of the pile tied with strong silk, number two. The strangulated portion is then cut off, care being taken to leave sufficient tissue distal to the ligature to prevent its slipping. The silk is cut off short. If the pile is very large it should be transfixed by a curved needle loaded with the silk, and each half tied separately. The cut edges of the mucous membrane can be united by a few catgut stitches, but this is not necessary, as they slip over the stump. Each haemorrhoid is treated in an exactly similar manner until all have been removed. At the conclusion of the operation no plug or tube should be placed in the rectum, as it merely adds to the discomfort of the patient. The oozing ceases when the parts are reduced within the sphincter. The region is dusted with boracic powder and covered with gauze and wool, and the whole supported by a T-bandage; whenever the dressing is soiled, it should be changed. When the patient has come round from the anaesthetic, but not before, a third of a grain of morphia can be given hypodermically if necessary, as is usually the case. For the first three days the diet should be light and mainly fluid. On the third night a purgative should be given, and, a short time before this is expected to act, 4 or 6 ounces of olive oil should be injected, per rectum, through a rubber tube and funnel. After the first action, the bowels should be moved daily, by medicine, and the diet increased as the patient progresses. At the end of ten days or a fortnight the patient can get up if the local condition is satisfactory; that is to say, if there is no tendency or sign of inflammation. The anus must be carefully washed and powdered after every action of the bowels; wool, not paper, being used for toilet purposes.

The operation described is much more satisfactory for general practice than simple ligature or the method of excision described by Whitehead; it being as effectual and

practically free from danger, whilst the risk of recurrence is very small. It is a common practice to leave the stout ligatures long and not to sew up the mucous membrane. The long ligatures, however, have to be removed by traction, and this is a painful process, whilst they are very uncleanly. Dr. G. R. F. Stillwell, of Beckenham, has urged that the ligatures should not be left at all, the pile being cut away so close to the ligature that it slips off. This is often followed by haemorrhage which must be stopped, otherwise the method is excellent. We would strongly recommend this operation to the practitioner. Its results are excellent and amply repay him. Often in a few days the patient can return to his work. As the operation for haemorrhoids is undergone for definite troubles, such as pain, bleeding, or dirtiness; and not because of any possible or hypothetical trouble in the future; a patient who has been relieved is truly grateful.

Recently, the authors have made a great change in their practice by giving salts, magnesium and sodium sulphates within twenty-four hours of the operation, as suggested by Dr. Stillwell. It is found that such patients can get up earlier and attend to their office or business letters. This is a great advantage to business men and quite compensates them for any slight risk of recurrence.

Finally, let the practitioner be on the look-out and guard against the formation of a fissure after the operation, which will mar his results.

THROMBOSIS OF HAEMORRHOIDS

People will go about with haemorrhoids for years until something like thrombosis, a fissure or strangulation, compels them to submit to operation. In this section we are only concerned with the first of these incidents. It has been contended that what is ordinarily called a thrombosed pile is a small haemorrhage into the tissues. Whichever it is, the pain can be relieved. The patient is given gas whilst lying in the left lateral position, the part quickly washed, the

thrombosed pile seized, incised, and held open with forceps, the clot removed and replaced by a small plug of cotton wool soaked in 1–2,000 perchloride of mercury. This little plug comes out of itself and gives no trouble. See to the diet and keep the bowels relaxed for the next few days. The operation for the cure of haemorrhoids should not be undertaken whilst the parts are inflamed. The question of its advisability at a later date can be placed before the patient.

FISTULA IN ANO

The true fistula in ano is a suppurating track which extends from an external opening on the skin around the anus, to an

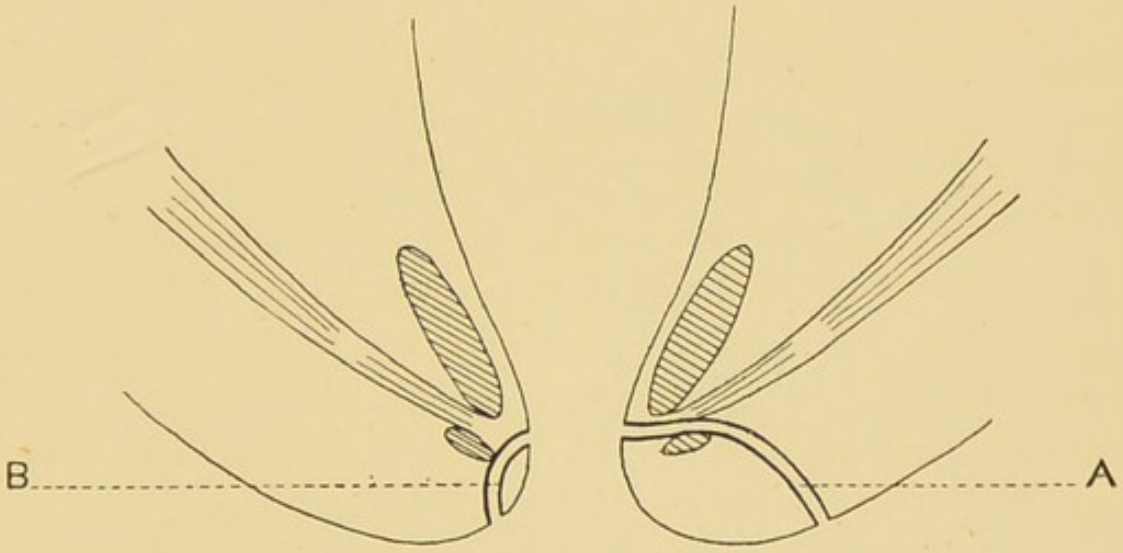


Fig. 94. Section of anal canal showing superficial (B) and deep (A) complete fistulae.

internal opening within the bowel. Sinuses having but one opening, either on the skin or within the bowel, are frequently called blind external or blind internal fistulae, in distinction to the complete fistula. Before deciding upon operation the question of the fistula being secondary to advanced phthisis, stricture or carcinoma of the rectum, must be considered. If it is decided to operate, the patient must be prepared both generally and locally, anaesthetized, &c., as described under the operation for haemorrhoids. Though not usually recommended, it is best to thoroughly stretch and paralyse the

sphincter (see p. 178). A director is passed through the external opening and along the fistula, the canal being carefully and gently probed until the opening into the rectum is found; while doing this considerable help is obtained if a finger is passed into the rectum, the internal opening may be felt, when the finger will serve as a guide to the probe. The end of the director, passing through the internal opening and projecting into the rectum, is hooked down by the finger and brought outside the anus, so that the portion of tissue between the two ends of the director is exposed. A cut is then made through this tissue down to the director, opening up the fistula from

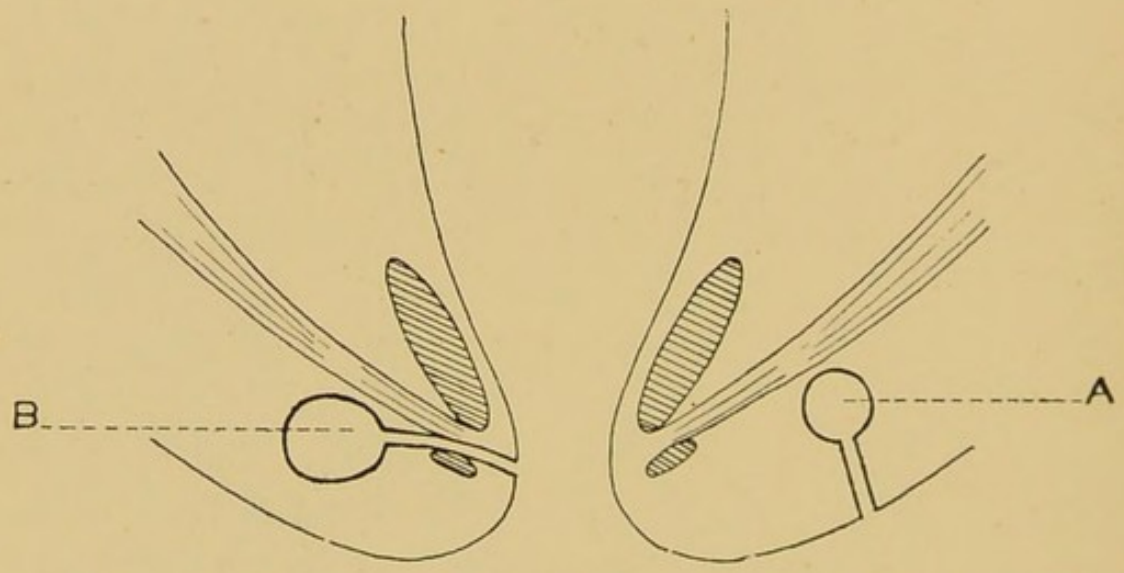


Fig. 95. Section of anal canal showing blind external (A) and internal (B) fistulae.

end to end; as a rule this cut will divide only the external sphincter. The next step is one of the most important in the operation, but is one which is frequently omitted; it consists of exploring the fistulous track and thoroughly laying open every branch and pit leading from it, but the sphincter must be divided only once. In order to deal with all the diseased tissues in this manner, the main track of the fistula is carefully examined with the aid of a probe, for side openings; if one is found a director is passed down it, if it has an external opening the director is pushed through and the tissues divided down to the director; if there is no external opening, the

point of the director is pushed through the skin and the bridge of tissue divided as before. All side branches are dealt with in this manner, and all projecting tags of skin cut away. The various tracks are thoroughly scraped so as to remove all unhealthy granulations. The whole success of the operation depends on the thoroughness with which the diseased tissues are exposed; so that, even when no side tracks are discovered, it is a good plan to make an incision at right angles to the original one, in order to completely

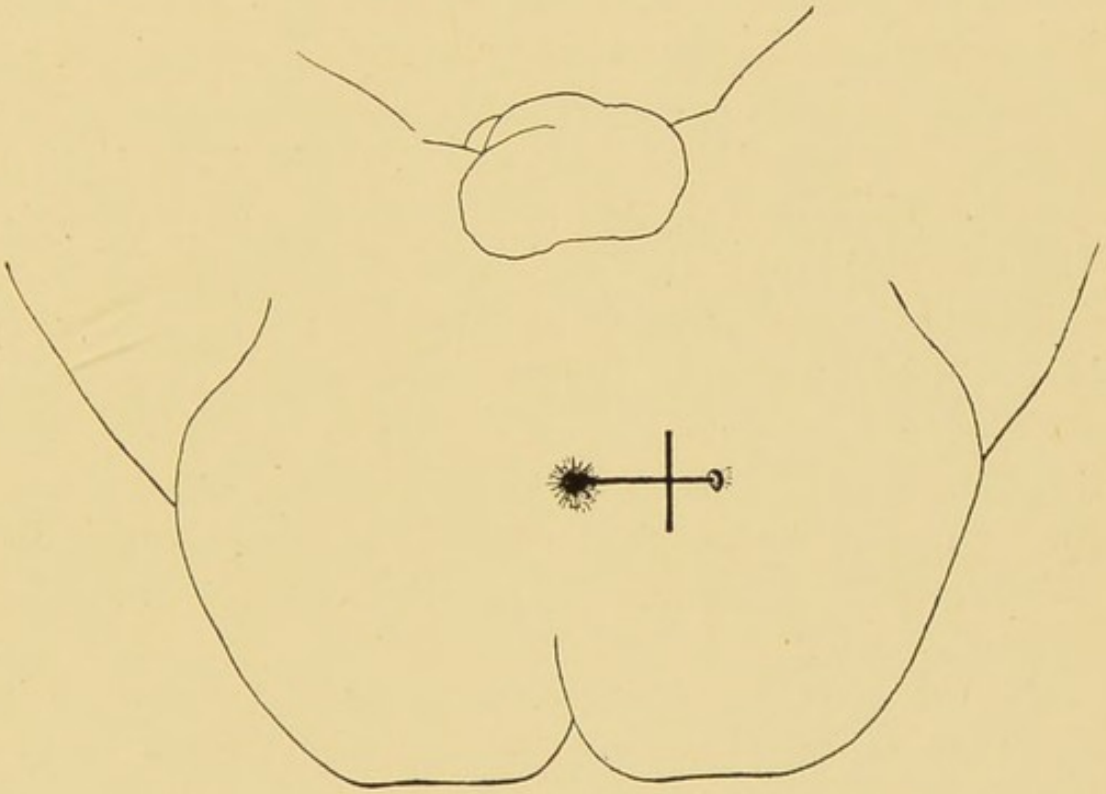


Fig. 96. Perineum showing crucial incision for fistula in ano.

open up the affected area. All bleeding points are ligatured, but the wounds are not sewn up. It is useless to attempt to pack the cavity as the plugs are displaced as soon as the patient's legs are straightened, but the wound is covered with gauze, a large pad of wool placed over this, the whole being supported with a T-bandage; the dressings should be changed at least twice daily. After the first or second day the patient obtains considerable relief by sitting for a quarter of an hour, half an hour or even longer, night and morning, in a warm bath; this helps to keep the wound

clean, and if the dressing is adherent it can be allowed to soak off in the bath. The bowels should be opened on the third day, and after that a daily motion must be secured. The wound heals from the bottom by granulation, and in doing so a considerable amount of contraction occurs, to such an extent that a large, gaping cavity becomes converted into a small, puckered scar.

Blind external fistula. A probe is passed down the track, and if the end of the probe projects beneath the mucous membrane in the rectum, it is pushed through, converting the blind into a complete fistula, which is then treated as above. If however, the probe enters the ischiorectal fossa, the external opening is enlarged by making a deep triradiate incision, and the wound is allowed to heal from the bottom by granulation. The after-treatment is the same as for the complete fistula.

Blind internal fistula. A probe with the end bent is passed into the rectum, and the tip of the probe inserted in the mouth of the fistula, and passed gently down the track. The tip of the probe projects beneath the skin at the anal margin, and is cut down upon, and a triradiate incision made. The incomplete fistula is thus converted into the complete one, and is treated as such.

The old operation of simply 'slitting' the fistula is not sufficient and should never be done, for the external wound closes before the deeper parts have healed, the condition will therefore recur and the patient be disappointed. It is desirable to remove the skin edges to prevent this; or to use the triradiate incision.

FISSURE IN ANO

A fissure in ano can frequently be cured by palliative treatment, but if this fails recourse must be had to operation, either stretching the external sphincter or dividing it. The patient is prepared in the same manner as for any other rectal operation, and is placed in the lithotomy position. The anaesthetic having been administered, the sphincter is

thoroughly stretched and paralysed. The patient is kept in bed on a light diet for a few days, the bowels being opened by an aperient on the fourth day. If it is decided to divide the sphincter, it should be cut through in the track of the fissure; the whole thickness of the external sphincter must be divided, but the internal sphincter must not be touched. The dressings and after-treatment are similar to those employed after an operation for haemorrhoids. A fissure is occasionally associated with a torn down valve at the lower end, called a 'sentinel pile'. In such a case the pile can be cut off with scissors under eucaine and adrenalin, but it is extremely doubtful if such treatment will always succeed in curing the fissure. It is a bad plan to lay down a rule of thumb for treating fissures, each case requiring some difference both in its medical and surgical treatment. After any operation for fissure it is necessary to regulate the habits of the patient with a view to preventing a recurrence of the condition; in other words, the constipation which is nearly always present in these cases must be treated, or the patient will be disappointed with the result of the operation.

PRURITUS ANI

Pruritus ani is a most distressing affection, and should be combated by every means short of operative treatment, unless there is some such condition present as haemorrhoids, fistula, &c., which require to be treated surgically. But if in spite of palliative treatment the pruritus still persists, and it has been ascertained that the symptoms are not due to gout or diabetes, there remains only one form of treatment, and this rarely fails. The patient is prepared, &c., as for the operation for haemorrhoids. The anaesthetic having been administered, the sphincters stretched and the region carefully inspected for any cause for the pruritus, such as a fistula, fissure, haemorrhoids, &c.; if anything is found it should be dealt with. But if no such cause is detected, the anaesthetist's drugs are removed to a safe distance and a Paquelin's cautery, heated to a dull red

heat, is drawn lightly over the skin from the mucocutaneous junction outwards in a radial direction for a short distance. This is done at intervals all round the margin of the anus, care being taken not to destroy the whole thickness of the skin, and to leave gaps of skin between the radial scars. If it is necessary to repeat the operation, these gaps of skin and any spots insufficiently treated before, are cauterized. If any mistake is made, let it be on the side of doing *too little rather*

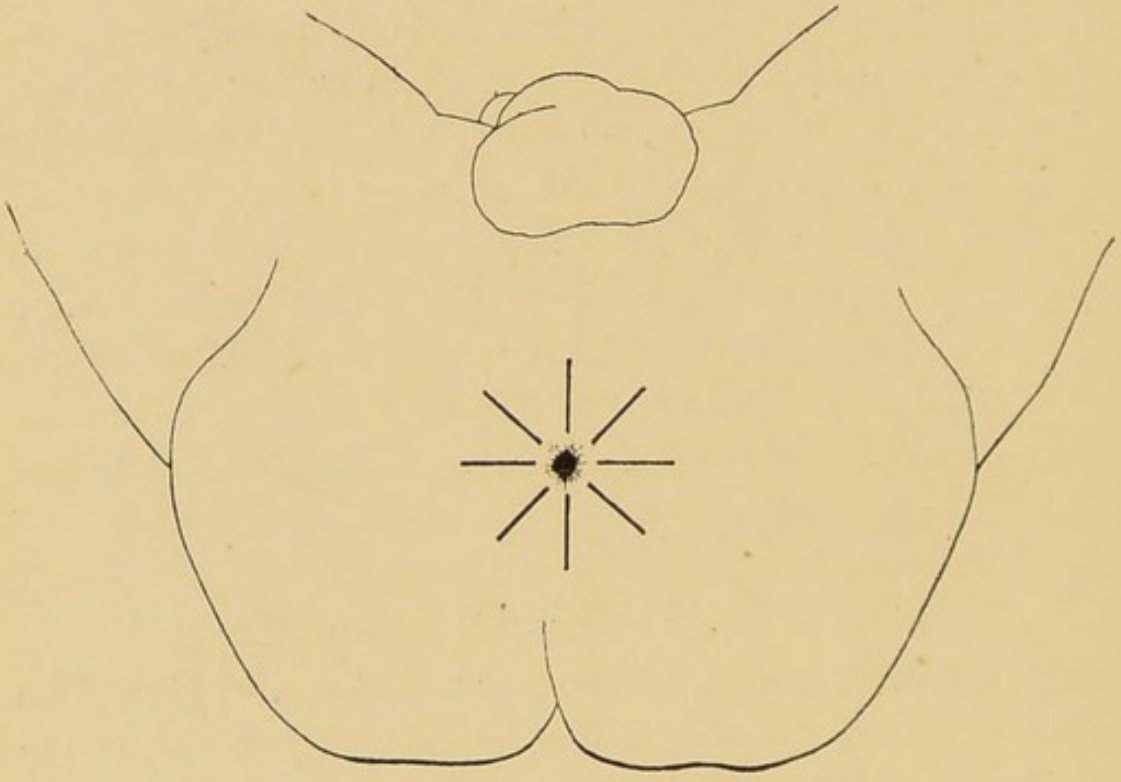


Fig 97. Perineum. The black lines radiating from the anus indicate the method of applying the cautery for the relief of pruritus ani.

than too much. The part should be dressed with boracic ointment on lint, covered with wool, and secured in position with a T-bandage. A hypodermic injection of morphia will be required when the patient comes round from the anaesthetic. The bowels should be opened on the third day and care taken to secure a daily motion afterwards. The part should be kept covered with some mild unirritating ointment for some time afterwards.

ADENOMATA AND POLYPI OF THE RECTUM

Adenomata of the rectum occur more often in children than in adults, and are not infrequently found to be the cause of haemorrhage from, or prolapse of, the rectum. They are either sessile or pedunculated. The latter can usually be pulled down outside the anus, the pedicle ligatured with stout silk, and the tumour cut away; but care must be taken to leave a sufficient amount of the pedicle behind to prevent the ligature slipping off. The silk ligature can be cut short and left to come away later, usually in about seven to nine days. The sessile variety should be treated by cutting through the mucous membrane all round the edge of the tumour, which can then be shelled out with a spoon or the finger. When this is done the sphincters should be stretched, and in cases where the tumour was large, divided, in order to prevent extravasation of faeces.

FOREIGN BODIES IN THE RECTUM

Foreign bodies met with in the rectum have either been swallowed or introduced through the anus. The former class are by far the more common, a fish-bone is the body which the practitioner will most often be called upon to remove. This reaches the rectum and is driven into the mucous membrane, causing great pain and sometimes even an ischiorectal abscess or a fistula. An anaesthetic must be given, the sphincters stretched, and the body extracted with forceps or the fingers. A little boracic ointment should be introduced into the rectum, and the bowels opened by enemata daily. In some cases, if the body has been present for a few days, an abscess may be formed in the ischiorectal fossa, which will require treatment (see p. 188). Occasionally bodies are introduced into the rectum by lunatics or weak-minded individuals, and should be removed in a similar manner to the above. Should it become necessary to enlarge the anus, an incision should be made through both sphincters towards the coccyx in the middle line. This incision should not be stitched up.

ISCHIORECTAL ABSCESS

Pus situated in the ischiorectal fossa tends to escape either externally through the skin or internally into the bowel, or simultaneously in both directions, when a complete fistula in ano results. Directly it is certain that an abscess has formed the pus should be evacuated, in order to prevent the formation of a fistula. The practitioner should not wait for fluctuation. These abscesses, if superficial, can be opened without an

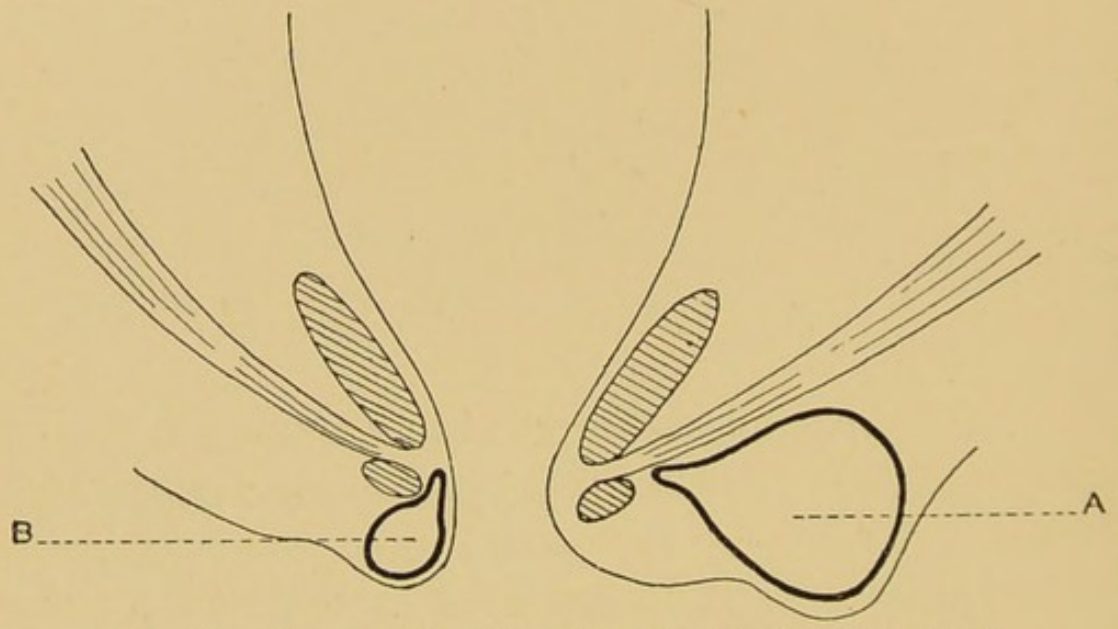


FIG. 98. Diagram of section of rectum showing ischiorectal abscess (A), anal abscess (B).

anaesthetic, but as a rule it is much more satisfactory to administer a general one. The patient must be prepared, when possible, in the same manner as for other rectal operations, and placed in the lithotomy position. The perineum having been shaved and cleansed, an incision (see Fig. 99) is made over the most prominent part of the swelling; a second incision should be made at right angles to the first in order to open the abscess cavity thoroughly. The most common cause of failure in treating these abscesses is that the opening has been made too small; if merely a single linear incision is used the cut tends to heal on the surface before the abscess cavity below, the result being the formation of a fistula at a later date. If pus is not found near the surface the

abscess should be opened with a pair of artery forceps, by Hilton's method. While doing this a finger should be placed in the rectum to protect the mucous membrane, which is very apt to be perforated. When the pus has escaped a finger is introduced into the abscess cavity and any fibrous bands broken down. The cavity should be lightly packed with gauze, to stop all haemorrhage, and the wound dressed with a hot boracic acid fomentation, secured by a T-bandage. On the following morning, the patient should sit in a warm bath, for a quarter of an hour or longer, when the plug is removed and the wound redressed without a plug. These baths should be repeated twice daily and the hot dressings discontinued as the inflammation subsides. As the discharge lessens, the dressings will require changing less frequently. The bowels should be opened on the third day by means of an aperient, and a daily evacuation secured afterwards; injections of olive oil (1 ounce) are useful, as they soften the motions and so lessen the pain. The abscess should heal from the bottom by contraction and granulation, care being taken to prevent the surface edges uniting before the deeper parts have healed. The more slowly the external wound heals, the more surely will it remain healed. As it is practically impossible to keep a plug in the cavity, the whole success of the operation depends on the adequacy of the external incisions.

ANAL ABSCESS

Small localized collections of pus are found occasionally round the margin of the anus, being situated just beneath the mucous membrane; if they are not opened, the pus will, in all probability, escape both into the bowel and through the skin, forming a superficial fistula (Figs. 94, 98). Gas is usually quite a satisfactory anaesthetic for these cases. The skin should be shaved, cleansed, and the abscess opened by means of an incision over the most prominent part. If possible the cavity is lightly packed with gauze or a pellet of wool

soaked in perchloride of mercury. The after-treatment is the same as for an ischiorectal abscess.

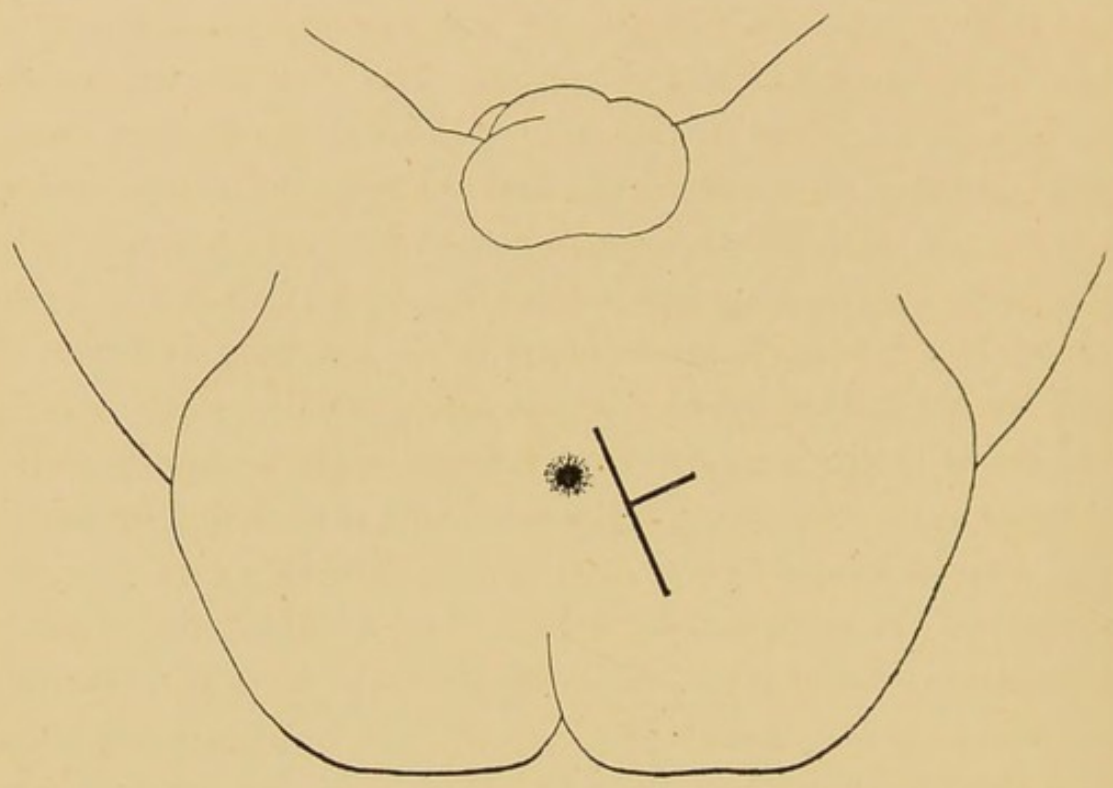


Fig. 99. Perineum. Crucial incision for ischiorectal abscess.

DILATATION OF RECTAL STRICTURE

The most satisfactory method of treating a simple stricture of the rectum is by *gradual* dilatation with bougies; rapid, forcible dilatation should never be practised. The instruments required are a set of vulcanite or composition, flexible rectal

Fig. 100. Rectal bougie.

bougies, conical in shape and of gradually increasing sizes. The bowels should be well evacuated by a purge taken the previous night, followed by an enema in the morning. When possible, six or more ounces of olive oil should be given through a tube passed as far up the rectum as possible. The

patient lies in the left lateral position, the knees being drawn up. A small bougie, of a size which will easily pass, having been warmed and oiled, is gently introduced through the stricture. This is withdrawn in a few minutes, and larger sizes introduced until one is gripped, which is left in position for at least a quarter of an hour. In two or three days' time, the last bougie introduced is again passed, and withdrawn after a few minutes; then the next size is inserted and left in position for about thirty minutes. This manœuvre is repeated every third or fourth day until the rectum is sufficiently dilated to admit the index finger easily. Then the last bougie introduced is passed once a week; after three months, once a month will usually be sufficient to maintain the dilatation. The patient should always have a bougie passed two or three times a year, and more frequently if at any time there is any difficulty in its passage. In passing bougies the two essential points are never to cause the patient pain and never to use force. They should not be passed if the patient has a high temperature or if there are any signs of local inflammation; as the passage of the bougies might displace a septic clot into the portal vein and set up pylephlebitis and portal pyaemia.

THE REMOVAL OF FAECES FROM THE RECTUM

It sometimes falls to the lot of the medical man to have to perform this disagreeable task. As a rule no anaesthetic is required. The patient lies in the left lateral position with the buttocks raised, when as much warm olive oil as possible is introduced into the rectum through a tube and funnel. If this is impossible at first, the faecal masses are broken up with a spoon to allow the oil to be injected. When the olive oil has softened the faeces, the masses are further broken up with the spoon and finger; rubber operating gloves should be worn: some is also removed so as to allow of the introduction of an enema. The process is repeated again and again until it is possible to administer a copious soap and

water injection to empty the bowel. After the action has been secured, the rectum must be again examined and any hardened mass, which has been brought down, removed. The operation makes the region so sore that it is often desirable to dress it with some emollient ointment and to defer the further proceedings for a few hours.

The very dry faeces lie in the rectum, and if once this hard plug can be broken up and removed the upper bowel can easily be emptied by enemata. The result of the enema should be inspected, and no one's word accepted.

THE ADMINISTRATION OF AN ENEMA

On occasions, an enema must be given by the medical man himself. This can be done either with a rubber tube and glass funnel or a Higginson's syringe, but the former is by far the more satisfactory. It can be administered with the patient in the left lateral position with the buttocks raised on a pillow. The sheet is arranged to expose the part sufficiently, and a towel placed so as to catch any escape of fluid. The solution for injecting, and the funnel and tube or syringe, should have been prepared previously. In introducing the end of the tube or syringe the direction of the anal canal must be remembered. It is directed upwards and forwards. After lubricating the end of the tube, it is introduced with a gentle screwing movement in the proper direction. The rubber tube should be introduced as far as possible, and the part should always be exposed to do this. The fluid is then introduced gently and slowly, pausing if necessary from time to time; the patient's feelings are the best guide. In cases of

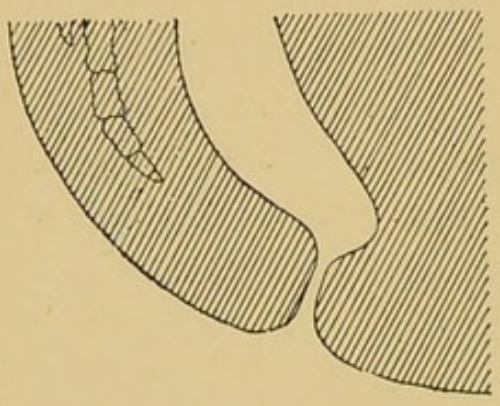


Fig. 101. Diagram of sagittal section of the lower end of rectum, showing direction of the anal canal.

severe constipation, it is well to introduce some warm olive oil, from a few ounces to a pint, half an hour before administering a simple enema. To give a copious enema such as may empty the large bowel, the administration must be done slowly. If the amount given is small and the action quick, the enema has probably been badly given. There is skill in this little operation, as is seen in the differences in the results obtained by various nurses.

RECTAL IRRIGATION

There is much difference of opinion about the value of rectal irrigation for the cure for intussusception, but it is certainly useful in many cases. It is also used for certain ulcerous conditions of the large bowel.

(*a*) In an adult. The patient is placed in the dorsal position with the buttocks raised on one or two pillows. A rubber tube about 3–4 feet long is anointed and passed as far up the rectum as possible. A glass funnel is then joined to it, and the injection, which has been warmed, poured in. It should be done very slowly to avoid stimulating the bowel to action.

(*b*) In children. Rectal injections are mainly used as an aid to the reduction of intussusceptions. The child is anaesthetized and laid on a warm water bag. If possible everything should be ready for operation. The injection usually consists of warm olive oil or saline solution. The buttocks can be slightly raised; it is unnecessary to invert the child. The fluid is injected through a rubber tube and funnel as above. The injection is done gently; it does not return until about 15 ounces have been injected. By abdominal palpation the tumour may be felt to move or disappear. If it does not disappear, there is no doubt that the operation is required: if it does disappear, some advise waiting and watching; others, that the ileocaecal region be inspected, when it is common to find that the last part of the intussusception has still to be reduced.

CHAPTER XI

THE LIMBS. GENERAL

ABSCESSES AND CELLULITIS

MANY small superficial abscesses can be opened without any anaesthetic, or by freezing the part; but, when done in this way, there is a tendency to make the incisions too small. By far the most satisfactory plan is to administer gas, for by doing so the abscess can be opened more thoroughly; and at the same time the patient suffers no pain. An abscess should always be opened by a free incision, usually parallel to the long axis of the limb, and at the most dependent point, in order to allow the pus to drain away. If there is any danger of wounding important structures, or if the abscess is deeply situated, it should be opened by Hilton's method. This consists in merely dividing the skin and superficial structures, and then pushing a director into the abscess; a pair of artery forceps is passed down the director, and opened, to enlarge the track sufficiently for drainage. When incising a deep abscess muscle fibres should be separated, not divided, unless they interfere with drainage. If the abscess is at all large a finger should be introduced, and any diverticula opened into the main cavity by breaking down fibrous septa, but the interior of an acute abscess should never be scraped with a sharp spoon, as this would break down the protecting barrier of granulations. An india-rubber tube should be placed in large abscesses, in smaller ones a thin gauze wick, in order to keep the wound open and allow the pus to escape. In a large abscess additional counter openings may be required (see p. 16). An abscess after being opened should be dressed with hot fomentations, which should be changed

every four hours until the inflammation has subsided: later, as the discharge decreases, dry dressings are better as they do not make the part sodden and need changing less often When dealing with cellulitis, the inflamed area must be thoroughly opened up, the incisions being parallel to the long axis of the part and extending to the limits of the inflamed tissues: it is of no use to make a small superficial incision. In many instances, multiple incisions will be required. Drainage tubes or small gauze strips should be placed in the wound if necessary, to ensure proper drainage taking place: commonly it is merely needful to leave the wounds open. The whole of the inflamed area is to be covered with hot fomentations, which must be changed frequently. In cellulitis of a limb it is often advised that it should be kept absolutely at rest on a splint. If, in spite of this treatment, the inflammation extends, fresh incisions should be made and, if the wounds are situated in the lower leg or forearm, they can be treated by means of a water bath. The limb is suspended by a sling in a metal vessel containing water or some lotion; at one end of the vessel is a tube carrying the water off, at the other end, water at a temperature of about 110° Fahrenheit runs in from a reservoir above the level of the limb. This bath should never be used for more than eight hours at a stretch. It is a method of treatment which is exceedingly troublesome to carry out, the apparatus requiring constant attention: but it can be used very easily for half an hour or so two or three times a day, when the dressings are changed, and is exceedingly useful.

Abscesses in certain situations require to be opened with special care, owing to the danger of wounding important structures.

1. *Whitlow.* The pus may be superficial to the tendon sheath or within it. If superficial, the finger should be incised on the flexor aspect in the middle line; the incision must be free, but care must be taken that the tendon sheath is not opened. If the sheath contains pus (suppurative teno-

synovitis) the condition is much more serious, particularly when the thumb and little finger are affected; as in these two, the sheaths of the flexor tendons communicate with the palmar sheath, and the infection, once within this, will travel up to the forearm. At first the finger should be incised in the middle line, the tendon sheath being opened throughout the whole length of the incision; if necessary, further incisions must be

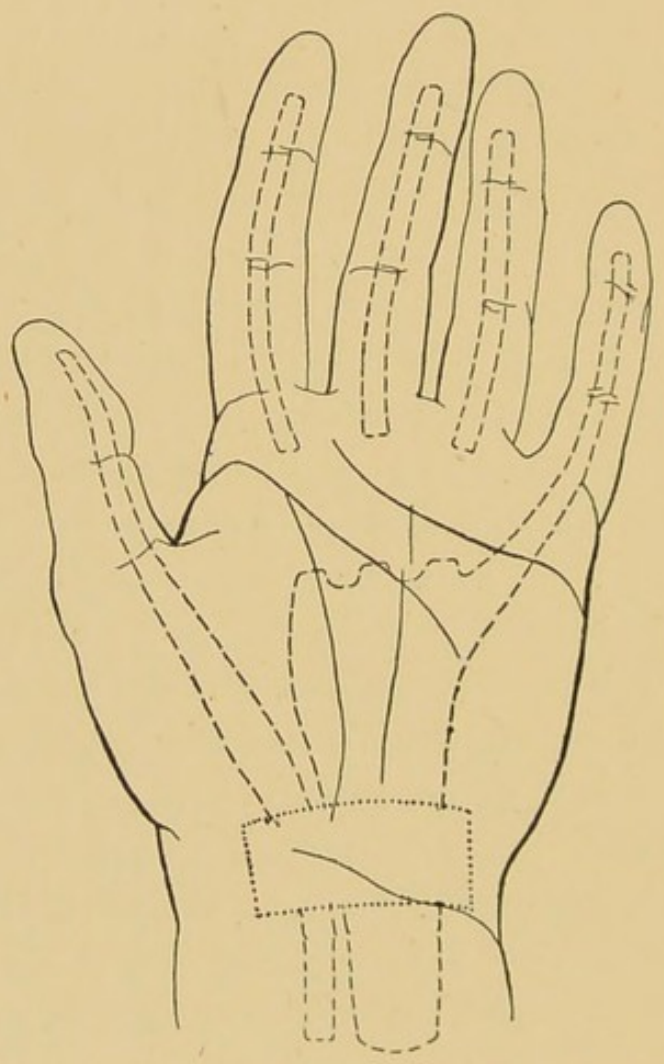


Fig. 102. Sheaths of tendons on palmar surface of hand and wrist.

made into the palm, and sometimes on the dorsum of the hand; and if the process extends, other incisions above the wrist joint may be required. The arm should be placed on a splint, the fingers being slightly flexed and the thumb held away from the rest of the hand: so that if subsequent stiffness occurs owing to the sloughing or fixation of the tendons, the hand will be in the most useful position. Massage and passive

movements of the fingers, thumb and hand, should be commenced as early as is allowed, and persevered with.

2. *A Palmar Abscess* should always be opened by Hilton's method, and the position of the main vessels carefully considered. The superficial palmar arch is at a level with a line drawn straight across the hand from the lower border of the outstretched thumb, i. e. at about the centre of the palm, and

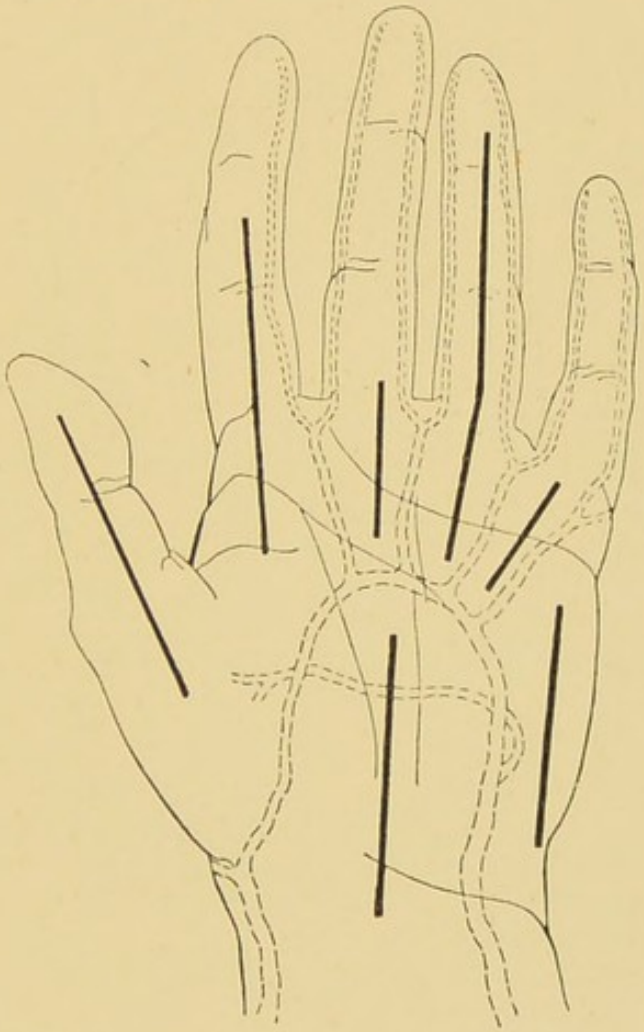


Fig. 103. Incisions on palm of hand. The dotted lines indicate the palmar arches and digital arteries.

below this line there is little danger of wounding vessels, provided that the incision is made in a line with one of the fingers, not between two of them, as the digital arteries divide at the centre of the web between the fingers (Fig. 103).

3. *Plantar Abscess.* Plantar are not nearly as frequent as palmar abscesses. Owing to the thick plantar fascia, they are

prone to spread beneath this fascia rather than to approach the skin. Their early incision is as important as it is in the case of suppuration in the palm. The position of the vessels and incisions is shown in the accompanying diagram, Fig. 104. A long incision can be made from the head of the fifth metatarsal bone to the heel without fear of dividing any

Fig. 104. Incisions on the sole of the foot. The dotted lines indicate the plantar arches and digital arteries.

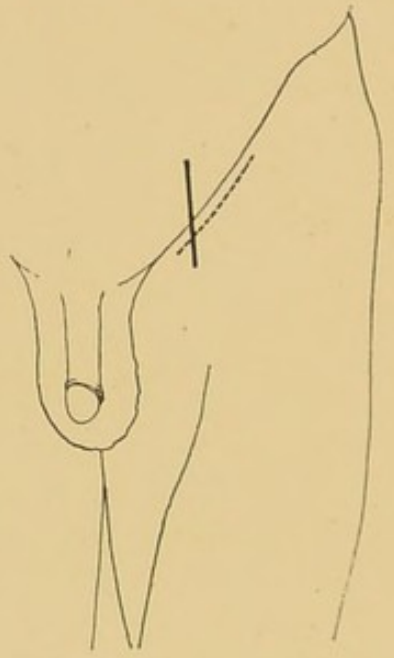


Fig. 105. Groin, showing vertical (black) and oblique (dotted) incisions for suppurating glands.

important structures. One from the head of the first or third metatarsal to the centre of the heel, twice passes over the plantar arteries, which, fortunately, are placed deeply.

4. *Axillary Abscess.* The incision should be made midway between the anterior and posterior margins, from above downwards towards the chest. Hilton's method should be employed.

5. *Bubo.* Pus in the inguinal region should be let out by means of a vertical incision at right angles to Poupart's ligament, so that, when the patient is seated, the edges of the incision gape, providing efficient drainage. But as the abscess tends to extend along the groin towards the anterior superior spine of the ilium, the vertical incision may be inadequate, and must be combined with or replaced by an incision parallel to Poupart's ligament (see Fig. 105).

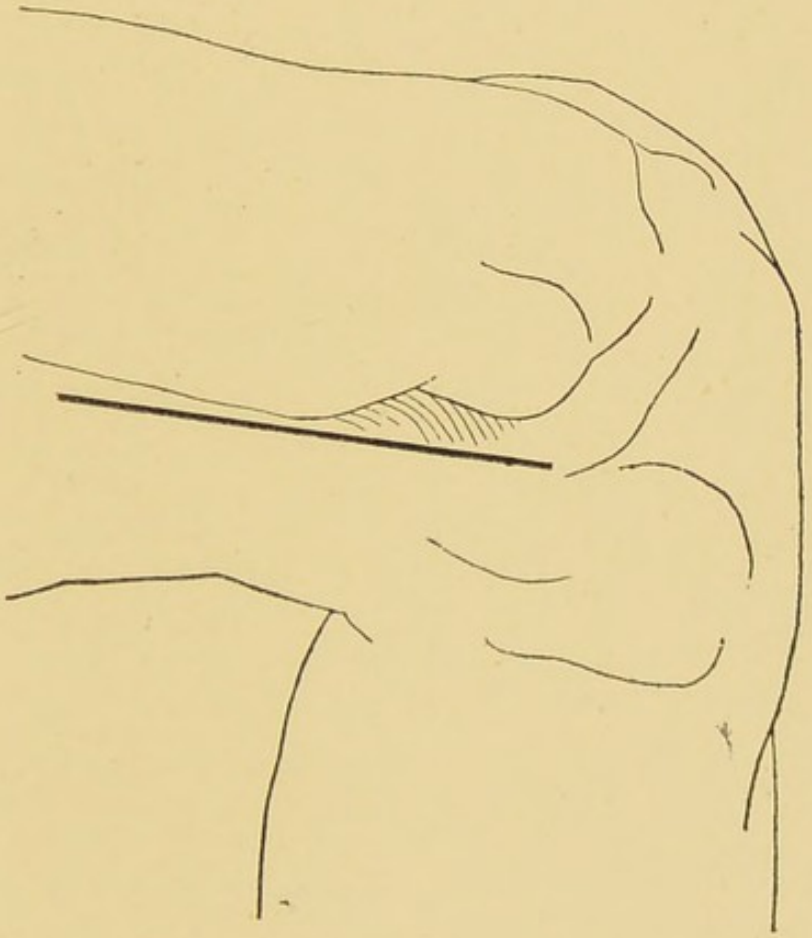


Fig. 106. Inner side of knee, showing incision for opening a popliteal abscess.

6. *Popliteal Abscess.* A general anaesthetic should be given before a popliteal abscess is opened. Commonly, they arise either from bone disease, from a septic knee joint, or from a septic sore on the heel. When due to bone disease, as is usually the case in the young, the abscess is opened best through an incision in the lower and inner part of the thigh. When under the anaesthetic the knee is flexed and the thigh

abducted and everted; a sand bag will retain the foot in this position. The inner part of the thigh and knee are cleansed. An incision is made, about 3 inches in length, parallel to the tendon of the adductor magnus, either beginning or ending at the adductor tubercle. The tendon is identified, and a finger, or better, a pair of artery forceps, is thrust into the popliteal space close to the posterior surface of the tendon.

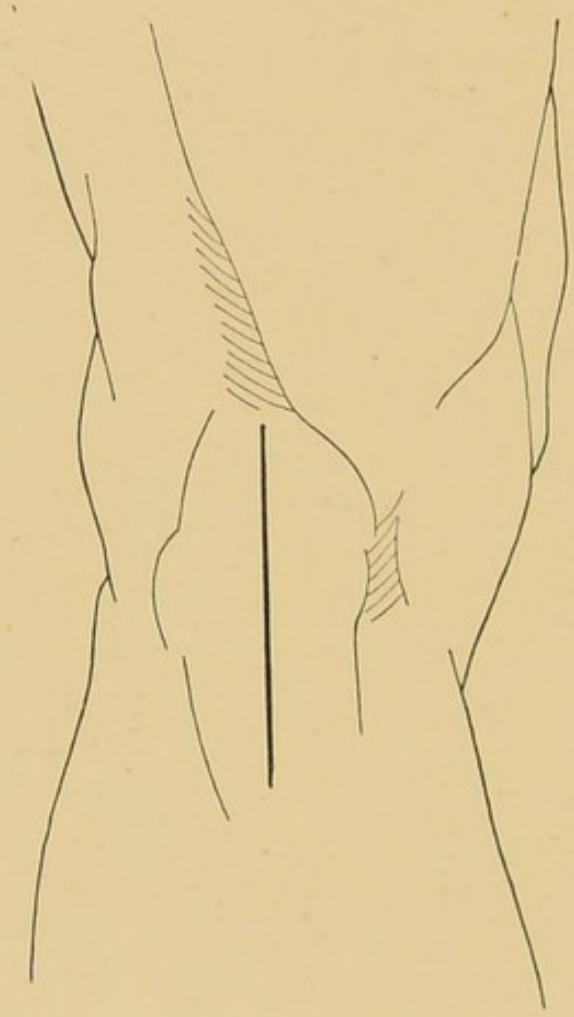


Fig. 107. Popliteal space showing median incision.

The incision must not be carried deeply up the thigh, because the femoral artery is winding round from the front to the back, so that its course will be crossed and, if the surgeon is careless, the vessel may be injured. Sometimes it is advisable to make a counter opening on the outer side. The best way to do this is to pass an instrument through the abscess cavity across the popliteal space until the point can be felt on the

outer side in front of the biceps tendon. It is then exposed through an incision. In this situation there is no danger of injuring the external popliteal nerve.

When pus originates deeply in the popliteal space, as from bone, the above incisions serve admirably. But if the infection is distributed generally in the cellular tissue, or arises in connection with the more superficial lymphatic glands, the lateral incisions are not so useful as a median posterior one (Fig. 107). The patient lies on his chest with a pillow under his shoulders. After shaving and cleansing, an incision 4 inches long is made in the middle line of the lower part of the popliteal space. The popliteal fascia is very strong, so that infections spread up into the thigh and down into the leg sooner than come to the surface. The fascia is incised throughout the length of the wound, the internal popliteal nerve is directly under it and is retracted to the inner side. A finger or director is passed into the abscess, the aperture, if necessary, being enlarged with artery forceps. A tube is inserted and, if the abscess is localized, the wound sutured in part. After all inflammation has subsided and the part is granulating well, the practitioner must see that the knee does not become flexed in the process. Movements must be begun and practised to avoid such a contingency; or a splint can be used.

7. *Antecubital Abscess.* Abscesses in the antecubital fossa, in front of the elbow, correspond to popliteal abscesses behind the knee, but are not nearly so frequent, and differ in being opened by an incision on the outer side, avoiding the cephalic vein, or from the front; instead of from the inner side or behind, as are the popliteal abscesses.

INFUSION

When a patient is suffering from severe haemorrhage, shock, diarrhoea, vomiting, or other loss of fluid, the introduction of saline into the body will raise the blood-pressure and benefit the patient. There are three main methods of doing this:—

1. *Injection per rectum.* When the haemorrhage or shock is not very marked, this method is quite satisfactory; the fluid, however, is not absorbed as quickly as by direct infusion into a vein. The patient should lie on his back or left side, with the buttocks raised on one or more pillows. A large-sized soft rubber catheter, to which is attached, by means of a glass junction, a piece of rubber tubing with a glass funnel at one

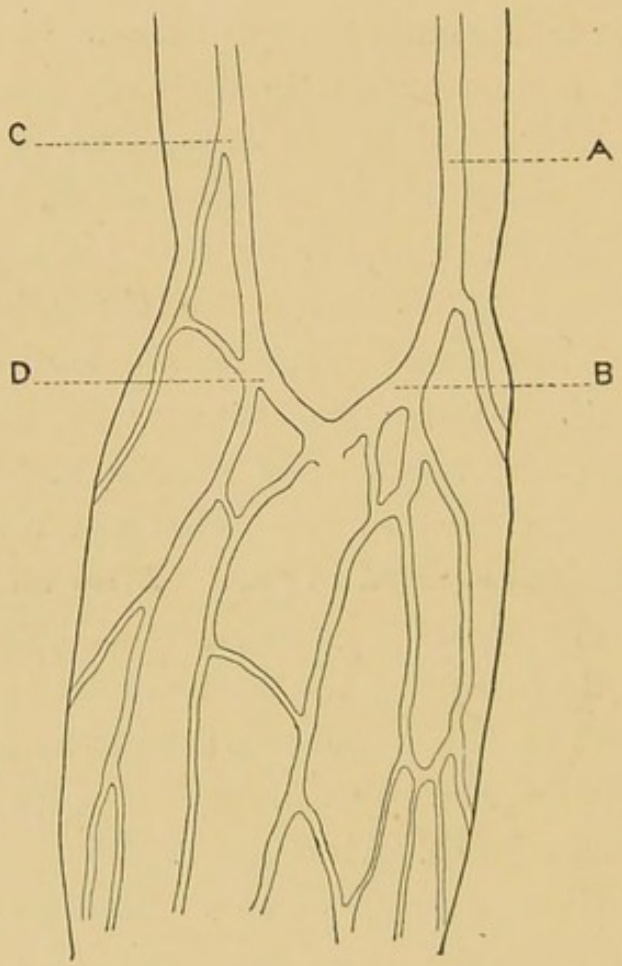


Fig. 108. Veins in front of elbow. A. Basilic. B. Median basilic. C. Cephalic. D. Median cephalic.

end, is the best form of apparatus to use. The catheter is lubricated and passed well into the bowel, and a solution of normal saline, 1 teaspoonful of salt to 1 pint of water at a temperature of 105° Fahrenheit, is poured slowly into the funnel. It must not be raised high, or the fluid will run in too fast; 1 pint should take about ten minutes to inject. As a rule, not more than a pint will be retained at a time, the injection being repeated in one or two hours. If required,

brandy can be added in the proportion of 1 ounce to 1 pint of saline solution.

2. *Injection into a vein.* This procedure is generally described under the name of 'transfusion'. The vein usually selected is the median basilic, but the median cephalic or internal saphenous is sometimes chosen. The apparatus consists of a small curved glass or metal cannula, of which the end to be introduced into the vein is bulbous; the other end, which is flanged, is connected with about 2½ feet of india-rubber tubing, at the extremity of which is a glass funnel.

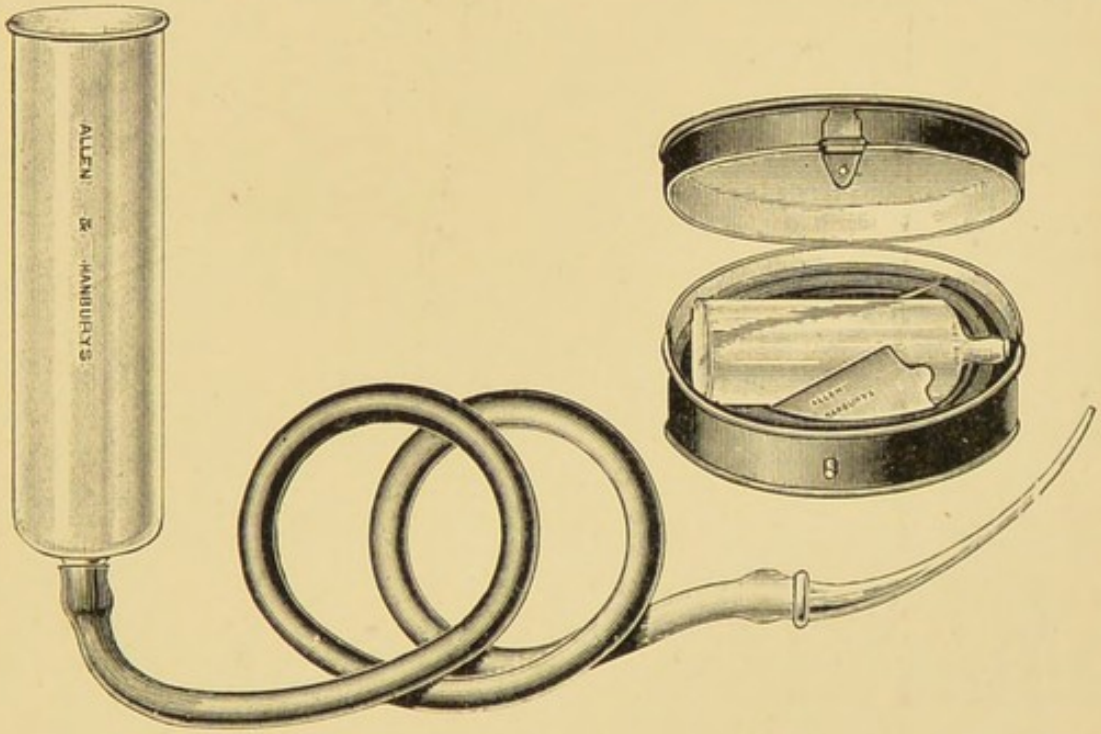


Fig. 109. Apparatus for intravenous infusion.

The apparatus is sterilized by boiling and cooled by being placed in sterilized water or saline solution, or on a sterilized dry towel. The fluid to be injected is prepared by mixing 1 teaspoonful of salt with 1 pint of sterilized water, at a temperature of 105° Fahrenheit. If there is difficulty in obtaining sterilized water, tap water can be used, and brought to the required temperature by mixing with boiling water; the risk of sepsis is extremely small, and quite negligible when compared with the grave condition of the patient. The skin around the elbow is cleansed, and an incision, 1 inch or so

in length, is made obliquely over the median basilic vein. If the vein cannot be seen, a bandage should have been placed round the upper arm, which will have the effect of making the vein prominent, but must be removed before any attempt is made to inject the fluid. The vein having been exposed and freed from its sheath, a double thread of silk is passed under it by means of an aneurysm needle; the loop is cut and the more distal ligature tied to compress the vein below the point where the incision is to be made. The infusion apparatus is then filled with the normal saline at a temperature of 105° Fahrenheit, great care being taken that no air is present in

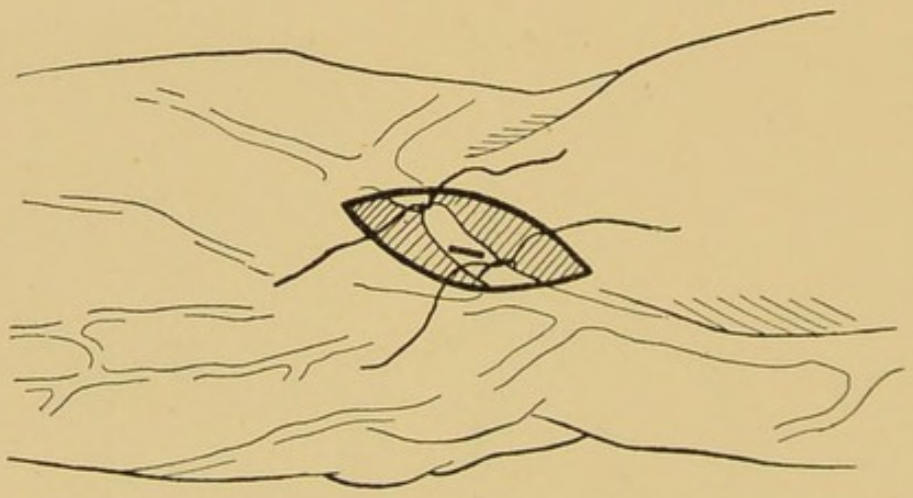


FIG. 110. Method of intravenous saline infusion. Two ligatures have been passed round the vein, the distal one has been tightened, and the vein has been incised.

the tube or cannula. The vein is then picked up with forceps, and an oblique incision made across it. The cannula, from which saline is escaping, is then pushed upwards into this opening, and the proximal ligature tied lightly round the part of the vein containing the cannula, in order to prevent any blood leaking between them. The funnel is raised, and the fluid runs, slowly at first, into the vein. As the funnel empties, more fluid is poured in, but care must be taken that it is refilled before all the solution in it has run out, or air will be driven into the vein with a fatal result. The quantity of saline to be introduced into a vein is a moot point at the

present time: some holding that large quantities such as 5 pints or more should be used, others that 1 pint is sufficient. The plan which is at the present time most generally adopted is to inject 1–2 pints, and to repeat it again later if necessary. It is essential that the fluid runs in slowly, 1 pint should take about ten minutes to inject; the rate of injection can be altered by increasing the height at which the funnel is held. Brandy, 1 ounce to the pint, or adrenalin, 10 minims of a 1 in 1,000 solution, can be added if thought desirable. When sufficient has been introduced, the cannula

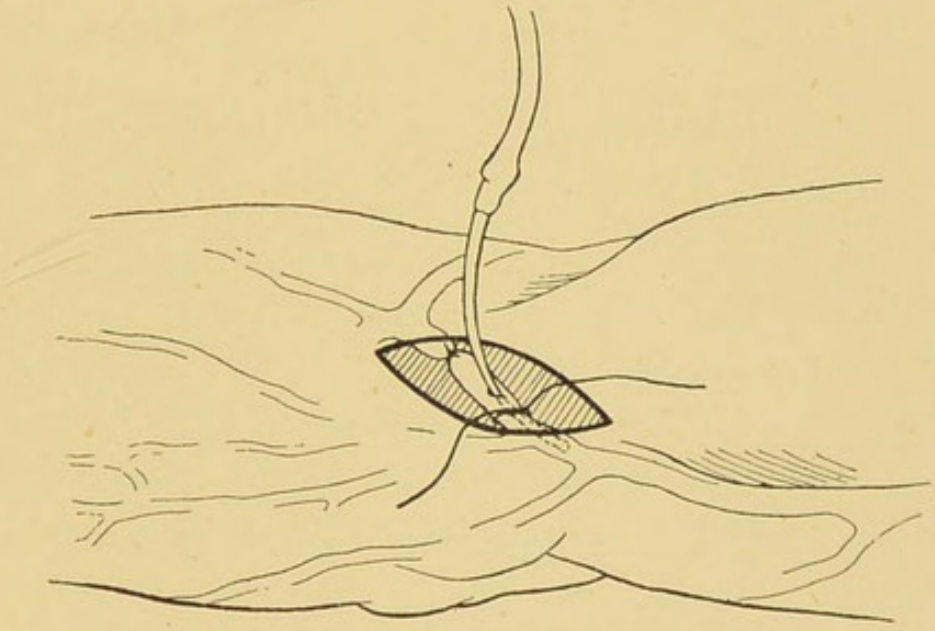


FIG. 111. Method of intravenous saline infusion. Cannula introduced into vein, to be retained there by tightening proximal ligature.

is withdrawn and the upper ligature tied. The wound is closed with two or three stitches, a subcuticular stitch is excellent in the case of females, dressed with gauze and wool, a bandage being then applied to the flexed arm. In some instances the vein is not exposed, but an exploring needle is stabbed through the skin directly into the vein in the direction of the heart. This requires practice; and in patients who are to be infused, the veins are collapsed and empty, rendering the operation most difficult.

3. *Continuous subcutaneous injection.* By this method saline solution is injected directly into the cellular tissues of

the groins, loins, axillae, flanks, or beneath the breasts. It is found that the fluid is absorbed slowly and that it is extremely difficult to introduce more than a few ounces at a time. Sometimes in young children, such as those suffering from diarrhoea and vomiting, a needle is introduced into the cellular

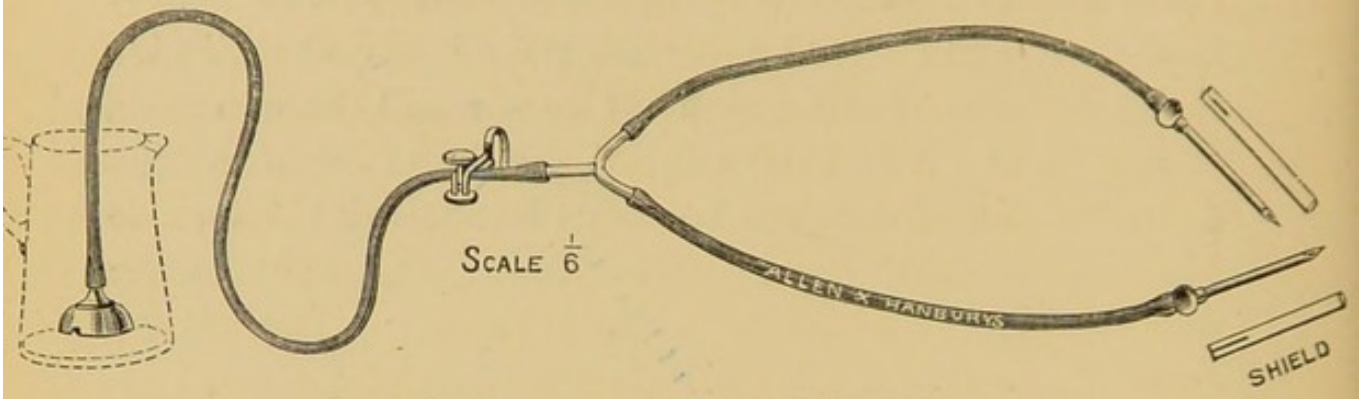


FIG. 112. Apparatus for intracellular infusion.

tissue and connected by india-rubber tubing with a douche tin or other reservoir containing saline solution, placed a little above the level of the patient; the solution then escapes slowly into the tissues, but in doing this, care must be taken that the proper temperature is maintained.

4. *Intermittent subcutaneous injection.* When quicker action is required than can be obtained by the method

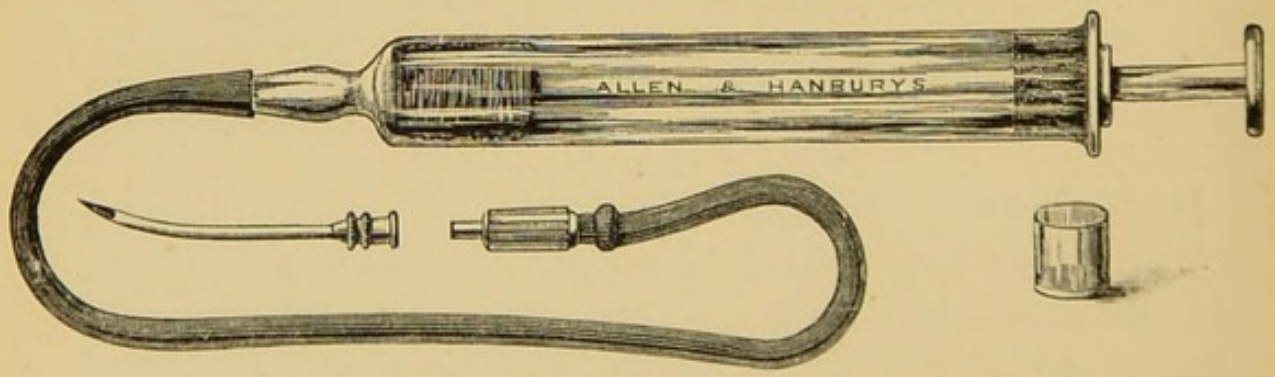


FIG. 113. Syringe for injecting fluids under the skin.

described in paragraph 3, the saline can be injected under the skin with a syringe. In this way, 2, 3, or even more ounces can be introduced into each of the situations mentioned above, the absorption of the fluid being hastened by gentle massage. This method is often useful in children, in whom it may be impossible to find a vein large enough to be used for an

intravenous injection. The syringe is taken to pieces and sterilized by boiling; a second barrel should always be at hand in case of breakage. Whilst this is being done, the saline solution for injection is prepared. The syringe is cooled, and put together and filled with saline. The site of the injection is selected and cleansed with ether or turpentine; the skin is picked up with the forefinger and thumb of the left hand, whilst the needle of the syringe is introduced beneath it with a sharp stab. The needle is passed well in, so that the injection is made at some little distance from the skin puncture. The injection must be done slowly. If the puncture allows none of the fluid to escape it will only need a little boracic powder as a dressing. The situations generally selected for injection are the loins, groins, breasts, axillae, and flanks.

THIERSCH'S METHOD OF SKIN GRAFTING

Skin grafts are most frequently employed in the case of ulcers, old-standing wounds, or for recent lesions where the skin edges will not meet. The following is a description of the method of grafting an ulcerated surface:—Before the grafts are applied to the ulcer, it is necessary for that surface to be aseptic or relatively so, and in a healing condition; it is useless to place grafts on a suppurating wound. The presence of a dry, thin, red line around the margin of an ulcer is an indication that it is healing; the quality and quantity of the discharge will determine whether it is suppurating or not. An anaesthetic having been administered, the surface of the ulcer is scraped over gently with a curette, the granulations being removed down to the layer of newly-formed fibrous tissue, on the floor of the ulcer. The edges of the ulcer, where fresh epithelium has formed, are cut away all round, and by this means a raw, fresh, bleeding surface remains. It is necessary to stop all haemorrhage before applying the grafts. For this purpose the wound is covered with a piece of protective gauze, over which several dry sponges are placed, the whole being then firmly bandaged. This continuous pressure,

while the grafts are being cut, will arrest all haemorrhage. The best grafts are obtained from the anterior surface of the thigh, which must have been thoroughly cleansed. An assistant draws the skin down towards the knee, and up towards the groin, by placing the ulnar edge of each hand firmly on the leg, and making traction in opposite directions. The operator fixes the skin by gripping the under surface of the thigh with his left hand, at the same time pressing the thigh upwards, and so flattening out the anterior surface. A razor with a broad blade is required, and this, while the grafts are being cut, should be kept continuously wet with sterilized water. The razor is applied to the surface of the thigh and is made to cut through about half the thickness of the skin, and is then drawn through the skin at the same level, with a sawing motion. The grafts should be cut as wide and as long as possible, each being of the same thickness throughout. As each is cut, it is placed in warm sterilized saline solution, or directly on the wound if the bleeding has ceased. When sufficient have been obtained, and it is always better to cut more than it is thought will be required, the dressings are removed from the surface of the ulcer, this being done gently in order not to restart the haemorrhage. One of the grafts is taken out of the solution and its raw surface applied to the ulcer. It will be found that the edges of the graft turn in and will require flattening out by means of two probes. The entire surface of the ulcer is covered in this manner, care being taken that the grafts extend over the skin edge all round the ulcer, and that they overlap each other. No raw surface must be left uncovered. A piece of wet protective is placed over the grafted area, and over this a dry dressing is firmly fixed. Care must be taken in applying the dressings that the grafts are not shifted. If the ulcer is situated on a limb, this should be immobilized by means of a splint. The dressing is removed at the end of a week, or longer, by carefully washing it off, in case some of the grafts are adherent to the protective. The part should again be dressed with pro-

tective, which can be left on for about the same time, and then the wound, if satisfactory, is dressed with boracic ointment. The situation from which the grafts are taken should be covered with protective gauze, and a dry dressing. This need not be changed for about ten days, when it will be found generally that the wound has healed; if, however, this is not the case, an ointment dressing should be applied. The patient often complains of more pain in the part from which the grafts have been taken than anywhere else. Recent wounds will not require scraping, it is only necessary to have the surface thoroughly clean. The grafts are cut and applied in exactly the same manner as described above. After grafting an ulcer on the lower limbs, the patient should not walk until at least two months have elapsed. The grafted area may be protected by lightly covering the part with a gauze bandage, which is painted layer by layer with Unna's dressing.[1] The whole is covered by a neat, firm bandage.

PLASTER OF PARIS SPLINTS

Plaster of Paris splints are used chiefly for treating fractures of the limbs and for tuberculous disease of the joints. The great virtue of plaster of Paris is that it makes an almost ideal splint; fitting the part perfectly and, at the same time, securing absolute immobilization. It can be employed in many different ways, but the two following are the methods most commonly used: (1) *Plaster of Paris bandage;* (2) *Bavarian plaster of Paris splints.* Both methods will be described as applicable to the fitting of a splint to the lower limb; the splints can, however, be used for other parts of the body in a very similar manner. In the case of a recent fracture or where any deformity has to be corrected, it is always advisable to administer a general anaesthetic. Should

[1] This dressing consists of oxide of zinc in gelatin made into a solid at ordinary temperature. It is melted by placing the vessel which contains it in warm water, when it is painted with an ordinary brush on each layer of gauze.

this not be done, the patient suffers considerable pain; and, owing to the fact that the muscles are not relaxed, the deformity is difficult or impossible to correct. There are many other cases, however, in which no anaesthetic will be required.

1. *Plaster of Paris bandage.* Before this is applied, the limb must be prepared. It should be washed with soap and water, thoroughly dried, and any abraded surfaces dressed with dry gauze and boracic powder, over which a pad of wool is placed. The limb is dusted with boracic powder, which is well rubbed in, and then loosely but evenly bandaged with flannelette, care being taken that the bandage covers all the skin over which the plaster is to be placed, that it is not tight and there are no creases in it. The next step is to apply a crinoline bandage impregnated with plaster. These can be obtained ready prepared, or they can be made by unrolling and unfolding a crinoline bandage and rubbing fresh plaster of Paris on both sides; it is then folded and loosely rolled up. Just before use, the bandage is immersed in a basin of cold water for a few minutes, by which time it will be thoroughly wetted. The affected limb is held in the required position by one or more assistants, and the plaster bandage rapidly applied from below upwards. This bandaging must be done wherever possible without any 'reversed turns', each turn must, however, overlap the one below it. It must not be put on tightly because plaster shrinks as it sets, and there must be no creases present. This last point is of especial importance in such situations as the ankle joint, where a little extra pressure would impede the circulation. Two or more bandages are applied in this way, and it will strengthen the splint considerably if an iron bar, bent to the required shape, and a little plaster and water, of the consistence of thick cream, are inserted between the layers of bandage. The limb must be held in position until the plaster has set; then a neat bandage should be put on outside. The patient is placed in the recumbent position in a bed provided with fracture boards; the

limb being surrounded with hot water bottles and not covered with the bedclothes, to allow the plaster to dry. Some cotton wool is wrapped round the toes, which must never be covered with the plaster. When lying in bed, the patient should always be provided with a cradle, in order to take the pressure of the bedclothes off the toes. On the following day the surface of the neat external bandage should be painted with flour or starch paste; this to a great extent prevents the plaster breaking off in flakes or getting dirty and untidy. When the splint requires removal this can often be done by unwinding it, a very dusty proceeding, or by sawing it through down the middle line with what ironmongers call a 'metal saw'; the patient can do this himself.

2. *Plaster of Paris Bavarian splints.* This method is a modification of Croft's original splint. The material used is thoroughly shrunken house flannel, known as Bavarian. A broad posterior and a narrow anterior splint are cut out of this material with scissors, to fit the shape of the sound limb. Several long, narrow, straight strips can be used instead, or a splint can be cut out in one piece, leaving a gap in front. Whichever method is adopted, the splints should be so arranged that one or two gaps are left all the way down the limb. A second set should be cut exactly similar to the first. The limb is prepared and bandaged with flannelette as before. The plaster is then made by slowly sprinkling fresh plaster into a basin of cold water, until it no longer sinks, and the fluid is of the consistency of smooth, thick cream. It is thoroughly mixed by stirring with the hand, and the splints are soaked in the mixture, wrung out, and laid flat, when some dry plaster is rubbed into the surface. The limb is held in position, and the splints accurately applied and securely fixed by a few turns of ordinary bandage, great care being taken not to allow any crease to form. Always see that the two splints do not overlap anywhere; there being a gap between them all the way down, where the bandages may be cut to remove the splint. When the first set is in position, the

second is applied in exactly the same manner. The limb is then held in position until the plaster has become firm. The immediate after-treatment is the same as that employed in the other method and need not be repeated. The plaster can be removed by cutting the bandages in the gap left for that

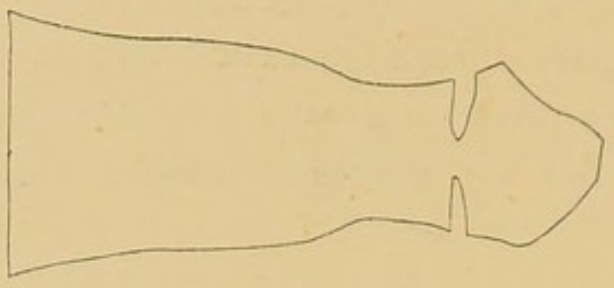


FIG. 114. Shape of splint for leg and foot, cut in Bavarian flannel, used for plaster of Paris splints.

purpose; after removal the splint can be reapplied if necessary, and it will still form a valuable support for the limb. The length of time that the splint is worn varies with the nature of the lesion, but as a rule it will be found to be efficacious for

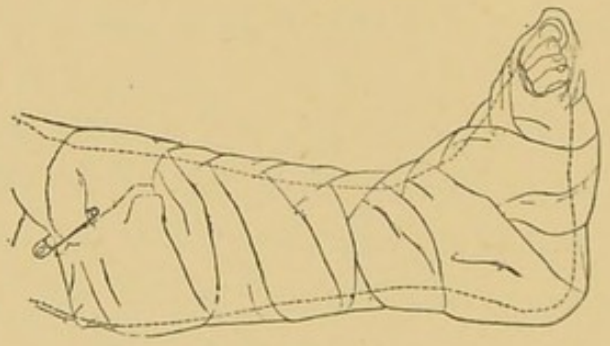


FIG. 115. Side view of leg in plaster of Paris splint.

from four to six weeks. In order to apply plaster splints successfully, the following points should be borne in mind:—

1. Never use stale plaster; it does not set well.

2. Bavarian shrinks when impregnated with plaster, so the splints should be cut a little larger than would otherwise be necessary.

3. Always leave the toes uncovered.

4. Avoid any creases; a bad crease will often necessitate the removal of the splint.

5. Always hold the limb firmly in the required position

from the commencement of the application until the plaster has set.

6. When using plaster splints for fractures, always fix the joints above and below; for a fractured femur, the splint should

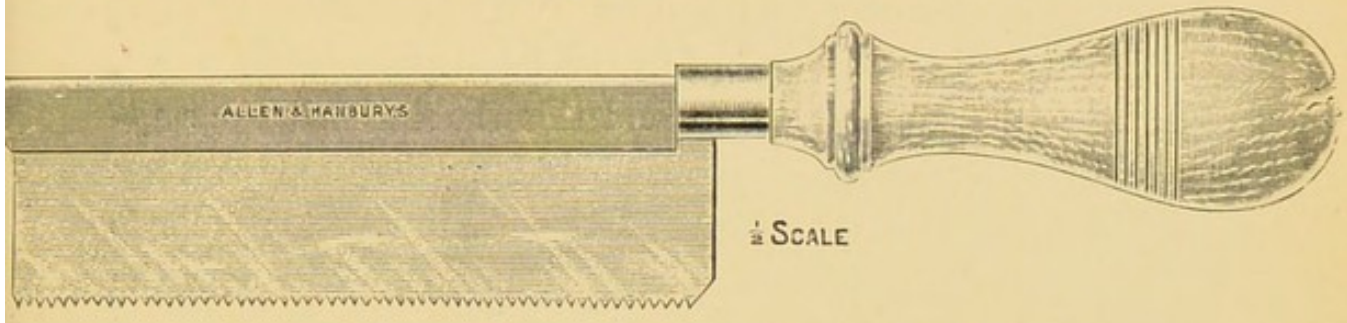


FIG. 116. Metal saw for removing plaster splints.

extend from well above the pelvis to below the knee; for a fractured tibia, from half-way up the thigh to the bottom of the foot.

7. In certain cases, iron bars can be placed with advantage between the two layers of plaster.

8. Always inspect the limb within an hour or two of the application, and again a little later if there is any

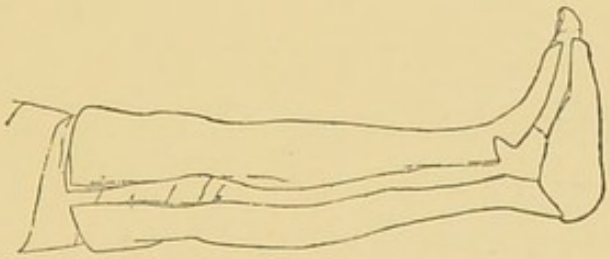


FIG. 117. Leg in plaster of Paris splint, showing gap along the side of the leg to facilitate the removal of the splint.

complaint, to see if the toes are cold, livid in colour, or anaesthetic, or if there is pain present. When desirable, the splint can be cut down the gap, wholly or in part, and the pressure relieved.

9. When treating fractures by this method, the plaster should be taken down within a few days of its application, the limb inspected, and, if desirable, put up in another plaster.

Plaster of Paris splints are the most perfect and comfortable of all splints.

VACCINATION

Vaccination is usually performed on the upper arm, but in the case of female children it is often done on the upper part of the leg, as the scar on the arm is apt to show. The left arm is usually selected, except in left-handed patients, and is cleansed with soap and water, and then rubbed with methylated spirit; mercurial solutions should not be used as they are apt to inhibit the action of the vaccine. A needle is rendered sterile by heating it in the flame, the skin over the insertion of the deltoid is put upon the stretch and scarified in not less than four places in the pattern of a network. The scratches should only just draw blood, if the haemorrhage is considerable, the blood should be washed off and the part dried. A little of the lymph is then blown out by means of

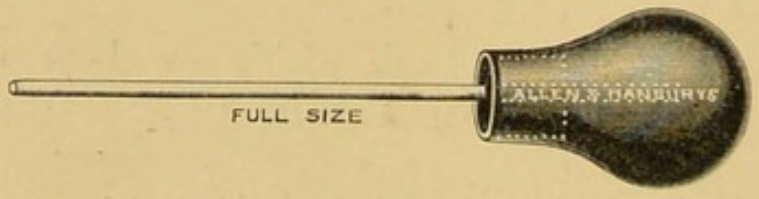


Fig. 118. Rubber bulb for ejecting vaccine.

a small india-rubber bulb which fits the tube, as a rule the india-rubber top of a fountain-pen filler can be made to answer the purpose, on to each of these areas. It is rubbed in with the needle, and then allowed to dry. If any dressing is applied, a simple pad of boracic lint fixed on with strapping is as satisfactory as any. This pad is changed at the end of a week, and more frequently as the scabs form. The scabs will usually fall off in about three weeks from the date of vaccination. If there is much reaction, the arm should be worn in a sling; if vaccinated on the leg the patient must lie up. Children are as a rule vaccinated before they are four months old; they should be revaccinated when about fifteen. It is a noteworthy fact that the worst arms are the most septic, not the best vaccinated, and that the most 'successful' vaccinators are often the most septic in their operations. The

septicity of the arm is no guarantee of the possessor's immunity from smallpox.

SOUTHEY'S TUBES

In certain cases of oedema of the lower limbs which does not respond to general treatment, and where the amount of fluid is great, relief can frequently be obtained by the use of Southey's tubes, which are an improvement on the former practice of making several small incisions in the limb. The apparatus consists of several fine cannulae with lateral openings in their lower parts, and of a trocar which fits them. The instruments are sterilized and the limb cleansed. The

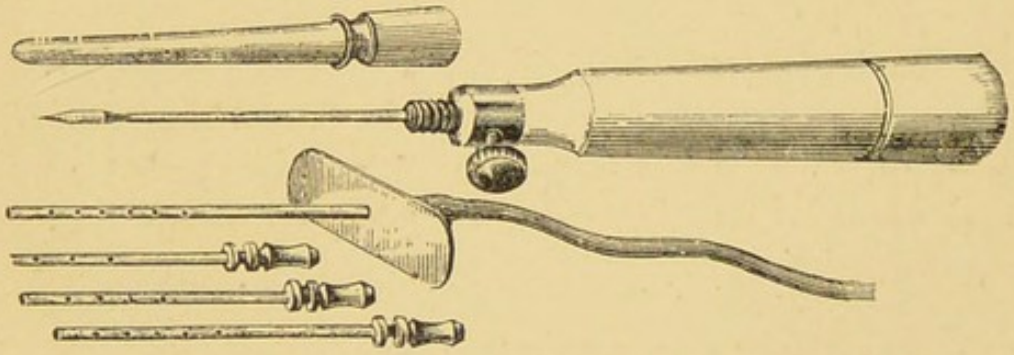


Fig. 119. Southey's trocar and cannulae.

skin is then stabbed at right angles to the surface with the trocar and cannula, which are made to enter as far as the cellular tissues. The trocar alone is withdrawn and a fine piece of india-rubber tubing fitted on to the end of the cannula; the other end of the tubing is led off into a receptacle. Three or more tubes are introduced in this manner, each being packed round with gauze. They are left in position until sufficient fluid has been withdrawn, and then removed; the punctures being sealed with small pieces of gauze and collodion. Unfortunately, the serum clots and blocks the tubes, so that the result of using them is often disappointing, and the practitioner has to fall back upon making one or two small aseptic incisions.

HYPODERMIC INJECTIONS

It is exceedingly easy to give a hypodermic injection, nevertheless it is frequently done very badly, causing the patient unnecessary pain and allowing a large proportion of the drug to escape. Apart from the purpose of inducing local anaes-

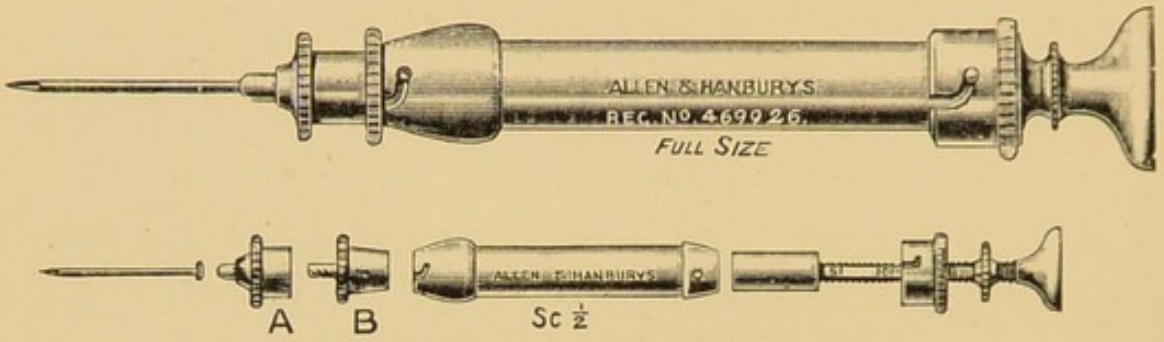


FIG. 120. Metal hypodermic syringe.

thesia, the injection is usually made into the arm. First of all, it must be seen that the syringe is in working order. If time permits, the skin is cleansed with ether, and the needle

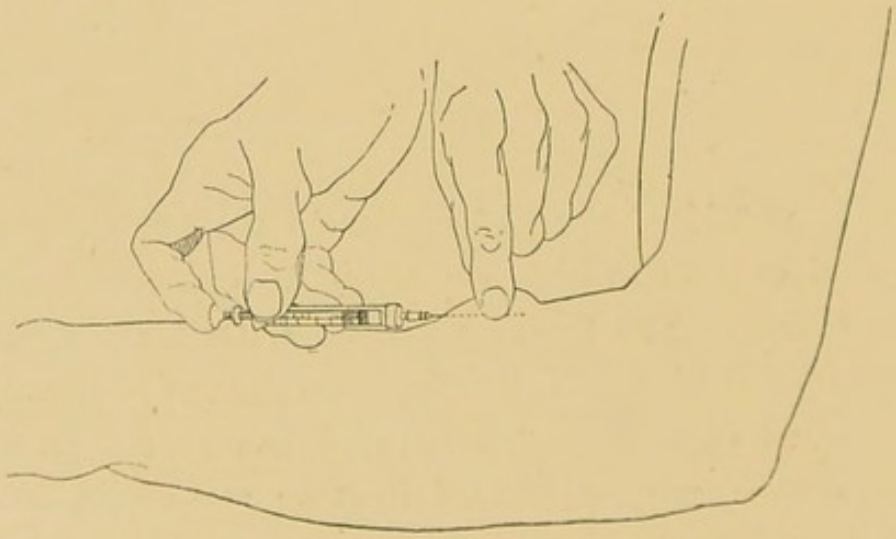


FIG. 121. Method of giving hypodermic injection.

of the syringe boiled in a test-tube. The solution of the required drug is drawn up into the syringe, the needle fitted to it, all air expelled, and the amount of the drug to be injected carefully measured. A spot is selected which is free from veins and where the skin is loose. A fold of skin and

subcutaneous tissue is picked up between the finger and thumb, and drawn in one direction, and the needle stabbed through the skin into the subcutaneous tissues in the same

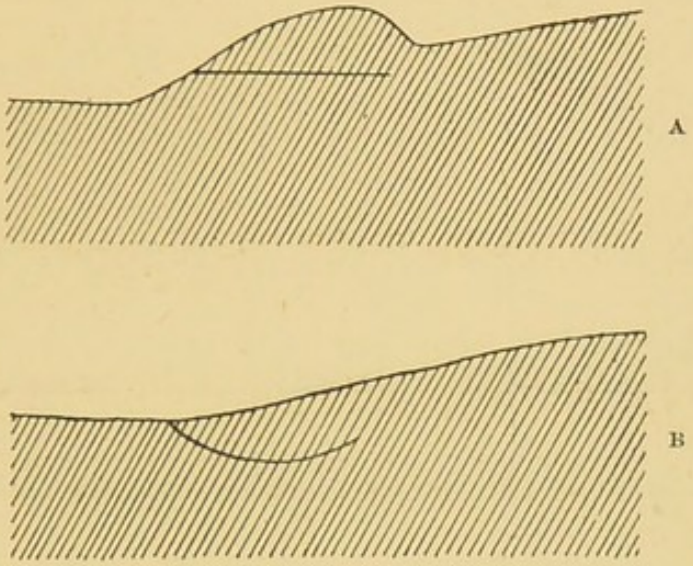


Fig. 122. A. Track of needle during the administration of a hypodermic injection. B. Oblique curved valvular track left by needle after giving a hypodermic injection.

direction, parallel to the fold of the skin; the full length of the needle should be inserted, so as to make the in-

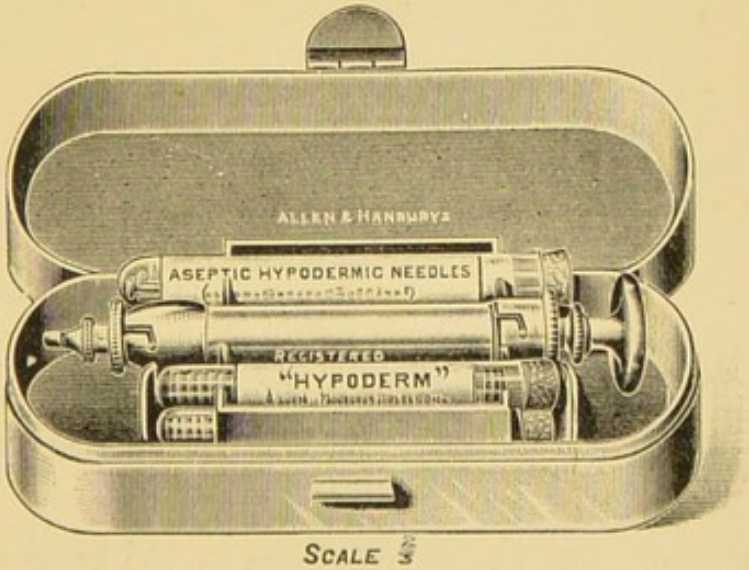


Fig. 123. Case of hypodermic needles.

jection as far from the skin puncture as possible so that none of the drug is lost. The usual mistake is to *push* the needle into the skin subcuticularly, or to make the injection

close to the skin puncture. When the needle is in position the fluid is injected slowly. The needle is then withdrawn, a finger being placed immediately over the track of the needle, and the skin around gently rubbed, disseminating the solution. When done properly none of the injection should escape

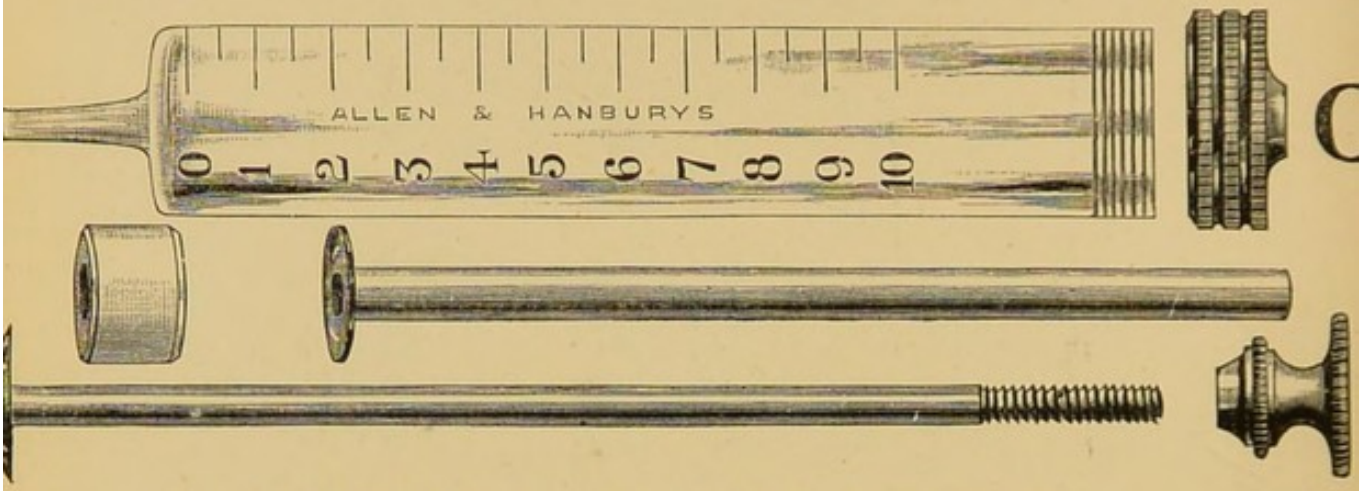


Fig. 124 *a*. Antitoxin syringe. In pieces for sterilization.

through the skin puncture. When solutions of ergot or mercury are injected, the needle must be thrust deeply into the muscles, in some such situation as the buttock ; for when injected directly beneath the skin an abscess is apt to form.

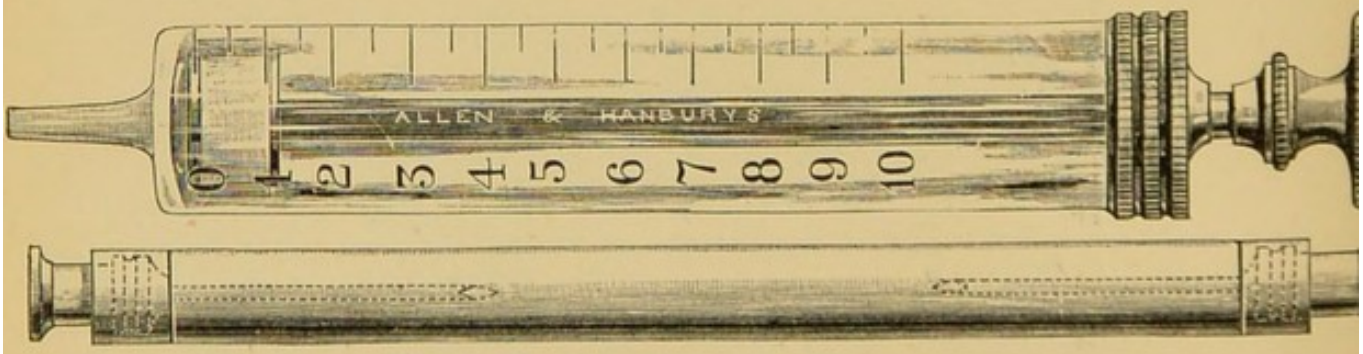


Fig. 124 *b*. Syringe put together, and case containing needles.

A serum or vaccine should be given in the same manner as a hypodermic injection. The syringe is taken to pieces and sterilized by boiling ; a spare barrel should always be at hand in case of a breakage. The pieces are turned out on to a clean or sterilized towel, allowed to cool, and then put together

again. The needle should be boiled with the syringe, but it can be sterilized by heating the end in the flame of a spirit lamp. The phials with the antitoxin should be opened and the serum drawn into the syringe, to which the needle is then fitted and the air expelled. A place, usually in the flank, is selected and cleansed. The skin is drawn one way and picked up between the finger and thumb, as in making a hypodermic injection, when the needle of the syringe is introduced under it by a stabbing movement in the same direction. Its full length is introduced. *The skin is drawn in the same direction as the needle is inserted, so as to make the injection as far from the puncture hole in the skin as possible, and by this device lessen the chance of any of the injection escaping.* The injection is made slowly, whilst the skin is kept drawn up. If needful, the syringe can be detached from the needle, which remains in the skin, filled again and more serum injected. After emptying the syringe the needle is withdrawn with a quick movement, its track being closed by the pressure of a finger, and the skin allowed to slide back to its natural situation. This little manœuvre makes the track valvular and oblique, preventing the escape of serum.

The puncture is dressed with gauze and collodion.

OBTAINING BLOOD FOR WIDAL'S TEST

In the diagnosis of typhoid fever by Widal's test, it is necessary to draw off a little blood. Tubes for collecting the blood are made of glass with a small bore channel within: the ends are drawn out to fine capillary tubes, and sealed. Just before use, the two extreme ends are broken off. A finger of the patient is washed, cleansed with ether, and stabbed close to the root or side of the nail with the point of a needle, which has been sterilized, by heating it in the flame of a spirit lamp. A drop of blood exudes, one end of the tube is applied to this drop in such a way that the blood runs into the tube, partly by capillarity and partly by gravity. When sufficient has

been collected the two ends of the tube are sealed off by heating them in the flame.

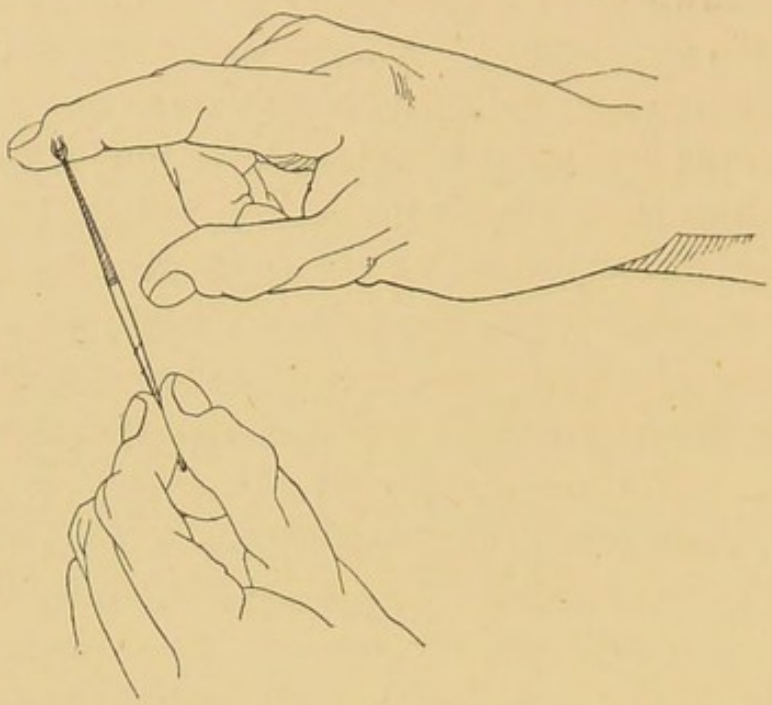


FIG. 125. Method of removing specimen of blood in capillary tube for Widal's test.

BIER'S PASSIVE CONGESTION TREATMENT

The introduction of the method of Professor Bier of Bonn will probably do much to revolutionize the treatment of

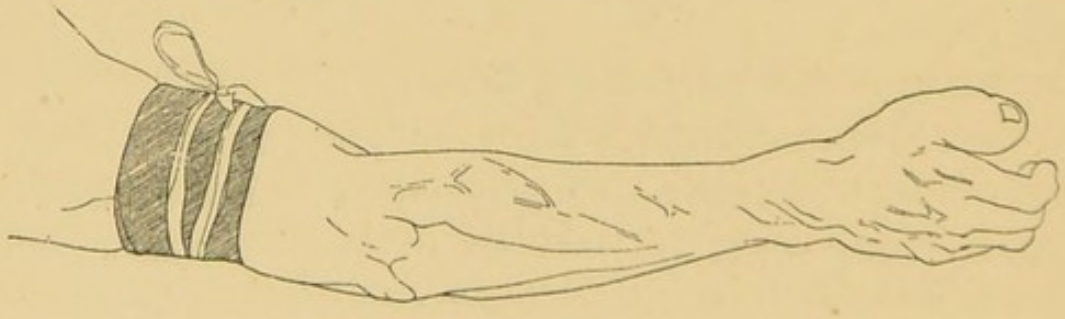


FIG. 126. Method of inducing passive congestion for the relief of septic inflammation of the thumb.

inflammatory lesions. As yet it is early days for any confident prediction, the method having only been tried to any extent on the limbs. An elastic bandage, Martin's

rubber bandage answers well, is placed round the limb well above the lesion; as for instance, round the upper arm in the case of a whitlow; and wound sufficiently tightly to impede the return of the venous blood but not to affect the arterial pulse, the limb below becoming very oedematous and blue. The bandage should be shifted every few hours, with an interval of one or more hours between the repositions. Great care must be taken to adjust the bandage exactly to the correct degree of tightness, sometimes this is very difficult to find. *Under this treatment, pain rapidly ceases (usually within twenty minutes), the patient feels more comfortable and sleeps, the temperature subsides, and, moreover, definite*

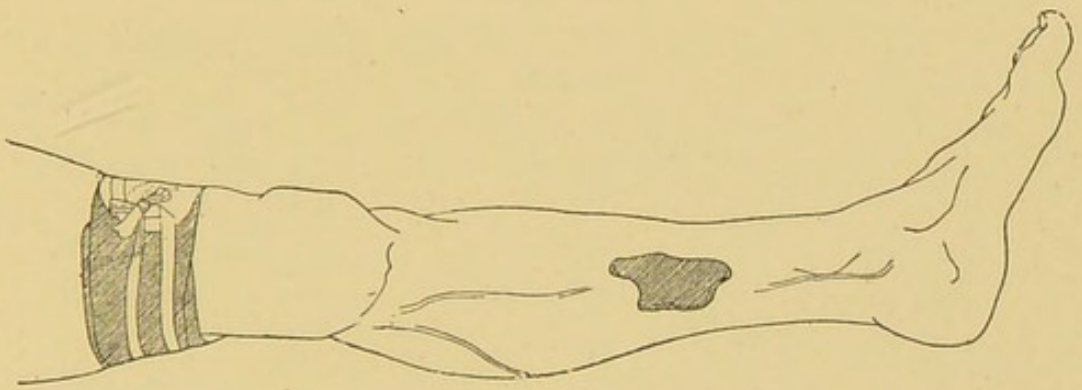


FIG. 127. Method of inducing passive congestion for the cicatrization of an ulcer of the leg.

septic inflammations have been known to become simple. It would seem that there is a great future for this method of treatment, and it is one which should become a part of the armamentarium of every practitioner; but a warning must be given: at the commencement of the treatment great care and attention are necessary, in order to adjust and change the bandage, and to see that all is progressing favourably. By this method patients can be saved from incisions, and the length of their illnesses shortened; and if incisions should be required later, mere punctures will suffice. For successful treatment by this method the three following conditions must be ensured:—(1) *the pain must cease;* (2) *the arterial pulse*

must not be affected; (3) *the temperature of the limb must not fall.*

The limb turns blue and swells, shortly after the application of the bandage; the affected part becomes very oedematous, the granulations look blue and the discharge increases in quantity, becoming sanguineous. To those unfamiliar with the appearance, it may seem that the treatment is doing harm. The pain should cease in about twenty minutes if the proper tightness of the bandage has been obtained. The temperature and pulse-rate fall, the patient feels better, the disinclination for food disappears, and nourishment may be taken. Often the patient will fall into a natural sleep after having spent

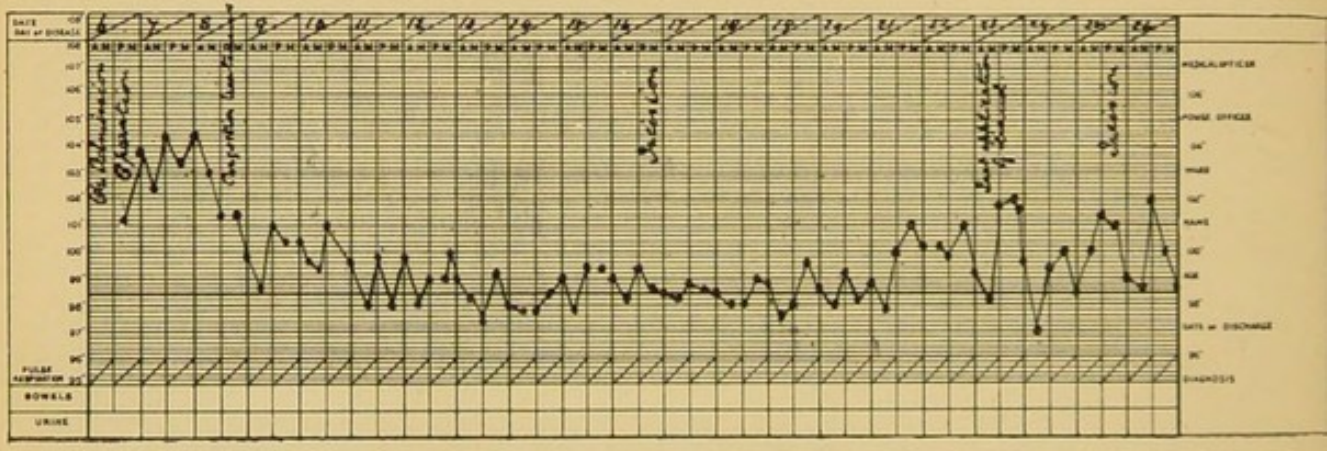


FIG. 128. Chart of a case treated by passive congestion.

many nights sleepless from pain. Thus, in some cases, we have seen the greatest blessings conferred upon the local and general conditions of the patient. But it is only fair to point out that this congestive method only aids the patient's tissues to resist the infection: it cannot do more. And if the extent or virulence of the infection is too great for the tissues, as it may be in an old patient or a diabetic, it will certainly not give good results. It should be combined with an incision or incisions. Besides being of great value in acute cases passive congestion assists the healing of chronic ulcers. With its aid, we have healed in three or four weeks a chronic ulcer on a woman's leg, which had been present for nine years!

In cases where it is doubtful where to make an incision, and in those where an incision has failed to give relief, Bier's method will recommend itself to the practitioner; not the least of all because it will fill up the trying period for the patient and friends when 'nothing is done'; whilst, at the same time, it is doing good. The authors would recommend it as an adjuvant rather than a substitute for incision.

To illustrate the benefits of this method of treatment, we have selected the chart of a case which illustrates what we wish, although the treatment was not entirely successful. The patient was an old lady of sixty, who had a septic hand. On the eighth day of her illness, when her temperature was 101·5°, the bandage was applied round her upper arm. The temperature went down to 98·6°; the patient slept, which she had not done for nights, and took nourishment better. The bandage was then removed for a few hours, with the result that the temperature rose immediately to 101°. Her temperature was maintained between 98° and 100°, during which period she improved in her general condition and developed an appetite, asking for special articles of diet! On the eighth day after the application of the bandage it was necessary to make an incision in the palm, and on the seventeenth it was needful to make more. We have reproduced her chart to illustrate how the general condition of a patient can be improved even when the local trouble is too great to react to this form of treatment. The inflammation extended up the lymphatics of the arm as far as the bandage, which had in consequence to be discontinued. Later, it was ascertained that the septic process involved the wrist and carpal joints, the tendon sheaths and the cellular tissue of the palm! The convalescence was slow, but the patient retained her hand!

Multiple tubercular nodules, fibromata, lipomata, naevi, &c., are treated in the same way as when in other situations (see pp. 41, 46, 49, 78).

TUBERCULOUS DACTYLITIS

Tuberculous dactylitis is frequently met with in children, especially in a hospital out-patient department. It is much more common than syphilitic dactylitis, for which it is occasionally mistaken. It commences in the diploe of the metacarpals, metatarsals and phalanges. At first, the bone is merely slightly expanded and enlarged; the disease may be arrested at this point or it may go on to caseation. In the latter case, the caseating material within the diploe first hardens and then softens, forming a cold abscess in connection with the bone; sometimes this abscess becomes infected and suppurates. There are four stages of the disease which may be presented for treatment; the *first* is that of the incidence or onset of the disease, when the treatment is for the most part general, though the local application of mercurial ointment seems efficacious at times. The *second* is the stage of cold abscess; when the part should be incised under aseptic precautions, all granulations and exposed bone thoroughly curetted, and the skin sewn up in order to obtain primary union. Should the abscess re-form, the process must be repeated. In the *third* stage a sinus is present; this must be opened up in order to allow of the thorough removal of the dead bone, &c., the presence of which has prevented the healing of the sinus; all diseased structures are curetted and the wound left open. Some surgeons, in these cases, use a powder or an emulsion containing a preparation of iodoform; but it is extremely doubtful if this does any good. In the *fourth* stage, when the part has become infected, it must be

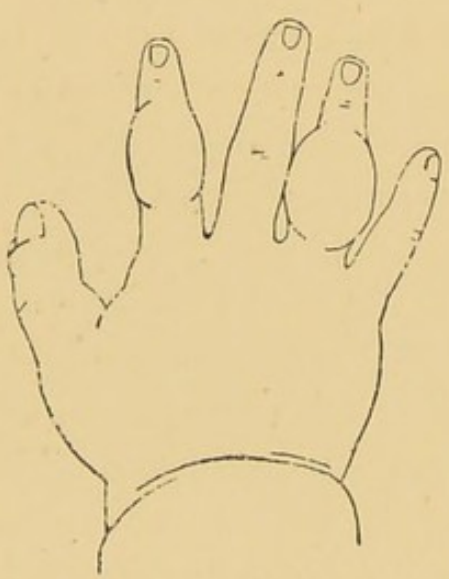


Fig. 129. Hand with tuberculous dactylitis of first and ring finger.

incised freely; but the diseased parts should not be curetted too thoroughly or vigorously, for fear of opening up new channels for the spread of the infection; neither should the external wound be completely closed. Should a sinus form, it will often be necessary to attack the disease again; this should not be attempted until the acute signs and symptoms have passed away, and when the curetting can be done thoroughly. General treatment must be carried on throughout these trying cases; and the parents must always be warned that the growth of the affected part will be interfered with, but to what degree it is impossible to state so early. Tuberculous dactylitis is much more frequent than syphilitic, and usually affects the hands. When the feet are affected, the treatment is similar, with the addition that the child is kept off its legs.

CHAPTER XII

THE ARM

AMPUTATION OF THE DIGITS

An injury is the usual reason for which it is found necessary to amputate the fingers or portions of them. It is a cardinal rule of surgery never to remove more of the hand than is absolutely necessary; a small portion of a phalanx should be retained whenever possible, as a much more serviceable hand will result than if the whole phalanx had been removed. When it is doubtful if the finger should be amputated or not, the doubt should be given to the patient, provided that he is healthy, and the part retained; fingers torn and crushed have a wonderful recuperative power. In many cases, owing to the nature of the injury, it will not be possible to perform a formal textbook operation; and the surgeon must devise methods of his own, obtaining flaps wherever there is sound tissue. The usual tendency in all amputations is to make the flaps too short; it is far better to err in the other direction. When amputating the fingers, a general anaesthetic should be used. Many of the cases requiring amputation are caused by machinery accidents, and the hands of these patients are generally exceedingly dirty; some of the grease can be removed with turpentine before the hand is washed. In all, the hand should be thoroughly washed with soap and water, care being taken that all dirt is removed from the nails; the hand is essentially a situation where the nail-brush can be used with advantage. Finally, the part should be rubbed with methylated spirit or turpentine. The following is a short description of the more common textbook amputations done on the fingers:—

AMPUTATION OF THE TERMINAL PHALANX

The operator holds the tip of the affected finger, the palm being directed downwards, between his finger and thumb, the assistant holding the other fingers as far away as possible; the finger is flexed to its fullest extent at the distal phalangeal joint. With a narrow-bladed knife a transverse incision is made down to the bone, across the dorsal aspect, an eighth of an inch from the dorsal aspect of the bent finger, and the interphalangeal joint opened. The lateral ligaments are divided and the joint freed. The terminal phalanx is more fully flexed and the knife carefully passed through the joint, turned on the flat, and then carried close and parallel to the bone towards the tip of the finger. A flap should always be cut a little longer than the breadth of the surface to be covered. When the flap is of sufficient length, the edge of the knife is turned towards the palmar surface and the flap defined by dividing the tissues transversely. By this means a rectangular palmar flap is obtained. Very little haemorrhage occurs; the digital arteries on each side may require ligaturing. The palmar flap is brought over on to the dorsum and accurately joined to the cut dorsal edge by interrupted sutures. The finger is then dressed with gauze and wool, and an anterior splint incorporated with the dressings. The stitches are removed at the end of a week, the splint discarded, and the wound re-dressed with gauze. In septic cases, such as when the amputation has been done for a whitlow, drainage must be provided, and the splint retained until the wound has healed.

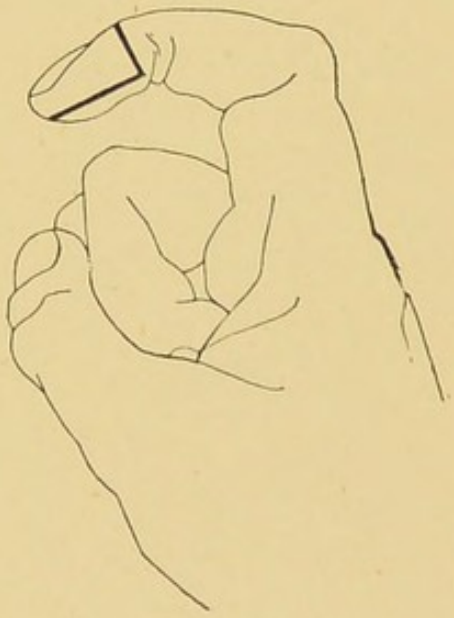


Fig. 130. Lateral view of incisions for amputation of terminal phalanx of first finger.

Bier's passive congestive treatment is most useful in these septic cases (see page 220).

AMPUTATION THROUGH THE SECOND PHALANX

A transverse incision is made down to the bone on the dorsal aspect of the finger, just below the point where it is to be divided. The tissues are freed from the bone, which

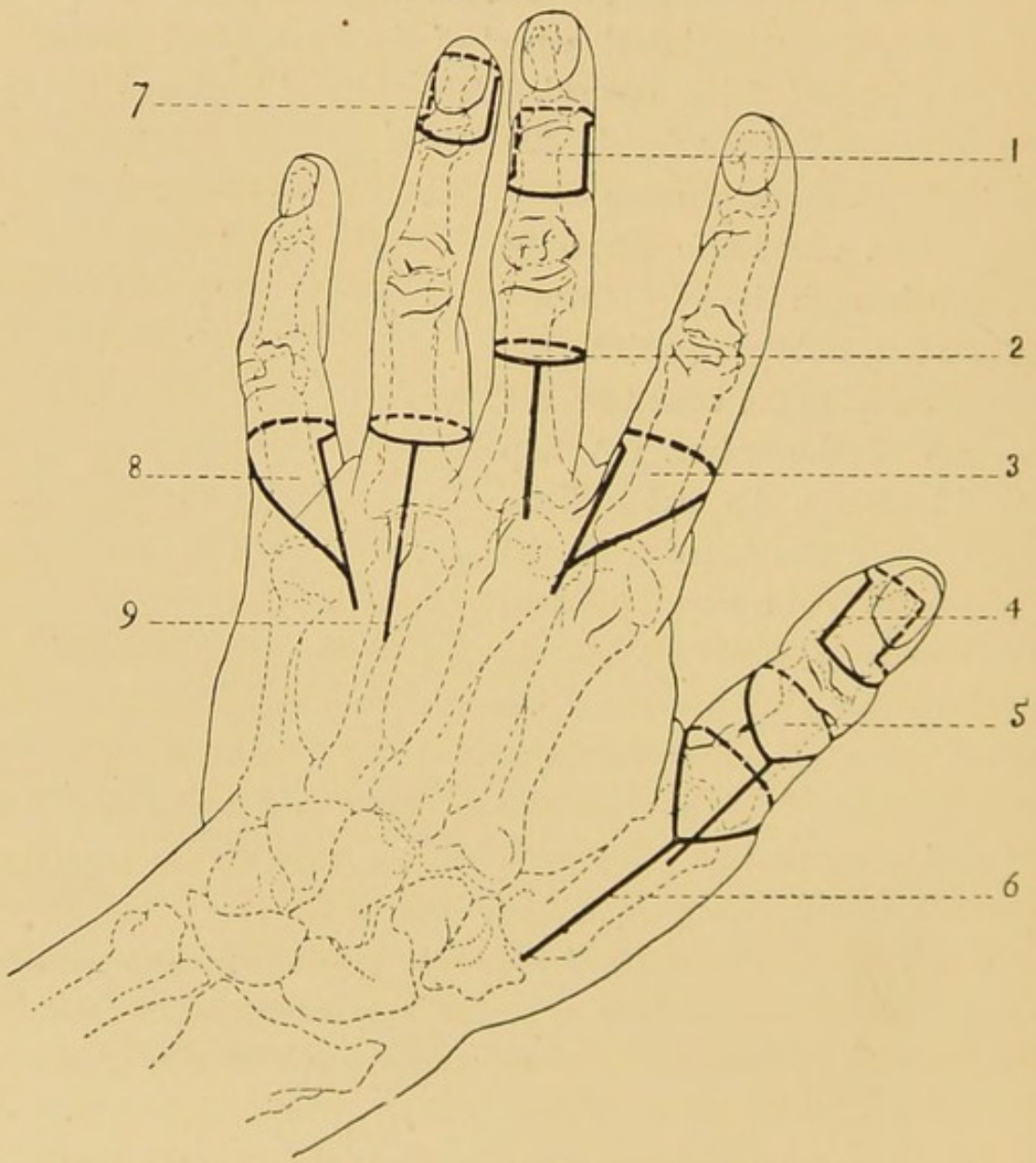


Fig. 131. Dorsal view of hand. Black lines indicate incisions for amputation flaps: 1, through second phalanx of middle finger; 2, through proximal phalanx of middle finger; 3, through metacarpo-phalangeal joint of first finger; 4, through terminal phalanx of thumb; 5, through proximal phalanx of thumb; 6, through metacarpo-carpal joint of thumb; 7, through distal interphalangeal joint of ring finger; 8, through metacarpo-phalangeal joint of little finger; 9, amputation of ring finger with removal of head of metacarpal bone.

is then cut through by means of bone forceps. The distal portion of the bone is lifted up and the knife passed beneath it, along its palmar surface, cutting towards the tip of the fingers as in the previous operation. When a sufficiently long flap has been defined, the knife is made to cut through the skin transversely. In this manner a rectangular palmar flap is obtained. If the remaining part of the phalanx has no muscles attached to it, it will be flail and useless. To prevent this, the tendons are secured with artery forceps, *before* being divided, and cut long; they are then sutured together over the stump of the bone or to their tendon sheaths; particular care should be given to the flexor tendons (Fig. 132). This will ensure the patient having some control over the stump. The haemorrhage is stopped and the flaps stitched in position. The dressing is the same as that in amputation of the terminal phalanx.

AMPUTATION AT THE METACARPO-PHALANGEAL JOINT

In performing this amputation the question will have to be decided as to whether or not the head of the metacarpal bone should be removed. It is better, if possible, not to remove it, as its presence ensures a stronger and more serviceable hand. The only drawback to retaining it is that the hand is more unsightly than if it had been removed. The finger is held by the end and the others flexed at the metacarpo-phalangeal joint and held on one side by an assistant. The incision is commenced at the middle of the dorsum above the knuckle, is continued along the centre of the dorsum over the knuckle, then curves round between the affected finger and the next one, appearing on the palmar surface, which it crosses transversely in the crease at the root of the finger, and comes round on the other side of the finger to join the original incision on the dorsum; thus making a racquet-shaped incision. At first, the knife should cut through skin and fat alone, marking out the incision. The

second time the knife traverses the incision, it cuts through all structures down to bone, the tendons should be put upon the stretch by twisting the finger against the knife. The flap is dissected off the bone, the ligaments round the joint are divided, the metacarpo-phalangeal joint opened from the palmar surface, and the finger removed. The digital arteries will require ligature. The flaps should be united, the wound dressed, and the wrist fixed by means of an anterior splint. The stitches are removed and the splint discarded at the end of a week (Fig. 131, 3.)

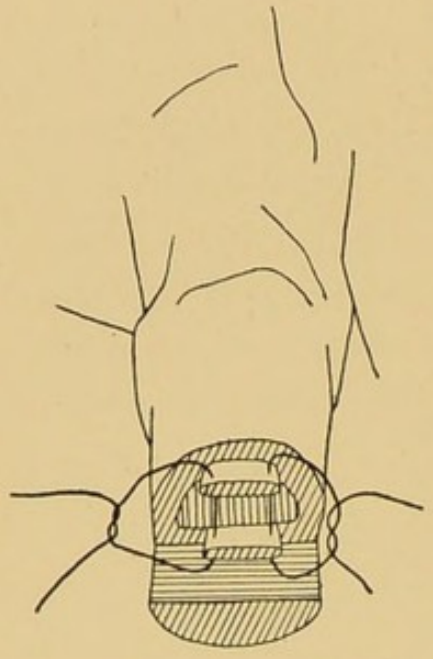


Fig. 132. Diagram of method of suturing tendons over stump of bone in amputation of finger.

When it is necessary to remove the head of the metacarpal bone, as in a lady's hand, the incision should be begun higher up on the dorsum, the flaps dissected up a little further, the neck of the metacarpal bone divided obliquely with bone forceps and the head removed. The amputation at the metacarpo-phalangeal joint of the index and little fingers can be performed in almost the same manner; only the handle of the racquet incision on the metacarpal bone, instead of being in the middle line on the dorsum, should be made towards the inner side of the finger (Fig. 131, 3. 8). By this method the scar will be less prominent and less liable to injury.

AMPUTATION WITH A PORTION OF A METACARPAL BONE

Sometimes it is necessary to remove a portion of a metacarpal bone as well as the finger. The future utility of the hand will depend to a large extent on the amount of bone removed; the greater the portion removed, the less strong and serviceable will be the hand. If possible the base of the

metacarpal bone should always be retained. The operation is similar to an amputation at the metacarpo-phalangeal joint, except that the vertical incision on the dorsum is begun as far up as is necessary to clear and divide the bone. The bone is freed from the surrounding tissues, cut through with forceps at the point desired, the flaps united and the wound dressed as in other amputations.

AMPUTATIONS OF THE THUMB

In the case of the thumb, it is especially important to retain as much of the bone as is practicable; and even if it is possible to keep but a very small portion, this should always be done, as its presence makes the hand very much more useful. A formal operation should seldom be performed on the phalanges of the thumb, but one devised which will retain as much of the bone as possible. The amputation of the terminal phalanx, and that at the metacarpo-phalangeal joint, can be done in a similar manner to these amputations on the fingers.

REMOVAL OF THE THUMB WITH METACARPAL BONE

A racquet-shaped incision is made commencing in the anatomical snuff-box, over, not above, the joint between the trapezium and the first metacarpal bone; thence running along the dorsum to the head of the metacarpal bone, where it diverges, sweeping round the thumb across the web. The knife is made to cut through the tissues down to the bone throughout the whole length of the incision at the second sweep. The tissues are then dissected away from the bone and, in doing this, care must be taken to keep the knife close to the bone, from which the muscles are cut away. With the left hand the thumb is twisted so that the soft parts are made tense and brought against the edge of the knife. The ligaments joining the trapezium and metacarpal bone are cut through and the thumb and metacarpal bone removed. The radial artery should not be injured; a few vessels, however,

will require ligature. The flaps are accurately united by interrupted sutures, and the wound dressed as for other amputations.

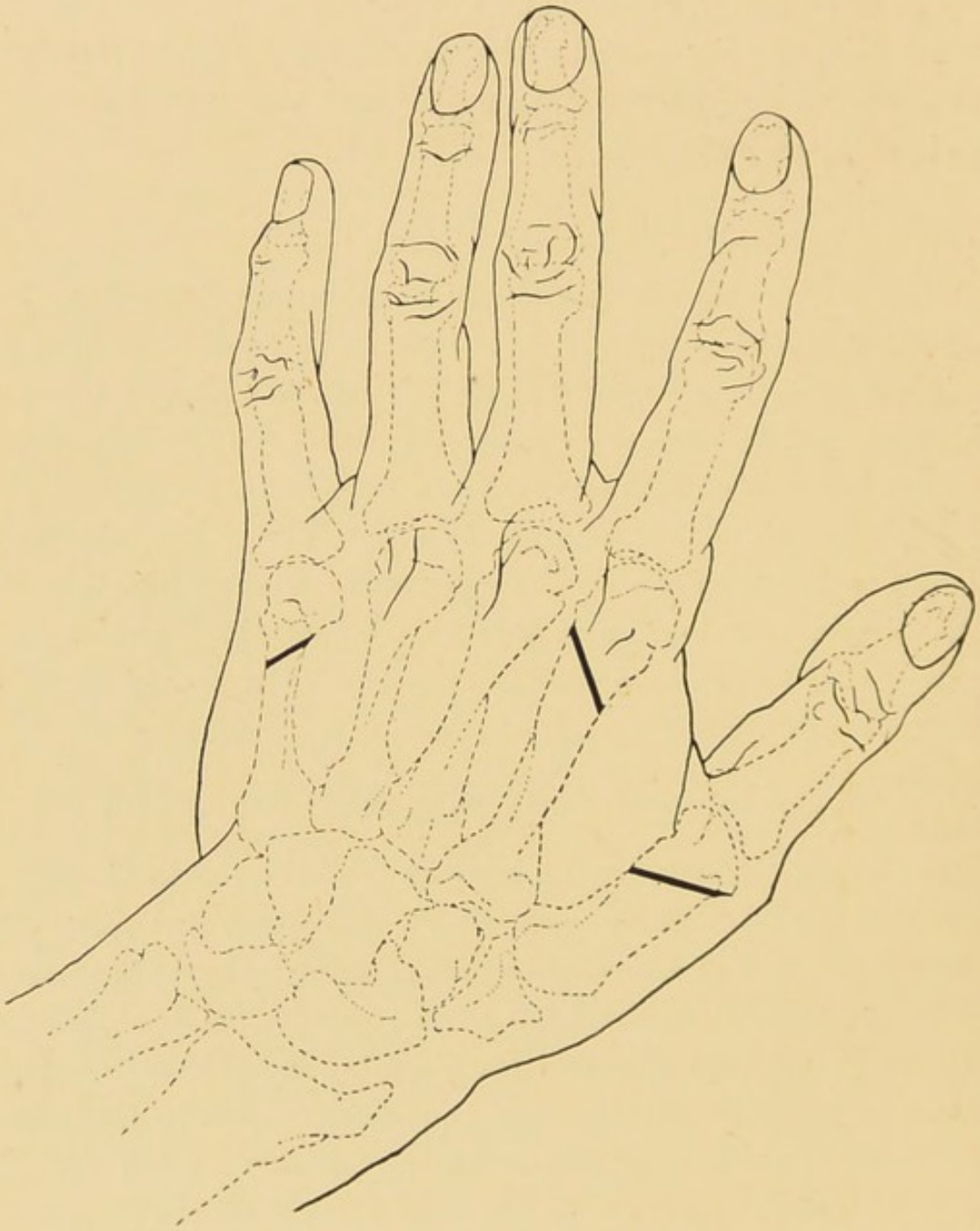


Fig. 133. Dorsal aspect of hand, showing methods of dividing metacarpal bones for amputations of thumb, index, and little finger.

It must be remembered that usually some modification of any one of these operations will be necessary. Often it will be found impossible to obtain flaps from the desired situation owing to the nature of the injury, in which case the operator devises a modification of the operation to meet the exigencies

of the case. The practitioner must not forget that when operating on the hand, it must happen that a joint or some tendon sheaths are opened; therefore special care must be taken to avoid the introduction of sepsis, all instruments being boiled, and the hands of both the patient and the surgeon made surgically clean.

METHOD OF DIVIDING THE METACARPAL BONES IN AMPUTATIONS

The metacarpal bones of the little finger, index finger, and thumb are divided in a different manner to those of the second and third fingers.

Little Finger. Fig. 133. The bone is divided obliquely so that the longest part is next to the third finger.

Second and Third Fingers. Fig. 134. The bones are divided obliquely so that the longest part is to the palmar aspect.

Index Finger. Fig. 133. The bone is divided obliquely so that the longest side is to the second finger.

The Thumb. Fig. 133. The metacarpal bone is divided so that the longest part is on the dorsum; that is to say, in the opposite direction to the second and third fingers.

By these devices, it is thought that any obtrusive deformity and inability to bear pressure are avoided.

Fig. 134. Lateral view of metacarpal, showing the direction of division when amputating, with removal of the head of the metacarpal of the second and third fingers.

METHOD OF DIVIDING THE METATARSAL BONES IN AMPUTATIONS

The method of dividing the metatarsal bones is much simpler than that for the metacarpals, as all are divided in a similar way. The obliquity is from above downwards and behind forwards, so that the longest side of the metatarsal is toward the sole. (See page 266, Fig. 167.)

GANGLION

A ganglion is either unilocular or multilocular. The unilocular cysts generally arise from a tendon sheath and are usually found about the wrist. The multilocular cysts are generally in connection with joints, especially the wrist-joint; they may extend widely and require for their removal difficult and prolonged dissection, and the practitioner would be well advised not to attempt to deal with them. Simple unilocular cysts can be treated by rupturing the sac by means of forcible pressure: often, however, owing to the thickness of the wall this method fails; and, even if successful, recurrence is very liable to take place. Recourse

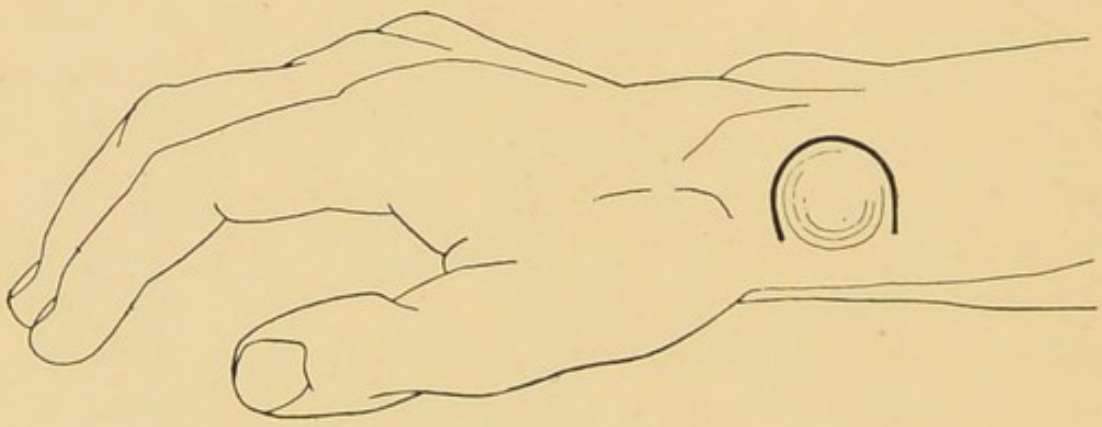


Fig. 135. Wrist, indicating position of incision for removal of ganglion.

can then be had to puncturing the sac, and this can be done under eucaine. When the part has been cleansed and rendered anaesthetic, a small puncture is made with a sharp tenotome at the side of the ganglion in the skin, which is drawn over the swelling so as to make the track oblique afterwards; the point of the knife is pushed through to the opposite side of the cyst wall, which it penetrates, and then a horizontal cut is made dividing the ganglion, care being taken not to injure the skin. It is no use merely to puncture the cyst, as, if this is done alone, recurrence is sure to take place. After the contents of the cyst have been squeezed out, or into the cellular tissue, the wound is dressed with

gauze and collodion, and a firm pad and bandage applied in order to prevent the sac refilling. If possible, an anterior splint should be worn. The dressings and splint are discarded in fourteen days. In performing this small operation, attention must be paid to the anatomy and position of surrounding structures, and it will sometimes be found that it is unwise to do a subcutaneous operation owing to the close proximity of important vessels or nerves. Tapping and injecting pure carbolic is not advised, owing to the communication with a joint or tendon sheath. In this case and in instances of recurrence after the subcutaneous operation, the ganglion must be excised. A general anaesthetic having been given and the skin thoroughly cleansed, a curved incision is made over the tumour, a flap turned back, and the ganglion exposed. The wall of the cyst is carefully defined, and by a few touches of the knife it can be removed entirely, but in doing this the tendon sheath or joint is of necessity opened. The sheath or joint is left open whilst the wound is closed with interrupted stitches and a dressing applied. In performing this operation particular attention must be paid to cleanliness, as suppuration is very serious if the joint or tendon sheath become infected. After five or six days the dressing can be removed, the stitches extracted, and gentle active and passive movements commenced, in order to prevent any adhesions forming between the tendon and its sheath.

FOREIGN BODIES IN THE LIMBS

The foreign bodies most commonly found lodged in the limbs are needles, small pieces of metal, glass, wood, &c. As a rule, needles are the most difficult to remove, partly owing to their shape, and partly because after a time they may penetrate further into the tissues owing to muscular movement; it is extraordinary the ease with which a large needle will hide itself in a muscle. These foreign bodies are generally driven into the hands or feet. The point of entrance should always

be carefully looked for; then by gentle palpation over this spot it may often be detected, or pain may be elicited by pressure

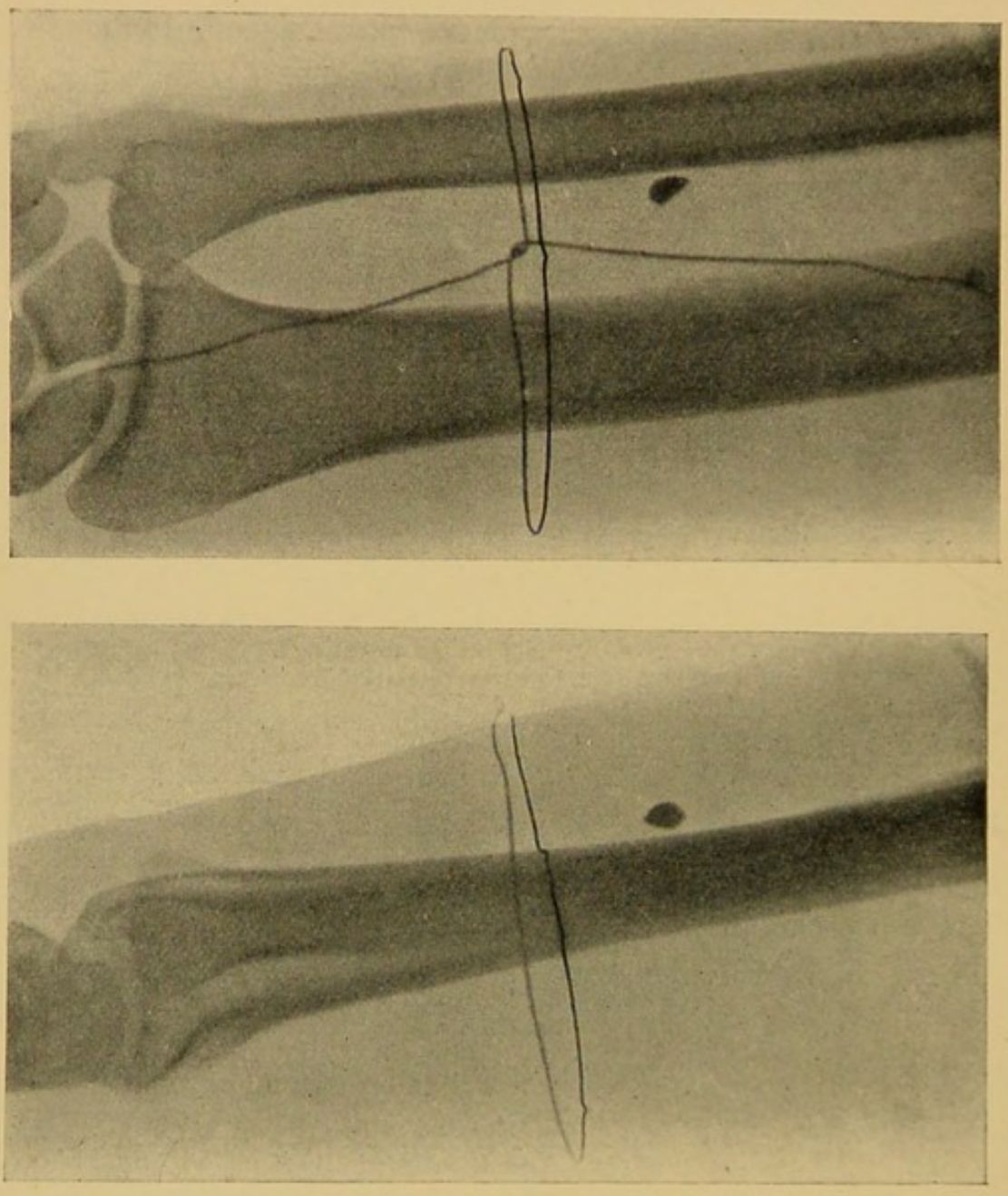


Fig. 136. Skiagraph of front and side views of foreign body in arm. A piece of wire has been placed round the arm and crossed over the scar where the foreign body entered.

over a definite localized area. If the body can be distinctly felt a simple incision will often bring it to light and allow of its removal. In other cases it is advisable to raise a skin flap in order to explore thoroughly the region where the body is. For needles, fragments of metal, &c., the X-rays are invaluable and should be used whenever available; a

screen examination by the surgeon is of very much more value than a skiagraph, but should a skiagraph be taken two views should always be obtained taken from different angles. The points to be observed in removing a foreign body, such as a needle, are:—

1. A too large rather than a too small incision should be made, if possible at a right angle to the long axis of the needle.

2. Control all haemorrhage, if necessary by a tourniquet.

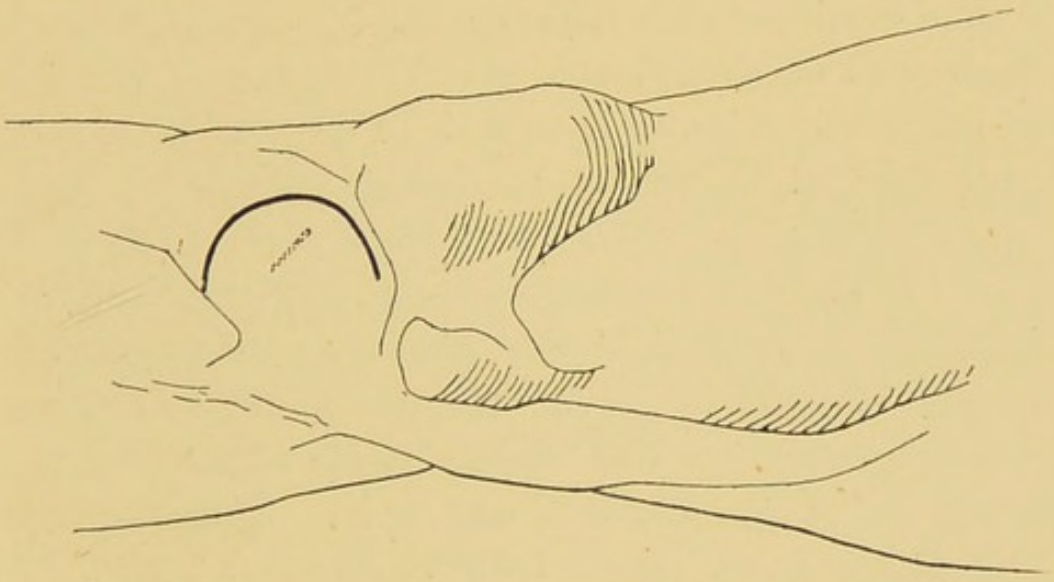


Fig. 137. Inner side of knee. Black curved line indicates incision for raising skin-flap to remove a foreign body.

3. After the first incision use the knife very sparingly, a probe is a more useful instrument.

4. In the hand and foot always remember the situation of the main arteries and nerves, and avoid cutting them.

5. Be gentle when sponging, and sparing with the use of retractors.

These small operations are frequently great tests of patience and skill.

Many of the superficial bodies can be removed under a local anaesthetic, such as eucaine, instead of a general anaesthetic; an additional advantage being that the patient can often help the surgeon by telling him when the foreign body is touched.

FOREIGN BODIES UNDER THE NAILS

Foreign bodies, such as splinters of wood, occasionally get driven under the nails. They are very likely to set up serious septic trouble owing to the difficulty presented to the escape of any discharge. Generally when first seen ineffectual attempts have already been made to remove the splinter, which in consequence has been driven further in and often the end outside broken off. The nail should be softened by laying on it for a short time a small piece of wool soaked in liquor potassae, and then should be carefully scraped through with a sharp knife over the splinter. When the body has been exposed it should be grasped with a fine-pointed pair of forceps and extracted; dissecting forceps or sinus forceps are not as a rule strong enough. After the removal of the body, the finger should be soaked for at least ten minutes in a solution of perchloride of mercury (1 in 1,000), and a hot boracic dressing applied for twenty-four hours. Attempts at extraction can be made in the above manner without any anaesthetic; but if they fail, gas should be given and the manœuvre repeated; or it is sometimes possible, by cutting a V-shaped piece out of the free edge of the nail, to grasp the end of the body with forceps and withdraw it. As a last resort, the nail can be split down with scissors and the body removed.

FIG. 138. Diagram of foreign body (splinter) under nail. V-shaped cut in edge of nail for its removal.

VENESECTION

In the past, venesection was resorted to on every possible occasion; later, a reaction set in; and in the present day it is very seldom performed. It can, however, be employed

with benefit much more frequently than it is. For preference, the patient should be sitting up in bed; a pad and bandage should be firmly bound round the arm above the elbow, the hand having been allowed to hang down for a few minutes before it is applied; this is of especial importance in stout patients in whom the veins are not prominent. The knife is sterilized and the skin over the front of the elbow thoroughly cleansed, when the patient is made to grasp some object, such as a bandage, in his hand, to make the veins stand out. Usually one of the veins at the bend of the elbow is selected, but the internal saphena in the leg does as well. At the elbow, the choice lies between

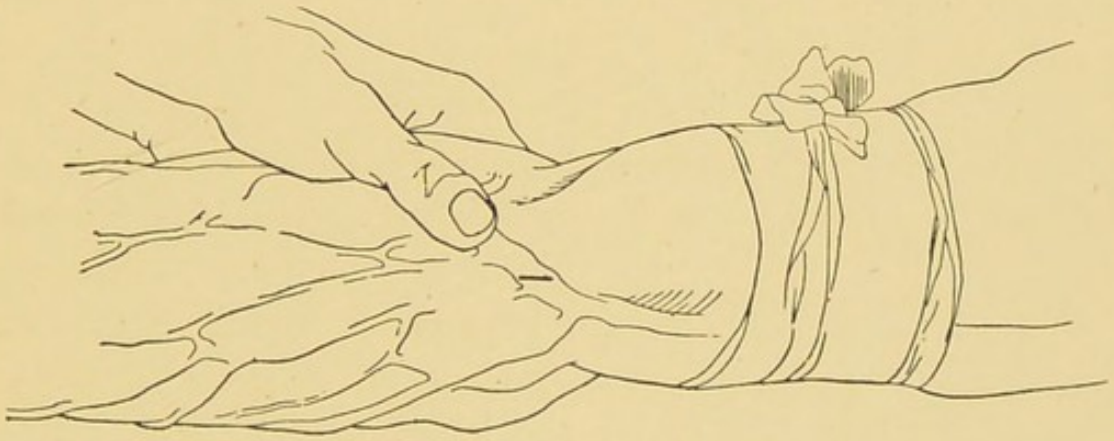


Fig. 139. Arm showing oblique incision in median basilic vein used in phlebotomy.

the median basilic and the median cephalic; the former is, however, the better vein to open, as it is larger and less movable than the median cephalic. Against this can be laid the fact that the brachial artery lies beneath it, which might be wounded by a careless operator, and crossing it are a few branches of the internal cutaneous nerve, which might be cut; but the advantages outweigh the disadvantages. The arm is grasped by the operator's left hand, and the thumb compresses the vein just distal to the point where it is to be opened. A small incision is then made obliquely across the vein, care being taken not to cut right through it. A bowl should be in readiness under the elbow to catch the blood, the arm is turned round towards

the bowl, and the thumb compressing the vein distally is relaxed; the blood then flows out. If sufficient blood cannot be obtained the limb must be massaged from below upwards. When enough blood has been removed, generally half a pint to a pint, a pad is placed over the vein, and the bandage above the elbow removed. The wound is then dressed with gauze and bandaged. When the vein is not prominent, it is often better to make a small cut in the skin, and dissect the vein out before incising it. At the end of the operation, the bandage round the upper arm is removed and the skin can be united, if needful, with a stitch; the wound is dressed with a pad and bandage.

WEBBED FINGERS

Webbed fingers are a congenital defect, and are of different degrees of severity. The practitioner should seek further advice before operating on cases where there is very little web between the fingers, or where the bones of the two fingers are united; but he can deal with cases where the web between the fingers is well defined. If the webbed finger occurs in connection with a supernumerary digit, amputation is the best treatment. If two otherwise normal fingers are webbed, different treatment is required. The most obvious operation is to split the web, and separate the fingers; this simple proceeding is, however, seldom successful, because the web grows up again from the bottom of the cleft. The recurrence of the condition can easily be prevented by a slight modification of this simple operation.

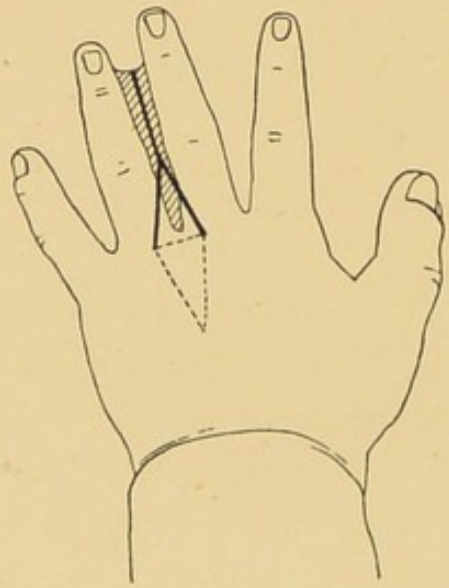


FIG. 140. Black lines indicate incisions of plastic operation for webbed fingers. The dotted line shows the flap reflected.

An anaesthetic is administered and the hand thoroughly cleansed. The web is then divided in the middle line towards the bottom of the cleft. From the end of this incision, on both palmar and dorsal aspects, two incisions are made, forming a Λ, the apex of which points towards the free edge of the cleft. Each little triangular flap of skin is then dissected up and the division of any soft parts remaining completed. The edges of the wound along each finger are united until close to the bottom of the cleft. This done, the triangular skin-flaps are sutured across the base of the cleft, side by side (Fig. 141). The wound is then dressed with gauze; there is no need to place a bulky pad between the fingers; it is uncomfortable and generally painful. The dressings should be changed at the end of two or three days if they get uncomfortable, otherwise they should not be touched for a week. It is as well not to remove the stitches all at once; a few can be removed in a week after the operation; two days later, a few more, and so on. Movements of the fingers are then commenced, the child being taught to move them separately, also to abduct and adduct them. The acquisition of these movements is essential to the success of the operation. If the part heals by first intention, the two flaps, crossing the base of the cleft, prevent the re-growth of the web. It is as well to perform this operation early, but never before the child is at least one year old, as previous to that date the hands are very small and are difficult to dress, the infant is too young to be taught to move them, &c. If more than two adjacent fingers are webbed, at first only one cleft should be operated on; the other being dealt with at a later date, when the first wound has healed soundly.

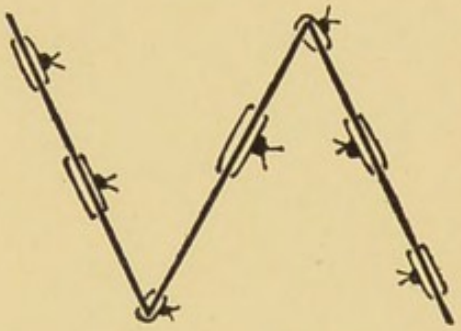


Fig. 141. Triangular flaps sutured across base of cleft in plastic operation for webbed fingers.

Catgut stitches can be used for the skin with great advantage, because they need not be removed.

In the operation described, the flaps are easily brought across the base of the cleft; but frequently it is not possible to close the wounds on the sides of the fingers, which, in consequence, granulate. So long as the flaps heal across the bottom of the cleft, the condition will not recur.

SUPERNUMERARY DIGITS

Wherever possible supernumerary digits should be treated by removal. It is sometimes doubtful which digit should be amputated, and a skiagraph will be useful in helping to form an opinion. For instance, there may be two sets of phalanges to one metacarpal bone, when it may be difficult to determine which set of phalanges to remove. If the supernumerary digit is merely attached by skin and fibrous tissue, it can easily be cut off and the flaps united. If the bone of the proximal phalanx articulates with the metacarpal, not only must the phalanx be amputated, but the articular surface of the metacarpal must be removed, otherwise it might grow and form an unsightly boss. If an extra metacarpal bone is present this must be removed together with the phalanx attached to it.

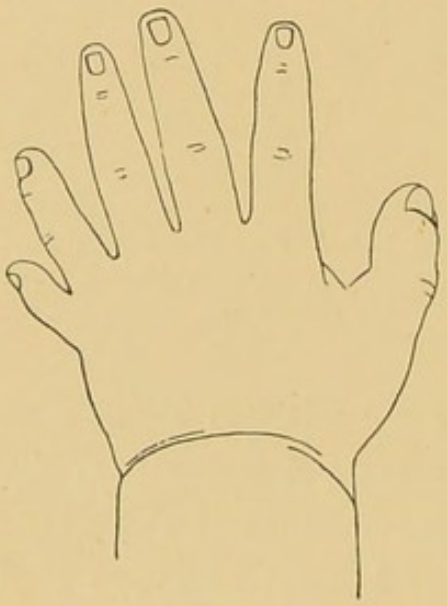


Fig. 142. Hand with supernumerary digit.

REMOVING RINGS FROM THE FINGERS

In some cases, owing to a lesion of the finger, a ring upon it becomes too tight and forms a constricting band which impedes the return of the venous blood, leading to oedema of the tissues distal to it. Finally, the patient seeks advice with a ring deeply embedded in the tissues of a

swollen finger. It must be removed at the earliest opportunity. A curved director should be placed obliquely under

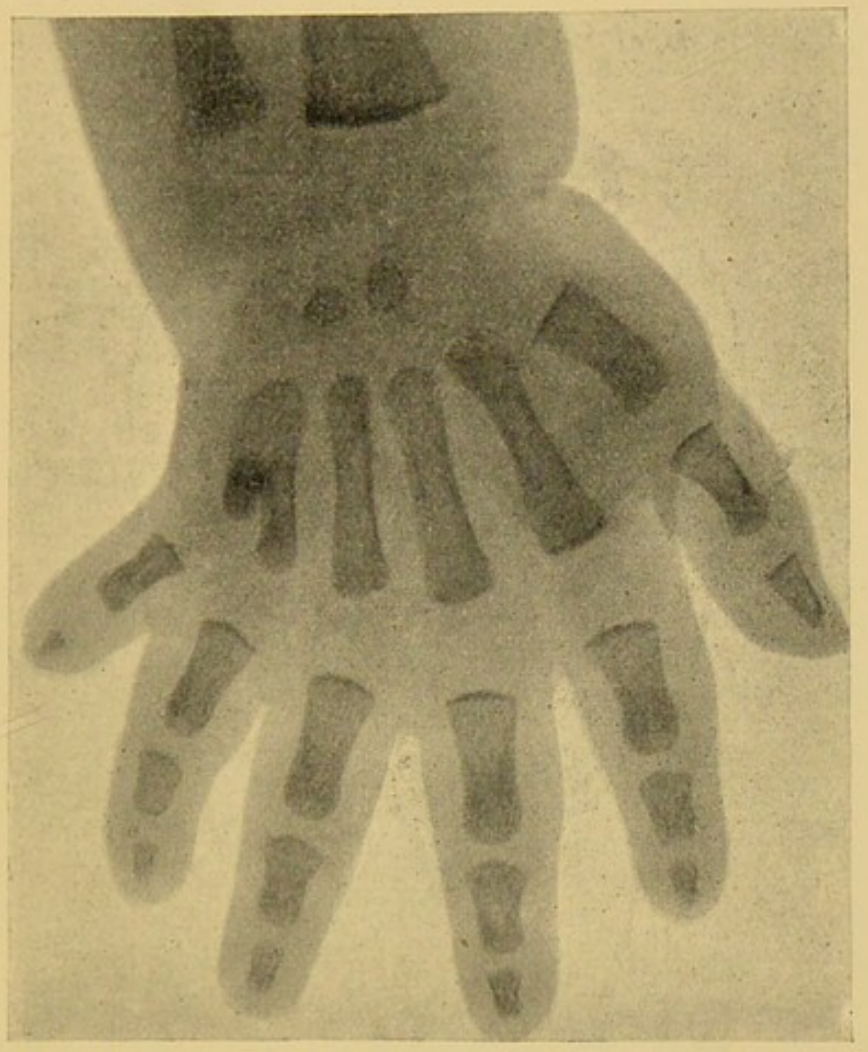


Fig. 143. Skiagraph of hand with supernumerary digit.

the ring, and one end of a Gigli's saw passed along it. The handles are attached to the ends of the saw and the ring sawn through without removing the director. The two ends can then be pulled apart with hooks and the ring removed. This method should always be employed, for it is, as a rule, painless, and the ring can easily be mended. When, however, much difficulty is experienced or pain caused in placing the director under the

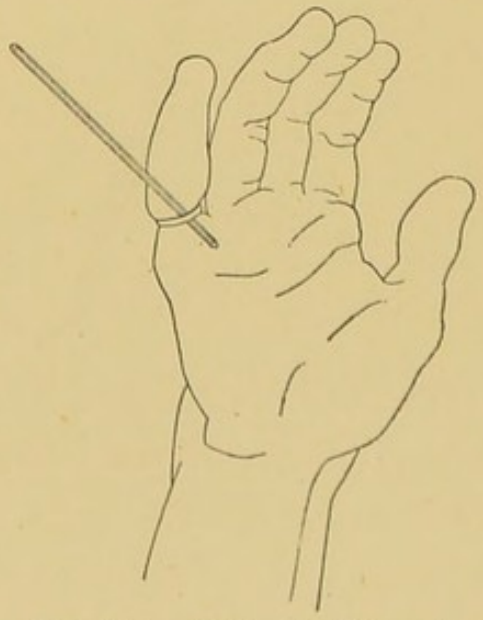


Fig. 144. Method of inserting director to remove ring from swollen finger.

ring, a general anaesthetic should be given. Formerly, attempts were made to cut the ring with bone forceps, but by this means, not only is the ring mutilated, but the

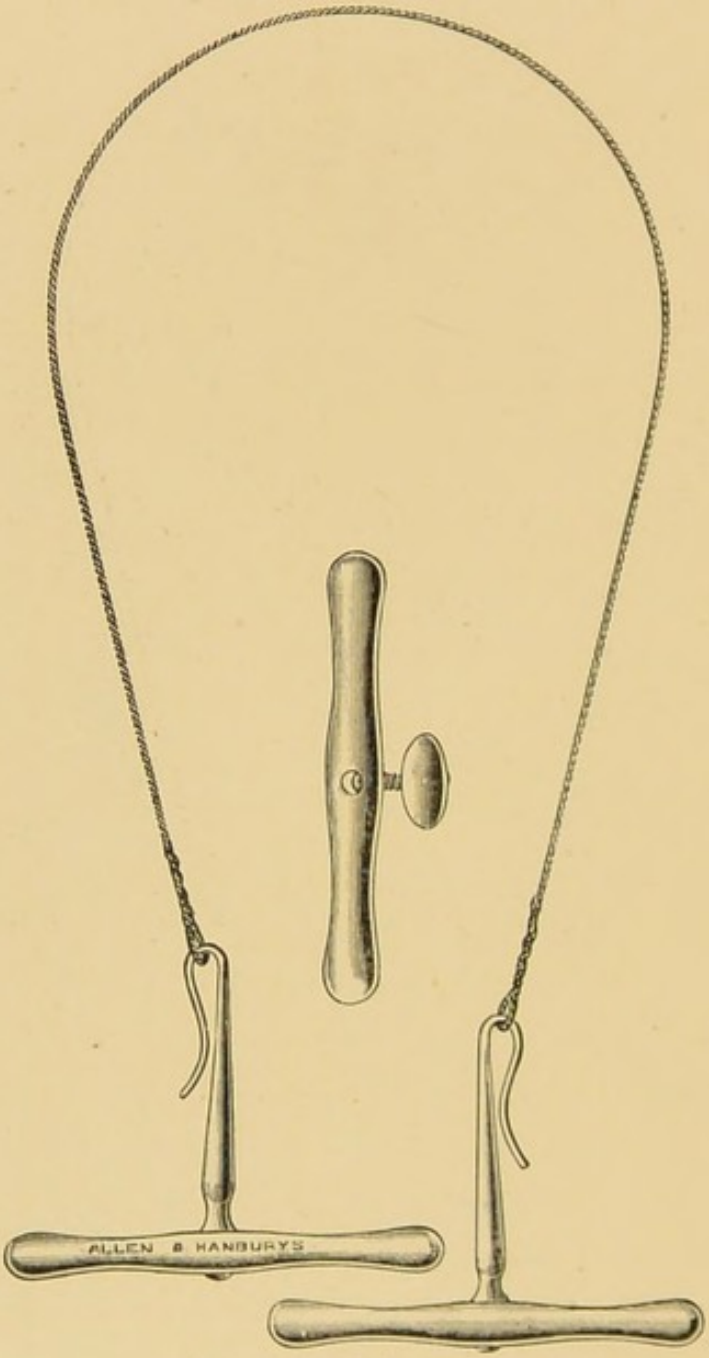


Fig. 145. Wire saw.

patient is caused considerable pain. Should the part be septic, warm boracic baths form an essential part of the after-treatment. A file may be used to cut the ring obliquely, but it is apt to inflict damage on structures other than the ring.

CHAPTER XIII

THE LEG

HALLUX VALGUS

In cases where the deformity is slight, much can be done by wearing correctly-shaped boots, splints, &c.; but if the deformity is severe, by far the most satisfactory method of

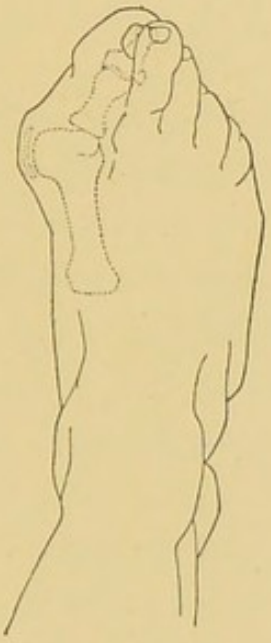


Fig. 146. Hallux valgus, showing deformities of bones.

Fig. 147. Foot showing incision for raising flap in the operation for hallux valgus.

treatment is the operative. When the anaesthetic has been administered and the skin cleansed, an incision is made along the inner border of the dorsal surface of the first toe, over the enlarged head of the metatarsal bone. This incision should be curved, the concavity being directed downwards, but it must not extend on to the sole of the foot. Only the skin and subcutaneous tissue are divided, and a flap

consisting of these structures is turned down, in doing this the bursa over the head of the first metatarsal bone will be opened or come into view, and should be dissected out. The head of the metatarsal bone being thus exposed, the enlarged inner surface is removed with a chisel and hammer, all sharp edges rounded off and the toe forcibly abducted; in order to bring it into the correct position, it may be necessary to divide the external lateral ligament, which can be done with a sharp tenotome passed through the joint. All bleeding points are ligatured and the skin edges united accurately by interrupted catgut stitches. The wound is dressed with cyanide gauze and wool, and a well-padded splint applied along the inner margin of the foot, projecting at each end beyond the toes and the heel. The first toe is firmly bandaged to this in a position of adduction, the deformity being slightly overcorrected. The stitches are free in one week or ten days; and after the toes have been gently moved, the splint is reapplied. Two weeks later, the splint is discarded and a firm bandage worn for about six weeks; then passive movements are commenced. As a rule it is about three months before the patient has a *perfectly* sound foot. The results of this operation are extremely satisfactory: when performing it, however, the surgeon must be especially careful not to infect the wound, as owing to the fact that the metatarso-phalangeal joint is open, the results of septic infection might be very serious. The operation will not succeed unless it is seen that the patient wears proper boots and shoes afterwards (p. 249). It is often beneficial for the patient to wear a 'toe post' in the boot or shoe.

INGROWING TOE-NAIL

In this condition, which usually affects the outer side of the great toe, it is best, if any ulceration is present, to do a thorough operation, as if only a small fragment of the nail is cut away the condition generally recurs. The essential

point of the operation is to remove a wedge-shaped portion of tissue which includes the margin of the skin, the outer third of the nail, and the matrix beneath this portion. A general anaesthetic must be given and the foot carefully cleansed, then an incision is made from a point about a quarter of an inch above the root of the nail, near the mid line, to the end of the toe, just to the inner side of the ulcerated area. One blade of a strong pair of sharp-pointed scissors is pushed down between the nail and its matrix, and

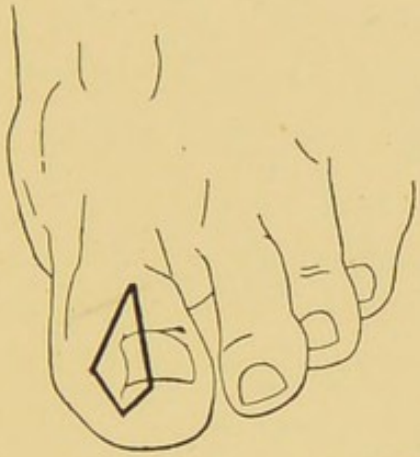


FIG. 148 *a*. Incisions of operation for ingrowing toe-nail.

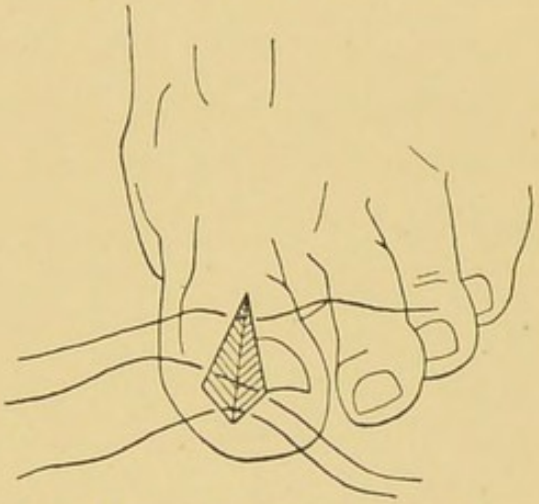


FIG. 148 *b*. Method of inturning in operation for ingrowing toe-nail.

the former divided just to the outer side of the middle line: it must be divided right down to the root. The portion of nail on the affected side is pulled away with forceps, and the exposed portion of the matrix is completely removed. By means of these two incisions a wedge-shaped piece of tissue is removed, and the two raw edges are united by catgut stitches and dressed with gauze. No nail will grow on the side operated upon as the matrix has been entirely removed, and a recurrence of the condition is impossible.

HAMMER TOE

Excision of the head of the first phalanx is the best operative method of dealing with this deformity. The patient having been anaesthetized and the foot thoroughly cleansed, special attention being paid to the intervals between the toes,

a longitudinal incision about 1 inch in length is made on the dorsum of the first phalanx, the centre of the incision being over the first interphalangeal joint, slightly to one side of the extensor tendon. If a corn is present on the dorsum, two superficial curved incisions enclosing the corn should be made, instead of one straight one. The tissues should be cut down to the bone, the extensor tendon split and retracted, and the soft structures detached from the head of the first phalanx, which is made to project outside the wound. This is done by cutting the dorsal and lateral ligaments joining the first and second phalanx. The head of the first phalanx is then removed by cutting through its neck with bone forceps; sufficient must be cut off to allow the toe to be

Fig. 149. Side view of hammer toe, showing disposition of bones, corns, and bursae as generally found in this deformity.

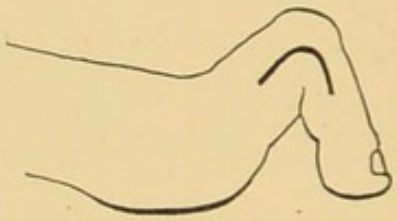


Fig. 150. Side view of second toe, showing lateral incision for removal of the head of the proximal phalanx.

straightened easily. Another method often employed is to make a lateral incision, by which means the extensor tendon is not interfered with; to remove the head of the phalanx, the joint is dislocated after the lateral ligament has been divided. This method has the great advantage of avoiding any corns or doubtfully clean skin. As a rule little or no haemorrhage occurs. The skin edges should be united with catgut stitches and covered with gauze, a plaster of Paris or light metal splint being incorporated with the bandages. The dressings are changed when the stitches will be free, at the end of a week or ten days; but the splint is retained for at least another week: then for three or four weeks a firm bandage must be worn. The patient will not have a perfectly sound foot until about six weeks after the

operation. The deformity of the toe is apt to recur, but the proximal phalanx has been so shortened that the patient no longer has corns or in any way suffers from it. Sometimes, however, it is painful and the toe may require amputation. As these cases are often in mature ladies who already have hallux valgus and *will* wear high-heeled pointed boots, the above treatment is not so satisfactory to the patient as if the toe had been amputated. In such examples, amputation should be proceeded to at once; the head of the metatarsal bone should not be taken away.

BOOTS TO BE WORN AFTER OPERATIONS FOR HALLUX VALGUS, INGROWING TOE-NAIL, AND HAMMER TOE

It is essential, after such operations as the above, that suitable boots should be worn. The following simple test

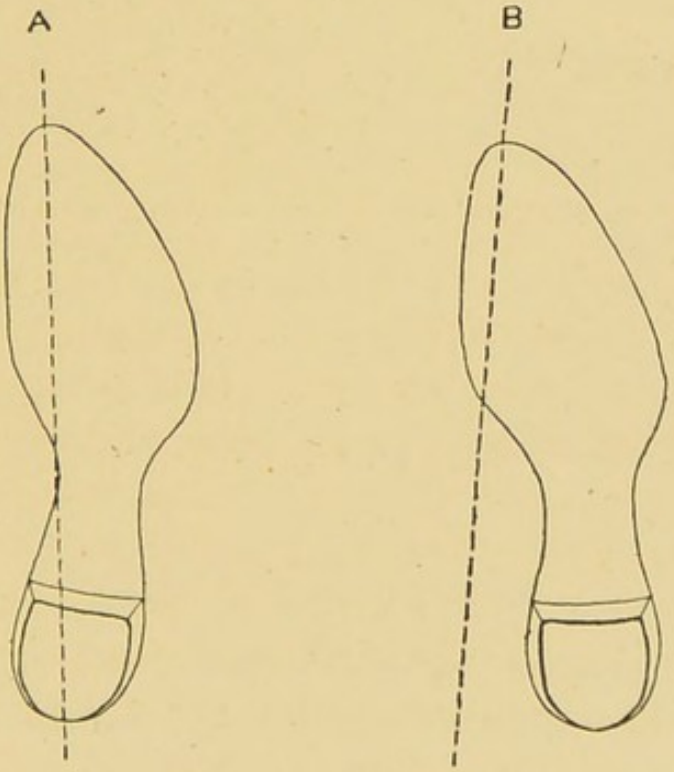


Fig. 151. A. Correct boot. B. Common but incorrect boot.

applied to a boot will at once show if it is constructed upon correct principles. A prolongation backwards of a line drawn from the mid point of the toe of the boot parallel to the inner margin, should pass through the mid point of the heel. If

this test be applied to any boot constructed on the usual lines it will be found that the line will pass to the inner side of the heel, showing that the boot twists the anterior part of the foot outwards, instead of following the natural line of curvature inwards. The wearer is in consequence unsteady. If a boot is worn that meets the requirements of the above test, it will tend to prevent any recurrence of the deformities. Such a boot need not be unsightly; the popular idea, that a broad, square, ugly toe to the boot is necessary, is quite

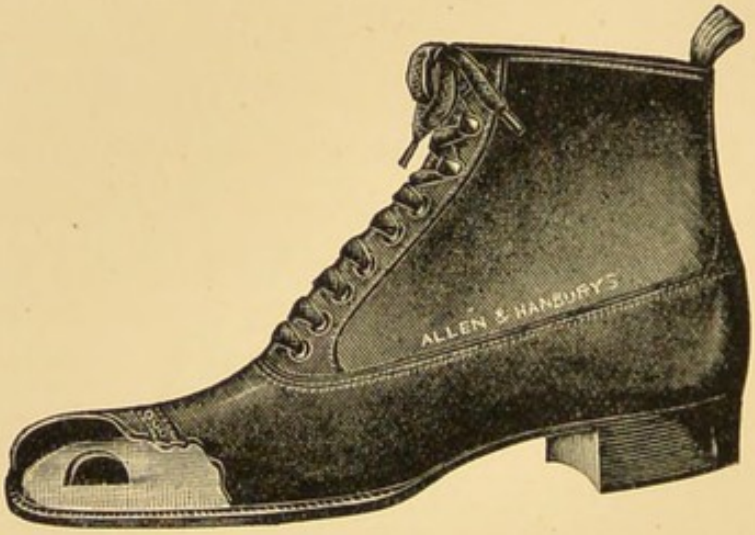


FIG. 152. Boot with upper cut away to show toe-post.

erroneous. The shape of the toe of the boot is determined to a large extent by that of the wearer's foot. After hallux valgus, a 'toe post' may be inserted in the boot. It is placed *between* the first and second toes, preventing the recurrence of hallux valgus.

AVULSION OF THE NAIL

In cases of suppuration at the root of the nail which will not respond to ordinary treatment, it is necessary to remove half or the whole of the nail, and this can be done under gas. One blade of a strong sharp-pointed pair of scissors is thrust down to the root, in the middle line, between the nail and its matrix. The nail is then divided throughout its length and the affected half removed with strong forceps. The essential point in the operation is to remove thoroughly the root of the

nail. If any granulations are present at the bottom of the exposed surface they should be swabbed with pure carbolic acid, and the wound dressed with hot fomentations. The patient will be saved a great deal of pain if, when the dressings are changed, the hand or foot is soaked in warm boracic lotion and the dressing allowed to soak off. The nail usually takes from four to six months to grow again and is, as a rule, perfectly formed. In many cases it is more satisfactory to remove the whole nail.

TAPPING THE KNEE JOINT

At times it is imperative that a joint should be tapped, either to relieve distension or to ascertain the nature of the fluid present. Of all joints, the knees offer most facilities for this operation. The greatest care and cleanliness must be exercised, on account of the disastrous results of the introduction of septic matter into a joint. The front of the knee should be carefully cleansed, and surrounded with sterilized or perfectly clean cloths. A trocar and cannula, a hypodermic syringe is usually too small and the needle too fine, is boiled and cooled in sterilized water. With a knife, a small superficial incision, about a quarter of an inch long, is made, about half an inch to the inner side of the ligamentum patellae, the knee at the time being flexed at a right angle. The trocar and cannula is then thrust through this opening into the joint; on withdrawing the trocar, the fluid escapes through the canula. From the mere appearance of the fluid, it is usually impossible to decide if it is simple synovial fluid or pus, as both may appear turbid. When there is any doubt, the fluid, which has been received in a sterilized syringe, should be inoculated on a culture medium and examined later by a bacteriologist. A single stitch closes the wound; this, however, is not always needed, as when the joint is empty and the knee extended the incision contracts. The wound should be dressed with gauze and collodion. Besides acute synovitis, the joint may require to be tapped in Charcot's disease.

TAPPING THE ELBOW JOINT

For similar reasons, it may be desirable to tap the elbow joint. When distended with fluid it bulges at the back on either side of the tendon of the triceps. The elbow is cleaned and the syringe sterilized as in the preceding section, after which, the needle is thrust into the joint through a minute incision on the outer side of the triceps tendon. The operation is concluded as above.

EXCISION OF THE PREPATELLAR BURSA

The best method of dealing with an enlarged prepatellar bursa, when chronic, is to excise it. An anaesthetic is given and the skin washed, particular care being taken to ensure that over the patella it is thoroughly cleansed, as this is a situation where dirt accumulates and is difficult to remove. A curved incision, with the concavity directed downwards, is made round the tumour, so that the two ends of the incision come below the level of the bursa. The skin and subcutaneous tissues are cut through, and the flap marked out by the incision is reflected downwards. The surface of the bursa, which is held down to the bone and ligamentum patellae by fibrous tissue, comes into view; a little dissection will succeed in freeing it, when it can occasionally be removed entire. In doing this there need be no fear of opening the joint, if ordinary care is exercised. The operator

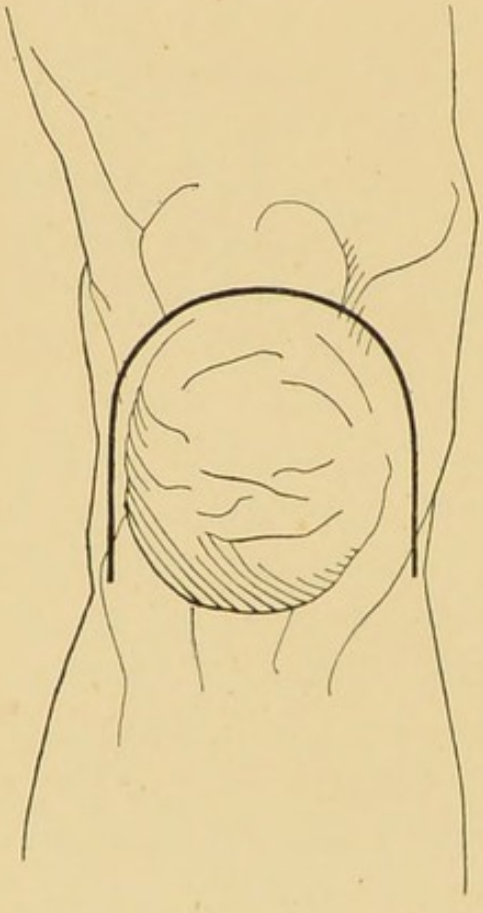


FIG. 153. Front of knee. Black curved line shows the incision made to raise skin-flap for the removal of an enlarged bursa patellae.

must avoid opening the bursa if possible, as not only may its contents, if septic, contaminate the wound, but its complete removal will be rendered more difficult. If the skin is adherent, it is almost impossible to separate it without opening the bursa; so it is better, in this case, to make two curved lateral skin incisions, and to remove the portion of skin between them with the bursa. All bleeding points are

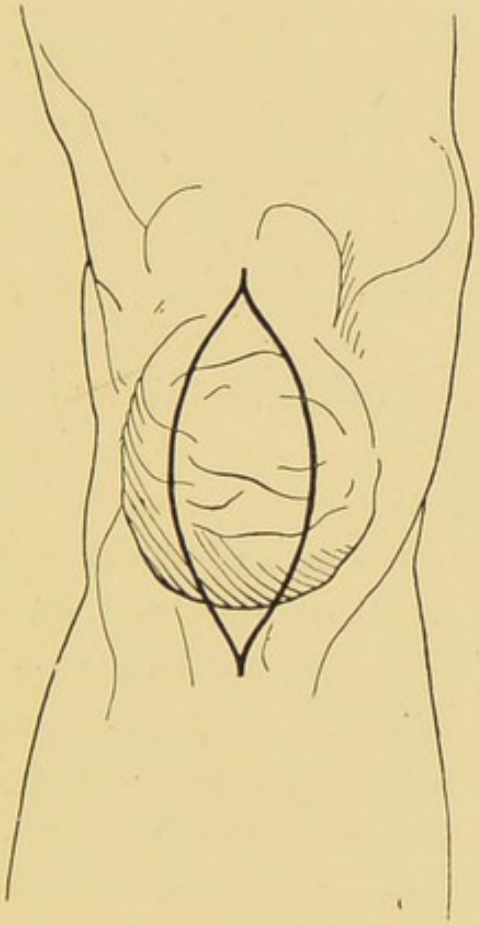


FIG. 154. Front of knee, showing curved lateral incisions sometimes used for the removal of enlarged bursa patellae.

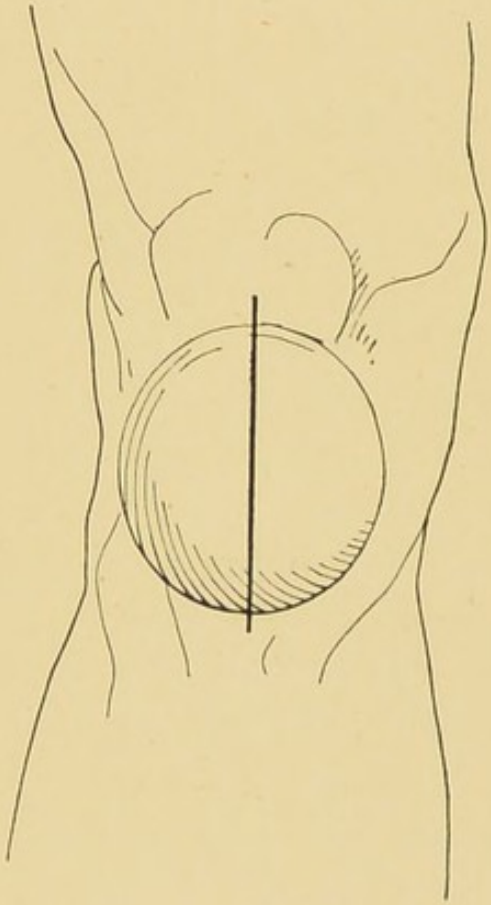


FIG. 155. Front of knee, indicating straight median incision for incision of suppurating prepatellar bursa.

ligatured and the skin-flap, or the two cut edges of the wound, carefully united with interrupted sutures. The wound is dressed with gauze, over which is placed a large pad of wool, and the whole fastened with a bandage. A back splint, reaching from just above the ankle to half-way up the thigh, is often applied; but a few sheets of wood wool firmly bandaged on are much more comfortable. The stitches are

removed in a week, but the splint should be retained for another week; at the end of which period the patient is allowed to walk.

Suppuration sometimes occurs in the prepatellar bursa, and the condition should be relieved by making a median incision, under gas. A counter opening should be made at the most dependent point, when desirable, by cutting down on a director passed through the first incision. An india-rubber tube can be passed through the two incisions to act as a drain, and the wound dressed with hot fomentations, which are changed frequently.

EXCISION OF A SEMIMEMBRANOSUS BURSA

This bursa lies under the tendon of the semimembranosus muscle and often has a connection with the knee joint. When enlarged, it increases in size along the line of least resistance, i.e. upwards along the tendon of the semimembranosus, to form a swelling on the back and inner side of the popliteal space. Before proceeding to operation, ascertain if the enlargement of the bursa is merely the result of chronic articular disease in the knee or not. Because, if it is secondary to some chronic arthritis of the knee, there being a connection between the joint and the bursa, it is likely that there will be a recurrence of the swelling after operation, which will prove a failure, disappointing both surgeon and patient. A general anaesthetic is most satisfactory, the patient lying in the prone or semiprone position, when he must be on the side of the leg to be operated on. After cleansing the skin, an incision is made over and a little longer than, the swelling. The strong popliteal fascia is incised and the subjacent swelling becomes obvious. The wound is held open with retractors and the cyst defined with a blunt dissector, *not the handle of the knife.* The retractors, perhaps three in number, are inserted more deeply as the swelling is defined. It is easier to separate it from the sur-

rounding connective tissue whilst it is tense than after it has been opened. When the cyst is clearly defined it is opened, the sac seized, held up with artery forceps and the connection with the joint, if it exists, identified. The walls are often very thick and the cyst nearly solid. If there is no communication, the cyst is removed; if the communication is small, the cyst can be removed after it has been cut across; if the communication is large, the operation is made much more difficult as it must be closed with two or three interrupted sutures. In closing the wound two or three mattress or rectangular stitches are used to close the popliteal fascia; the skin edges are united by interrupted sutures and the wound dressed with gauze and collodion. The leg is wrapped in sheets of wood wool fastened by a bandage. This splint is much more comfortable to the patient than any other. The wound is dressed in a week or ten days. If there was no communication with the joint, the patient can get up and commence walking in ten days. But if the bursa was connected with the joint the patient must lie at least a fortnight to three weeks on his back; in fact, the larger the communication the longer the convalescence.

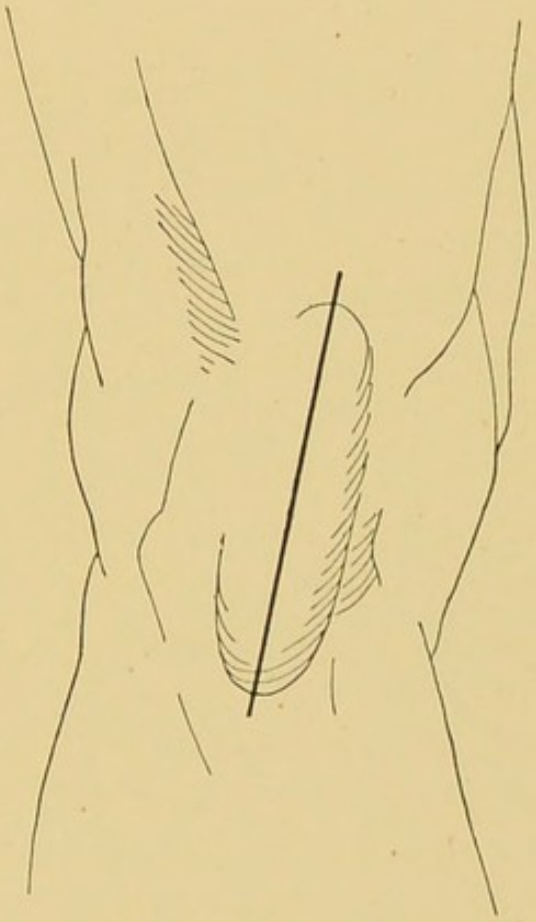


Fig. 156. Popliteal space, indicating position of an incision for removal of semimembranosus bursa.

Owing to the risk, in reality very small, of infecting the knee joint, these cases *must not suppurate.*

EXOSTOSES

In a few situations only is it wise for the practitioner to undertake to remove bony excrescences. The situation to which we would especially direct attention is that of the adductor tubercle of the thigh. It is not infrequent for an exostosis to be formed in this situation, where it causes the

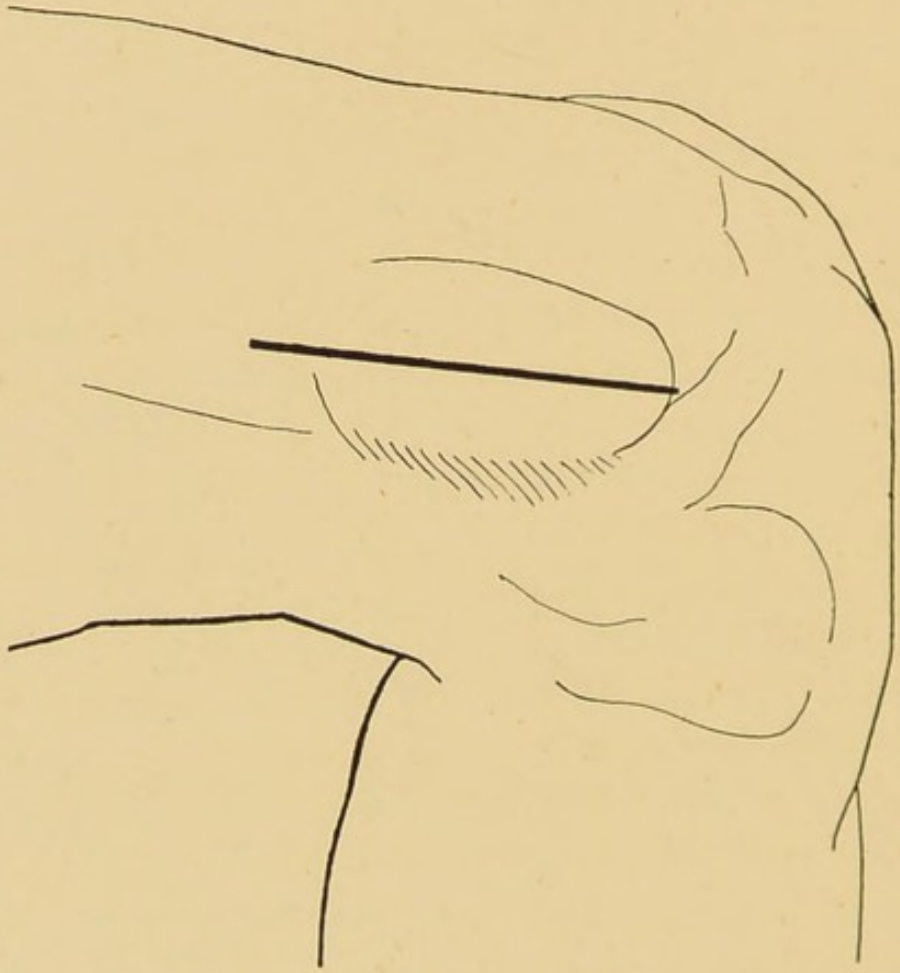


Fig. 157. Inner side of knee with incision for removal of exostosis of adductor tubercle.

patient great inconvenience owing to the fact that it extends in part into the tendon of the adductor magnus. A skiagraph should be taken in side view to show the exact relation of the tumour to the femur. The thigh is shaved, cleansed, and then flexed at the hip and knee joint, at the same time being externally rotated. In fact, it is placed in the same position as for tying the femoral or popliteal artery, tying

the upper part of the saphenous vein (p. 267), &c. An incision is made, along the tendon of the adductor magnus, of a length a little greater than that of the tumour, which is then exposed. It must be separated from the adductor magnus tendon, which must not be divided, nor must the tumour be shelled out subperiosteally as it would be re-formed to some extent by the periosteum left behind. It can usually be freed with a knife and an elevator. The base of the

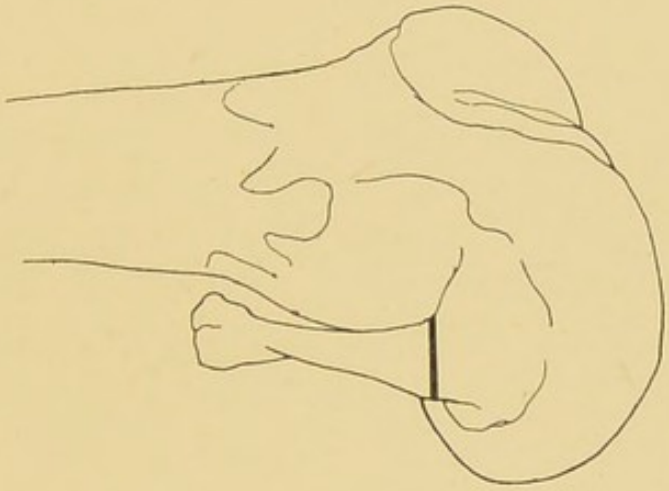


Fig. 158. Exostosis of adductor tubercle in tendon of adductor magnus. Black line indicates situation of removal with chisel.

tumour is then cut through with a chisel and mallet and the separated part removed. The skin is closed and the wound dressed. The limb should be wrapped in one or two layers of wood wool and fastened with a bandage, to act as a splint. It is dressed in a week's time and the part massaged and moved for a few days.

SEQUESTRECTOMY

After an acute bone abscess has been opened, except in very young children, a sinus will remain; at the bottom of which is a piece of dead bone, the sequestrum. If small, the dead bone may be discharged and the sinus will heal. Unfortunately, if left 'to nature' these sinuses do not heal, surgery having to step in and help. After opening and draining the abscess, the practitioner and patient must be quiet and con-

tented until the natural inflammatory processes have separated the dead from the living bone. This takes time, the length of which varies with the situation and the size of the sequestrum. For instance, sequestra separate more quickly in the arm than in the leg. As a general rule, it will take at least eight weeks. It is usually said that with the help of two probes the sequestrum can be tilted and proved to be

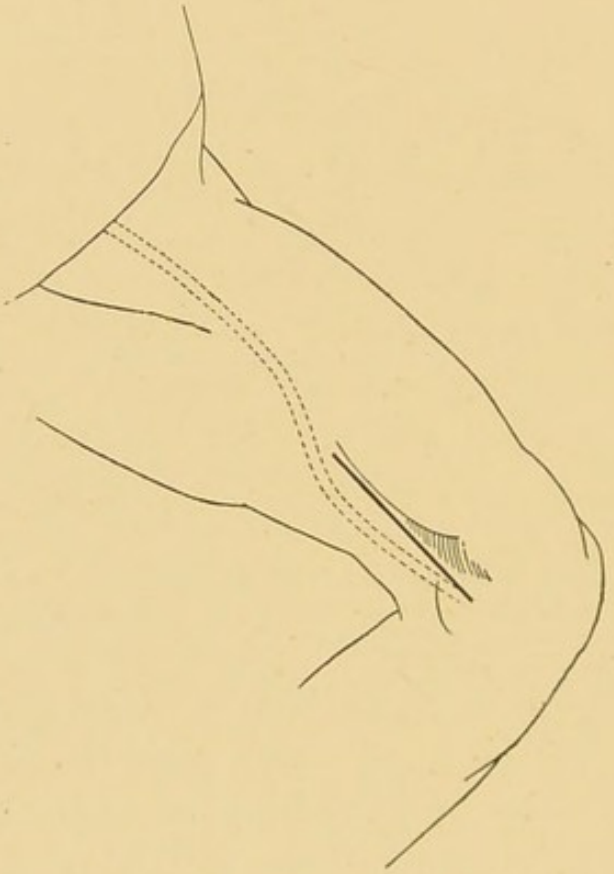


Fig. 159. Diagram of inner side of thigh, indicating the course of the femoral artery and incision for removing sequestrum from popliteal space.

loose. In practice this method is not very useful, as the sequestrum is not loose, like a cork is in a bowl of water, but is glued by granulations to the living bone, from which it can be separated. In fact, it lies in a bed of granulations and is not free and loose in the popular sense. To remove it, the wound is enlarged, cautiously on the inner side of the knee on account of the femoral artery crossing by the upper end of the incision. The sequestrum is hard, dry, and white, giving a ringing note when struck with a steel instru-

ment. It is then loosened with an elevator, *not* with gouge and mallet, seized with necrosis forceps and withdrawn. The cavity is then examined with the finger to ascertain if other sequestra are present. If so, they are removed; if not, the granulations are curetted and the cavity syringed out with warm water or saline at a temperature of 110° to 115° Fahrenheit. A gauze drain should be inserted, not a plug; and the wound partially closed or even left open. It is syringed out and the drain changed daily.

Too long a period must not be allowed to elapse between the incision of the abscess and the removal of the sequestrum, otherwise the latter becomes enclosed in a cavity whose walls become more tough, fibrous, and unyielding, as time passes. So that, after its removal, the walls of the cavity are too stiff to yield and fall in; the sinus remaining open for months or longer. Indeed, it may be necessary to excise or divide the stiff walls in order to allow the cavity to close and heal.

The hammer and gouge should not be used to loosen the sequestrum. The need of their use is a sign that the operation has been done too early, before the dead bone has been separated from the living. These bone sinuses are always septic, so that if a chisel or gouge is used, freshly cut cancellous bone is opened up; which will in all probability become infected and undergo some degree of necrosis. This necrosis is usually superficial, but will be sufficient to delay healing and may be followed by the discharge of small sequestra. Massage and movements must be employed during convalescence to restore the muscles and render the movements of the neighbouring joints free.

TENOTOMY OF THE TENDO ACHILLIS

It is better to do this operation by the subcutaneous rather than by the open method, as if a scar is left it may become adherent to the cut ends of the tendon. When the anaesthetic has been given, the parts are cleansed and the foot

placed on its outer side and supported by a sand bag, the toes being held down, i.e. plantar flexed, by an assistant. A sharp-pointed tenotomy knife, about a quarter of an inch only of the blade being sharp, is introduced on the deep surface of the tendo Achillis, about 1 inch from its insertion into the

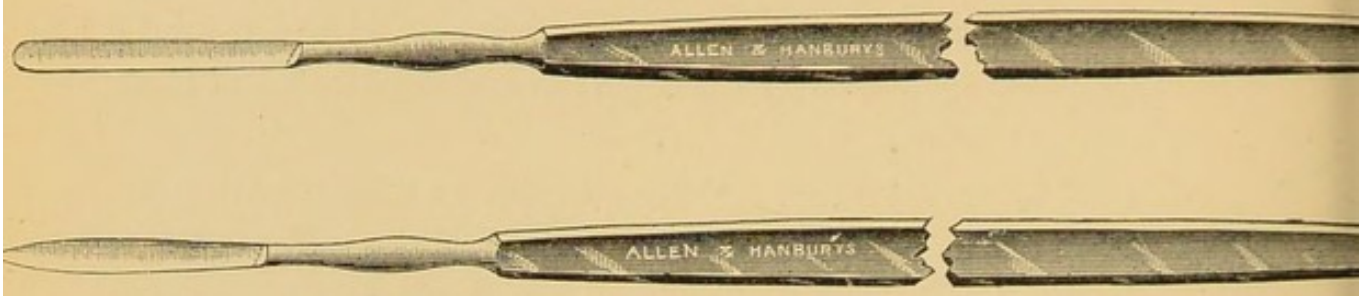


Fig. 160. Sharp and blunt tenotomes.

os calcis. The knife, held at right angles to the long axis of the leg, should be slowly and carefully introduced by the side of the tendon until its point can be felt beneath the skin of the opposite side. A blunt-pointed tenotome is introduced alongside the sharp, which is then withdrawn, and the assistant puts the tendon on the stretch by dorsiflexing the foot. The knife is then turned so that its edge presses against the tendon, which is severed by a gentle sawing movement. Towards the end it snaps suddenly, a gap being left between the two ends, and the knife is withdrawn. The foot should be forcibly dorsiflexed several times in order to ensure that all the fibres are divided. There is no haemorrhage and no stitches are required, a small piece of gauze with collodion being placed over the wound. In mild cases of talipes equinus, the

Fig. 161. Method of introducing sharp tenotome for the division of the tendo Achillis.

foot should be put up, at less than a right angle with the leg, in plaster of Paris or on a right-angled splint. The plaster or splint should be removed in a week, and the deformity over-corrected, the foot being again put up at less than a right angle in the plaster or on the splint. At the end of a fortnight the splint should be discarded and massage with passive movements commenced. In a few days the patient should begin to use the foot, walking a little with a stick, and then perform exercises.

LENGTHENING THE TENDO ACHILLIS

In some cases, particularly those where a contracted or spastic condition of the muscles is present, as in congenital spastic diplegia, the divided ends of the tendon do not unite. To guard against the possibility of this, it is better to lengthen the tendon and not simply divide it. After the usual preparations, an incision is made obliquely across the tendon, which is exposed. The tendon having been defined, is split from its insertion on the os calcis upwards for such a distance as is required by the needs of the case. At either end of this incision a transverse cut is made across the tendon on opposite sides from the free surface to the median incision in it, as in Figs. 163 B and C. The ends are sutured as in the last figure, the tendon being lengthened by the length of the median incision in it. Fine silk is used to unite the ends. The skin edges are united by horsehair stitches, and the wound dressed in the same manner as after simple tenotomy. The stitches are removed in a week or ten days, after which gentle move-

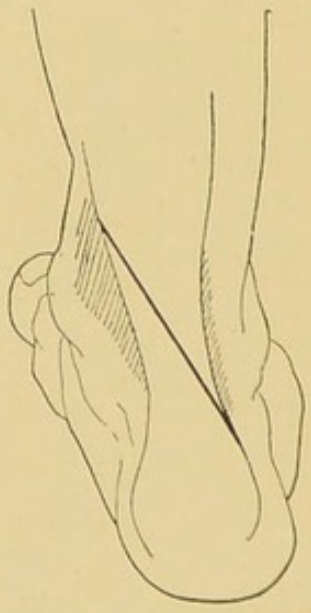


FIG. 162. Back view of heel, showing oblique incision employed for lengthening tendon.

ments and massage are begun, the patient not putting a foot to the ground for at least three weeks.

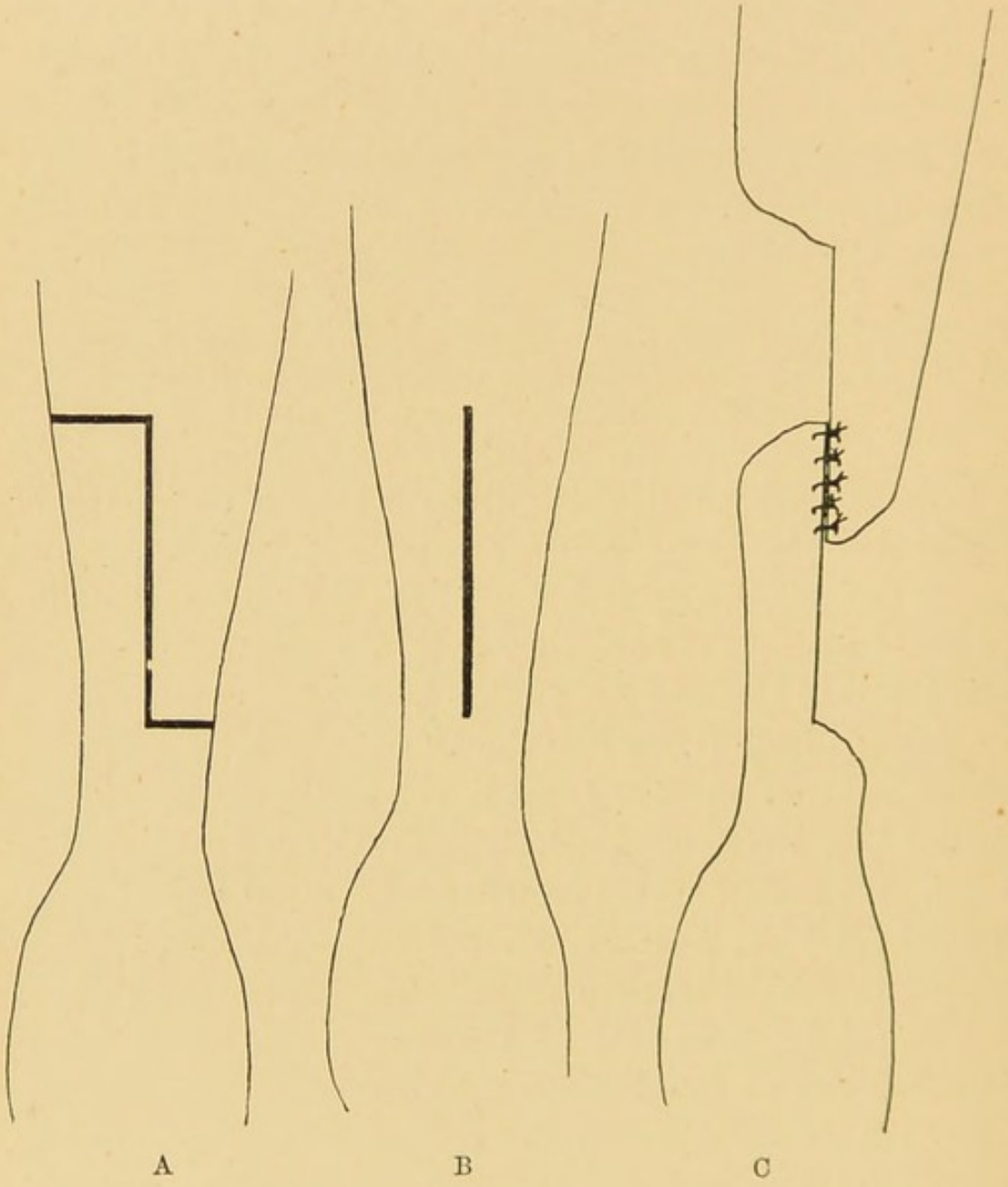


FIG. 163. A. Vertical incision splitting tendo Achillis. B. Lateral incisions completing division of tendon. C. Method of suture for lengthening tendon.

SUTURE OF A DIVIDED TENDO ACHILLIS

When the ends of a divided tendon have not united, the cut ends must be exposed as by the incision in Fig. 162. They are then freed and united by a skeinwork or scaffolding of fine silk. The operation must be strictly aseptic and, for

success, union *must* be by first intention. Massage and gentle movements are begun about the eighth to tenth day, no attempts to stand should be made for about five or six

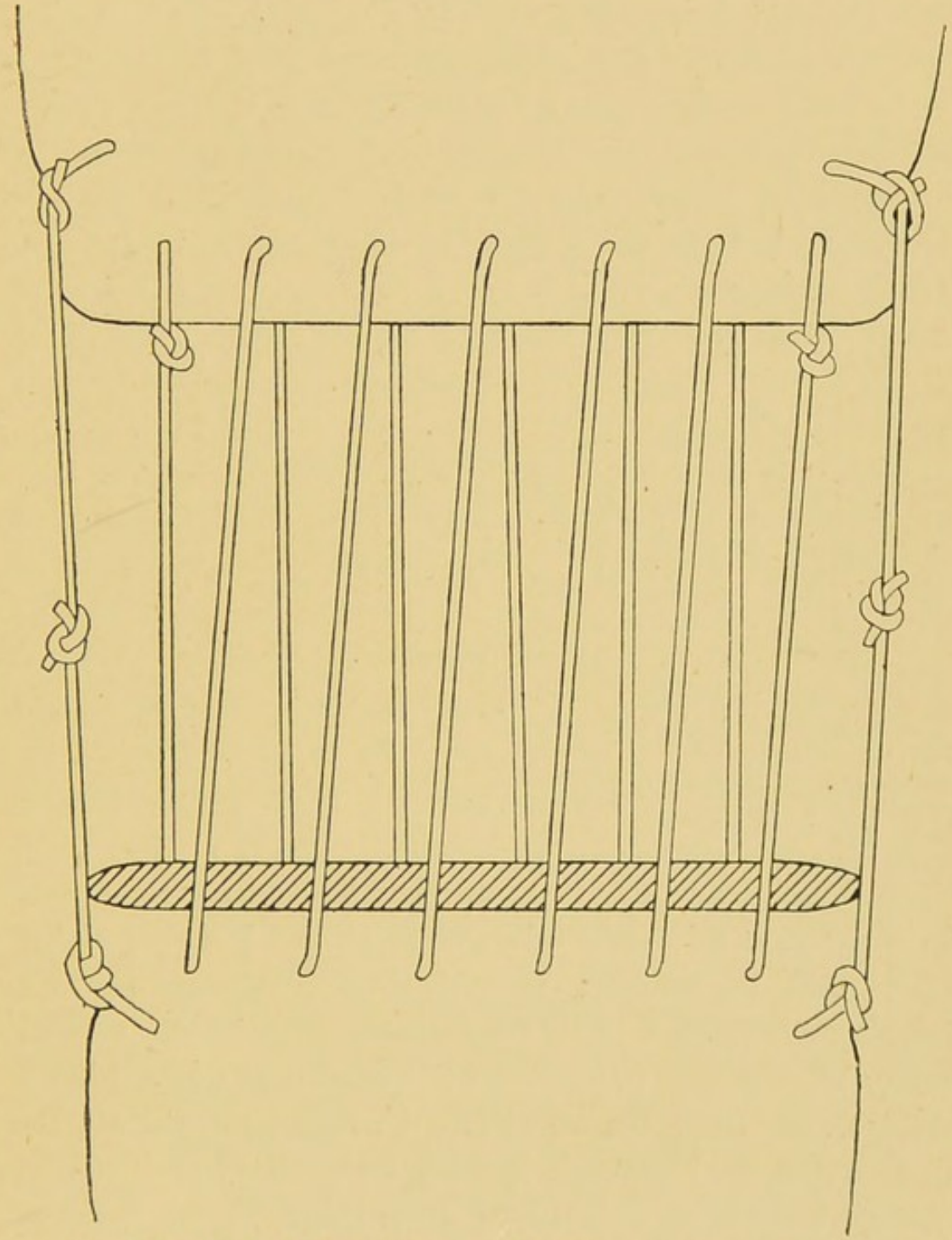


Fig. 164. Method of uniting severed tendon which could not unite owing to retraction.

weeks. This scaffolding of silk enables scar tissue to unite the ends of the tendon, which are too far apart to be joined directly.

SUTURE OF TENDONS

The practitioner will most frequently be called upon to suture cut tendons in the forearm. This should never be undertaken if the wound is septic. First of all ascertain what tendons are cut. After which, a few minutes' study of the pictures in a good anatomy book will refresh the memory and facilitate the operation. If only one or two tendons are cut, the operation is easy and can be done through a straight incision made along the line of the divided muscle. If many or deep tendons are cut, it is better to turn back a flap large enough to expose fully the field of operation. The distal portions of the divided tendons are easy to find; but the proximal ends retract a long way within their sheaths, so that far the greater part of the incision must be on the proximal side of the point of section. The ends of the tendon must be freed and united by fine silk sutures passed horizontally through the ends. If the tendon has ruptured, the separation generally takes place at the junction of the muscle and its tendon; in which case, it may be very difficult to suture a soft retracted muscle to its tendon. It may be necessary to lengthen the tendon as a preliminary measure. Should a tendon be found whose proximal attachment cannot be identified, it must be sewn to such neighbouring tendon as anatomical knowledge would indicate. Such a proceeding is called *tendon grafting*. When all the divided tendons have been united and all haemorrhage stopped, the wound is closed with interrupted stitches, dressed, and the limb immobilized on a splint or in thick layers of wood wool bandaged to it.

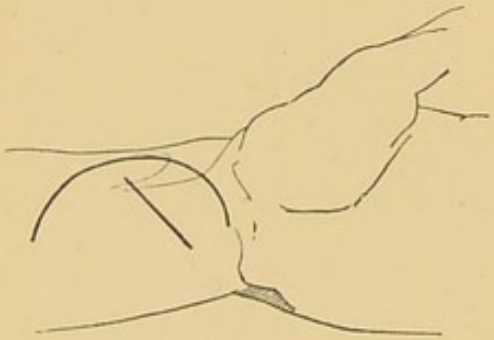


FIG. 165. Curved black line indicates the incision used for raising a skin-flap for the suture of divided tendons in forearm. The oblique black line indicates the wound which caused the division.

For success, this wound *must* heal by first intention, or the tendons will part and become adherent to surrounding structures. The stitches are removed at the end of a week and the fingers gently moved. On the tenth day the patient is instructed and encouraged to move them himself, both actively and passively. The movements must be gentle at first, becoming stronger as time passes. Six weeks is approximately the minimum period before a hand fully recovers. Massage of the bellies of the muscles can be begun at the end of a week from the operation, electrical treatment at the end of a fortnight.

AMPUTATION OF THE TOES

The toes can be removed in a manner similar to the various operations already described on the fingers p. 227. But in

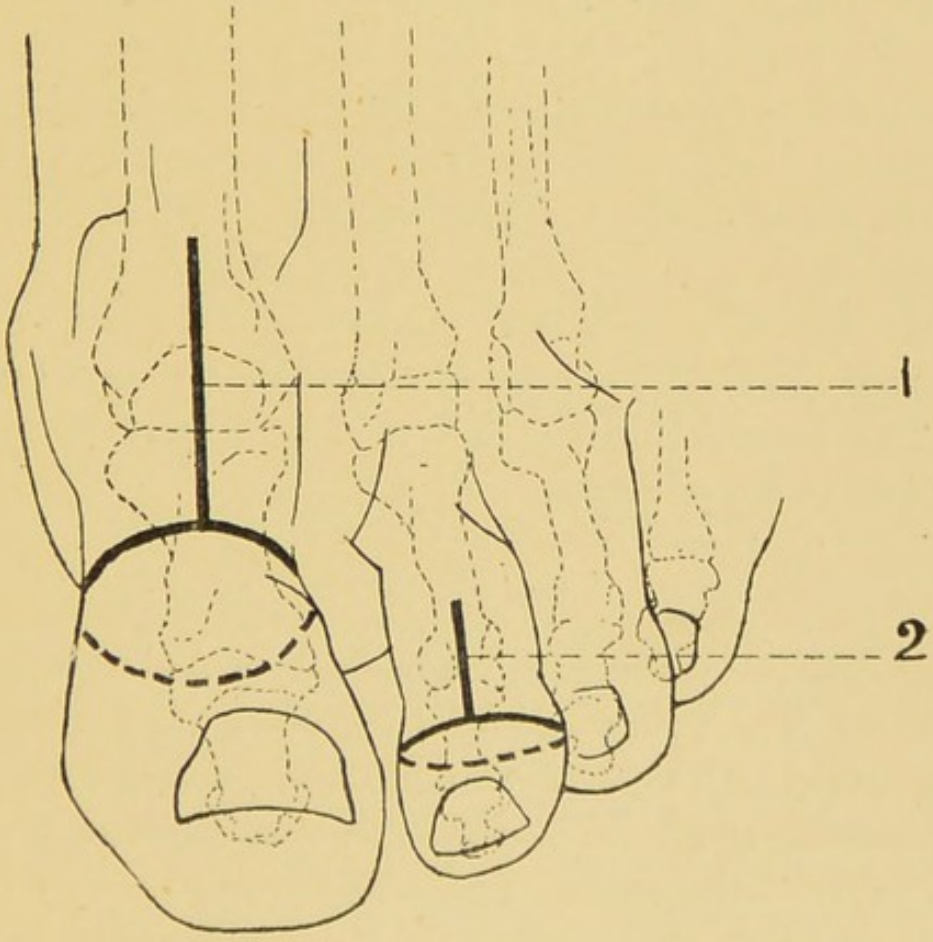


FIG. 166. Toes. 1. Black lines indicate flaps for amputation of great toe at the metatarso-phalangeal joint. 2. Black lines indicate flaps for amputation of second toe at interphalangeal joint.

the case of the toes, it is useless to retain a portion of a phalanx; for if any is left behind, it gradually becomes drawn up, ulceration, &c., being produced by the pressure of the boot. It is important, however, to retain the heads of the metatarsal bones. The great toe differs from the others in supporting part of the weight of the body, so that it is necessary to retain as much of it as possible, always remembering to suture the cut tendons to the periosteum or tendon sheath. In operating on the toes special care must be

FIG. 167. Method of dividing the metatarsals; the upper surface being the dorsal aspect.

taken with disinfection, as the toes are exceedingly difficult to render surgically clean. The toes and their metatarsal bones can be amputated in a similar way to that used for the fingers and their metacarpals; it is important, however, to retain the metatarsal bones of the great and little toes, as through these a large portion of the bodyweight is transmitted. Incisions must not be made on the inner or outer borders of the foot, as the pressure of the boot may cause pain, &c. The breadth of the foot is very important for the steadiness of the possessor.

VARICOSE VEINS

There are two main operative methods of dealing with this condition: (1) Tying and excising part of the internal saphena vein high up in the thigh, Trendelenburg's operation; (2) removing the veins locally. In most cases *it is best to combine the two methods.* Undoubtedly, when the varicosity is only slight and is limited to the lower part of the leg, local removal of the dilated veins will give a satisfactory result, at all events temporarily; but the main column of blood is not

interrupted, and so there will always be a possibility of the recurrence of the condition.

1. *Trendelenburg's operation.* The object of this operation is to divide and ligature the internal saphena vein just before it passes through the saphenous opening to join the femoral vein. The anaesthetic having been given, the hip and knee are flexed, and the leg externally rotated and fixed with a sand bag; the skin is then cleansed, and a slightly oblique incision about 3 inches in length is made. This incision commences about

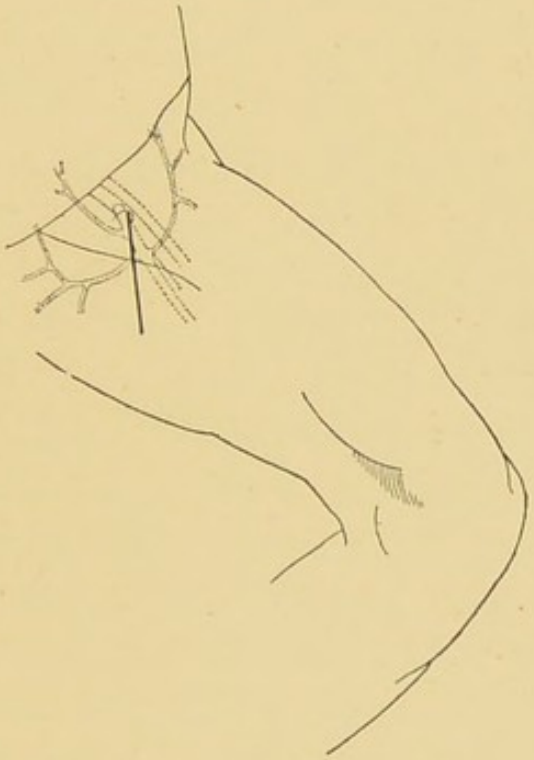


Fig. 168. Diagram of inner side of thigh, showing incision for excision of upper part of internal saphenous vein.

1 inch below Poupart's ligament, slightly to the inner side of the femoral artery, and runs slightly downwards and inwards across the tight tendon of the adductor longus. The fascia and fat are cut through and the vein exposed; it is then dissected out throughout the whole length of the incision. Occasionally it is difficult to find the vein, which must be sought first on the inner and then on the outer side of the incision. The vein is clamped above and below with artery forceps, the intervening portion being removed and the two

ends ligatured. The vein is often very much thickened, and requires to be securely tied, care being taken that the ligature is not applied so close to the cut end that it may slip off. The three veins, the superficial circumflex iliac, the superficial epigastric, and the superficial external pudic, which join the internal saphenous vein just before it enters the saphenous opening, should also be tied. All bleeding points are ligatured, the skin edges accurately united by interrupted sutures, and the wound dressed with gauze; over this a thin layer of gauze is fixed with collodion, as there is a tendency for the dressing to slip when in this situation. All steps of the operation should be done by sight, never by touch.

2. *Local removal.* Before the anaesthetic is given, the position of the most marked varicose veins should be noted, or the skin over the veins can be marked with a solution of carbolfuchsin, the patient standing up while this is done. When the skin has been cleansed, a *curved* incision is made over one of the marked situations, as by this means more veins are exposed than through a *straight* incision. Care must be taken that the incision is made through healthy skin, and not in a situation where it has become thinned. The cut must not extend so deeply that the veins are wounded, as the haemorrhage will greatly increase the difficulty of the operation. The veins are then dissected with a knife and forceps from the fat and fibrous tissue which hold them down, and portions are cut away between artery forceps. All bleeding points are ligatured, the wound closed with interrupted stitches, and dressed with gauze and collodion. In several other situations where the veins are most markedly varicose, they are dealt with in a similar manner. Incisions should not be made in situations which will be exposed to subsequent pressure or irritation, such as the inner side of the knee, which is rubbed in riding. The stitches are removed in a week, and the wound redressed, but the patient must not stand until about three weeks after the operation.

It is an easy operation, and a perfectly safe one if the

wound is kept clean, but very dangerous if it is made septic; fingers, therefore, should never be put into the incisions.

CHRONIC INFLAMED GLANDS

Chronic inflamed glands which have resisted all medical treatment are found as a rule in the groin, as the result of some old venereal infection. They are very painful, and show a tendency to enlarge rather than to subside. They are hard to the touch, and show no areas of softening. After the usual preparations, a free oblique incision is made through the skin over the glands. It is inadvisable to attempt excision: one of the authors has known of a case in which the peritoneal cavity was opened and infected by an unwise attempt being made. Each gland should be incised, and the contents shelled out with a spoon in the same manner as the inside of an onion can be enucleated when the outer layers are incised. No attempt should be made to excise all the capsule, as it is usually adherent to structures by chronic inflammatory tissue; veins may be torn, &c., giving much trouble and offering the chance of dangerous infection. All small and recently infected glands at the periphery of the area should be removed. Having treated all the glands in the same manner, the wound is packed with gauze; it must not be stitched up. Within twenty-four hours the patient is placed in a boracic bath and the gauze plug allowed to soak out; a fresh one is inserted, and the wound redressed in this manner until it heals from the bottom by granulation. However thoroughly and carefully this operation is done, two disappointing results

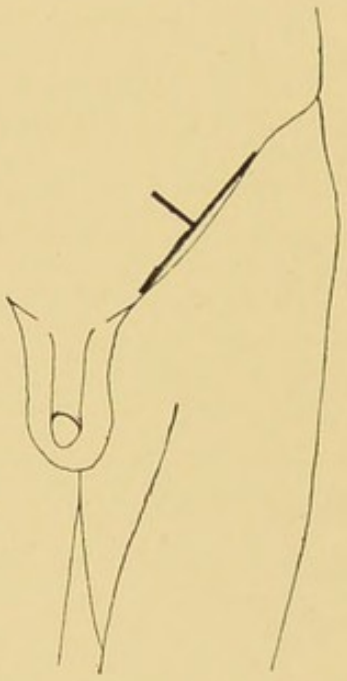


Fig. 169. Groin with triradiate incision for the operation of the removal of chronically inflamed glands.

may happen. The leg or thigh may become oedematous from lymphatic obstruction ; or other glands may become infected. The oedema is treated by massage, and will, in all probability, disappear, though it may take months to do so. Should fresh glands become infected, they will often subside under medical treatment; but if this fails, they must be treated surgically as above, especial care being taken that the skin incision exposes a little more than the affected area.

It is no uncommon thing to find chronic inflamed glands in the groin tuberculous, whether they have arisen from venereal trouble or otherwise.

CHAPTER XIV

PREPARATION FOR OPERATIONS

From time to time a practitioner has to make the arrangements for an operation of the greater magnitude, which is to be performed by a surgeon. Every case requires special consideration: a nasal operation necessitates different preparation to a gastric one. Every surgeon, too, has his own particular method and his own ideas with regard to the preparation of the patient, &c., for a special operation. It is impracticable to deal with these points in a small work, and it must suffice to advise the practitioner to consult the surgeon who is to perform the operation. A patient can be operated upon, either in a nursing home, in which case the practitioner will not be consulted as to all the preparations required; or in his own home, in which case the preparations can be considered under two headings; an operation by arrangement, and an operation of emergency.

1. OPERATIONS BY ARRANGEMENT

The room selected for the operation should be large, airy, and provided with a good light. A practical point is not to select a room which provides a view of its interior from the street; but if this cannot be avoided, the offending window must be draped with some diaphanous material which will not darken the room. Always see that the artificial lighting is satisfactory, in case the daylight fails owing to the hour, rain, or fog. When there is no electric light, a good mantle should be obtained for the gas jet, with an adjustable reflector if possible. The next point is the preparation of the room. All superfluous hangings, furniture, and ornaments should be removed. The room should be thoroughly dusted, cleaned,

and aired. On the day before the operation, its ledges and panelling should be wiped over with a damp cloth. It is better to have no carpet; the floor being thoroughly scrubbed and covered with a clean dust sheet. A table for the operation must be provided. In some cases the surgeon will bring his own, or it can be hired at a reasonable cost from any instru-

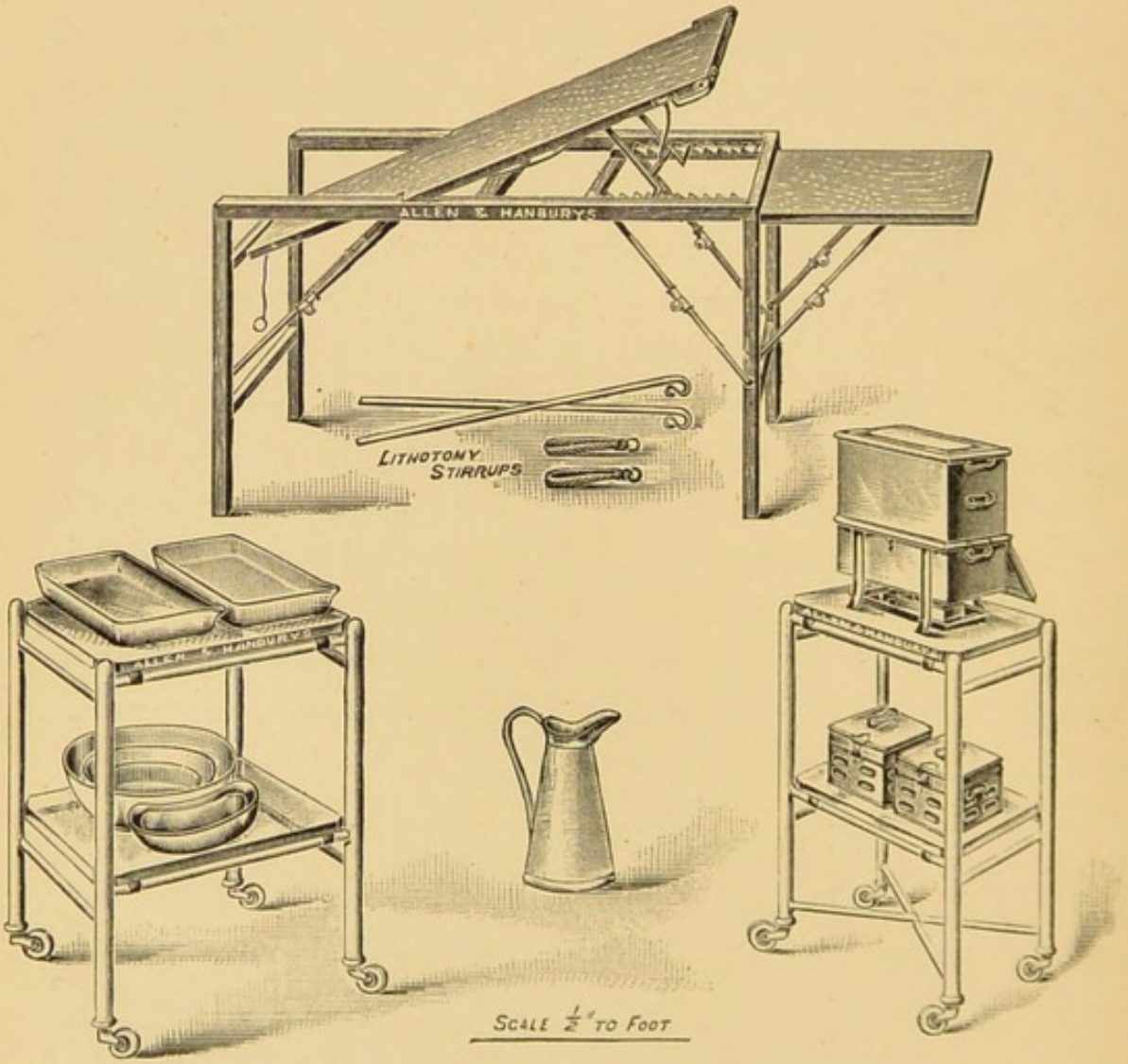


FIG. 170. Operation requirements.

ment maker. If neither of these methods is practicable, the practitioner must provide a makeshift. It must be remembered that the first essential in an operation table is that its strength and size render it capable of supporting the patient. The ideal table should be from 2½ to 3 feet high, about 2 feet broad, and 6 feet long, but the last measurement will vary with the size of the patient. It should

be made of unpolished wood, and covered with a blanket and a mackintosh. A large supply of carefully cleaned basins, bowls, porringers, and clean dry towels must be at hand. Having consulted the surgeon as to what antiseptics and lotions will be required, a plenteous supply must be provided. It must always be seen that there is an abundance of hot and cold water ready in the room, and that there are facilities for quickly obtaining more if desired. A small table covered with a clean towel must be provided, on which the surgeon can place a sterilized towel and his instruments, ligatures, &c. Also a safe site must be selected for the boiling of his sterilizer ; the fireplace is usually satisfactory. It now remains for the operating table to be prepared, and this will usually be done by a nurse, but the practitioner will be wise to see that it is done properly. The table should be padded with one or two blankets folded to a sufficient thickness to prevent the patient lying on a hard surface. The whole is then covered with a sheet of mackintosh, which has been washed, aired, and dried; its surface being warmed immediately before the operation by means of hot bottles. A pillow, with a thick clean towel wrapped round it, is placed at the head ; and another blanket supplied to cover the patient. A small table covered with a thin towel is required for the anaesthetist, on which he can arrange his bottles, &c., ready to hand. The practitioner must see, but unobtrusively, that brandy, strychnine, sal volatile, and other restoratives are at hand ; also a porringer. The bed is arranged by the nurse, who must see that it is well warmed and aired, that there is a sufficiency but not an excess of bedclothes, and that a mackintosh is placed where necessary. Two or three hot-water bottles should be placed in the bed while the operation is being done, so that it will be warmed by the time that the patient is placed in it. Where it is possible, the surgeon and assistant should wash their hands first outside the room, such as in a lavatory, so as to remove the 'outer coats' and husband the resources of the operating room.

2. AN OPERATION OF EMERGENCY

In the case of an emergency operation, after the room has been selected, the carpet, &c., must be carefully damped to lay all dust, and all unnecessary furniture and ornaments must be removed. The windows and doors should be opened to air the room thoroughly whilst the table, operation bowls, &c., are being prepared. From this point onward the previous description can be followed as closely as the degree of urgency permits.

Since the above was written, it has become possible to hire by telegram or telephone message all the apparatus required for an operation, including an operation table, two small glass tables, sterilizer for instruments, bowls, jugs, trays, two sterilized overalls, and a dozen sterilized towels, for a guinea upwards, according to the distance. The table alone can be obtained for 7*s.* 6*d.*, and drums of sterilized dressings at 2*s.* 6*d.* each. Thus, all these important requirements are now placed within the reach of all who can afford to have operations done at home, conferring a very great boon on both the patient and the practitioner.[1]

PREPARATION OF THE PATIENT

This is in part general and in part local.

General. Whenever possible, it should be so arranged that the patient is dieted for two or three days before the operation. The diet should be plain and easily digestible; and during this time it is best for him to keep quiet, and to have plenty of sleep. On the evening of the second day before the operation a purge should be given; the ideal one is castor oil, but in most cases several others are just as efficacious; in general, the patient should be given the one he is in the habit of taking. On the morning of the operation the lower bowel should be

[1] The above is supplied by Messrs. Allen & Hanbury, of Wigmore Street, and the Hospitals and General Contract Company, 33 & 35 Mortimer Street, W.

emptied by one or more enemata. The best time for the operation is in the morning about nine to ten o'clock, but this may be rendered impossible by the exigency of the operation or by the time at the surgeon's disposal. A patient should take no solid food for four or more hours before an anaesthetic; but two hours before, he should be given a cup of beef tea.

Local. Whenever possible, the part to be operated upon should be prepared the previous day. The technique of this has already been described (see p. 5). To recapitulate, the various steps are: Shaving where necessary, cleaning with soap and water, rubbing with ether or turpentine, and covering with a dry antiseptic powder beneath a dry dressing.

THE ASSISTANT

A practitioner frequently prefers to give the anaesthetic himself, no matter his deficiencies or proficiencies in that respect, rather than undertake the more noticeable but less onerous task of assisting. But a man whose want of opportunities has prevented his becoming apt and skilled, is of more use as an assistant than as an anaesthetist. The rules to guide him in assisting are very simple. A surgeon of experience in reality requires but little assistance at an operation, except for the minor details, such as taking off artery forceps when the ligatures are being tied, holding retractors, &c. There are, nevertheless, occasions when more highly skilled assistance is required, and then, as a rule, the surgeon elects to bring his assistant with him. A practitioner who has not had much experience in assisting at an operation should remember the following points:—

1. After the hands have been thoroughly cleansed, never touch anything which has not been sterilized, for fear of contaminating them again. Avoid such temptations as feeling the patient's pulse; that is the anaesthetist's business, he commands that part of the 'ship'.

2. Never put fingers in the wound or touch the patient's

skin if it can be avoided. Use only sterilized instruments and touch only their handles.

3. Always be quick to do anything you are asked, but do not try to anticipate the wishes of the surgeon, unless you know his methods exceedingly well.

4. Care must never be relaxed until the wound is closed and covered with a dressing.

The practitioner should wash his hands first; and when they are clean, should thoroughly cleanse the site of operation whilst the surgeon is washing. Then they change places, the practitioner washes his hands again whilst the surgeon arranges his sterilized towels, &c. Both are then ready to commence the operation simultaneously, and the anaesthetist has had plenty of time to get the patient under. During the operation the assistant may have long periods with little to do. For instance, in an abdominal operation, after he has finished sponging and retracting the wound, and the peritoneum is opened, he has a period of leisure whilst the surgeon is doing his special work. Times like these afford opportunities for the practitioner in an absent-minded way to commit aseptic solecisms, such as scratching his unsterilized head or nose, feeling the pulse in the patient's unsterilized wrist, &c., which faults are obvious to the surgeon, anaesthetist, and nurse. He must avoid doing anything like this, as such acts must detract, even if done absent-mindedly, from the confidence placed in him by these three people. If he should do any of these things, he must carefully wash again; his temporary absence may be annoying to the surgeon, but this is preferable to the possible introduction of sepsis.

Assisting at an operation is a very simple duty to perform, only requiring common sense and a little special knowledge. And these remarks may be closed with one final piece of advice. Assist quietly, avoid flurry, never be officious.

THE ANAESTHETIST

When called upon to administer an anaesthetic, it is always necessary to be well equipped with the requisite instruments and appliances. If the patient is one to whom it is intended to give gas and ether, chloroform and a mask should always be taken as well as the apparatus for gas and ether. It is important to make certain that there is a plentiful supply of the necessary drugs; there is nothing more annoying to the surgeon, anaesthetist, and the patient's friends than the discovery in the middle of an operation that the chloroform has run short. The anaesthetist should always take with him a pair of tongue forceps, some sponge-holders and sponges, a hypodermic syringe and drugs, brandy and ether for hypodermic injections, some amyl nitrite capsules, and the necessary apparatus for performing a tracheotomy or a laryngotomy. The surgeon frequently has some of these instruments with him, but the anaesthetist, being wholly responsible for his part of the patient's condition, should always be provided with them. It is a golden rule to have *too many rather than too few* instruments and appliances.

Before the anaesthetic is administered the patient should always be examined: in doing this, great care should be taken that he is not frightened or upset, but rather reassured as to his condition. The heart should be examined, and when doing this it is as well to remember that usually the patient is very nervous and the rate of the beat therefore accelerated. In cardiac disease the presence or absence of a murmur matters little, the important point being whether the lesion is compensated or not, and as indicators of this, the colour and pulse are far better than a murmur. The lungs should be auscultated for signs of bronchitis. The choice of the anaesthetic will depend on the age and general condition of the patient and the length and nature of the operation (see pp. 30–2). Inquiries should be made as to the presence of false teeth; as a rule these should be removed, but if a large

plate is worn it is often better for the patient to retain it; if removed there is a tendency for the lips to fall together, obstructing respiration. The position of the patient will, to a great extent, depend on the wishes of the surgeon. If the nature of the operation does not render it impossible, the patient should lie on his back, the head being turned to one side, preferably the right, and a low pillow or sand bag placed under the other shoulder. In such a position he is comfortable and can breathe freely; when he is unconscious, the position can be altered if required. Chloroform should never be administered with the patient in the sitting-up position.

DIFFICULTIES AND DANGERS

The two chief dangers in administering an anaesthetic are respiratory failure and cardiac failure. Respiratory failure may be due either to some local cause, such as an obstruction to the breathing, or to some general cause which inhibits the action of the respiratory centre.

RESPIRATORY FAILURE DUE TO SOME LOCAL CAUSE

1. In old or edentulous patients the lips tend to fall together, preventing the proper entry of air; this can usually be remedied by placing the end of a towel in the corner of the mouth, or by inserting a small dental prop between the jaws.

2. One of the most frequent causes is the tongue falling back into the pharynx and blocking the air-way. This should be treated by turning the head to one side, placing a finger behind the angle of the jaw which is uppermost, and pressing directly towards the mouth. A finger placed beneath the chin will keep the jaw well forward. If this does not succeed in restoring normal respiration, the mouth must be opened, if necessary by a gag, the tongue seized with tongue forceps and pulled forward. These should never be applied so tightly as to bruise or lacerate the tongue, but just sufficiently to hold it firmly.

3. Mucus sometimes accumulates at the back of the mouth, leading to obstructed breathing and the inhalation of the mucus into the lungs, especially when using ether. It should be treated by opening the mouth and wiping out the pharynx with sponges mounted on holders. If the obstruction is marked the patient must be allowed to come round sufficiently to vomit and expel the accumulated mucus. In any case the anaesthetist should change to chloroform.

4. When a patient is about to vomit, the breathing is often obstructed; in these cases the corneal reflex is always present. The condition rapidly improves, if the dose is increased, or after the patient has vomited.

5. Spasm of the glottis may be due to a variety of causes; it only occurs with ether, and is generally due either to too rapid administration or to a too rapid increase of the dose. It should be treated by diminishing the strength of the ether or by changing to chloroform.

6. Occasionally obstruction to breathing is caused by the surgeon or assistant pressing on the patient's chest; this can be easily remedied.

7. The breathing sometimes ceases temporarily when the skin incision is made; in these cases the anaesthesia is in all probability too light. If the tongue is pulled forward or the lips rubbed, the breathing will recommence.

8. Occasionally a foreign body finds its way into the larynx, leading to obstruction of breathing. The commonest body is a tooth or a portion of one. This accident usually happens when the patient is sitting up for the extraction of a tooth under gas. The head should be bent forward and the patient's back struck sharply. Attempts should be made to remove the body with the finger or forceps. If, however, the breathing is very embarrassed and is accompanied by cyanosis, laryngotomy or tracheotomy should be performed at once. If vomited matter is carried back into the larynx, the mouth should be forced open, with a gag if necessary, and attempts made to clear the air-way with the finger. If

this fails and the symptoms demand urgent treatment, no delay should be allowed, but laryngotomy or tracheotomy done at once (see pp. 81–6).

RESPIRATORY FAILURE DUE TO SOME GENERAL CAUSE

One of the most common causes of failure of respiration is an overdose of the drug; but it may also be due to shock caused by the operation. The following signs indicate the fact that an overdose has been given: The breathing gradually becomes more feeble, the face changes colour taking on an ashy grey tint, the pupils become widely dilated and are insensitive to light, no corneal reflex is present, the pulse is affected later, becoming feebler. The anaesthetist should always be on the look-out for these signs of an overdose, so that by removing the anaesthetic, the danger can be averted. If an overdose has been given the anaesthetic should be stopped immediately, the head turned to one side and pressure made with the finger upon one angle of the jaw in the direction of the mouth; this will often restore respiration, but if not the tongue should be drawn forwards with tongue forceps. These various manipulations take very little time; and if the patient does not recover quickly, artificial respiration should be commenced, Sylvester's method being the most satisfactory. While this is being done, the chest should be flapped with wet towels, and ether and strychnine given hypodermically. An interrupted or continuous current can be given, one pole being placed over the heart, the other on some indifferent part of the body; as a rule, however, the necessary apparatus is not at hand. If the patient does not respond, artificial respiration should be continued for at least half an hour from the time that respiration ceased.

CARDIAC FAILURE

This is undoubtedly the greatest danger to which a patient taking an anaesthetic is liable; it seldom occurs except when

chloroform is the anaesthetic employed. It may take place at the commencement of the administration, when the patient is deeply under, or when he is coming round and is about to vomit. The symptoms of cardiac failure sometimes come on with startling rapidity, especially when occurring in the early stages of anaesthesia; but, as a rule, they are more gradual in onset. The anaesthetist should always be on the look-out for the signs of cardiac failure, which are:—The pulse becomes gradually more rapid and weaker, the pupils dilate, becoming insensitive to light, the face changes in colour, becoming pale, at first the respiration is unaltered but gradually becomes shallower until it ceases. The treatment should be preventive to a large extent. The patient should be carefully prepared for the operation; he should not be held down forcibly when conscious by assistants, but gently restrained from doing harm to himself or to those around; he should never be disturbed until fully under the anaesthetic. Administration should always be commenced gradually, particular care being taken if the breath is held not to pour on a large amount and so give an overdose. When cardiac failure has occurred, artificial respiration is the best form of treatment. The remedies recommended for dealing with respiratory failure apply with equal force to cardiac failure. Other remedies to be tried, while artificial respiration is being carried on, are inhalation of amyl nitrite, hypodermic injections of ether, and the puncturing of the heart with a fine needle.

When the cardiac failure is due to shock or loss of blood, stimulants should be given hypodermically, and saline solution injected per rectum or intravenously; if the abdomen is opened hot saline may be poured into the peritoneal cavity, whence it is absorbed very rapidly. The extremities should be raised, swathed in wool and bandaged; the body is warmed by means of hot-water bottles, care being taken not to burn the unconscious patient.

AFTER-TREATMENT FROM THE ANAESTHETIST'S POINT OF VIEW

The duties of the anaesthetist do not cease when the administration is finished. If the operation has been on the head or neck he must see that the bandages are not placed so that they impede the respiration. The patient should be lifted from the operating-table and placed in a previously warmed bed; in doing this, care must be taken that he is not jolted, and that the head and shoulders are not raised above the rest of the body. If the surgeon raises no objection the patient should be placed on his right side, as this facilitates the escape of mucus. Before leaving the patient the anaesthetist should always make certain that the patient's pulse and respiration are satisfactory, and that his general condition is good. The room should be darkened and at a temperature of about 65° Fahrenheit, with all draughts excluded, A responsible person should be at the patient's bedside for at least two or three hours after the end of the operation. When vomiting, the head should be turned to one side, and care taken that no vomited matter enters the larynx. No talking should be permitted in the room; and when conscious, the patient should be encouraged to go to sleep. Sickness after an operation is as a rule more distressing to the onlookers than to the patient; it is often relieved by sipping small quantities of very hot water. With regard to diet no food should be given for at least three or four hours after the operation, and then a little beef tea or soup is more suitable than milk; but as a rule the surgeon will give instructions on this point. If a patient is violent when recovering from an anaesthetic, he should never be tied down, but persuasion and restraint tried; if these fail and the condition becomes worse, morphia must be administered hypodermically.

SHOCK

After severe and prolonged operations the patient may be found to be suffering from shock. The face will be white

and perspiring, the extremities cold, the respiration shallow, the pulse small and rapid. This condition should be treated by raising the foot of the bed, keeping the patient warm by means of hot bottles, strychnine given hypodermically, in 10 minim doses for an adult, and if necessary saline solution injected per rectum or intravenously. Too much stimulation must be avoided, warmth, quiet, and rest will allow the patient to recover.

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