

**Surgical emergencies, together with the emergencies attendant on parturition and the treatment of poisoning : a manual for the use of general practitioners / by Paul Swain.**

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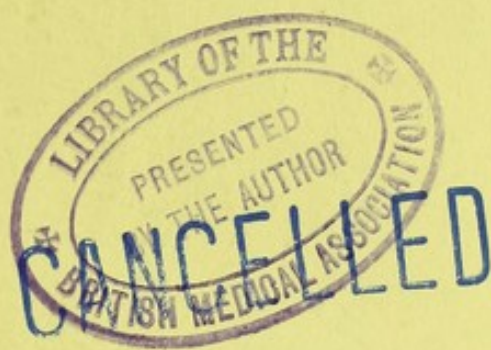
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SURGICAL EMERGENCIES



*By the same Author*

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INJURIES AND DISEASES OF THE KNEE-JOINT,  
and their Treatment by Amputation and Excision Contrasted.  
Jacksonian Prize Essay of the Royal College of Surgeons.  
With Wood Engravings. 8vo. 9s.

SURGICAL

EMERGENCIES AT  
AND THE TRE

FOR THE USE OF

PAUL

SURGEON TO THE NORTH DORSET  
HOSPITAL

J. & A. C.  
7, GREAT MAR  
(printed from 1

# SURGICAL EMERGENCIES

TOGETHER WITH THE

EMERGENCIES ATTENDANT ON PARTURITION  
AND THE TREATMENT OF POISONING

A MANUAL

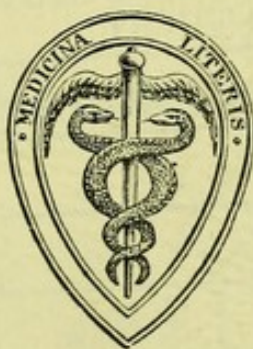
FOR THE USE OF GENERAL PRACTITIONERS

BY

PAUL SWAIN, F.R.C.S.

SURGEON TO THE SOUTH DEVON AND EAST CORNWALL HOSPITAL; HONORARY  
FELLOW OF KING'S COLLEGE

FIFTH EDITION



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*This Book is Dedicated*

AS A TRIBUTE OF SINCERE PERSONAL REGARD  
AND IN REMEMBRANCE OF MANY KINDNESSES RECEIVED

BY  
THE AUTHOR





# PREFACE

TO THE

## FIFTH EDITION

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IN preparing a Fifth Edition of this Manual, I have endeavoured, to the best of my ability, to bring it up to the present standard of surgical procedure.

In the chapter on the Abdomen, the most recent advances in Intestinal Surgery have been noticed.

The chapter on the Emergencies of Parturition has also been extensively revised, whilst that on Poisoning has been added to.

Together with Antiseptic Treatment I have included a condensed notice of Asepsis, obtained principally from the book on that subject by the late Dr. C. T. Schimmelbusch.

I have to thank the Messrs. Down for kindly placing at my disposal many of the new illustrations which appear in the following pages.

PAUL SWAIN.

PLYMOUTH;  
*June, 1896.*







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THE HISTORY OF THE

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The history of the Republic of the United States is a subject of great interest and importance. It is a subject which has attracted the attention of the people of all nations. The history of the United States is a history of progress and achievement. It is a history of the struggle for freedom and independence. It is a history of the growth of a great nation. The history of the United States is a history of the people. It is a history of the people's struggle for a better life. It is a history of the people's struggle for a more just and equitable society. The history of the United States is a history of the people's struggle for a more perfect union. It is a history of the people's struggle for a more perfect government. It is a history of the people's struggle for a more perfect world.



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# SURGICAL EMERGENCIES

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## CHAPTER I

### INJURIES TO THE HEAD

Wounds of the Scalp—Concussion and Compression—Fractures of the Skull—Trephining—Hæmorrhage from Middle Meningeal—Bullet Wounds of Skull—Fracture of the Base—Injuries to Cerebral Nerves—Injuries to the Face—Wounds of Eyelids—of Lips—Fracture of the Nasal Bones—Foreign Bodies in the Ear and Nostril—Epistaxis—Plugging Posterior Nares—Fracture of Nasal Bones—of the Antrum—of the Zygoma—Fractures and Dislocations of the Jaw—Injuries to the Spine.

WOUNDS of the scalp are generally flap-wounds, and, however extensive, the flap should be thoroughly cleansed with a stream of warm carbolic lotion (1—100), replaced and kept in position by horsehair or silver wire sutures and strapping. Care must be taken not to include any part of the occipito-frontalis muscle in the sutures. The same treatment will be pursued if the bones of the skull are exposed. As a rule, these wounds are not followed by erysipelas. Punctured wounds are sometimes followed by diffuse inflammation, and if suppuration takes place very free incisions down to the bone must be made. Hæmorrhage from scalp wounds is often very profuse, but can generally be arrested by the pressure of a pad of lint and a bandage. Should arterial bleeding continue it may arise from a partially divided vessel, and the division should be completed with a scalpel. It is next to impossible to put a suture on a vessel in the dense tissue of the scalp, so that other means failing, an acupressure needle



should be placed under the vessel, and a twisted suture applied.

Concussion of the brain, following a blow on the head, may be very slight and transitory, or its effects may be severe and lasting. In a severe case the principal signs are—loss of motion and reflex action, but no true paralysis, loss of consciousness, or if capable of being roused, the patient relapses into unconsciousness; the pulse is also feeble, and often intermittent; the pupils are, as a rule, dilated, sometimes one dilated and the other contracted. If contracted, other complications may be found. The sphincters are relaxed. This condition terminates favorably by an attack of vomiting, with restoration of heat and recovery of the pulse. The treatment consists in restoring heat by wrapping the patient in hot blankets, applying hot-water bottles to the feet, and using friction to the surface. If the collapse is severe, an enema of beef-tea and brandy should be administered.

Compression, as the immediate result of a blow, arises from the pressure of a depressed portion of bone, or from extravasated blood within the cranium. The symptoms are complete coma, stertorous breathing, full, slow pulse, passage of fæces involuntarily, retention of urine, and a hot, moist skin. The condition of the pupils is variable, but generally dilated. They are, however, fixed and insensible to light, in contradistinction to the contracted pupil of a drunken person, which dilates on attempts being made to rouse him. Should these symptoms supervene shortly after the accident, they are probably due to extravasated blood. The general treatment of compression should be to relieve the bowels by the administration of a drop or two of croton oil, mixed with mucilage, and the use of turpentine enemata. The head should be shaved and ice applied, and the urine drawn off night and morning. The rules for any operative procedure are given below.

Fractures of the skull may occur in the vault or at the base. In the vault, fractures are generally the result of



direct violence. The external table alone may be driven in, especially over the frontal sinuses, or a very slight injury to the external table may be accompanied by extensive fracture of the inner table. Very extensive depressions of bones may exist, especially under the temporal muscles, without the possibility of discovery, whilst extravasations of blood under the scalp may be mistaken for depressed fractures. If there be a wound down to the bone, care must be taken not to confound the cranial sutures with fissured fracture. The distinguishing point is, that a fissure presents a red line along the course of the fracture.

Simple fractures with depression, and comminuted fractures unaccompanied with a wound of the scalp without brain symptoms, are not to be interfered with. Neither should an operation be proposed if the symptoms are slight, as they may arise from mere concussion. If, on the other hand, the nature of the accident and the severity of the symptoms indicate severe compression and contusion of the brain, trephining for the local injury is worse than useless. In children, compound depressed fractures, if no brain symptoms are present, should be let alone.

In compound comminuted fractures, with depression, the bone should be at once elevated, without waiting for symptoms, and if needful the trephine should be used. Any spicula of bone penetrating the substance of the brain should be removed, if this can be accomplished without damage to the brain tissue. In injuries to the skull, arising from blows with sharp instruments, it is not uncommon to find the inner table extensively splintered. In the event of any bad symptoms threatening, the trephine should be used at the earliest moment. In fact, it is advised by some authors in all cases of punctured fracture to apply the trephine at once. An instrument with a large crown should be used, and the circle of bone containing the puncture should be removed. If the injury be such as to make it probable that the middle meningeal



artery is wounded, the trephine may be used near the anterior inferior angle of the parietal bone, for the purpose of letting out the effused blood (see p. 7).

The instruments required for the operation of trephining are—1, Scalpel; 2, Trephine; 3, a Quill; 4, Hey's Saw; 5, a Trephine Brush; 6, Elevator; 7, Bone Forceps; 8, Probe, with flattened or pointed extremity; 9, Cutting Forceps; 10, Dissecting and Pressure Forceps; 11, fine-toothed Forceps and fine Scissors for the dura mater; 12, fine Tenaculum for bleeding vessels; 13, Needles and Sutures.

The patient's head, supported on a sand-bag covered with mackintosh, having been shaved, is well scrubbed with a new nail brush, soap and water. It is then washed with ether, and finally with a solution of carbolic acid (1—20). A free semilunar incision is then made down to the bone, the convexity of the flap being downwards. This flap is reflected upwards. Bleeding vessels are secured with pressure forceps, and all oozing checked by sponge pressure. The surface of the bone is now examined. If a depressed portion of bone is discovered and there is room for the insertion of the elevator (Fig. 1), it may be raised. If this is not possible, a portion of sound bone may be sawn off with Hey's saw (Fig. 2), or nipped off with sharp cutting forceps (Fig. 3), making room for the insertion of the elevator. When it is needful to use the trephine (Fig. 4), the pin is placed in the trephine and secured by another pin above. The pin is then placed on the edge of the sound bone so as to secure the removal of two thirds of a circle, the remaining third being over the fractured area. The trephine is then worked by a semi-rotatory movement. The teeth of the trephine are so set as to cut from left to right. Pressure on the instrument should therefore only be exerted when it is rotated in that direction. When a sufficient groove is made in the bone, withdraw the pin of the trephine, and complete the section of the outer table: cut through the inner table with great caution. The approach to the inner table through the diploë is indicated by the detritus being soft and bloody, instead of



FIG. 1.



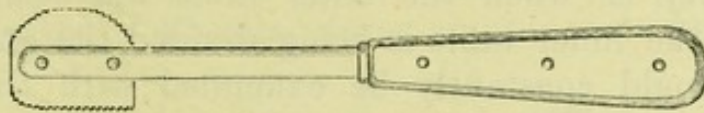


FIG. 2.

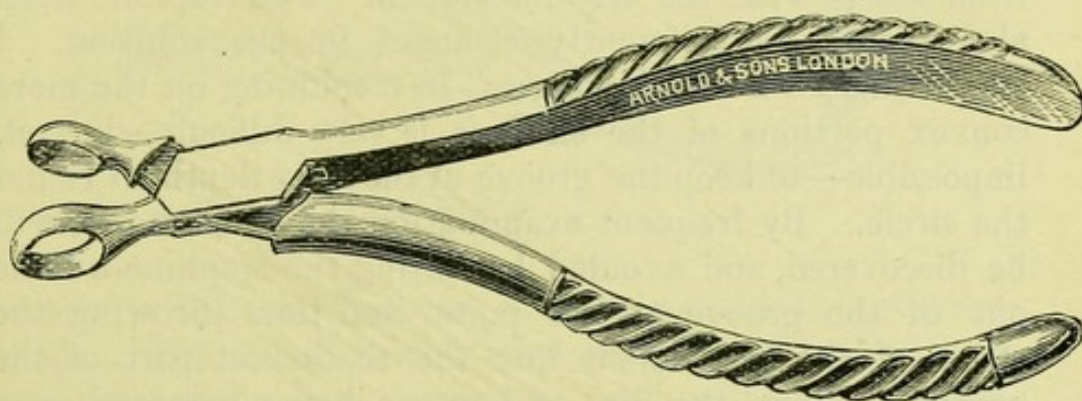


FIG. 3.

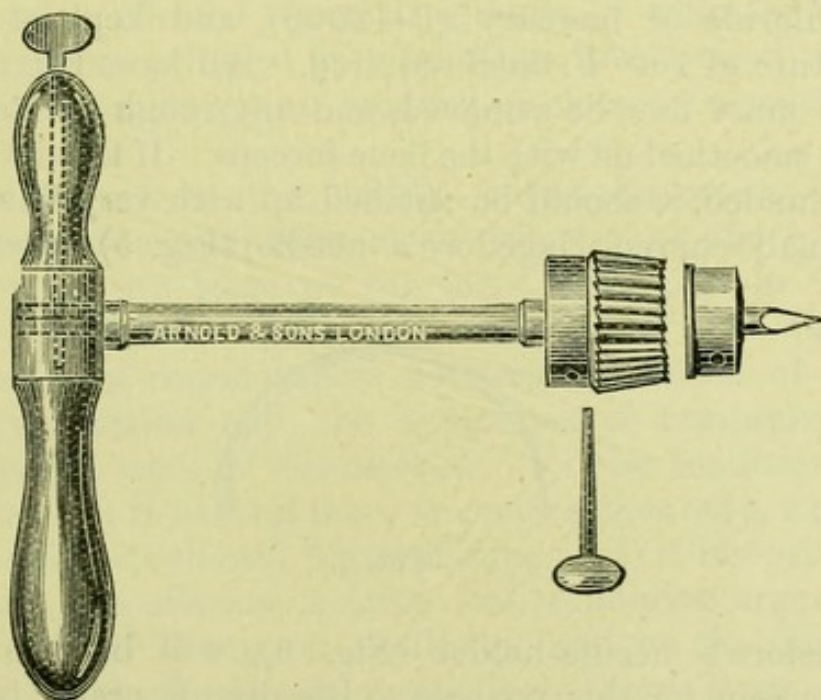


FIG. 4.



FIG. 1.



being dry as when the outer table was being divided. Whilst the inner table is being divided the groove in the bone should constantly be examined with the quill, to ascertain that in no part has it been quite cut through. The groove in the bone at this stage should be constantly irrigated with an antiseptic solution, and further cleansed from *debris* with the trephine brush. The trephine itself also should be frequently cleansed in the solution. I would suggest a warning here. In trephining on the more convex portions of the skull it is very difficult—in fact, impossible—to keep the groove at the same depth all round the circle. By frequent examination the deepest part will be discovered, and avoided by tilting the trephine a little out of the groove at this point, and thus throwing the stress of the instrument into the shallowest part of the groove. When the disc of bone is being removed, care should be taken to strip off the dura mater. If it is proposed to replace the disc, as is the practice of some surgeons, it should be immediately placed in a solution of perchloride of mercury (1—2000), and kept at a temperature of 100° F. until required. All loose fragments of bone must now be removed, and any rough points on the edge smoothed off with the bone forceps. If the dura mater is wounded, it should be stitched up with very fine catgut. A small curved Hagedorn's needle (Fig. 5), inserted by

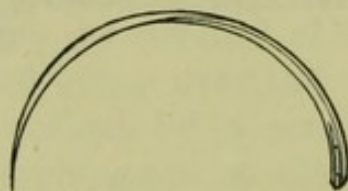


FIG. 5.

Hagedorn's needle-holder (Fig. 6), will be found most convenient for this purpose. Bleeding is pretty free, but can be generally stopped by sponge pressure. Persistent bleeding from the diploë may be arrested by pressing the point of a probe into the orifice or by plugging with wax.



Fine catgut ligatures can be applied to the bleeding points in the dura mater. Bleeding from sinuses is stopped by

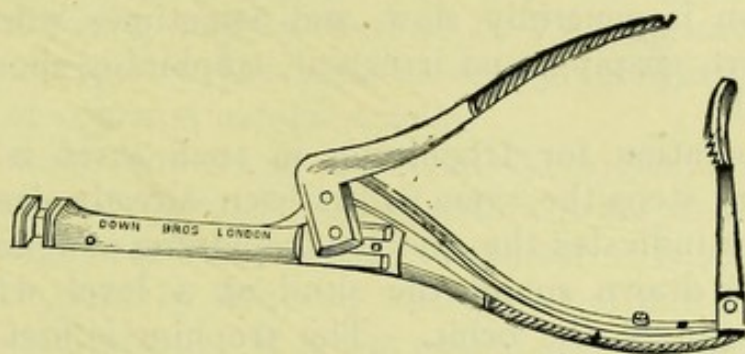


FIG. 6.

pressure with small pieces of sponge held in pressure forceps. The disc of bone is now placed *in situ*, or as it is recommended by some surgeons, any portions of bone removed are broken up and the fragments sprinkled over the exposed dura mater. The skin flap is now turned down and secured in place by silkworm-gut sutures, drainage being effected by small strands of catgut. The wound is then sprinkled with iodoform and dressed with iodoform or cyanide gauze, retained in place by a capeline bandage.

Hæmorrhage from the middle meningeal artery is a not infrequent accompaniment of injuries to the head. The following are some of the main symptoms as laid down in Jacobson's 'Operations of Surgery':—1. There is an interval of consciousness between the effects of the primary concussion and the symptoms of compression. 2. Hemiplegia more or less marked. 3. The condition of the pupils: (*a*) if natural there is compression only, which will probably be relieved by trephining; (*β*) if insensitive and dilated, the effusion is large and trephining urgently required; (*γ*) if one pupil is dilated, and on the side of the injury, the effusion is most likely very large and invading the base. 4. The pulse is generally unusually slow, full, and laboured. 5. Coma varies with the amount of effusion: when great and rapid coma is very deep.



Sometimes it is insidious, and may be mistaken for natural sleep or drunkenness. Occasionally it is deferred, and then comes on suddenly—generally a fatal symptom. 6. Respiration is generally slow, and sometimes stertorous. When short, gasping, and irregular, trephining should not be delayed.

The operation for trephining in such cases is in its preliminary steps the same as has been already described. Mr. Treves indicates the spot for trephining as follows:—  
“A line is drawn round the skull at a level with the upper margin of the orbit. The trephine is first placed at a spot on this line, which is from one inch and a quarter to one inch and a half, according to age and the size of the head, behind the external angular process of the frontal bone (Fig. 7, A). Should the opening reveal no

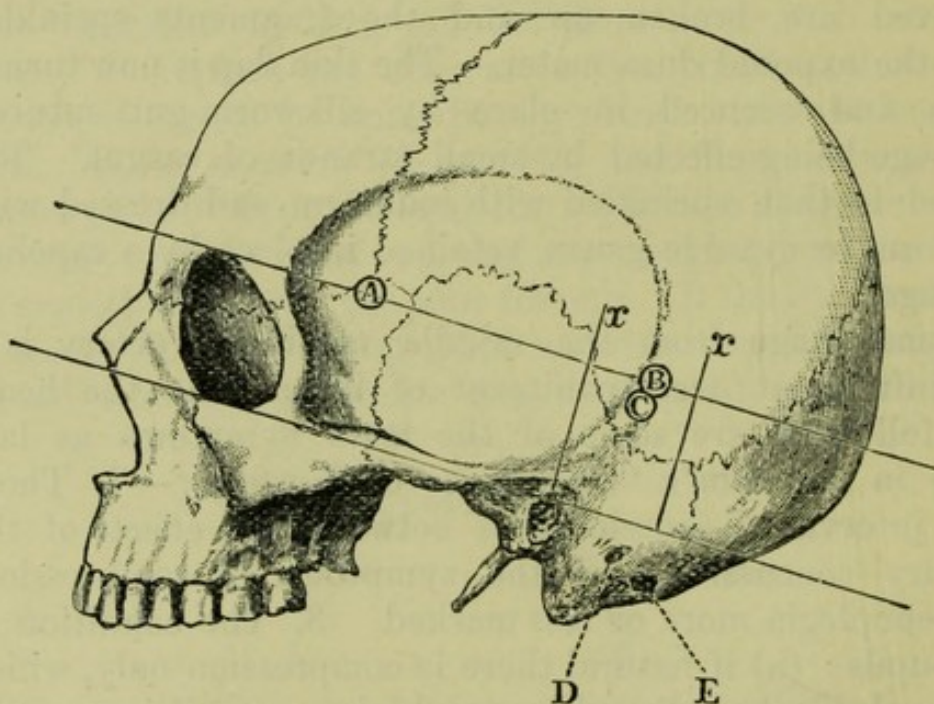


FIG. 7.—(From Treves' 'Manual of Operative Surgery'.)

blood-clot and no bleeding vessel, a second trephine-hole is made upon the same line, just below the parietal eminence (Fig. 7, B).” When the clot is exposed, it is



gently removed with a scoop and plentiful irrigation. All accessible vessels are ligatured with fine catgut; bleeding from canals by plugging with iodoform gauze or wax. General oozing may be checked by the application of ice. In some cases it has been necessary to ligature the external or common carotid artery.

In bullet wounds of the head the exploration for the bullet should be made either with a probe or with a silk-web bougie, the latter being the safest. If the bullet is found, it must be removed with a pair of fine forceps and the track drained. If it has passed through the brain and lies on the opposite side, a counter opening should be made with the trephine and the bullet removed. A long drain-tube should then be passed through from one opening to another. Hernia cerebri must be guarded against by compression with antiseptic pads.

Fractures of the base are generally the result of indirect violence, except in the nostrils and orbit, through which foreign bodies are sometimes thrust into the brain. In fractures through the orbital plate of the frontal, blood appears *first* beneath the ocular conjunctiva, then it spreads to the eyelids, the lower one being generally the first affected. If the hæmorrhage be excessive, the eyeball may be protruded. Bleeding from the nose and mouth, *if continuous*, indicates fracture through the ethmoid, body of the sphenoid, or basilar process. Large and continuous bleeding from the ears, especially if the blood filling the meatus pulsates, points to fracture through the petrous portion of the temporal. So, too, the profuse discharge of cerebro-spinal fluid indicates rupture of the cerebral membranes. The fluid will run out of the ears in large quantities so as to saturate the pillow, and may even be collected in a cup. It is a clear limpid fluid, containing a large quantity of chloride of sodium and a little sugar. It is not coagulated by heat or nitric acid. In fractures of the base the following symptoms indicate injury to the nerves:—Loss of smell and sight indicate injury to the 1st or 2nd pair; ptosis and dilated pupil to the 3rd;



inability to chew and loss of sensation on the injured side, loss of taste and sensation on the same side of the tongue, and loss of sensation in the nostril, to the 5th; internal strabismus, to the 6th; facial paralysis, to the 7th; loss of hearing, to the 8th. The 8th, 9th, 10th, 11th, and 12th pairs are seldom injured; but when they are, aphonia, dysphagia, and dyspnœa are the prominent symptoms.

Wounds of the face should be brought together very accurately, if possible with plaster only, the surface being painted over with flexile collodion. The strapping should not be removed for some days, unless swelling and redness appear. When the wound cannot be kept in apposition with plaster alone, *serre-fines* will be found useful, as avoiding the cicatrix left by a suture. If sutures are required, horsehair will be found to be the best. For sewing wounds about the eyelids a very fine curved needle is the best, and the operation is much facilitated by the use of Hagedorn's needle-holder. In wounds of the eyelids fine ophthalmic silk is the most convenient for use when the skin only is involved. If the tarsal cartilage is cut through by a clean incision, a very fine needle should be inserted close to the tarsal edge, and the edges drawn together with a twisted suture of fine silk. If the cut through the cartilage is jagged, it is better to pare the edges with a small scalpel, and then bring them together as above. If the wound involves the lower canaliculus the opening into the lachrymal sac should be kept patent. In the eyebrow care should be taken to preserve the line. In wounds of the ears and nose the parts should be accurately replaced and fixed with fine horsehair sutures. This should be done under the most unpromising circumstances. Wounds through the thickness of the lips should be brought together with horsehair sutures, care being taken to keep the exact red line of the lips; in order to effect this the first suture introduced should be at the margin of the lips. When the lip is cut internally against the teeth, considerable hæmorrhage may occur, the blood being swallowed and finally vomited in large quantities. The

bleeding will most  
coronary artery.

Foreign bodies may  
ordinary polypus form  
Or a current of water  
nostril, when, if the p  
open, it will return b  
For this and other like

will be found very useful  
regulated by the height  
water is placed. The pe  
in the bottom of the jug  
curled up under the water  
Then raise the jug to the



bleeding will most likely be found to proceed from the coronary artery.

Foreign bodies may be removed from the nose with ordinary polypus forceps, or by those figured below (Fig. 9). Or a current of water may be injected up the opposite nostril, when, if the patient is directed to keep the mouth open, it will return behind the foreign body and eject it. For this and other like purposes the syphon-tube (Fig. 8)

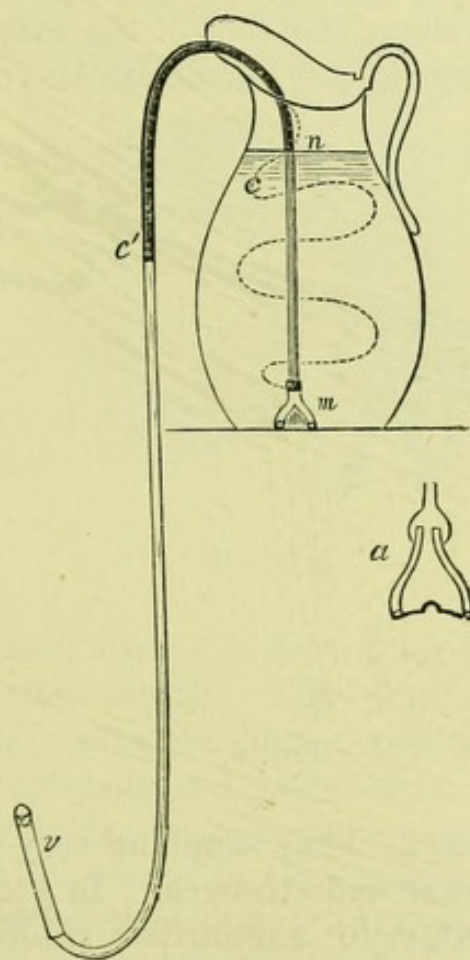


FIG. 8.

will be found very useful, the force of the current being regulated by the height at which the jug containing the water is placed. The perforated weight, *a*, is placed at *m* in the bottom of the jug. The india-rubber tube is then curled up under the water, and left for a couple of minutes. Then raise the jug to the required height, and pinching the

tube at *c* between the forefinger and thumb, draw it out over the brim of the jug to *c'*, when, being converted into a syphon, water will run continuously through the nozzle *v*. If this instrument be not at hand a Higginson's syringe will serve the purpose. For injecting the nostrils salt and water should always be used, water alone being very painful.

For removing foreign bodies from the ear a current of water will very frequently suffice, care being taken to direct the stream along the roof of the canal ; but if this fails, then the forceps (Fig. 9) made by Mayer and Meltzer

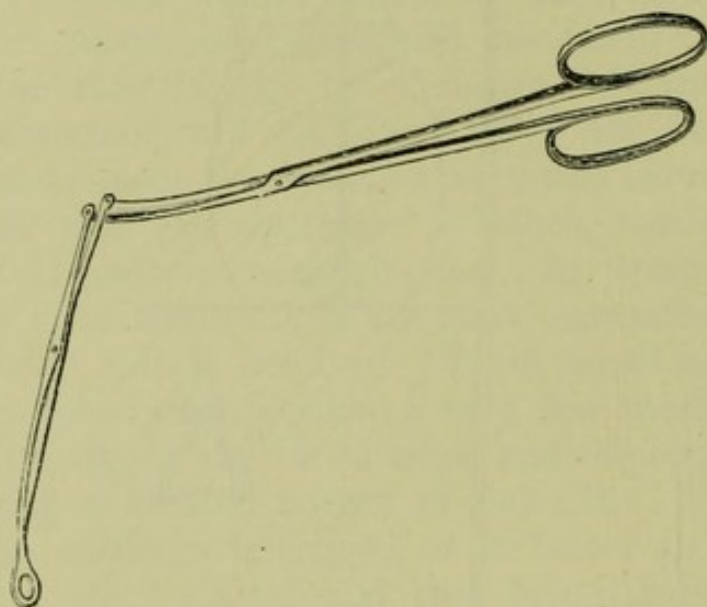


FIG. 9.

are the best I know. They combine very great fineness with wonderful power and strength. In young and timid children it is better to administer chloroform if any difficulty occurs in removing the foreign body.

Epistaxis may, when slight, be arrested by placing the patient in the recumbent position, and elevating the arms as high as possible, making the patient snuff up tannic acid, or by injecting a current of hot salt and water through the nostril with the syphon-tube, as described above, or a Higginson's syringe. These plans failing, pressure on the facial artery as it passes over the edge



of the lower jaw will sometimes succeed. If it be needful to plug the posterior nares, the usual instrument recommended is Bellocq's cannula (Fig. 10). By this a plug of

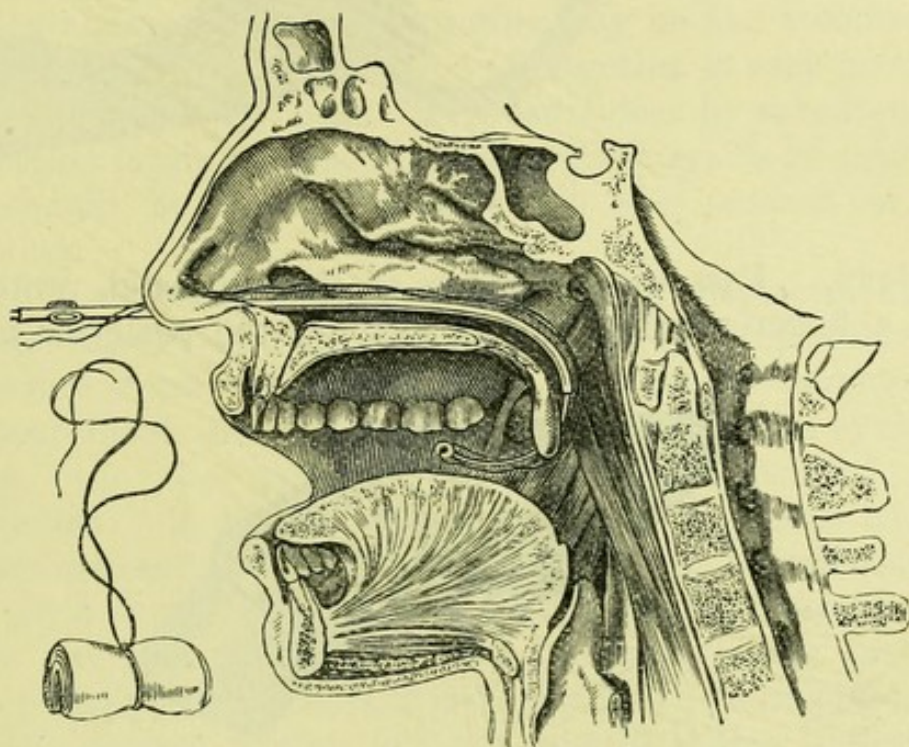


FIG. 10.

lint or compressed sponge is drawn up into the posterior nares through the mouth. The plug should be guided behind the palate with the finger, and should lie with its long diameter upwards and downwards. The ends of the string hanging from the nostrils are separated, and tied over a plug of lint placed in the anterior nares, whilst one string should be brought out through the mouth, to assist in withdrawing the plug if needful. A flexible gum-elastic catheter is a good substitute for the cannula, the silk or whipcord being passed down through the eye of the catheter. Howard's epistaxis instrument consists of a thin rubber bag which in its collapsed condition is introduced into the nostrils, and is then inflated (Fig. 11), the air being retained by a stopcock. I have frequently adopted a very efficient and ready method of plugging as



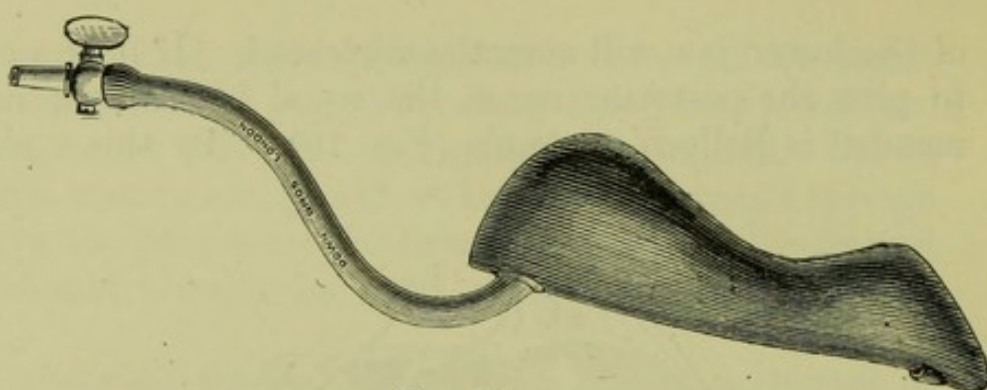


FIG. 11.

follows. Pass the forefingers of the left hand, protected by a finger-guard (Fig. 12), well up the posterior nares.

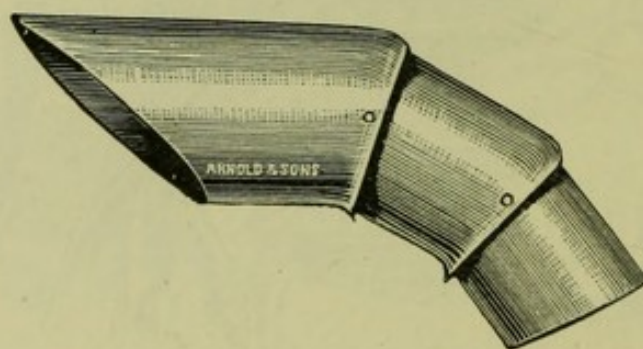


FIG. 12.

Then with a pair of slender polypus forceps (Fig. 13) pass a long strip of antiseptic or iodoform gauze through the anterior nares, until the point of the forceps is felt to

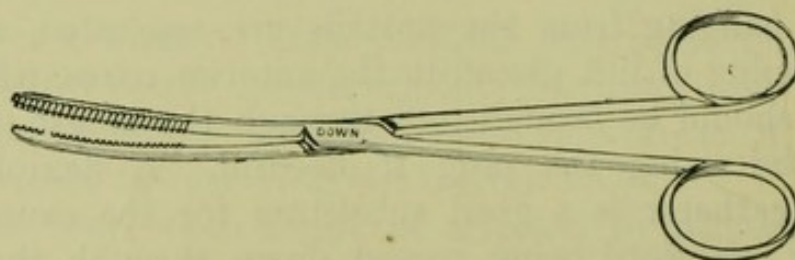


FIG. 13.

impinge on the left forefinger projecting up the posterior nares. Then withdraw the forceps and pack the strip of gauze well down on to the finger until the whole cavity



is filled. The end must be left hanging out of the nostril for withdrawal. Before plugging, care should be taken to syringe out all clots, which are often the cause of the hæmorrhage being kept up. In very extreme cases the subcutaneous injection of ergotine may be had recourse to. Huggett's permanent solution of ergotine is very good for this and other purposes. The usual dose by subcutaneous injection is ten minims, containing three grains of ergotine. It should be injected deeply into the muscles of the buttock.

In fractures of the nasal bones with displacement the bones should be replaced as accurately as possible by pressure from within the nostril. Should emphysema appear about the root of the nose and below the eyes, the skin over the parts affected should be painted with collodion. A female catheter is the instrument usually recommended to effect the replacement of the bones, but its point is too large, especially when the parts are swollen. The end of a small sound will be found better adapted. No plugging of the nostril is of any use. In displacement of the septum, a plug in both nostrils with a well-fitting gutta-percha shield on the nose, outside, will be found of advantage.

In cases where is much displacement of the septum upon the subsidence of the swelling, Mr. Adams has devised the following plan of treatment:—The patient being placed

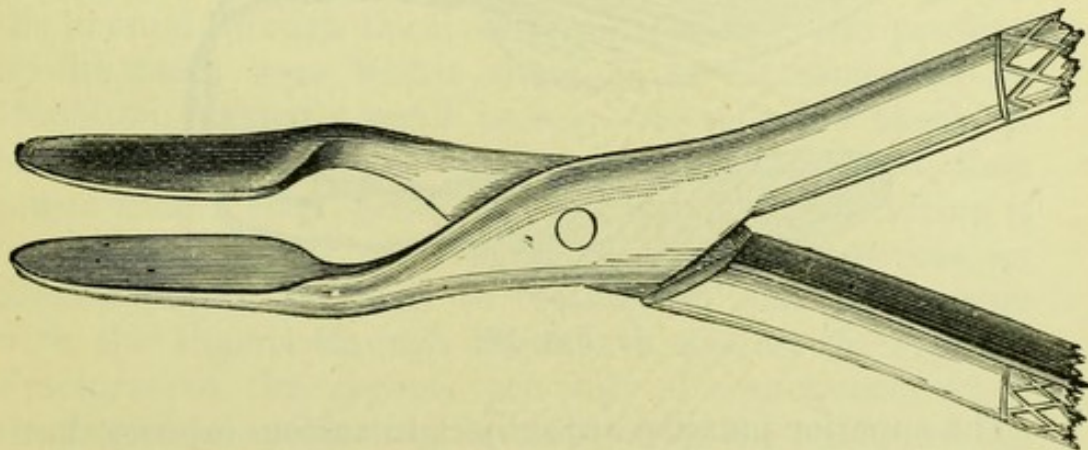


FIG. 14.



under the influence of chloroform, a pair of strong forceps (Fig. 14) are used to straighten the bent cartilaginous septum. The same forceps, with the blades closed, may be forced up each nostril under the lower portion of the nasal bones, should they be displaced, and the bones raised from within, whilst lateral pressure is made at the same time externally with the thumb.

In order to support the septum in its place, a steel screw compressor (Fig. 15) is used, one blade being intro-

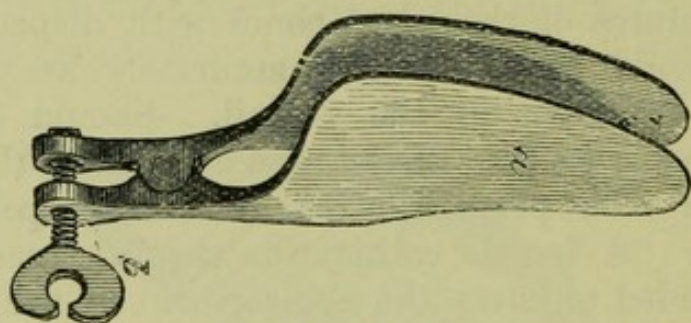


FIG. 15.

duced into each nostril, and the screw sufficiently tightened to hold it in place. This may be worn for a few days, after which its place may be supplied by two ivory plugs (Fig. 16), one placed in each nostril, which can be removed and replaced by the patient himself.

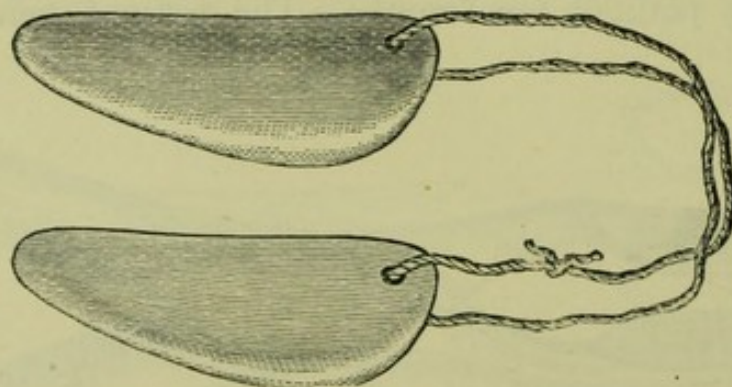


FIG. 16.

The superior maxillæ are subject to various injuries, but there is seldom room for more treatment than that afforded



by evaporating lotions and ordinary retentive bandages. The two bones are sometimes separated from one another, but reunion takes place without much interference on the part of the surgeon. It is possible that the central incisors of the alveolus may be pushed by direct violence up into the nostril. In such a case the fragment will be felt in the nostril, and can be easily pushed down into its place, and retained there by wiring it to the adjacent teeth, at the same time placing a firm plug in the nostrils. When the fragments are much displaced, an attempt should be made to place them in position by running the fingers along the alveoli, and restoring any irregularity. This may be facilitated by introducing a pair of dressing forceps into the nostril. The teeth may then be wired together, or a gutta-percha shield may be moulded round the alveolar process, care being taken not to let the molars of the lower jaw become imbedded in the gutta percha whilst it is soft. If there is much comminution, the greatest care should be taken not to remove any fragments. Hæmorrhage from the branches of the internal maxillary is sometimes very excessive. It must be controlled by the application of ligatures, if possible, the actual cautery, ice, or the perchloride of iron. Fracture of the nasal process is treated in the same way as fracture of the nasal bones. A very serious deformity is caused by depression of the malar bone and fracture of the antrum. The deformity may be remedied by making an opening into the antrum through the alveolar process, and then pressing up the malar bone with a sound, or, as recommended by Hamilton, making a small incision through the cheek at the anterior margin of the masseter muscle, and then introducing a hook under the zygoma, and thus lifting it up. Before having recourse to these severe measures, an attempt should be made to replace the bone by pressing with the thumb, through the mouth, against the zygoma. Fractures of the zygoma are only of consequence when the fragments, projecting inwards, enter the tendon of the temporal muscle and impede the movements of the lower



jaw. Reduction should then be attempted from within the mouth. In fractures of the alveolar process the teeth in the broken fragment should be secured to a firm tooth, if there is one, by silver wire ; or a mould of gutta percha may be fitted to the fragments. On no account should the fractured portion be removed.

Fractures of the lower jaw are generally the result of much violence. Fractures are more frequent in the body of the bone, and they generally happen at or near the mental foramen. If it be a single fracture it is easily detected by pressing the posterior fragment inwards, when mobility and crepitus will be discovered. If the fracture—as is not unfrequently the case—be double, then it is discovered by taking the central fragment between the finger and thumb and moving it. Fractures at the angle and ascending ramus present the same features as those of the body, only there is less displacement and mobility. Fractures of the coronoid are rarely met with, but a severe blow on the chin will sometimes fracture the neck of one or both condyles. This may be discovered by the pain at the seat of fracture, on moving the jaw, and by crepitus, which the patient can himself generally feel and hear. The chin is also turned towards the affected side, which will distinguish it from dislocation. In the treatment of fracture of the jaw, all teeth that are very much loosened from their sockets, in the immediate neighbourhood of the fracture, should be removed. It should also be ascertained that no tooth, or portion of a tooth, has fallen between the fragments. If there is much displacement, and the teeth contiguous to the fracture are sound, they should be tied together either with silver wire or thick silk : but this should be avoided if possible ; and if a ligature is used it should be tied up as high as possible, to prevent the gum from being cut and irritated. In severe cases, especially when the fracture is compound, an interdental splint of iron wire, invented by Mr. Hammond, may be used. It is made of a piece of wire bent so as to embrace the whole of the teeth and connected together between the teeth by



bits of thinner wire (Fig. 17). In order to fit this splint perfectly a mould of the teeth must be taken in wax from

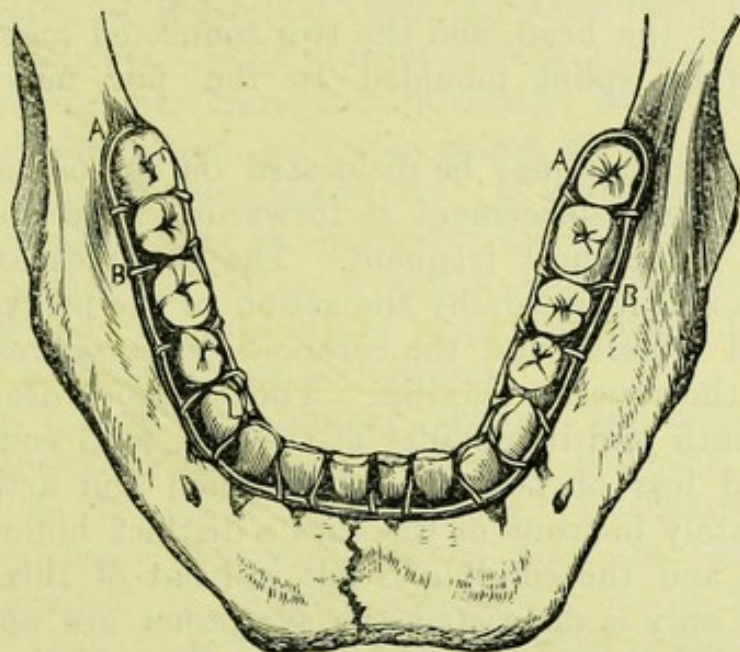


FIG. 17.

which a plaster cast is made. The simplest and most efficacious form of bandage is the one figured (Fig. 18). It is made with a piece of bandage or muslin, a yard long



FIG. 18.

and four inches wide. A slit four inches long is made longitudinally in the centre, and the ends of the bandage



are torn down to within three or four inches of this slit. The chin is then placed in the slit, the anterior tails are tied behind the nape of the neck, the posterior ones over the top of the head, and the two connected together. A gutta-percha splint moulded to the jaw may also be useful.

The lower jaw may be dislocated on one or both sides. In both the displacement is forwards. The double dislocation is the most frequent. The condyles are drawn upwards and forwards by the action of the pterygoid and temporal muscles, and the coronoid processes rest on the back of the superior maxillæ. The symptoms are—widely open mouth and immobility of the jaw, with considerable pain and loss of power of deglutition and articulation. Immediately in front of the ears a distinct hollow is perceptible, and the condyle is felt in front of this. When one side only is dislocated the symptoms are not so prominent, and it may be overlooked. The chief points are that the chin is usually directed to the sound side, and the hollow in front of the ears is found on the injured side. The dislocation may be reduced in two ways. Place the patient on the floor with the head between your knees. Then put two pieces of cork as far back as possible between the molars on either side. Press the point of the chin steadily and directly upwards. Or, standing in front of the patient, place your two thumbs well guarded with a towel between the last molars. Grasp the jaw firmly with the hands. Press downwards and backwards with the thumbs, and at the same time elevate the chin.

Sprains of the spine are found principally in the cervical and lumbar regions. In the neck they are accompanied with intense pain, and partial loss of power in the arms and legs, with numbness and pricking throughout the body. In the lumbar region there is general pain across the loins, with considerable swelling, and frequently hæmaturia. But the line of spinous processes is found level, and the pain on pressure cannot be limited to any



particular spot. Perfect rest and hot fomentations are alone required.

Concussion of the spinal cord may arise from direct or indirect violence. Injury from direct violence in the cervical region may cause instant death; or there may be a sense of suffocation, irregular action of the heart, and vomiting from injury to the vagus. If the spinal accessory is involved, there may be spasmodic action of the trapezius and sterno-mastoid. Hiccup and a sense of constriction round the body indicate injury to the phrenic. Paralysis of one or both arms may be induced.

In the dorsal and lumbar regions concussion may produce complete paraplegia. There is, however, no priapism, as in laceration of the cord. Concussion from indirect violence frequently takes place in the severe shock sustained in railway accidents, and it is to be remarked that the remote injury produced is quite out of proportion to the apparent slightness of the accident. It is also to be remarked that the symptoms of spinal concussion seldom appear when serious injury has been inflicted on other parts of the body, unless the spine itself has been directly injured. The principal treatment consists in perfect and prolonged rest, the patient lying as much as possible on the face. The administration of chloral and bromide of potassium will be found of service. Dry cupping and the application of ice-bags will also give relief.

Fractures of the spine above the level of the fourth cervical vertebra cause, as a rule, instant death. In the cervico-dorsal region fracture frequently takes place. All below the point of fracture is paralysed, but there is sensation as low as the nipples. Breathing is entirely carried on by the diaphragm and the serratus magnus. In the dorsal region, between the fourth and the tenth vertebræ, there is generally complete paralysis of the lower extremities, of the abdominal muscles, and of the bladder and rectum. Respiration is imperfectly performed by the diaphragm and upper part of the thorax.



In the lumbar region there may be an absence of paralysis, or if it is present in the erect position, when the patient is placed on his back the fractured parts are replaced, and he recovers the use of his lower extremities.

Dislocation of the axis from the atlas sometimes occurs, and is followed by instant death. Dislocation of any one of the five lower cervical vertebræ may take place from forcible flexion and rotation combined. Dislocation of the transverse processes of the cervical vertebræ sometimes occurs, the head being fixed immoveably and turned to the opposite side to that on which the injury has taken place. Reduction may be effected by placing the two knees on the patient's shoulders, extending the head, and forcibly turning it into position.

In such injuries all motion of the spine should be guarded against during the removal of the patient, by placing him on a door or board (see Chap. XII). If the fracture be cervical, the head should be surrounded with a sack filled with sand, to prevent all motion, and the clothes should be cut off to avoid disturbance. Bleeding should not be resorted to. The patient should at once be placed on a water-bed, a catheter introduced at the earliest moment, and the urine drawn off.



## CHAPTER II

## INJURIES TO THE EYE

Injuries and Acute Diseases of the Conjunctiva, Cornea, and Sclerotic—The Iris—The Lens—The Choroid—Injuries from Chemicals—Acute Glaucoma—Foreign Bodies within the Eyeball—Excision of the Eyeball—Injuries to the Orbit—Injuries to the Optic Nerve External to the Eyeball.

SUDDEN effusions of blood sometimes take place beneath the conjunctiva, following a sneeze, or some other violent exertion. They produce considerable alarm, but call for no treatment. Lacerations of the conjunctiva produce much swelling, but it is seldom needful to do more than keep the eye closed, and apply some evaporating lotion. If a large flap is torn, it may be sometimes necessary to put in one or two sutures of fine ophthalmic silk. Very small curved needles are the best for the purpose, used with a needle-holder (Fig. 6, p. 7).

Catarrhal ophthalmia is an acute inflammation of the conjunctiva arising without apparent cause, or from exposure to cold. It is epidemic and very contagious. The characteristic symptoms are bright redness, large secretion of muco-pus, the affection of both eyes simultaneously, or one following the other rapidly. Treatment:—Bathe the eye every three hours with a lotion of alum (gr. iij to iv ad ʒj). Drop in two or three drops of a solution of nitrate of silver (gr. j ad ʒj) night and morning. Keep the lids from sticking together by smearing a little vaseline over the edges. Give a smart purge and then administer tonics.

Ophthalmia neonatorum, or the purulent ophthalmia of



new-born infants, commences from the second to the seventh day after birth. Both eyes are simultaneously affected. It commences with slight muco-purulent discharge gluing the lids together. The discharge rapidly increases and changes to pure pus. The lids become red and swollen, and the cornea in some cases is rapidly involved. Treatment:—Wash away the discharge as soon as it collects, and syringe out the eyes with an alum lotion (gr. vj ad ʒj) every hour. Twice a day drop in nitrate of silver drops (gr. ij ad ʒj). Above all things keep the child in a darkened room, but do not cover the eyes.

Gonorrhœal ophthalmia is a specific disease induced by the contact of gonorrhœal matter. The symptoms are—profuse purulent discharge, great chemosis, swelling of the lids, which become red, tense, and closed; rapid involvement of the cornea. Treatment:—Full administration of stimulants, and liberal diet. A free purge, and then quinine in 2-gr. doses every four hours, with opium, if required, to allay pain. Nitrate of silver (gr. x ad ʒj) applied on the everted lids with a camel's-hair brush, and then washed off with a stream of salt and water (gr. v ad ʒj) once or twice daily. If the lids cannot be everted the solution may be dropped in. Wash the eye every hour with an alum or zinc lotion; cold applications are generally the most grateful. In adults, in the early stages several leeches to the temples give great relief. If the swelling is very tense the outer canthus may be divided with scissors.

Very minute portions, generally of iron, become embedded in the epithelium of the cornea. They cause great pain, lachrymation, and intolerance of light. To remove them, seat the patient in a chair, and, standing behind him, draw up the upper lid, and steady the globe of the eye with the fore and middle finger of one hand, whilst with the other pick out the foreign body with a small spud or chisel (Fig. 19). This little instrument for the pocket contains on one side a curette, which is very useful for everting the lids, and other purposes, whilst on



the other side is the spud. Care must be taken, if the foreign body is deeply fixed, not to press it into the



FIG. 19.

anterior chamber; and if there be danger of this, a broad needle must be passed into the anterior chamber from the corneal edge, and pressed against the cornea immediately behind the foreign body, which can then be pricked out with another needle. For this operation there will be required a spring speculum (Fig. 20), a broad

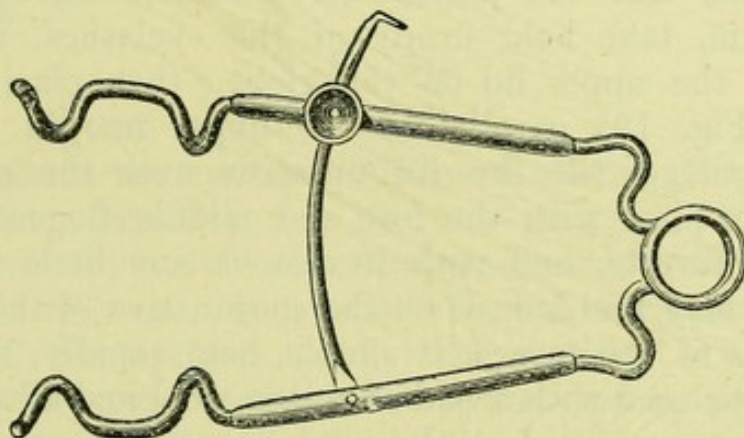


FIG. 20.

needle (Fig. 21), a fine needle (Fig. 22), and conjunctival forceps to steady the eye with. Before attempting to

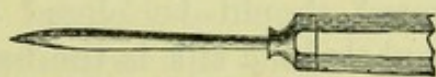


FIG. 21.

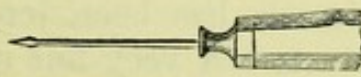


FIG. 22.

remove the foreign body, drop into the eye a 2 per cent. solution of the hydrochlorate of cocaine two or three times at intervals of three minutes, so as to deprive the cornea of sensibility. After this operation a little castor oil dropped into the eye is very soothing. Atropine is soluble in castor oil, and is a useful addition when there is much pain and irritation.



Abrasions of the cornea cause considerable pain, intolerance of light, and lachrymation. They appear as little facets where the cornea has been abraded. The application of a 2 per cent. solution of hydrochlorate of cocaine two or three times a day, and the closure of the eye, will afford very great relief.

Foreign bodies very frequently become lodged beneath the upper lid, and abrade the cornea. They cause much distress, and are frequently overlooked, the inflammation of the eye caused by their presence being put down to cold, &c. It is wise always to evert the upper lid when there is the least suspicion of a foreign body been present. To do this, seat the patient on a chair, and standing behind him, take hold firmly of the eyelashes, and by them lift the upper lid off the globe: then placing the curette (Fig. 19) parallel to the upper margin of the tarsal cartilage, tilt the lid upwards over the curette. Keep it in place with the fore and middle fingers, withdraw the curette, and with it remove any little foreign body you may find lodged on the conjunctiva of the lid.

Wounds of the cornea, if simple, heal rapidly, the eye being kept closed with a pad of cotton wool and a bandage. Wounds accompanied with much contusion, especially those involving the sclerotic, are very dangerous, and perfect rest should be at once enjoined, both eyes being closed, and three or four leeches applied to the temples. In extensive wounds of the sclerotic, even when much vitreous has been lost, the wound should be closed by suture. A very fine suture of ophthalmic silk is the best.

For closing the eye, in this and other cases requiring such treatment, "Liebreich's eye-bandage" (Fig. 23) will be found the most useful. It consists of a knitted band, A, ten inches long and two and a half inches broad. The tape B, twelve inches long, passes over the top of the head, from ear to ear; the second tape, CD, passing through a loop at the end of B, and tying with E at the side of the temples. The bandage is thus applied:—Make the patient close both eyes gently, and over each



place a square of linen, and again on this a round pad of cotton wool. The bandage, being fitted to the head, is

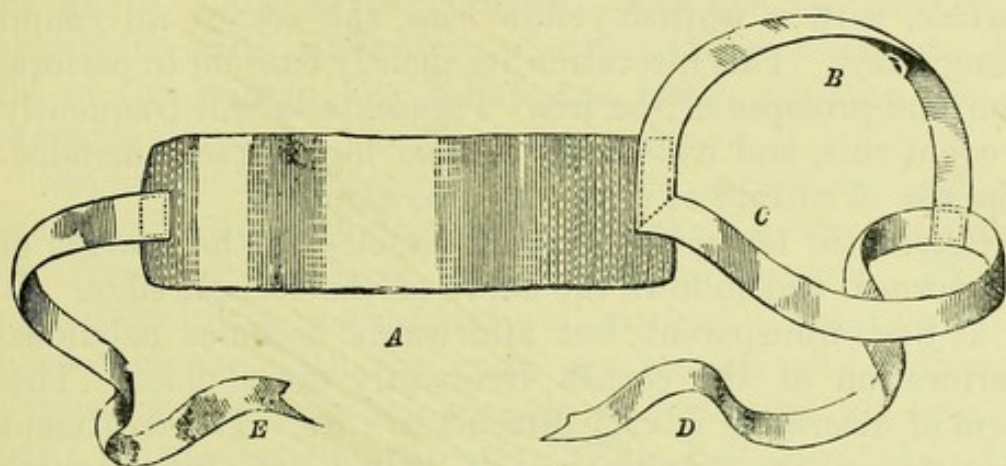


FIG. 23.

drawn across the eyes, and fastened on the temple opposite to the injured eye.

Diffuse suppurative corneitis commences with pain and heat in the eye, congestion of the conjunctiva and sclerotic, photophobia, and lachrymation. The cornea becomes steamy, and pus is soon effused in its layers. If the disease advances the deeper tissues become involved, and pus is effused into the anterior chamber, settling down into its lower part and constituting hypopyon. The treatment consists of the application of warm belladonna fomentation (Ext. Belladon.  $\mathfrak{z}\mathfrak{j}$ , Aq. ferv. Oj). The fomentation should be applied as hot as possible and changed frequently. If there is increased tension, iridectomy should be performed or paracentesis. The latter operation is performed as follows:—Introduce the wire speculum, and seizing a fold of conjunctiva with the conjunctival forceps, perforate the cornea at its edge with a broad needle (Fig. 21), keeping the point well towards the posterior surface of the cornea. Then turn the needle on its edge, so as to stretch the wound and allow the aqueous to escape. When the iris approaches the cornea, as it will do on the escape of the aqueous, turn the needle again on



the flat and withdraw it. Remove the speculum and close the eye with a fold of wet lint and a bandage.

A sloughing ulcer of the cornea presents an excavated surface, with a whitish-yellow base, the cornea all round being hazy. This ulceration frequently runs on to perforation and prolapse of the iris. Paracentesis will frequently prevent this, and iridectomy is also highly recommended. The use of nitrate of silver is to be avoided.

Crescentic ulceration appears exactly at the margin of the cornea, and follows the curve of the corneal edge. It is at first transparent, but afterwards becomes nebulous. Perforation of the cornea frequently takes place. This form of ulceration is very difficult to cure. The treatment consists in the application of belladonna fomentation, dropping in *Liq. Atropiæ*, and keeping both eyes closed. Sometimes nitrate of silver is of use. It should be applied with a camel-hair brush, moistened with water, and drawn several times over a stick of nitrate of silver. In both these forms of ulceration, liberal diet, stimulants, tonics, and sedatives should be administered.

The iris is sometimes injured by sharp blows, as from a cork discharged from a soda-water bottle, &c. The immediate result may be hæmorrhage into the anterior chamber, from rupture of some of the vessels of the iris. As a rule the blood is rapidly absorbed, rest and an evaporating lotion being the treatment. Another effect of a blow may be the separation of the iris from its ciliary border. This is accompanied by considerable hæmorrhage into the anterior chamber, but if uncomplicated by other damage generally does well.

Wounds at the edge of the cornea are frequently accompanied with prolapse of the iris. Immediately after the accident, atropine drops should be instilled, and a firm compress applied. This should be removed two or three times a day, the eye bathed with warm water, and fresh drops put in.

When seen early, the prolapsed iris should be cut off with a pair of scissors. If the prolapse is large and not



seen until after adhesions have been contracted to the edges of the wound, and the corneal wound is inclined to gape, the protruded iris should be punctured with a needle so as to allow it to collapse. The general treatment should be—the application of two or three leeches to the lid of the injured eye, belladonna lotion, and the use of atropine drops (gr.  $\frac{1}{2}$  ad  $\frac{3}{4}$ ) twice a day.

Syphilitic iritis commences as the secondary rash is fading. Its peculiar characteristic is the deposit of nodules of lymph on the edge and surface of the iris. Photophobia and pain are neither well marked. Treatment:—Give mercury until the gums are tender, with iodide of potassium; drop in atropine drops (gr.  $\frac{1}{2}$  ad  $\frac{3}{4}$ ) twice a day; or use belladonna lotion (Ext. Belladonn.  $\mathfrak{D}$ ij, Aq. ad  $\mathfrak{z}$ viiij).

In rheumatic iritis the aqueous becomes yellow. The pain is very severe and neuralgic, with great photophobia. Treatment:—Iodide of potassium, in small doses, with bicarbonate of potash, or 2-gr. doses of quinine every four hours. Slight mercurial inunction to the temples. Keep the pupil dilated with atropine.

Acute traumatic iritis may come on four or five days after an injury. The symptoms are oedema of the lids and chemosis of the conjunctiva, with rapid exudation of lymph on the surface of the iris and in the pupil. Treatment:—Leeches to the temple, atropine drops, belladonna lotion or fomentation, a purge to relieve the bowels, and opium to relieve pain. If suppuration should occur, with much distension, paracentesis of the cornea should be performed (see p. 27). In all these cases the use of a shade covering *both* eyes is of consequence. By far the best shade is one cut out of brown paper. It should reach from ear to ear, and should be from four to six inches deep. A strip of brown paper passing round the back of the head, and pinned to the shade above either ear, will secure it in place.

The lens is frequently wounded, in company with the cornea and iris. When this is the case the lens tissue



rapidly swells and becomes opaque. The iris should be kept fully dilated with atropine to prevent the swollen lens pressing upon it. Should symptoms of traumatic glaucoma come on, indicated by increased pain, hardness of the globe, diminution of the anterior chamber, and pink tinge of the sclerotic, the lens should at once be removed. As it is generally soft, the suction operation will be applicable, or the entire lens may be removed through a small corneal wound, by the simple introduction of the curette, accompanied with slight pressure on the cornea.

If urgent symptoms, however, do not manifest themselves, atropine drops, belladonna lotion, and perfect rest by closing both eyes should be the plan of treatment. It must be remembered that opacities of the lens sometimes come on some little time after a blow on the eye, unaccompanied by any external wound.

Dislocation of the lens into the anterior chamber may be the result of a blow. The lens appears "like a large drop of oil lying at the back of the cornea, the margin exhibiting a brilliant yellow reflex." The iris is pushed backwards and widely dilated. Great pain and inflammation attend this accident as a rule. It is advisable at once to remove the lens, linear extraction being the operation most suitable. When the lens is dislocated into the vitreous, the symptoms are a falling backwards and dilatation of the iris, which also becomes tremulous. If great pain and irritation come on, it is better to endeavour at once to remove the lens—the traction operation being in this case the best.

Partial dislocations of the lens are the result of severe blows, and generally terminate in cataract. There is also sometimes a glaucomatous state produced, which intermits, but is highly dangerous to sight, and the lens should be removed by the traction operation, with a large iridectomy. In all these cases the operation is sure to be accompanied with loss of vitreous.

A severe blow on the eye will frequently cause hæmorrhage to take place between the choroid and the retina.



If the hæmorrhage is severe all useful vision is lost ; but if slight, recovery may be looked for with a blind spot corresponding to the detached portion of retina. The treatment should consist of a couple of leeches to the temple, ice over the eye, atropine drops, and perfect rest to both eyes.

Injury to the eye by lime or mortar, if *seen immediately*, should be treated by washing out with a tepid solution of vinegar (ʒj ad Aq. ʒij). The upper lid should be everted, and all portions remaining in the eye carefully removed ; a drop of castor oil may then be put in, and the eye closed with a pledget of wet lint.

When the eye is injured by a strong acid it should be syringed out with an alkaline solution (Sodæ Bicarb. gr. v, Aq. ʒj), the after-treatment being the same as that above described. If the lids are injured with the acid they should be dressed with the following liniment :

Olei Lini,  
Liq. Calcis, āā fl. oz. iv ;  
Cretæ Preparatæ, oz. ij.

Lint dipped in this liniment should be applied over the eye, and a pad of cotton wool placed over it with a bandage.

When the eye is injured by an explosion of gunpowder, all the loose powder should be carefully removed with a syringe and tepid water. The cornea should also be carefully searched, and all particles embedded in it removed with the spud. Castor oil should then be dropped in, and belladonna lotion applied.

Acute glaucoma is sudden in its attack. The eye presents all the appearance of acute inflammation. The anterior chamber is greatly diminished, so that the iris is almost in contact with the cornea. The pupil is dilated and very sluggish, if not entirely inactive. The patient sees rainbows round the candle or gas-light. The field of vision is much diminished, and sight greatly impaired. The tension of the globe is increased even to stony hard-



ness. The pain is most intense, especially at the back of the head, and as it is frequently accompanied by sickness, the attack is too often mistaken for a simple bilious one. If the fundus can be seen with the ophthalmoscope, the optic entrance will be found cupped, the retinal arteries pulsating, and the veins tortuous and distended. Small blood-clots may also be seen scattered over the retina. A few hours will frequently accomplish the destruction of the eye. Treatment:—The immediate performance of an iridectomy gives the only chance of saving the eye.

The fragments caused by the explosion of percussion-caps, and small shot, very frequently penetrate the eyeball. If the foreign body can be seen, an attempt should be made to remove it. If its presence is only suspected, great watchfulness must be exercised. The following symptoms indicate the presence of a foreign body :

1. Continuation of primary inflammation.
2. Subacute choro-iritis after the subsidence of the primary inflammation.
3. Non-union of the corneal wound.
4. Severe and continued pain in the eye.

The continuance of these symptoms should lead to excision of the eyeball. But if at the time of the accident sight is destroyed, and no doubt exists as to the presence of a foreign body within the eye, the eyeball should be at once extirpated.

The instruments required for this operation are—1, a spring speculum ; 2, conjunctival forceps ; 3, a blunt-pointed pair of scissors curved on the flat (Fig. 24) ; and

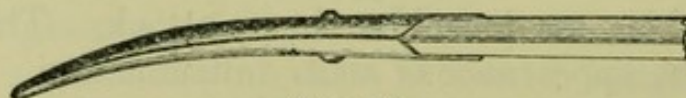


FIG. 24.

4, a strabismus-hook. The patient being placed under the influence of chloroform, the spring speculum is introduced between the eyelids. A fold of conjunctiva is then nipped up with the forceps close to the corneal edge.



One blade of the scissors being introduced into this opening, they are run round the edge of the cornea, snipping as they go, and thus dividing the conjunctiva completely. The forceps are then laid aside, and the recti muscles are taken up on the squint-hook in succession, and divided with the scissors close to the globe. By pressing the speculum backwards into the orbit the globe is now made to protrude from the socket. The remaining oblique muscles and the fascia are then divided. The closed scissors are next passed backwards along the inner side of the eyeball, and on being opened are made to include the optic nerve, which is divided, and the entire globe lifted from the orbit. Brisk hæmorrhage ensues from the central artery, which is easily controlled by a stream of cold water. If it continues to bleed, the best plan is to leave the speculum between the lids, and press a small dry sponge into the orbit, retaining it there firmly with a bandage for an hour or two.

An artificial eye should not be introduced until six weeks or two months after extirpation. The following instructions are useful with regard to wearing the eye:—It should be taken out every night and replaced in the morning.

*To take the Eye out.*—The lower lid must be drawn downwards with the middle finger of the left hand; and then with the right hand the end of a small bodkin must be put beneath the lower edge of the artificial eye, which must be raised gently forwards over the lower eyelid, when it will readily drop out. At this time care must be taken that the eye does not fall on the ground or other hard place, as it is very brittle, and may readily be broken by a fall.

*To put the Eye in.*—Place the left hand flat upon the forehead with the fingers downwards, and with the two middle fingers raise the upper lid towards the eyebrow, and then with the right hand push the upper edge of the artificial eye beneath the upper eyelid, which may now be allowed to drop upon the eye. The eye must then be



supported with the middle finger of the left hand, whilst the lower eyelid is raised over its lower edge with the right hand.

Foreign bodies are sometimes impacted in the orbit. To remove them, the outer canthus should be slit with a pair of scissors or a scalpel. If the body be in the upper part of the orbit, the upper lid must be turned up, and the fold of mucous membrane reflected from the globe divided. The foreign body, being felt, may then be removed with a pair of forceps. If it is in the lower part of the orbit, the lower lid must be drawn down and the conjunctiva divided. Should the foreign body be small and metallic, anything like prolonged search is to be deprecated, as frequently little or no harm comes from its presence in the orbit, and considerable mischief may follow the attempt to remove it.

It sometimes happens in gunshot wounds that a shot will enter the orbit, and, passing outside the eyeball, will either divide or so injure the optic nerve as to entirely destroy vision. The accident is sometimes accompanied with much hæmorrhage into the orbit, which protrudes the eyeball. It is a point of considerable importance as to whether the shot has entered the eyeball or not ; as in the former case extirpation of the eyeball would be an undoubted necessity, whilst in the latter no interference is needed. Ophthalmoscopic examination will clearly demonstrate the presence of a shot within the globe. If it is found not to be there, then the other alternative must be adopted, viz. that the shot has entered the orbit external to the globe, and passing backwards, either divided or injured the optic nerve external to the globe.



## CHAPTER III

## INJURIES TO THE MOUTH, PHARYNX, ŒSOPHAGUS, AND LARYNX

Wounds of Tongue—Foreign Bodies in Pharynx and Œsophagus—Foreign Bodies in Windpipe—Scald of Larynx—Laryngitis—Laryngotomy—Laryngo-tracheotomy—Tracheotomy—Cut Throat—Artificial Feeding—Stabs in the Throat—Ligature of Common Carotid—Drowning—Hanging—Respiration of Noxious Gases—Artificial Respiration.

WOUNDS of the tongue, if the parts gape, must be drawn together with fine catgut. The suture should be placed deeply, with a curved needle set in a handle. In young children it is better to give chloroform, the mouth being opened with a gag (Fig. 25), and the tongue drawn well

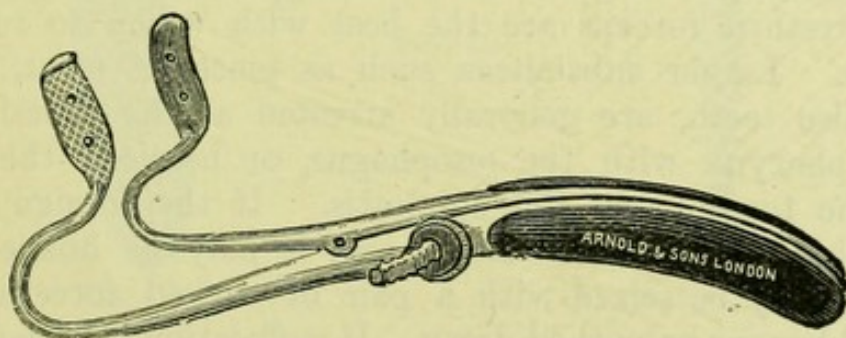


FIG. 25.

forward by seizing it at the tip with a pair of tongue forceps (Fig. 26). Ice, or the application of perchloride of iron, will generally stop all bleeding; but if it persists, a ligature may be passed with a curved needle round the bleeding point, enclosing the muscular tissue. It is well to remember that in cases of considerable hæmorrhage



from the tongue it can be immediately arrested for the time by passing the forefinger behind the epiglottis and

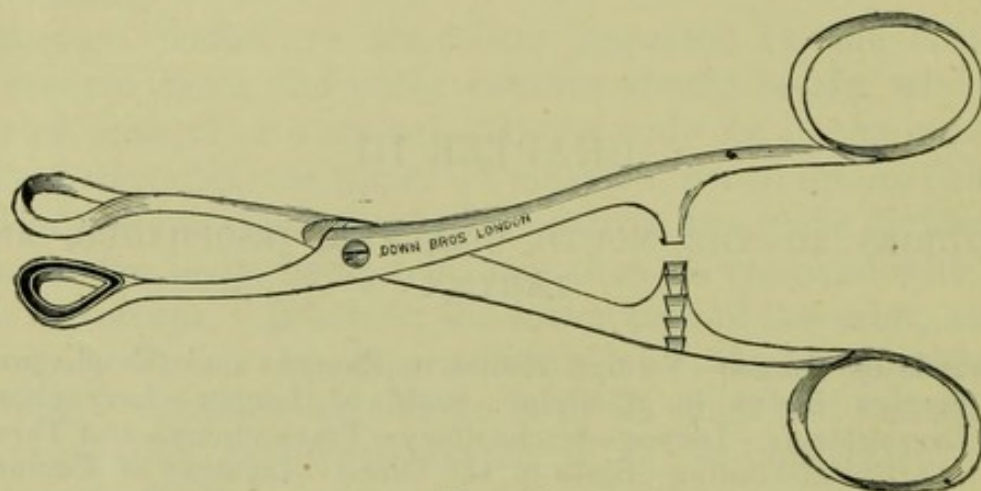


FIG. 26.

hyoid bone, and pulling the base of the tongue upwards and forwards towards the chin, as recommended by Mr. Heath.

Small sharp bodies, such as bristles, fish-bones, or pins, are generally found sticking between the pillars of the fauces, the tonsils, or under the epiglottis. The laryngoscopic mirror is a great aid in finding them, and a pair of fine urethral forceps are the best with which to remove them. Larger substances, such as pieces of meat, coins, or false teeth, are generally arrested at the junction of the pharynx with the œsophagus, or between the base of the tongue and the epiglottis. If the foreign body can be reached with the fingers it may be hooked up, or it may be seized with a pair of curved forceps. It should never be pushed down. If suffocation is impending, laryngotomy should be immediately performed (see below), and then further attempts made to remove the obstruction. If the body is rough or angular, a blunt hook will often catch it. A common skewer, heated in the fire, and the point turned, has served for this purpose. A tongue-depressor, made by the Messrs. Weiss (Fig. 27), seems a most useful instrument. The spatula is passed into the mouth, the handle being held beneath the chin. Thus no



light is lost, and the patient can himself hold the instrument.

Foreign bodies stick in the œsophagus generally, either opposite the cricoid cartilage or just above the diaphragm. If they are soft, and not likely to damage the stomach, they may be pushed on with an ordinary sponge probang or stomach-tube. Sharp bodies, like pins, should not be pushed on, but an endeavour should be made to catch

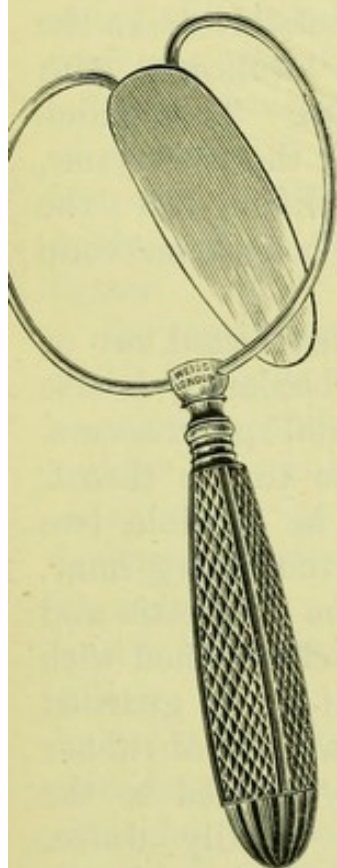


FIG. 27.

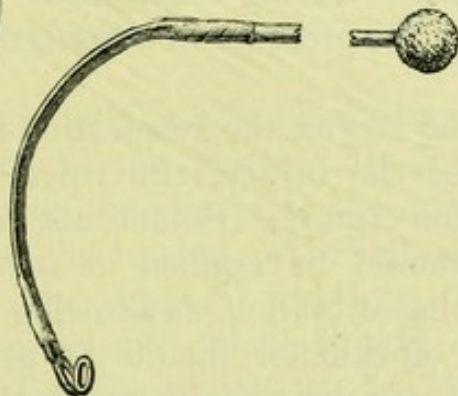


FIG. 29.

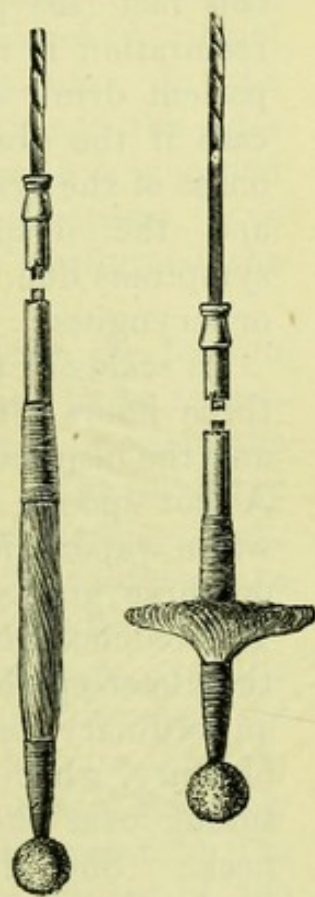


FIG. 28.

them with the "horsehair probang" (Fig. 28). This being pushed gently, unexpanded, beyond the point where the pin or bone is stuck, is expanded by pulling up the handle, and then withdrawn with a slight rotatory motion. If a coin is impacted, a "money probang" (Fig. 29) may succeed in catching it. This may be easily improvised by turning a loop of stout wire sharply on itself.



A sudden inspiration, when the mouth is full, may draw a large piece of food into the larynx and cause instant death. Smaller bodies may be arrested in the cavity of the larynx, causing suffocation by spasm; or they may pass onwards into the trachea, the symptoms being intermittent cough, with pain at the point of impaction, or they may become impacted, generally in the right bronchus, absence of respiration in the lung indicating this fact (see p. 45). To be sure that the impediment to respiration is not in the œsophagus, if possible make the patient drink some water, which will be swallowed with ease if the obstruction be in the windpipe. The sudden onset of the symptoms, the intermission of the paroxysms, and the dyspnœa during *expiration*, distinguish the symptoms due to the presence of a foreign body from croup or laryngitis.

In scalds of the larynx the respiration is affected two or three hours after the injury, the voice becoming hoarse and the inspiration croupy. Sometimes fatal spasm occurs. A hot sponge should be applied at once to the throat, warm vapour inhaled, and if swallowing be possible, two or three grains of calomel should be given every hour. The œdematous mucous membrane of the epiglottis and the glosso-epiglottidean folds should be well scarified with an ordinary tenaculum, or by the point of a guarded bistoury, which is best done by slipping a piece of rubber tubing over the blade, and leeches freely applied to the neck. Should the respiration become rapidly worse, tracheotomy must be performed (see below), and the earlier the better, before the lungs become involved. The same treatment is applicable to injury by strong acids. When taken suicidally the windpipe is rarely injured; but when taken by mistake, the acid frequently finds its way into the larynx in the efforts made to expel it from the pharynx.

Laryngitis generally attacks adults, and is the result of exposure to cold, to the poison of erysipelas or of syphilitic infection. The acute form generally commences with



difficulty of swallowing, and pain and tenderness on pressure over the *pomum Adami*. The voice, at first harsh, becomes stridulous; dyspnœa, often spasmodic, sets in; the face becomes pale, and the lips livid. (Edematous laryngitis is generally associated with some specific cause, as erysipelas or syphilis. There is less tenderness on pressure, but the fauces are swollen and dusky red. The voice, too, is more rapidly lost. In either form the immediate treatment should consist of plentiful leeching round the neck, the administration of large doses of calomel with antimonials, and the inhalation of steam. In the œdematous variety the root of the epiglottis and the sides of the glottis should be freely scarified with a guarded bistoury. When, however, dyspnœa and spasm have fairly set in, the sooner tracheotomy is performed the better.

Laryngotomy is applicable in adults when the foreign body is above or in the larynx. It is not to be recommended in children, in disease of the larynx, or when the foreign body is in the trachea or bronchus. The following rules apply to the three operations of laryngotomy, laryngo-tracheotomy, and tracheotomy. If possible, give an anæsthetic. Lay the patient on his back, with a pillow under his shoulders, and the head thrown back over the pillow. Place a pad under the neck, to increase the anterior convexity of the cervical spine. Elevate the chin and depress the shoulders. The head being held perfectly straight, a line drawn through the middle point of the lower jaw, and the notch in the upper border of the thyroid, down to the upper border of the sternum, will give the direction for the incision. These two points should be marked with iodine paint, or by making an indentation with the thumb-nail. The illustration (Fig. 30) indicates the anatomical points for the three operations: III. Laryngotomy; IV. Laryngo-tracheotomy; V and VI. High and low tracheotomy. The instruments required are—1, a scalpel; 2, dissecting forceps; 3, retractors, button-hooks being as good as any; 4, blunt hooks (for



which bent probes answer the purpose); 5, sharp hook ; 6, dilator ; 7, tracheotomy tube or laryngotomy tube.

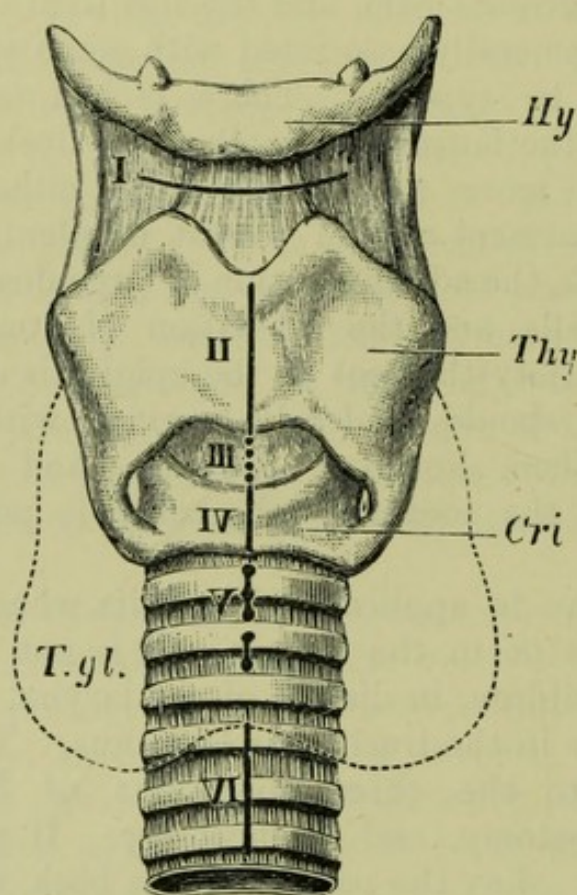


FIG. 30.—(From Treves' 'Operative Surgery'.)

Laryngotomy may be performed, in great emergency, by the simple thrust of a penknife horizontally through the skin and crico-thyroid membrane, at a point just an inch (in the adult) below the pomum Adami, the wound being then enlarged laterally. When the operation is performed more deliberately, an incision is made through the skin perpendicularly in the middle line, an inch and a half long, extending from the middle of the thyroid cartilage to the base of the cricoid. The sterno-hyoid muscles are then separated, and held aside by retractors, and the crico-thyroid membrane exposed. The knife is thrust well through the mucous membrane into the larynx, the blade being at right



angles to the long axis of the windpipe—air, blood, and mucus being expelled. The opening is enlarged transversely, and an oval cannula, curved on the flat, introduced. Care must be taken, in introducing the cannula, that it does not pass between the crico-thyroid membrane and the mucous membrane of the windpipe. If time allows, bleeding vessels should be ligatured before the larynx is opened, some branches of the superior thyroid (the crico-thyroid arteries) being the only vessels likely to be wounded. The cannula must be secured by tape passing round the neck, and may be repeatedly cleared with a feather or with a camel-hair brush. A flannel or sponge, wrung out of hot carbolized water, should be placed over the throat, and the patient, if possible, placed in a bed surrounded by thick curtains, the atmosphere being kept warm and moist by a steam spray. In cases of diphtheria the tubes should be cleansed by a feather dipped in a solution of bicarbonate of potash (ʒj to Oss of water), and the wound sprayed with the same solution.

The first steps of the operation for laryngo-tracheotomy are the same as laryngotomy, except that the external incision must be a little lower. The incision in the windpipe is prolonged through the cricoid cartilage and the first ring of the trachea. This latter incision must be made from below upwards, to avoid wounding the thyroid body. The operation is useful in children, when the obstruction to respiration is either in or above the larynx, and is more rapidly performed in great emergencies than tracheotomy. It should be avoided, if possible, in the adult.

In tracheotomy the steps of the operation are as follows:—Standing on the right side of the patient, make—1st, a free external incision in the median line, from just above the cricoid cartilage to the upper edge of sternum. 2ndly, clear away fat and cellular tissue, and making out the division between the sterno-hyoid muscles, separate them with the handle of the knife, and let them be gently held aside by retractors. If needful secure



bleeding arteries, and let large veins be hooked aside with bent probes. The isthmus of the thyroid lies across the third and fourth rings of the trachea, and if possible a spot should be selected for the opening above the isthmus as near the cricoid ring as possible. By dividing the fascia that binds it down the isthmus may be drawn down with a blunt hook. The division of the isthmus in children is of little or no consequence. 3rdly, on getting the rings of the trachea in view, pass a sharp hook into the upper part of it to steady it, and pull it well forward. 4thly, turning the edge of the knife upwards, puncture the trachea at the lowest point, being careful not to plunge the knife too far in, and incise it freely upwards. The trachea should be opened as soon as possible, and in spite of free venous hæmorrhage, which will most probably cease immediately respiration is restored. 5thly, in-

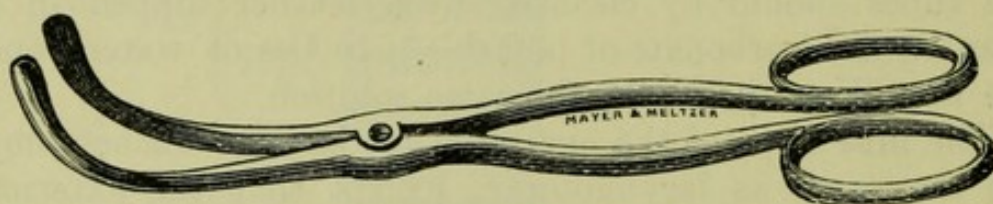


FIG. 31.

introduce a dilator (Fig. 32) which will admit of the easy insertion of the tracheotomy tube (Fig. 32). Instead of

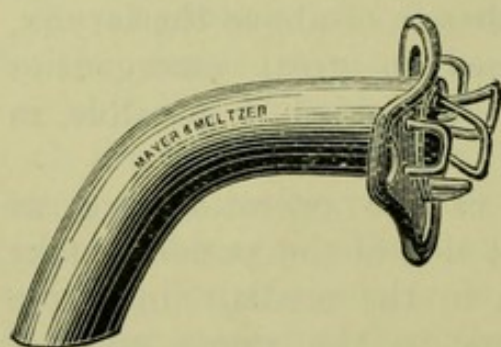


FIG. 32.

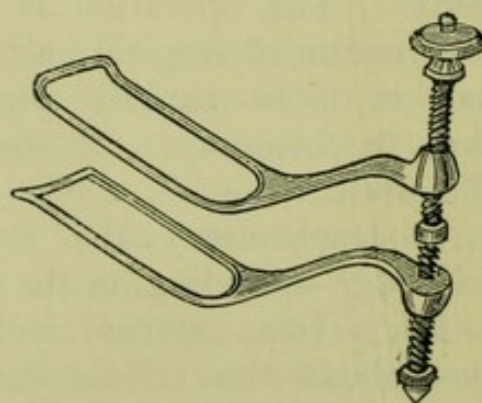


FIG. 33.

the use of the dilator, the right side of the tracheal incision may be taken hold of by a pair of fine-toothed



forceps, and the wound held open for the insertion of the tube. The introduction of the tube is necessary when the obstruction is *above* the opening in the trachea. When there is a foreign body in the trachea and it is lodged below the opening, the edges of the incision in the trachea should be kept widely open, a spring speculum used for separating the eyelids being a good form of instrument for the purpose, or a large strong hair-pin somewhat stretched, the free ends bent into hooks. A special instrument for this purpose (Fig. 33) is a useful adjunct to tracheotomy instruments. An attempt may be made to catch the foreign body with a pair of tracheal forceps, but it should not be persevered in. Better to keep the tracheal wound open. Allow the head and shoulders to hang over the end of the table; wait for the subsidence of the spasm, and then renew the attempt.

If during the operation respiration should cease, the tube must be introduced as rapidly as possible, and artificial respiration immediately commenced, and persevered with for a considerable time, until natural respiration is restored. If any blood gets into the cannula and obstructs the entrance of air, it must be sucked out with the mouth if it cannot otherwise be disposed of. But the use of Parker's tracheal aspirator (Fig. 34) is safer and more effectual.

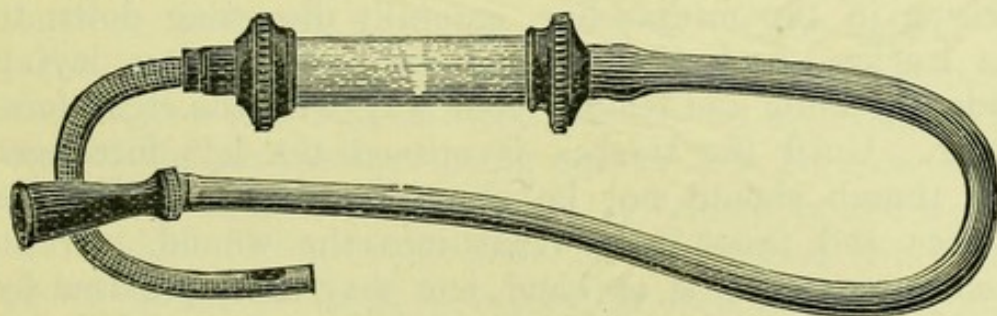


FIG. 34.

Messrs. Meyer and Meltzer have constructed at my suggestion a tracheotomy case (Fig. 35) containing all the instruments necessary for the operation.\*

\* This case contains 2 scalpels, 2 retractors, 1 sharp hook, 2 dissect-



In the absence of good assistants, and when every moment is of consequence, the following method of per-

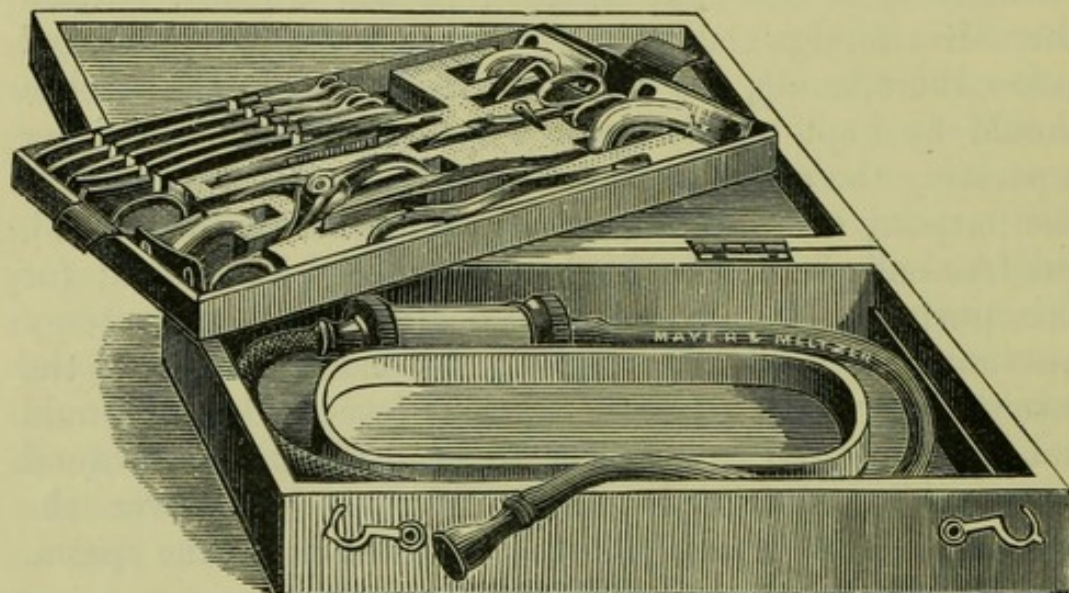


FIG. 35.

forming tracheotomy will be found useful:—Place the patient as before described, and standing on the right side, put the forefinger of the left hand on the left side of the trachea, and the thumb on the right, and make uniform and deep pressure until the carotids on both sides are felt pulsating. Firmly grasp the trachea between the forefinger and thumb. Then with the right hand make the incision in the median line, carefully dissecting down to the trachea; and, if needful, from time to time laying aside the knife and feeling your way with the right forefinger. Until the trachea is opened the left forefinger and thumb should not be removed, but should fix the trachea and press it forwards into the wound. If no tracheotomy tube is at hand, one may be improvised by bending a bit of glass tubing in the flame of a spirit lamp, and making a shield out of a piece of tin.

If there is reason to believe that a foreign body has ing forceps, 1 pair of curved blunt-pointed scissors, 1 dilator, 1 pair of artery forceps, 3 Parker's tracheotomy tubes, 1 dilator for leaving in the trachea, and 1 Parker's tracheal aspirator.



become impacted in either bronchus, the patient should be inverted and slapped smartly on the back, by which means the foreign body is sometimes dislodged and ejected through the wound. This failing, and it having been ascertained by the stethoscope in which bronchus it is lodged, a bit of pliant wire doubled so as to form a loop, and bent with its convexity slightly towards the obstructed bronchus, may be passed down and beyond the foreign body, when on the withdrawal of the wire it may be caught and brought out of the wound. If it is impossible to catch the foreign body, the tracheotomy tube should not be inserted, but in its place a dilator, such as the one shown in Fig. 33, through which probably it will be expelled.

In cut throat the first thing to be done is to search for all bleeding vessels, veins as well as arteries, and ligature them. If hæmorrhage is severe, and the bleeding point cannot at once be seen, compress the common carotid against the transverse process of the fifth or sixth cervical vertebra, and then continue the search. If it is impossible to arrest the hæmorrhage, put a ligature on the common carotid. (See below.) In the next place, all coagula should be cleared away, and the wound thoroughly washed out by a hot antiseptic solution. If the air-passages are not opened, the wound in the integuments must be brought together with silkworm-gut sutures. Care should be taken accurately to adapt the skin edges, as the contraction of the platysma causes them to be inverted. The fact of the air-passages being opened will be ascertained by the air being seen and heard to bubble in and out of the wound during respiration. If the wound is inflicted above the hyoid bone, it is possible that the tongue may fall backward, and cause suffocation. A ligature should be passed through the tip, and secured to the cheek by sticking-plaster. If the wound is just above the thyroid cartilage, a portion of the epiglottis may be divided, and obstruct respiration. It should be either cut off altogether, or else secured in its place with a suture.



If the trachea is entirely divided, the divided edges may be kept together by some catgut sutures. If there is considerable venous hæmorrhage, a silver tube should be inserted through the wound in the trachea, and the surrounding parts plugged with iodoform gauze. Place the patient in bed, with the shoulders well raised, and the head thrown forward on the chest, and secured there by tapes passing from a nightcap to a roller round the chest. The temperature of the room should be raised to  $80^{\circ}$  if possible, or at any rate the bed should be placed near the fire and surrounded with a screen. Steam should then be conveyed for the patient to breathe by a piece of india-rubber tubing, placed on the spout of a kettle boiling on the fire. If the pharynx or œsophagus is wounded, the patient must be fed artificially. The best way to accomplish this is by passing a soft rubber catheter through the nostril well down the œsophagus. This catheter must be attached to a bit of rubber tubing about four feet long, with a flap funnel at the end. By this means beef tea and brandy or milk and brandy may be easily administered. If the passage of the catheter through the nostril causes distress, it may be much diminished by painting the parts with a 10 per cent. solution of cocaine. It is better to resort early to this feeding, as the patient is generally much depressed by shock and loss of blood. In great collapse from loss of blood intra-venous injection of saline solution should be had recourse to (see Chap. XII).

In stabs and punctured wounds of the throat the general treatment is the same as for cut throat. If the trachea is wounded, emphysema may ensue. A pad of dry lint, firmly applied, will suffice. When any large vessel is wounded, the wound must be enlarged if needful, and the bleeding vessel secured. If this cannot be done, the common carotid must be ligatured, generally below the omo-hyoid. For this operation the following instruments are required:—1, Scalpel; 2, dissecting forceps; 3, blunt hooks and retractors; 4, grooved director; 5, aneurism needle; 6, ligatures.



Place the patient on his back, with raised shoulders, the head being thrown back and turned to the opposite side.

1st. Make an incision through the skin, platysma, and superficial fascia, extending along the anterior border of the sterno-mastoid, from a point opposite the thyroid cartilage, to the sternum.

2ndly. Relax the sterno-mastoid by turning the head slightly, and pull this muscle outwards, the sterno-hyoid and thyroid being drawn inwards with blunt hooks. Look for the anterior belly of the omo-hyoid in the upper part of the wound, its fibres being seen passing downwards and outwards.

3rdly. Divide the dense fascia attaching this muscle to the sheath on the director. The descendens noni will then be seen on the sheath, and must be drawn to the inner side.

4thly. Pinch up the sheath with forceps, and divide it with the knife, cutting on the flat. Enlarge the opening on the director.

5thly. Insert the aneurism needle, armed with the ligature, from without inwards, between the vein and artery; care being taken to keep close to the under surface of the artery, so as to avoid the vagus.

6thly. Disengage the ligature from the needle, and tie, taking care not to raise the artery from its sheath. The wound is then to be brought together with sutures and dressed. During the operation all veins should, if possible, be held aside with bent probes, to avoid wounding them.

In cases of suspended animation from drowning the following rules should be observed :

1st. Remove from the mouth all dirt, saliva, &c., and, pulling the tongue well forward, cause it to be retained in that position either with a pair of tongue forceps, or by passing an elastic band over it and under the chin.

2ndly. Remove from the body all clothing that may constrict the chest, and lay the body on its back, with the shoulders raised on a firm cushion placed under the shoulder-blades.



3rdly. Adopt Sylvester's method to restore respiration :

(a) Standing or kneeling behind the patient, grasp the arms above the elbows, and draw the arms steadily upwards above the head, and keep them so stretched for a couple of seconds (Fig. 36).

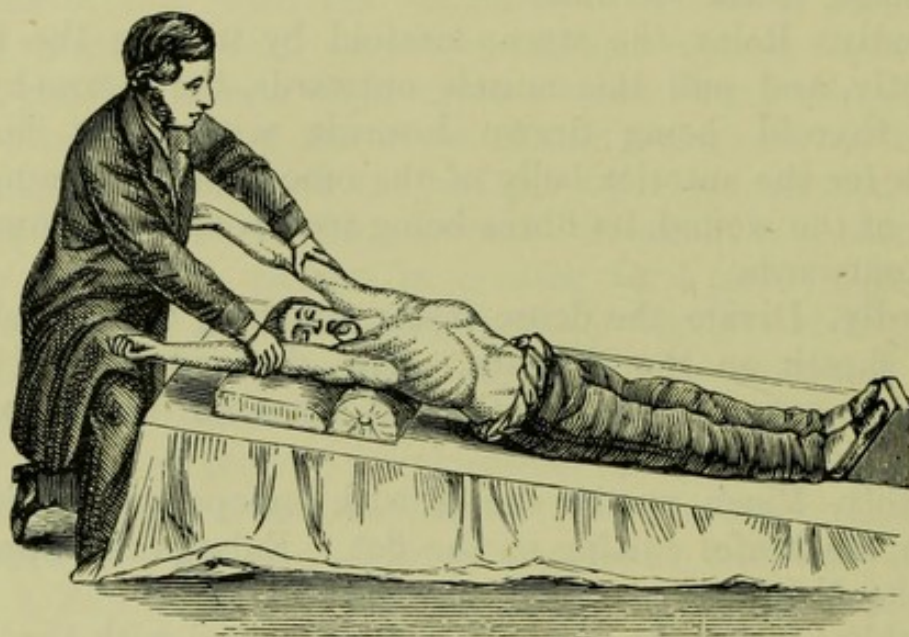


FIG. 36.

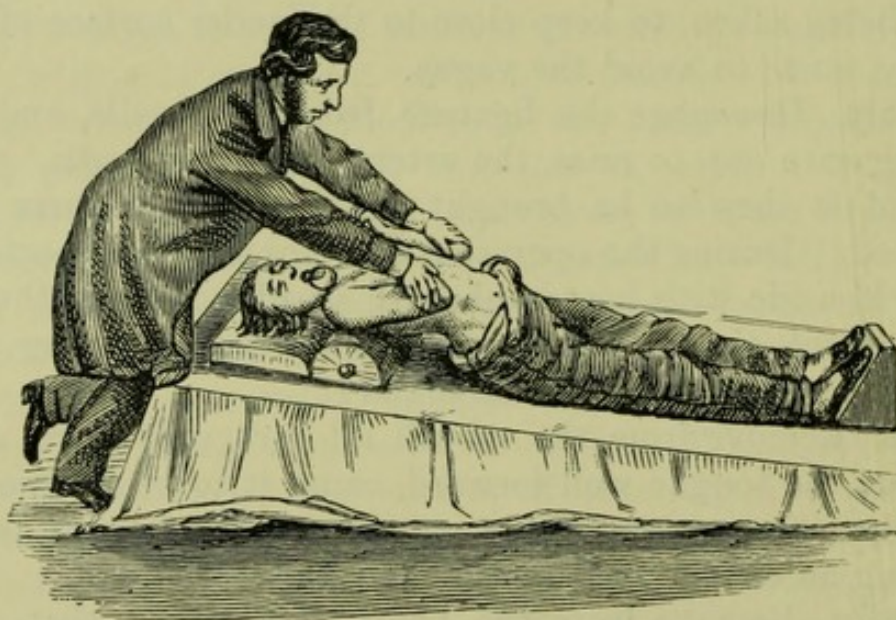


FIG. 37.

( $\beta$ ) Turn the arms down, and press them firmly for a couple of seconds against the sides of the chest (Fig. 37).



Repeat these movements from fifteen to twenty times in a minute, and persevere in them, if needful, for one or even two hours. The expiratory act is much aided by an assistant pressing on the lower border of the ribs and the diaphragm.

4thly. During these efforts, have the wet clothes removed from the body, and let the limbs be rubbed in an upward direction with hot flannels. Dash hot and cold water alternately on the chest. If a warm bath is procurable, the body may be immersed in it for five minutes, Sylvester's method being still pursued.

If there is much congestion about the head and face, the external jugular vein, or the temporal artery, may be opened.

The operation of bleeding from the external jugular vein is thus performed:—Select a spot where the vein passes over the sterno-mastoid muscle. Compress the vein just above the clavicle with the left thumb, and open it with a lancet, making the incision in the direction of the fibres of the sterno-mastoid. Care must be taken not to admit air into the vein, by keeping the thumb well pressed on it during the operation until the wound is closed by a firm pad. The external wound in the skin should be rather larger than that in the vein, to avoid the formation of thrombus.

5thly. As soon as natural respiration is established, the patient should be removed to a warm bed, the room being kept thoroughly well ventilated, and free from all crowding. An enema of brandy and beef-tea may be administered. If any fluid is given by the mouth, it must be in very small quantities, and with considerable care, lest suffocation should ensue.

In cases of suffocation from hanging, the treatment is substantially the same as is adopted in case of drowning. The body should be instantly cut down, the ligature taken from the throat, and Sylvester's method commenced. Bleeding from the external jugular may also be useful, and a galvanic current may be passed from the nape of



the neck to the pit of the stomach to excite the diaphragm.

In asphyxia from the inhalation of noxious gases, as carbonic acid, &c., the body should be immediately exposed to cold air, water dashed on the face, and artificial respiration commenced. Both in this case and in hanging, if it is difficult to establish respiration through the mouth, tracheotomy or laryngotomy should be performed, and the lungs inflated through the opening.



## CHAPTER IV

## THE CHEST

Fracture of the Ribs—Wounds of the Chest—Contusion of the Lung—Hernia of the Lung—Wounds of the Lung—Emphysema—Pneumothorax—Hæmothorax—Paracentesis Thoracis—Wounds of the Heart—Gunshot Wounds of the Chest.

FRACTURE of the ribs may be from direct violence, the ends being driven inwards; or it may be from indirect violence, as from a squeeze against a wall, when the rib gives way at its most convex part, and the ends are driven outwards. There are also cases on record of ribs being broken by muscular action. The fourth, fifth, sixth, seventh, and eighth ribs are the most frequently broken. The symptoms are—1, Pain at the seat of injury; 2, Increased pain on taking a deep inspiration; 3, Arrest of the movements of the ribs in breathing; 4, Crepitus, which may be detected by pressing one hand over the seat of the injury, and the other on the opposite side of the chest. Crepitus is also detected on deep inspiration, or the stethoscope may reveal it when it cannot in any other way be discovered. In simple fracture, the best plan is to apply strips of plaster two inches broad, stretching from the opposite side of the spine behind to the sternum in front, and extending some inches above and below the site of the fracture. The strips of plaster should be applied from below upwards, and each strip should well overlap the one below it (Fig. 38). If many ribs are involved, extra support may be given by a short, well-padded splint placed over the plaster at right angles to the ribs, and retained in place by another layer of plaster.



By this means the ribs are kept perfectly at rest on the injured side.

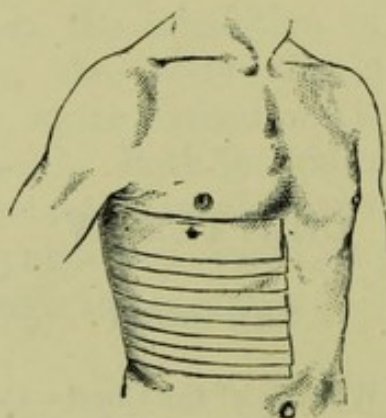


FIG. 38.

The occurrence of crackling under the skin, and of hæmoptysis, are indications that the lung has been wounded by the point of the broken rib. The immediate treatment will not vary from that for ordinary fracture of the ribs.

A severe blow or fall may cause contusion of the lung, without fracture of the rib. The symptoms are paroxysmal difficulty of breathing, mucous expectoration, coarse crepitation, and dulness on percussion. The treatment consists of perfect rest in bed, salines and antimonials, turpentine stupes, and linseed-meal poultices.

In wounds which do not penetrate the chest cavity, but involve the muscular tissue in front, the edges should be approximated with sutures, and the arm brought forward in front of the chest, and secured there with a bandage. In extensive wounds posteriorly, the elbows should be as much as possible approximated behind.

In wounds of the intercostal arteries the application of ice and a compress should first be tried. To apply this compress, lay a large piece of aseptic or iodoform gauze over the wound, and press the central portion into the wound with the finger. Into this depression insert pieces of sponge, until firm pressure is made. Thus all fear of the compress slipping into the cavity of the chest is



avoided. If this plan fails, the wound must be enlarged, and if possible the divided ends of the vessel secured. This is difficult to effect, and if the hæmorrhage cannot in any other way be arrested, digital pressure must be kept up.

Penetrating wounds of the chest are easily diagnosed, the symptoms being the passage of blood and air-bubbles through the wound, the expulsion of air from it, or the protrusion of the lung itself. Emphysema and hæmoptysis are also pretty sure signs of a wounded lung. In deep punctured wounds, when these prominent signs are not present, it is impossible to say for certain whether the wound is a penetrating one or not. No attempt must be made to ascertain this, either by introducing the finger or a probe. A careful search for a foreign body must, however, be made, and its removal effected if present. Hæmorrhage must be stopped, and the external wound closed. The parts should then be kept perfectly at rest with strapping or a rib bandage.

The lung may protrude through a wound, forming a round tumour covered with pleura. It should be returned by gentle manipulation, and if there is much constriction at the neck, the wound may be cautiously enlarged with a blunt-pointed bistoury. If symptoms of gangrene are present, the protruded lung should not be returned, but ligatured and cut off.

The symptoms of wounded lung are—1. Passage of air and blood through the wound. 2. Expectoration of bright red, frothy mucus. 3. Deep pain in the chest, with cough and dyspnœa and abdominal breathing. If the chest be examined with the stethoscope at the point of injury, immediately after the accident, loud, rough crepitation may be detected. There is generally also great collapse. The treatment must be perfect rest of the parts, by strips of plaster from the spine to the sternum, arrest of all hæmorrhage externally, immediate closure of the external wound, application of ice to the chest externally, and exhibition of it internally. Stimulants should not be



administered in the collapse stage, unless under very urgent circumstances. Morphia may be administered to allay coughing.

Emphysema presents a pale, puffy swelling, which crackles when pressed upon. When resulting from fractured rib, the swelling commences over the site of fracture and spreads up over the trunk and neck. It is sometimes the result of a ruptured bronchus or air-vessel, without any external wound being present. The air escapes into the posterior mediastinum, and thence up into the neck, along the course of the vessels and nerves.

In emphysema resulting from wounded lung, either by a punctured wound or fractured rib, if the pressure of the hand relieves the patient, a bandage should be applied. If, however, pressure increases the dyspnœa, no application should be made. In penetrating wounds it is better to close the external wound at once, and if possible make pressure. If the emphysema should become so extensive as to encumber the patient's breathing, incisions through the skin may be made with a scalpel, or scarificators, and cupping-glasses applied to various parts over the incisions. Antimony and ipecacuanha should be given in full and repeated doses.

Pneumothorax is easily recognised by auscultation. There is diminution or entire absence of respiratory murmur, and vocal fremitus, with great tympanitic resonance on percussion. It only calls for immediate treatment when it occasions great compression of the lung, and consequent dyspnœa. The original wound may then be enlarged, or the air may be drawn off with a small trocar and cannula, or by the aspirator. (For use of aspirator see Chap. XII.)

Hæmothorax may be diagnosed by the presence of the symptoms of excessive hæmorrhage, together with dulness on percussion, absence of respiratory murmur, and immobility of the ribs on the affected side. If the symptoms become urgent, paracentesis must be performed. Owing to the coagulation of the blood it is difficult to remove the



accumulation through a cannula ; therefore it is better to enlarge the wound, or make counter-openings in a dependent position and wash out the clots with sterilised water and boracic acid.

The operation of paracentesis is best performed with the pneumatic aspirator. But if this is not to be had, an ordinary trocar and cannula will serve. The spot to be selected should be the sixth or seventh intercostal space, midway between the sternum and the spine. An incision should be made with a scalpel through the skin close to the lower rib, and the trocar or needle thrust in. If a cannula is inserted, care must be taken to exclude the entrance of air as the fluid ceases to flow ; and an assistant should firmly compress the ribs whilst the cannula is being withdrawn. The opening is then to be closed with a pledget of lint and a strap of plaster.

Where wounds of the heart are not immediately fatal, the symptoms are those of internal hæmorrhage, with small intermitting pulse. Absolute repose, ice externally, and early venesection, if there is much venous congestion, must be employed, with the administration of belladonna and digitalis internally.

In penetrating gunshot wounds of the chest, arrest external hæmorrhage, remove foreign bodies and spiculæ of bone. If there is only one wound, place the patient on the wounded side. If there is a wound of exit as well, let the upper wound be closed, and the other left for drainage.



## CHAPTER V

## THE UPPER EXTREMITY

Wound of Wrist-joint—Wound of Palmar Arch—Needle in the Hand—Fish-hook in the Hand—Fractures and Dislocations of the Clavicle; of the Scapula; of the Humerus—Compound Injuries to the Shoulder-joint; of the Arm—Injuries to Elbow-joint—Fracture of Olecranon—Resection of Shoulder-joint—Amputation at Shoulder-joint; Fractures and Dislocations of the Radius; the Ulna; the Bones of the Hand—Compound Injuries to the Elbow-joint—Excision of Elbow—Amputation at Elbow-joint and in Forearm—Compound Injuries to Wrist-joint—Amputation of the Thumb and Fingers.

IN wounds near the wrist-joint the ulnar or radial arteries are frequently divided. If possible, both ends of the bleeding vessels should be secured, and the hand and arm placed on a long splint, to secure perfect rest. In incised wounds of the palmar arch the vessels can generally be secured. In punctured wounds, it is not advisable to enlarge the wound in order to secure the vessel, but a compress must be applied to the wound, and a hard ball being placed in the palm, the fingers must be firmly bandaged over it. Before applying the compress it is advisable to place a tourniquet on the brachial, and then thoroughly cleanse the wound from all clots and foreign bodies. Each individual finger should then be carefully bandaged, a narrow pad placed over the radial and ulnar arteries above the wrist, and the hand and arm placed on a back splint, the hand being fixed to the opposite shoulder. A ready method of compressing the brachial is as follows:—Take two sticks, each about eight inches long; arrange them, one on the outer and the other on the



inner side of the arm, with a pad of lint intervening, and tie or strap the ends of the two sticks firmly together. This failing, extreme flexion of the forearm on the arm, with a pad at the bend of the elbow, will effectually compress the brachial, and prevent further hæmorrhage.

Needles, or portions of them, are frequently run into the hand. The ordinary practice of cutting down on the needle is a troublesome, and frequently a useless proceeding, as the needle recedes before the knife. A plan, which will rarely fail, is to pass the point of a long curved bistoury under the needle, and cut out a flap. The needle will generally be found lying in the flap, and may be removed with a pair of forceps. The flap is then replaced and secured with a strip of plaster and a bandage. To remove a fish-hook, seize the hank firmly with a pair of watchmaker's pliers, and then push the point of the hook with the barb through the skin at the most convenient spot. The hank can then be drawn through the wound, or the barb cut off with pliers and the hook withdrawn.

The clavicle is generally fractured by indirect violence, such as a fall on the point of the shoulder, or on the hand when the arm is outstretched. This is frequently the case in children, when they fall forward in running and put out the hand to save themselves. The fracture is usually found near the outer side of the middle third. Symptoms:—1, the patient leans towards the injured side; 2, the shoulder falls downwards, forwards, and inwards; 3, the sternal fragment is tilted upwards, and can be distinctly felt; 4, pain when the arm is raised towards a right angle with the body; 5, crepitus when the shoulders are forcibly drawn backwards. Sometimes the fracture takes place at the acromial extremity, when the external deformity is wanting. In fractures from direct violence the bone is often comminuted, and the intervening fragments sometimes fall out of the line of the bone, and are difficult to restore. Paralysis or loss of sensation is sometimes caused by injury to the brachial



plexus, or it may be due to the pressure of the pad placed in the axilla.

The usual treatment with the pad in the axilla and the figure-of-eight bandage is quite inadequate to keep the fragments in place; and, if no other means are at hand, bandaging the arm to the side, and supporting the forearm in a sling, is sufficient. The following plan is simple and efficacious:—Two strips of adhesive plaster (Leslie's Holland plaster is the best) are cut, each about three and a half inches wide, and sufficiently long—the one part to encircle the arm, and then the thorax—the other to reach from the opposite shoulder, obliquely across the chest under

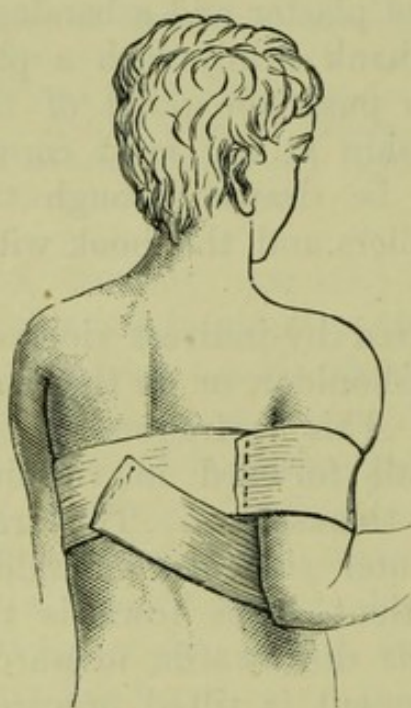


FIG. 39.

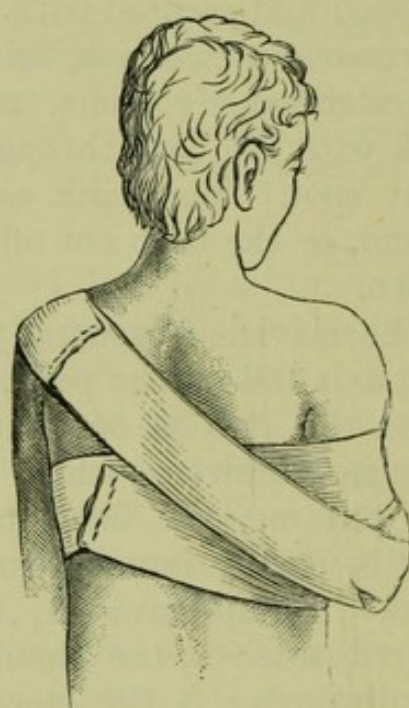


FIG. 40.

the elbow of the injured side, and across the back to the point of starting. The first strip is looped round the arm just below the axillary borders, a bit of lint being placed between the plaster and the skin. The arm is then drawn downwards and backwards, until the sternal fragment falls into place. The strip of plaster is then carried round the back, and passing completely round the body is stitched



to itself as in Fig. 39. The second strip is then applied, commencing at the opposite shoulder, and passing down behind under the elbow, a slit being cut to receive the point of the elbow, thence across the front of the chest to the point of starting, where it is stitched as in Fig. 40. Safety pins do equally well, and are more quickly applied. Before passing the plaster below the elbow, the elbow must be pressed well forward and inward, and so held until the plaster is fixed in position. The arrangement in front is shown in Fig. 41. A good pad of cotton wool should be placed in the palm of the hand. Union takes place in adults in from four to five weeks, and in children in about three weeks.

Dislocation of the sternal end of the clavicle forwards is the most common displacement. Symptoms:—1, the head of the bone can be felt on the sternum; 2, the shoulder falls a little back; 3, the clavicular portion of the sterno-mastoid is very prominent; 4, placing the knee against the spine, and drawing the shoulders back, the deformity may be reduced.



FIG. 41.

It has been mistaken for a tumour of bone, and fractures of the sternal end sometimes very much resemble it.

Dislocation upwards is rare. Symptoms:—1, depression of the shoulder; 2, elevation of the sternal end. Dislocation backwards is still more rare. Symptoms:—1, disappearance of the head of the bone behind the sternum; 2, difficulty in respiration.

Dislocation of the acromial end of the clavicle, or as it should be more correctly described, dislocation downwards of the scapula, is generally upwards on to the acromion process. It is not of frequent occurrence. It is caused by direct blows on the scapula or by falls on the back.



Symptoms :—1, prominence of the acromial end of the bone on the acromion ; 2, inability to raise the hand to the head ; 3, depression of shoulder ; 4, prominence of clavicular portion of trapezius. Reduction is effected by drawing back the shoulders. But when the clavicle is displaced upwards it is most difficult to retain the bone in its place. A pad over the acromial end, and a broad webbing carried over it and round the point of the elbow, is the best method of treatment.

The reduction of these dislocations is very simple, viz. by placing the knee against the spine, and drawing back the shoulders. But in the first two varieties it is almost impossible to retain the bone in position. In dislocation backward, the bone may be retained in position by placing the patient on his back with a thick pillow placed between the shoulders, or by bandaging the shoulders to a splint placed across behind, with a thick pad intervening between it and the spine.

Fractures of the scapula are the result generally of direct violence, and are difficult to diagnose on account of the accompanying contusion. Fractures through the spine of the scapula are easily felt on passing the finger over the ridge. Fracture of the posterior angle is best discovered by placing the hand of the affected side on the opposite shoulder. In examining for fractures below the spine the forearm must be laid across the back.

Crepitus may be detected by placing the hand on the scapula, and moving the arm in various directions. A fracture of the neck through the supra-scapular notch is rare. The symptoms are described in column 2, p. 63.

Fractures of the body of the scapula are treated by bandaging firmly to the trunk with a pad over the scapula below the spine. Fractures of the neck require the shoulder to be raised by a sling round the elbow, and to be kept out from the side by a pad in the axilla, the arm being confined to the side by a bandage.

The scapula is sometimes dislocated from its acromial attachment to the clavicle. The displacement is usually



downwards. Symptoms :—1, falling of the shoulder ; 2, prominence of acromial end of clavicle. The treatment is to raise the shoulder, and depress the clavicle, by a belt passing round the elbow and over the clavicle.

Injuries about the shoulder-joint are frequently difficult to diagnose. The Tables, from 'Hamilton on Fractures and Dislocations' (pp. 63, 64), present the points of similarity and difference between the various injuries.

Fracture of the humerus at the anatomical neck is rare and the result of direct violence. It is more liable to occur in old people. It may happen that the head of the bone is thrust through the capsular ligament into the axilla. If it remains in the glenoid cavity there is little displacement of the fragments, and little deformity. Pain at the seat of fracture, and crepitus, with the absence of the signs of other injury, are the chief indications. Sometimes impaction occurs, and then the humerus is shortened, the acromion projects more than is natural, and the globular head of the bone is not distinctly felt. This accident is usually accompanied with fracture of the tuberosity, so that crepitus is felt on firmly grasping the head of the bone and rotating the arm.

For symptoms of fracture at the epiphysis and surgical neck see columns 3 and 4, p. 64.

Fractures of the anatomical neck without displacement, and impacted fractures, may be treated in the simplest manner by bandaging the arm to the side and securing perfect rest. Great care should be taken, when the fracture is impacted, not to displace the fragments by forcible manipulation. In fracture at the epiphysis, and at the surgical neck, when there is displacement the splint (Fig. 42) is useful. The crutch is placed in the axilla, the strap and pad passing over the shoulder. The arm and forearm are then bandaged to the splint, and extension made with the key. Care must be taken, in making extension, not to press too firmly on the axillary vessels. A more simple plan is to mould a firm gutta-percha splint to the outer side of the arm, taking care to make it fit as



a cap, well over the shoulder. The arm is then bandaged to this splint, and the upper turns of the bandage passing

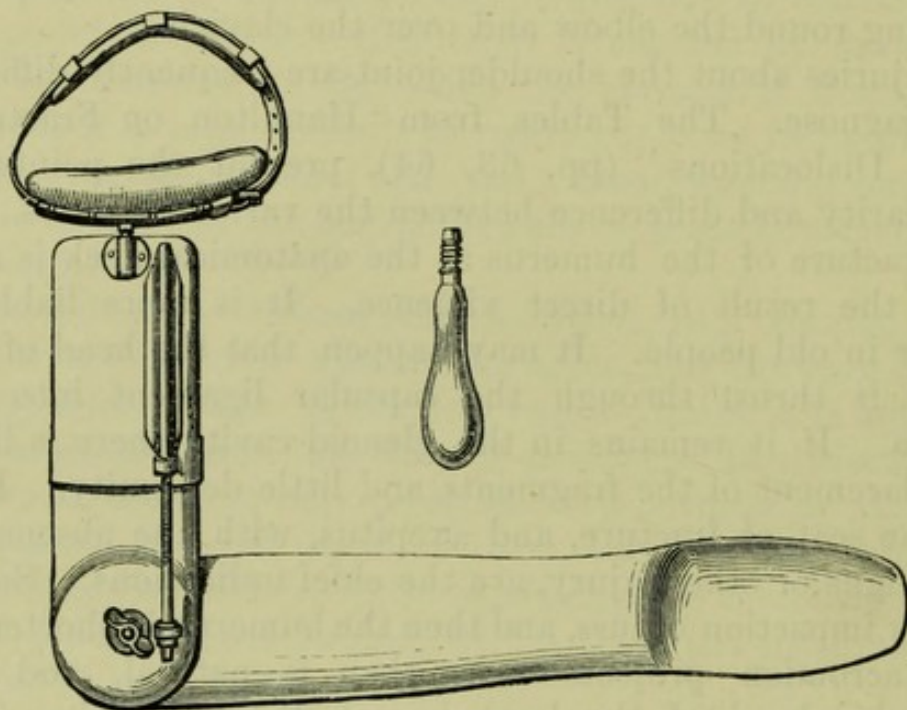


FIG. 42.

over the shoulders, and pressing against the acromion, draw the lower fragment outwards. The elbow should be carried well forward across the chest. The arm is then placed in a sling, the elbow being dependent. Union takes place in about five weeks. In fractures through the anatomical neck passive motion should be commenced early.

Fractures of the shaft of the humerus are usually the result of direct violence, sometimes of muscular action. If, as is usual, the fracture is transverse, there is little displacement; when oblique, the fragments over-ride. If the fracture is above the insertion of the deltoid, the upper fragment inclines inwards, and the lower one outwards; if below the insertion the reverse effect is observed. An angular splint should be applied on the inner side, extending from the axilla to the hand, with short splints from the shoulder to the elbow externally, and posteriorly, if



## HAMILTON'S DIFFERENTIAL DIAGNOSIS

## COLUMN I.

*Signs of a dislocation. (Cause, a fall upon the elbow, or sometimes a direct blow.)*

1. Preternatural immobility.

2. Absence of crepitus.

3. When the bone is brought to its place it will usually remain without the employment of force.

4. Inability to place the hand upon the opposite shoulder, or to have it placed there by an assistant, while at the same time the elbow touches the breast.

5. Depression under the acromion process; always greatest underneath the outer extremity, but more or less in front or behind, according as the dislocation may be into the axilla, forwards or backwards.

6. Round smooth head of the bone sometimes felt in its new situation, and very plainly removed from its socket, moving with the shaft. Absence of the head of the bone from the socket.

7. Elbow carried outwards, and in certain cases forwards or backwards, and not easily pressed to the side of the body.

8. Arm shortened in the dislocation forwards, and slightly lengthened, or its length not changed when in the axilla.

## COLUMN II.

*Signs of a fracture of the neck of the scapula. (Cause, generally a direct blow.)*

1. Preternatural mobility.

2. Crepitus, generally detected by placing the finger on the coracoid process, and the opposite hand upon the back of the scapula, while the head of the humerus is pushed outwards and rotated.

3. When reduced it will not remain in place.

4. The hand may generally, but with difficulty, be placed upon the opposite shoulder with the elbow resting upon the front of the chest.

5. Depression under the acromion process, but not so marked as in dislocation.

6. Head of the bone may be felt in the axilla, but less distinctly than in dislocation, never much forwards or backwards; head of the bone moves with the shaft. Head of the bone not to be felt under the acromion process, although it has not left its socket.

7. Elbow carried a little outwards, but not so much as in dislocation. Easily brought against the side of the body.

8. Arm lengthened.

9. The coracoid process carried a little toward the sternum and downwards.

10. Pressing upon the coracoid process, it is found to be moveable, and it is also observed that it obeys the motions of the arm.



## HAMILTON'S DIFFERENTIAL DIAGNOSIS

## COLUMN III.

*Signs of separation of the epiphysis.  
(Cause, direct blows.)*

1. Preternatural immobility.
2. Feeble crepitus; less rough than the crepitus produced when broken bones are rubbed against each other.
3. Fragments replaced are not easily maintained in place.
4. The hand can be easily placed upon the opposite shoulder while the elbow rests against the front of the chest.
5. The depression is not immediately under the acromion, yet higher than in most fractures of the surgical neck, perhaps one inch below the acromion process.
6. Head of the bone in its socket, and not moving with the shaft. Upper end of lower fragment projecting in front when displacement exists, and feeling less sharp and angular than in case of a broken bone; indeed, being slightly convex and rather smooth, it may easily be mistaken for the head of the bone.
7. Elbow hanging against the side when the fragments are not displaced, but away from the side when displacement exists.
8. Length of arm not changed, unless the fragments are overlapped or both fragments are tilted upon each other. When the fragments are overlapped, the arm is shortened.

## COLUMN IV.

*Signs of fracture through the surgical neck. (Cause, generally direct blows, but in aged people frequently caused by falling on the elbow.)*

1. Preternatural mobility often, but not constantly present.
2. Crepitus produced easily when there is no impaction, or when the displacement is not complete, but with difficulty when impaction exists or the displacement is complete.
3. When once the fragments have been displaced, it is exceedingly difficult ever afterwards to maintain them in place.
4. The hand can be easily placed upon the opposite shoulder while the elbow rests against the front of the chest.
5. A slight depression below the acromion, not immediately underneath its extremity, but an inch or more below.
6. Head of bone in the socket, and moving with the shaft when impacted. The upper end of the lower fragment being often felt distinctly pressing upwards towards the coracoid process, its broken extremity being easily distinguished by its irregularity from the head of the bone.
7. Elbow hanging against the side when the fragments are not displaced, but away from the side when displacement exists.
8. Length of arm unchanged, unless the fragments are impacted or overlapped or both fragments are much tilted inwards. If the fragments are completely displaced, the arm is shortened.



needful (Fig. 43). The ribbed "Crimean arm splints" made by Aitken, of York, are admirably suited for this purpose (Fig. 44). In some cases where the fracture is

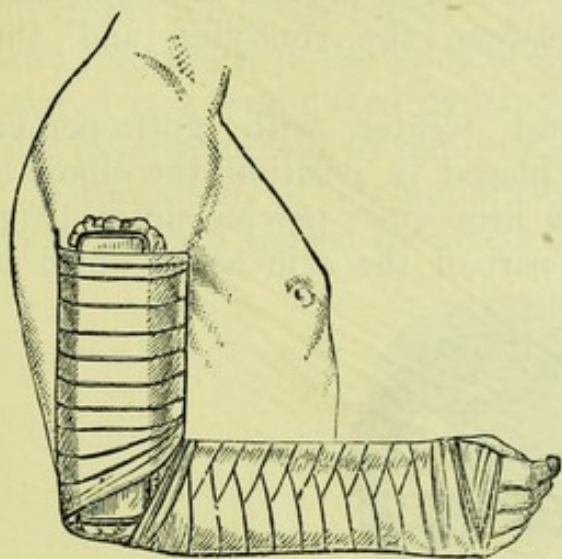


FIG. 43.

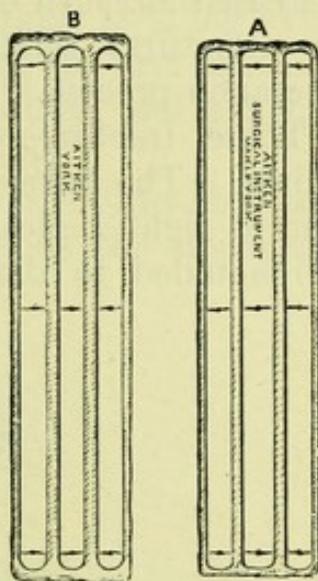


FIG. 44.

very oblique, and there is much shortening, a weight should be attached to the elbow, which hangs dependent if the patient is out of bed, or over a pulley if confined to bed. Union takes place in about five weeks.

The lower extremity of the humerus is fractured above the condyles by falls upon the bent elbow. In young subjects the lower epiphysis is separated in the same way. In consequence of the great and rapid swelling, considerable difficulty sometimes arises in diagnosing between fracture of the humerus and dislocation of the radius and ulna backwards. The former injury is always caused by falls on the elbow; the latter never so, but by falls on the palm of the hand. Symptoms:—1, preternatural mobility, which, however, ceases after a few hours; 2, crepitus, discovered on extending the forearm; 3, reduction on extension, but immediate return of the deformity on flexion; 4, shortening on measurement from the internal condyle to the tip of the acromion; 5, detection of the ends of the fragments, particularly the lower one, beneath the triceps;



6, unnatural relations between the condyles and the olecranon. Sometimes the fracture extends into the joint so as to separate the condyles. In such a case there is increased breadth of the lower end of the humerus, and an unnatural relation between the condyles and the olecranon process.

These fractures are best treated with gutta-percha splints. The bones being placed in position, the elbow is bent at right angles, and a firm gutta-percha splint (Fig. 45) moulded to the back part of the arm as far down as

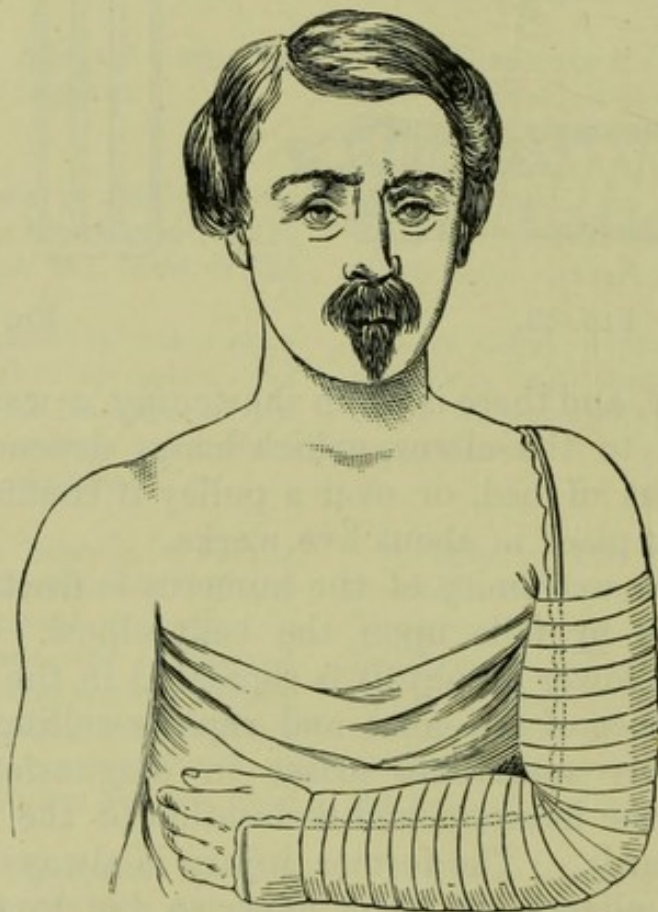


FIG. 45.

the wrist. In order to secure perfect symmetry it is better to mould the splint to the sound limb. The arm and forearm are firmly bandaged to the splint, care being taken to put plenty of cotton wool at the bend of the elbow, and to protect all the prominent points of bone



with thick padding. Passive motion should be commenced at the end of a fortnight or three weeks. Firm union takes place in children at the end of three weeks, in adults in from four to six weeks. If considerable swelling exists, and fracture into the joint is suspected, the arm should be placed in a semi-flexed position on a pillow, and evaporating lotions applied to reduce the swelling.

Dislocations of the humerus downwards into the axilla (Fig. 46) are caused by direct blows upon the upper part



FIG. 46.

of the humerus, or by violent leverage carrying the elbow away from the side. Symptoms:—1, a depression immediately under the acromion; 2, the elbow carried outwards from the side and a little backwards; 3, the head of the humerus felt in the axilla; 4, numbness of the arm, and pain; 5, the elbow being placed against the side, it is



impossible to place the hand on the opposite shoulder (common to all); 6, lengthening of the arm, from half an inch to an inch.

Dislocations forward (Fig. 47) arise from the same

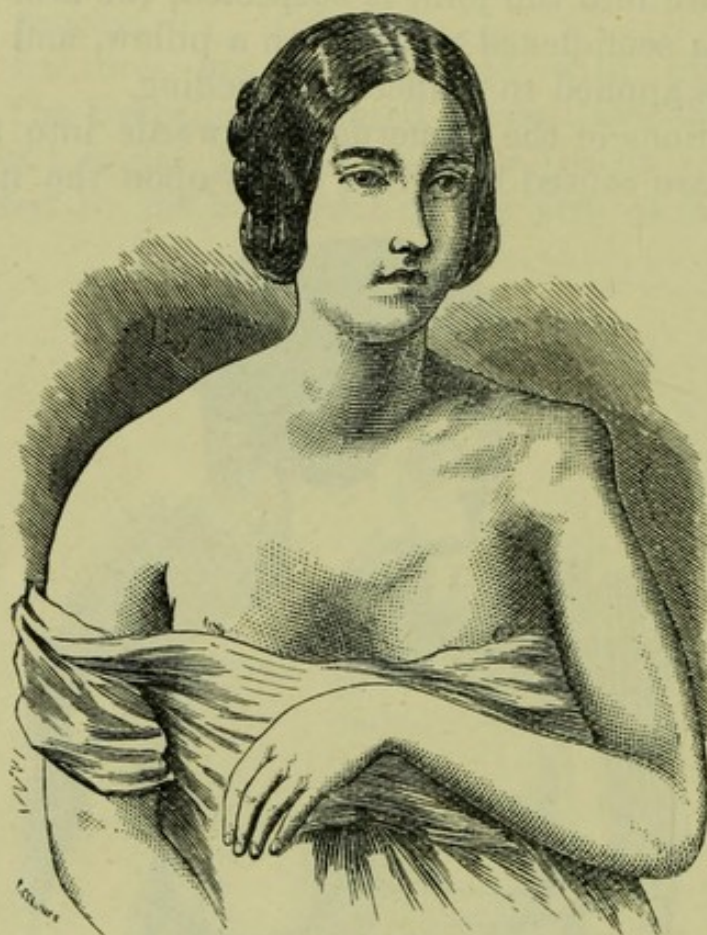


FIG. 47.

causes, except that the force is generally from behind, as, for example, from a fall on the elbow, when the axis of the limb is directed backwards. Symptoms:—1 and 2, same as above; 3, axis of the limb directed towards the middle of the clavicle; 4, fulness underneath the clavicle on the sternal side of the coracoid process.

Dislocations backwards are rare. They arise from falling forwards on the extended arm, or from pushing violently with the arm elevated. Symptoms:—1, projection under the spine of the scapula; 2, wide space between the head of the bone and the coracoid process;



3, forearm carried across the chest; 4, axis of humerus upwards and outwards, to a point posterior to the glenoid cavity. One point of diagnosis common to all is, "that in taking the vertical circumference of any shoulder in which dislocation exists, by means of a tape carried over the acromion and under the axilla, an increase of about two inches over the sound side is an invariable concomitant."

Whenever it is possible, give an anæsthetic in the reduction of these dislocations. The method by manipulation may then be used. When the patient is fully under the influence of the anæsthetic, grasp the arm below the elbow with one hand, and carry it well out from the side. Place the other hand on the shoulder, pressing with the thumb upon the head of the bone (Fig. 48). Next,

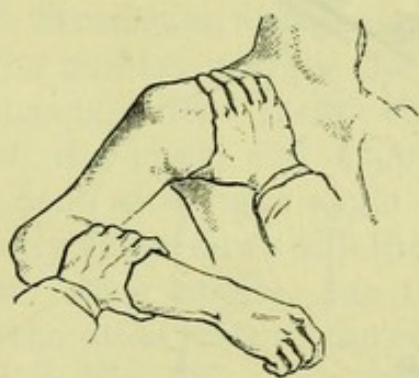


FIG. 48.

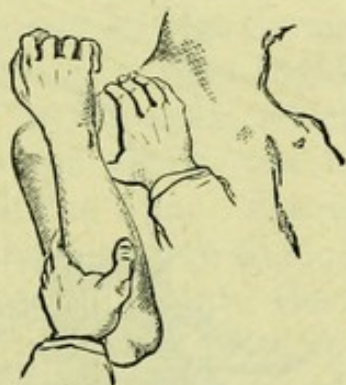


FIG. 49.

firmly extending the limb, make it describe a semicircle towards the sternum, at the same time pressing the head of the bone towards the glenoid cavity. Then suddenly bring the arm down to the side (Fig. 49).

When an anæsthetic is not given, the reduction is accomplished as follows:—The patient being placed on his back, the surgeon places the heel of his foot in the axilla, at the same time grasping the wrist, and making firm extension. The arm should be slightly rotated, and drawn towards the body. After reduction the arm is to be bandaged to the side, and the forearm placed in a



sling. An evaporating lotion should be applied to the shoulder if much swelling is present. To facilitate this operation, and give the surgeon more power, I have had two pads made by Messrs. Mayer and Meltzer, of Great Portland Street. The pad consists of a metallic shield, into which is fixed a handle. The shield is well padded, the pad extending well beyond its edges. It is fixed on directly above either condyle, and connected to its fellow by straps and buckles (Fig. 50). The handles give the

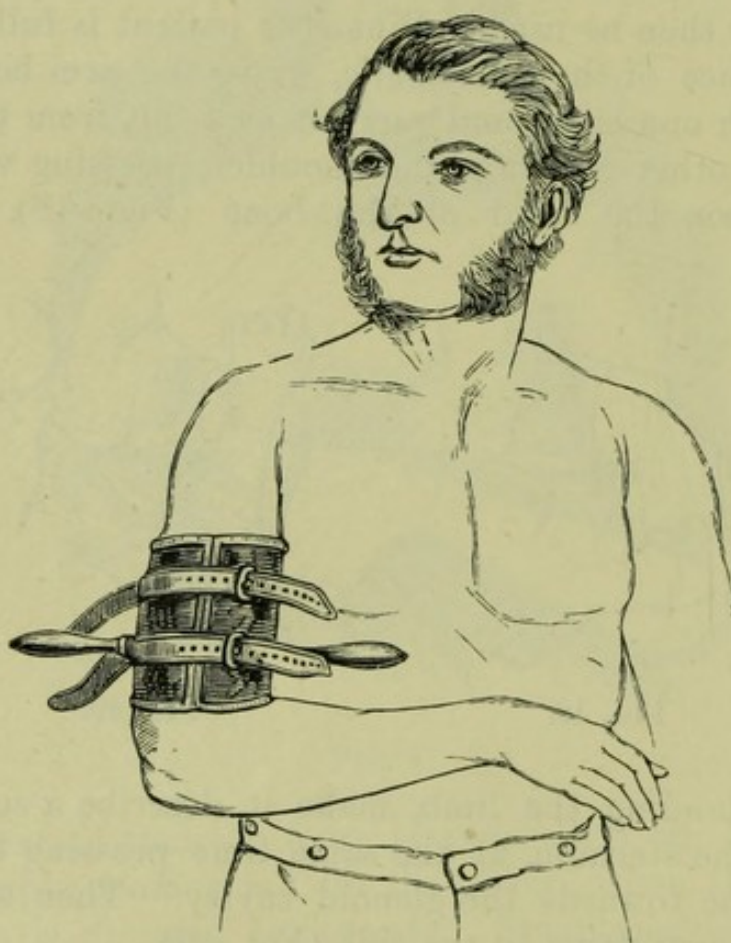


FIG. 50.

surgeon considerable power over the limb in making extension, and the pulleys may be attached to them as well. By the use of these pads it is likely that the terrible excoriation of the skin, sometimes produced by the use of a towel or rope, may be avoided.



When there is a dislocation of the shoulder, together with a wound into the joint, if the soft tissues are not much injured, the dislocation must be reduced, and the wound treated antiseptically (see chapter on Antiseptic Treatment). A bag of ice should be *continuously* applied, and the patient kept under the influence of opium. If the soft parts are much involved, it is better to resect the joint at once.

In severe injuries, especially in gunshot wounds, where the bone is very much comminuted, the soft parts lacerated, or the main vessels involved, amputation at the shoulder-joint may be required (see below, p. 73). But every possible attempt should be made to save the limb, and the following plan of treatment, extracted from Surgeon-Major Porter's 'Surgeon's Pocket-book,' is worthy of notice. The shattered limb is to be placed on a cushion devised by Dr. Stromeier, and thus described by Mac Cormac :\*—

"The cushion may be described as a right-angled isosceles triangle, four inches thick at the apex, which rests against the chest and supports the elbow, the forearm being bent at a right angle with the arm. The cushion gradually thins down till the base is a mere edge ; and of the two other angles, one is passed up into the axilla, while the other rests on the chest under the wrist, as represented in Fig. 52. The cushion is readily fastened in its place by a tape round the neck and one round the body, as seen in Fig. 51. When this simple apparatus is applied the arm rests upon it, beautifully supported and in excellent position. Whilst lying in bed, nothing beyond the ordinary dressings are required for the wound ; and if the patient needs to be transported from one place to another, or is fit to walk about, this can be arranged for with the utmost facility, as cushion, arm and all, can be bound by a broad bandage to the body and thus form an immoveable whole."

In resection of the shoulder-joint for compound injuries the instruments required are :—1, large bistoury ; 2,

\* 'Notes and Recollections of an Ambulance Surgeon,' p. 36.



retractors; 3, lion forceps; 4, saw; 5, bone forceps; 6, pressure and artery forceps. The operation is thus performed:—1st. Enlarge the original wound in a direction which must accord with the condition

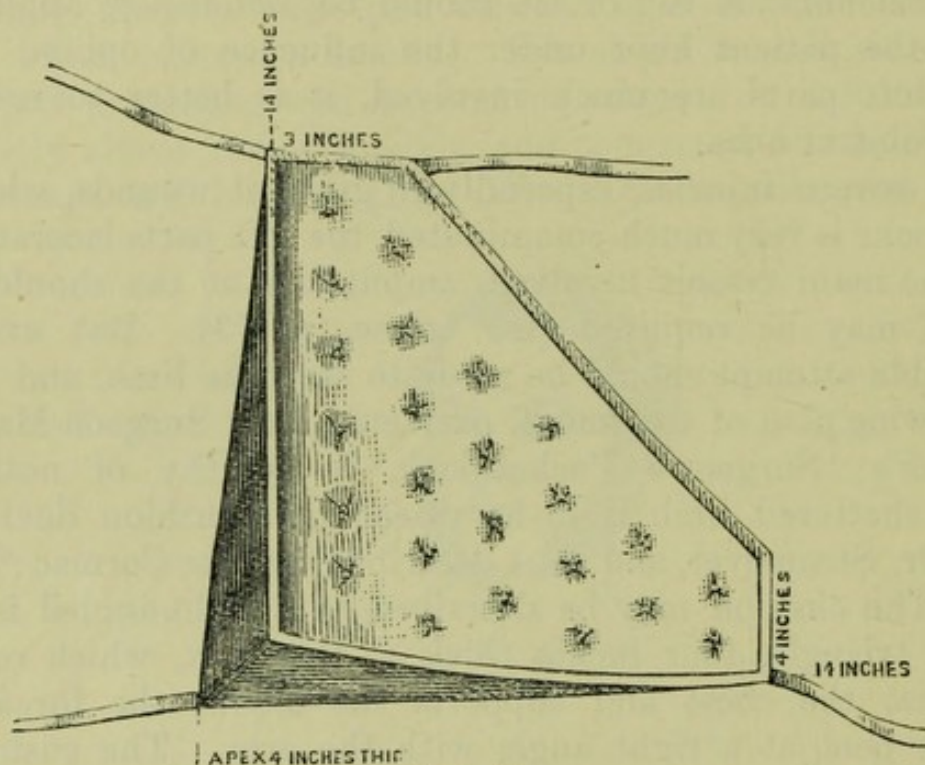


FIG. 51.

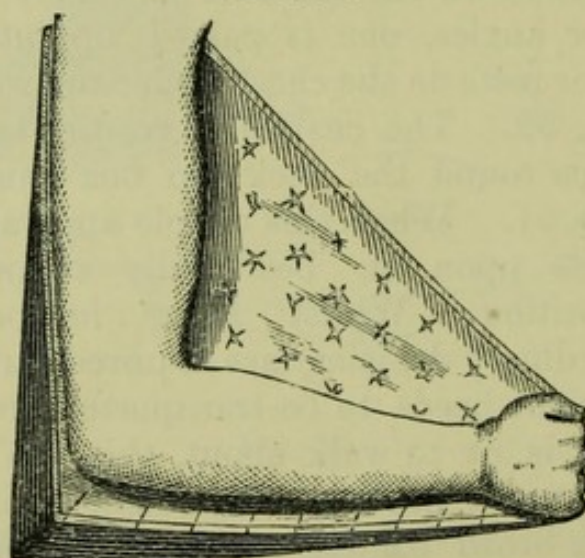


FIG. 52.

of the soft parts. A line from the tip of the acromion to the insertion of the deltoid is the usual direction. 2ndly. The arm being carried across the chest, rotate it first



inwards, and then outwards to allow of the division of the scapular muscles attached to the tuberosities. 3rdly. Open the capsule of the joint, the long head of the biceps being, if possible, slipped aside. 4thly. Carry the elbow backwards, and thrust the head of the bone out through the wound. 5thly. The head of the bone being held firmly with the lion forceps, remove it with the saw, cutting through the tuberosities. The saw best adapted for this, and many other purposes, is one made by Matthews, of Portugal Street (Fig. 53), with a bent shaft and a moveable

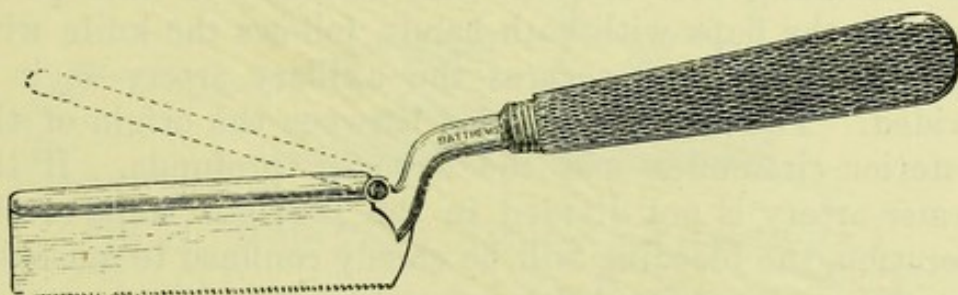


FIG. 53.

back. The wound being dressed, the arm is abducted and laid on a pillow.

In amputation at the shoulder-joint the instruments required are—1, a long stout bistoury ; 2, pressure forceps ; 3, lion forceps ; 4, retractors ; 5, artery forceps ; 6, scissors ; 7, needles. The operation is thus performed on the right side as described by Mr. Spence :—Slightly abduct the arm and rotate the bone outwards if possible. Cut down upon the head at a point just external to the coracoid, and carry the incision straight down to the insertion of the pectoralis major, which is divided. Carry a curved incision outwards through the fibres of the deltoid to the posterior border of the axilla. The whole of this incision is carried down to the bone. The inner flap is then marked out through the skin and fat only, commencing at the termination of the straight line, and curving across the inner aspect of the limb to join the first incision. The fibres of the deltoid are then separated from the bone by the fingers or a raspatory, together with the the posterior circumflex, which



enters the deep surface of the muscle. Thus the head of the bone and tuberosities are exposed. As the upper part of the shaft of the humerus is frequently shattered in these cases, the head of the bone must be grasped by lion forceps. Divide in succession the muscles attached to the tuberosities, the head of the bone being alternately rotated outwards and inwards. The head of the bone is then well thrust out above the glenoid cavity. The surgeon, drawing it well away from the body, passes his knife close to the bone and divides the remaining soft tissues. An assistant at this point, grasping the flaps with both hands, follows the knife with his two thumbs, and secures the axillary artery as it is divided. The artery is divided between the origin of the posterior circumflex and the superior profunda. If the former artery is not divided in the previous steps of the operation, the bleeding will be chiefly confined to muscular branches in the deltoid flap.

Amputations at lower points of the arm are best performed by the ordinary flap operation—by transfixion. In making the anterior flap the brachial artery should be avoided, so as not to cut it until the last sweep of the knife in the formation of the posterior flap.

Fractures of the lower end of the humerus, involving the elbow-joint, have been noticed at p. 65.

Fracture of the olecranon is caused by falls on the elbow, or direct blows upon the part. Symptoms:—1, crepitus when the fragments are not separated, or when they are brought together by extension of the forearm; 2, depression between the fragments; 3, semi-flexion of the forearm, and inability to straighten it. Before the age of fifteen this fracture seldom or never happens. Great swelling soon follows the injury, and obscures the diagnosis. If suspected, the arm should be kept in the straight position, and evaporating lotions applied. Treatment:—The following plan is recommended by Mr. Pick. Lay a strip of linen some inches in length longitudinally on either side of the fractured olecranon. A bandage (wetted, in order to



prevent its slipping) is then applied to the arm immediately above the upper margin of the olecranon, and a second to the forearm. These bandages are to include the strips of linen. By now tying tightly together the ends of the strips the bandages will be approximated, and the upper one will force down the displaced fragment until it comes in contact with the lower. An anterior splint is now to be applied to the forearm and arm so as to keep the elbow extended (Fig. 54). At the end of three weeks the

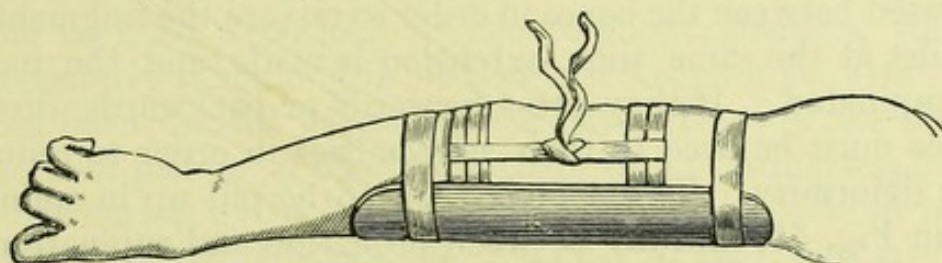


FIG. 54. (From Pick's 'Fractures and Dislocations.')

patient should be placed under an anæsthetic. The thumb being firmly placed on the top of the olecranon, the elbow should be gently flexed and placed on an angular splint. After a further interval passive motion must be commenced.

Fracture of the coronoid process is very rare. Symptoms:—1, luxation backwards of the ulna, or the ulna and radius; 2, probable crepitus; 3, the fragment felt in front of the trochlea. Treatment:—The arm must be placed at right angles, and so secured on a rectangular splint.

Fracture of the neck of the radius is rare. Symptoms:—1, the upper end of the lower fragment is carried forward by the action of the biceps; 2, the displacement is increased on extension; 3, pronation, and inability to supinate. Treatment:—The forearm must be flexed on the arm, and supported by a single dorsal splint, whilst a compress must be placed over the upper end of the lower fragment, and secured with a bandage.

Fracture of the shaft of the ulna alone is generally the result of direct violence. It is frequently found in conjunction with other serious injuries—*e. g.* dislocation of the head



of the radius, or dislocation of both bones backwards. Symptoms :—1, crepitus and mobility, discovered by seizing the bone above and below the point of contusion, and moving it in opposite directions. The direction taken by the fragments is uncertain. When outwards towards the radius, there is slight projection of the styloid process. When accompanied with dislocation of the head of the radius, there is shortening of the forearm. Treatment :—If the fragments fall towards the radius, the finger must be forcibly pressed between the bones in order to restore the fragments ; whilst at the same time extension is made, and the hand is supinated. If they press forwards or backwards, direct force must be used to their extremities in order to reduce the deformity. The arm is then to be put up in splints, as in Fig. 55, midway between pronation and supination.

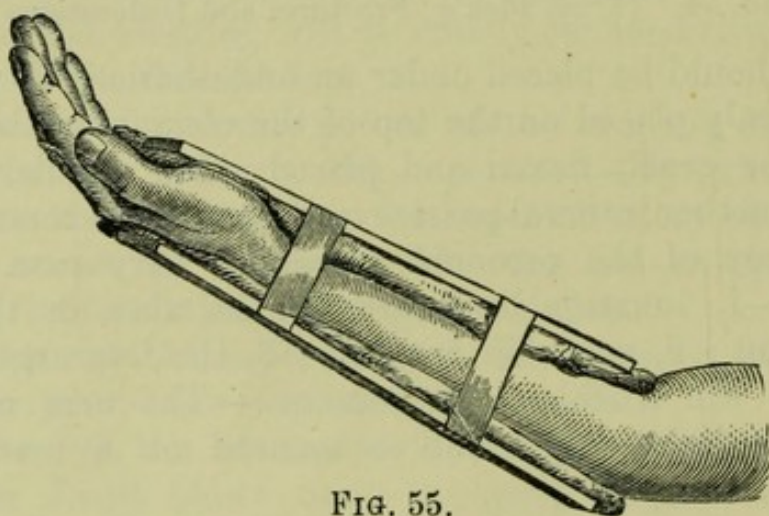


FIG. 55.

If dislocation of the head of the radius is also present, this must, if possible, be reduced. Let an assistant seize the humerus, not in front, but by the condyles, and at the same time flex the forearm and extend it. Then push the head of the radius towards its socket. Fix the arm to an angular splint, placed upon the palmar surface. Should the fracture be compound, as it not unfrequently is with dislocation, the same plan must be followed, the wound being dressed aseptically (see chapter on Aseptic Treatment).



In fractures of the shaft of the radius at the middle third, the lower end of the upper fragment is tilted up by the biceps and pronator teres, whilst the lower fragment is tilted in against the ulna by the pronator quadratus and supinator longus. The displacement of the bones is in some cases very great when the fracture is above the insertion of the pronator radii teres. In fact, nothing short of complete supination will restore the bones to their proper position. In ordinary practice it is nearly impossible to keep a patient in the required position, which necessitates remaining in bed, or else keeping the arm in a most inconvenient position stuck out in front of the body. The best plan is to put the fracture up in ordinary splints, endeavouring by pads to fix the ends of the bone in position. The patient must be directed to keep the arm in the supine position.

In fractures of the lower third, the ends of the fragments are generally tilted in towards the ulna. The treatment of these fractures is the same as that indicated above for fractures of the shaft of the ulna.

Colles' fracture takes place an inch above the carpal end of the bone, and is generally caused by falls on the palm of the hand. Symptoms:—1, the patient cannot pronate or supinate, except with great pain; 2, the hand is turned backwards, and to the radial side; 3, the styloid process of the ulna is very prominent; 4, prominence on the dorsum of the wrist, and a corresponding depression in front; 5, crepitus on powerful extension. The reduction of this fracture, and its treatment by Gordon's splint, is thus accomplished:—Supposing the left radius to be broken, reduce the deformity by laying hold of the forearm, placing the thumb of the left hand upon the lower end of the upper fragment, and the thumb of the right hand upon the upper end of the lower fragment, as much to the inner side as possible. Both fragments are thus pushed backwards and outwards, the hand being at the same time strongly adducted.

Apply the bevelled portion of the under splint (Fig. 56),



previously padded, against the lower end of the upper fragment. Then place a thick pad over the metacarpus,

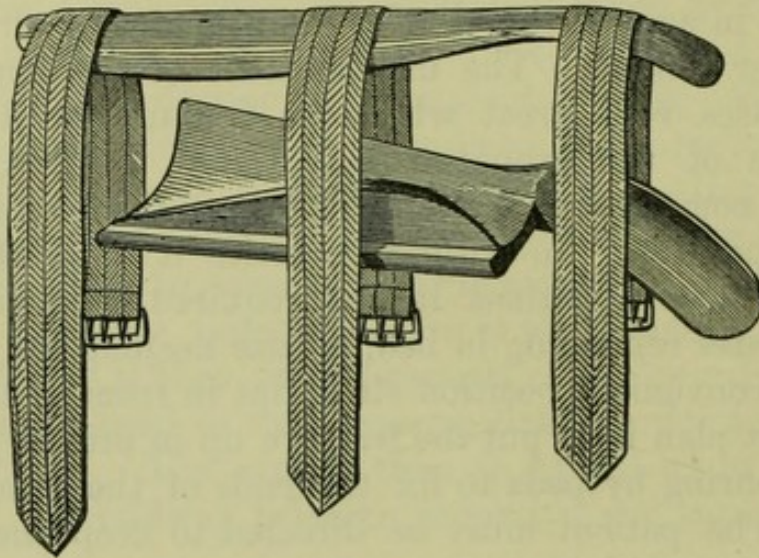


FIG. 56.

carpus, and the back of lower fragment, and apply the upper or back splint, its lower end resting upon the dorsal pad.

Both splints are now held in their position by three straps with buckles attached, the upper strap being placed as high as possible, and the second strap low down, almost at the end of the body of the splint (Fig. 57). This

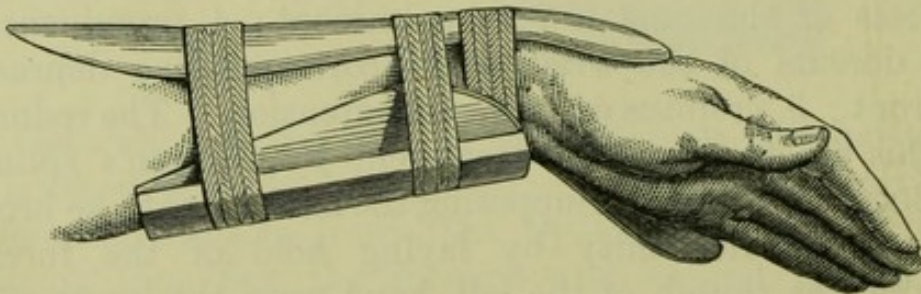


FIG. 57.

strap serves the double purpose of pressing the bevelled portion of the splint against the lower end of the upper fragment, pushing it backwards, whilst at the same time, acting upon the back splint, the carpus and the carpal frag-



ment are pushed forwards, restoring and maintaining the natural form of the radius.

As the main displacement of the lower fragment is backwards and outwards, it is necessary that the hand should be maintained in a state of abduction; therefore place a moderately thick pad over the outer margin of the carpus, the third strap being applied encircling the dorsal splint, and the ulnar portion of the front splint (Fig. 57). The indications fulfilled by the last strap are to force the carpus inwards towards the ulna, and remove the pressure of the upper surface of the carpus from the outer part of the carpal surface of the radius.

A more recent method of treatment by Carr's splint gives very good results, as by its use stiffness of the fingers is avoided. It consists of a splint about 11 inches long, slightly raised on the radial side, and with a cross-bar to be

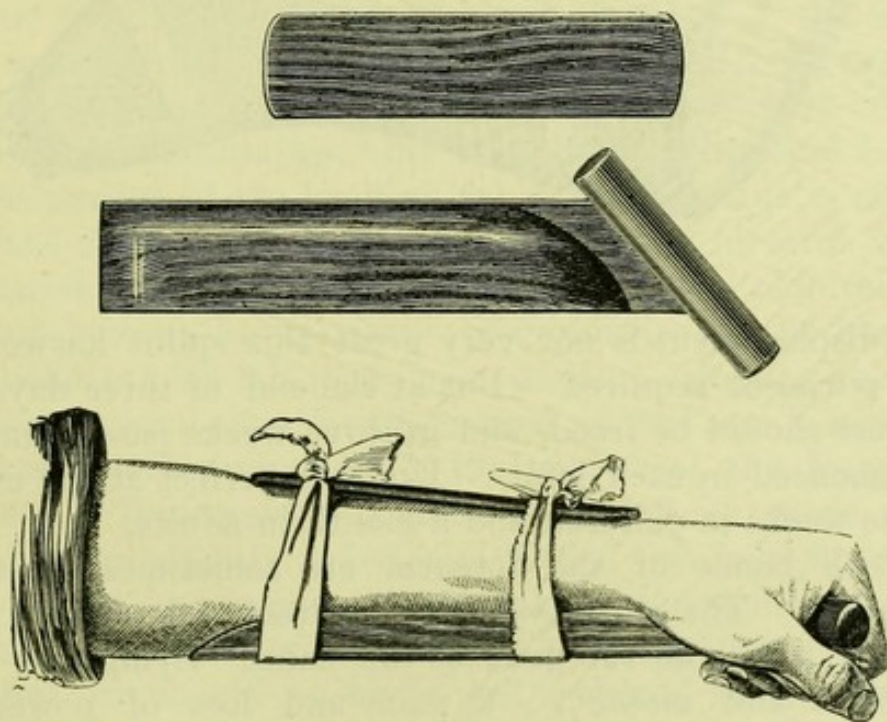


FIG. 58.

grasped by the hand (Fig. 58). A short splint is applied to the back of the arm.

It is applied as follows:—The arm is laid on the splint



previously padded with a double layer of lint, and the hand grasps the cross-bar. The short splint, also padded, is placed on the back of the forearm, and the whole fixed with a bandage, a few turns being taken round the fingers. The fingers should be freed about the third day, and passive motion employed. The splint should be removed at the end of the third week, after which the arm should be kept in a sling for another week, and gently worked.

The simpler method of treating this fracture is with the pistol splint. To apply this splint the arm should be firmly grasped, and the hand adducted. The splint is then applied to the palmar surface (Fig. 59). In cases where

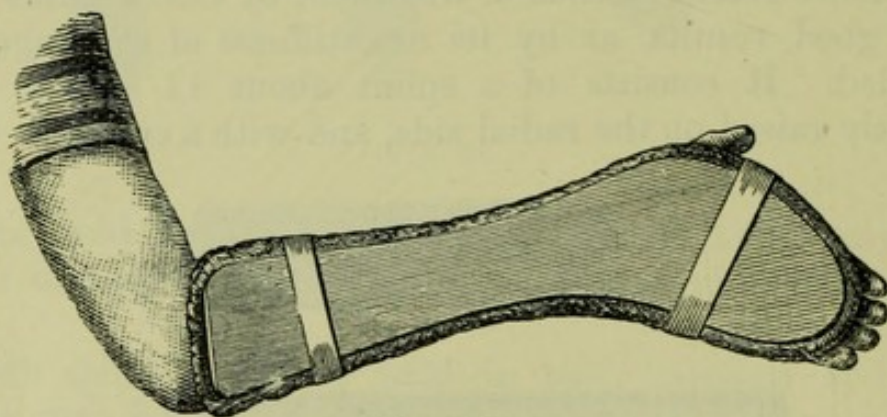


FIG. 59.

the displacement is not very great this splint answers all the purposes required. But at the end of three days the fingers should be freed, and in three weeks passive motion commenced in each joint. Union is perfect at the end of three weeks in children and a month in adults.

Both bones of the forearm are sometimes fractured together. The cause is generally direct violence, or, more rarely, a fall on the palm of the hand. Symptoms:—1, crepitus and mobility; 2, pain and loss of power; 3, visible bend in the limb.

Treatment:—If there is but little displacement, the limb must be put up in the ordinary manner (Fig. 55, p. 76). If the fracture is oblique and there is shortening, extension must be made. If there is much tendency for the bones to



fall together, the limb should be put up in a position of complete supination, and the pads should be so adjusted as to well fill the interstices between the bones, the dorsal splint being quite narrow— $1\frac{1}{2}$  to 2 inches broad—in order to wedge the bones apart, and thereby prevent fusion by the callus which would prevent pronation and supination.

Fractures of the carpal bones are generally compound. When it is a simple fracture, little or no treatment is required beyond rest. Fractures of the metacarpal bones are the result of direct violence, or of blows upon the clenched fist. Crepitus may be detected, and in some cases an angular projection on the dorsum. Treatment:—A ball or a roller is placed in the palm, and the fingers firmly fixed over it, either with a bandage or adhesive plaster. If the fragments are much displaced, traction on the fingers of the broken metacarpal bones will bring them into place, and they may be retained there by a gutta-percha splint, moulded either to the back or palm of the hand, and well padded. Care must be taken to make the splint project on either side of the hand, in order to keep off the pressure of the bandage from the lateral metacarpal bones.

Dislocation of the head of the radius forwards is caused by falls on the elbow, or on the extended forearm when pronated. It may be caused also in young children by lifting them up by the arm. Symptoms:—1, the head of the bone can be felt in its new position, and its absence from its natural situation discovered; 2, the arm is inclined outwards and pronated; 3, the tendon of the biceps is relaxed. Treatment:—Extension should be made with the forearm slightly flexed, and whilst this is kept up the elbow must be grasped, and the head of the radius forcibly pushed back into its position. No attempt to straighten the forearm should be made, but it should at once be put up flexed at right angles, and placed in a sling.

Dislocation backward is generally the result of a direct blow on the front and upper part of the bone. It is rare without accompanying fracture. Symptoms:—1, the head of the bone is felt rotating behind the condyle; 2, the



forearm is slightly flexed and pronated; 3, supination cannot be performed. Treatment:—Extension being made, the forearm is forcibly supinated, the head of the bone being at the same time pressed forward into its place.

Dislocation of both bones of the forearm is an accident to which youth is particularly liable. Dislocation backwards is caused by a fall on the hand, or inner side of the ulna; or by a violent twist, or a direct blow on the front and upper part of the forearm. Symptoms:—1, the forearm is slightly flexed; 2, the lower end of the humerus can be felt in front of the elbow; the olecranon projects behind the condyles of the humerus, becoming more prominent on flexion and less so on extension (just the reverse of what occurs in fractures of the humerus above the condyles); 3, the olecranon, instead of being below the internal condyle, is carried about an inch above it; 4, the forearm is shortened, on measurement from the internal condyle to the styloid process of the ulna; 5, there is no shortening from the acromion to the internal condyle. Treatment:—Seat the patient sideways on a chair. Place your foot on the chair, and your knee in the bend of the elbow. Take firm hold of the wrist, and pressing the knee firmly against the radius and ulna, forcibly, but slowly, bend the forearm. Thus the coronoid process is brought forward in front of the elbow, and is pulled by the muscles into its place. When reduction is supposed to have taken place, the joint should be flexed and extended, and if this can be done with ease, it is evident that the bones are in place.

Dislocation outwards is usually incomplete. Symptoms:—1, great prominence on the inner side of the internal condyle, with a deep depression below; 2, prominence on the outer side of the cup of the head of the radius. Treatment:—Extension and counter-extension being kept up, lateral pressure must be made on the radial side.

Dislocation inwards is a rare accident. Symptoms:—1, the olecranon is felt projecting on the inner side, and



the head of the radius indistinctly in the bend of the arm ; 2, the external condyle is very prominent ; 3, the forearm is flexed and the hand pronated. Treatment :—As above, by extension, counter-extension, and pressure in the direction of the natural position of the bones.

Dislocation forwards is very rare. Symptoms :—1, the forearm flexed at right angles, immoveable and supinated ; 2, absence of the olecranon from its natural position ; 3, head of radius in the coronoid fossa. Treatment :—Flexion on the knee, as described above. The ulna may be reduced without the radius, which must then be pressed into its position as before described.

Dislocations at the wrist are rare, fracture of the lower end of the radius being generally the accident mistaken for it. Dislocation backwards may be caused by falls on the palm, or on the back of the hand. Symptoms :—1, a very abrupt angle caused by the projection of the carpus ; 2, absence of crepitus ; 3, easy reduction. Treatment :—Simple extension on a splint will generally be sufficient.

Dislocation of the carpus forwards may be the result of a fall on the palm. The radius and ulna are felt projecting posteriorly, whilst the carpus forms a tumour anteriorly. It can be reduced by extension.

The most usual dislocation of the thumb is that of the first phalanx backward on the metacarpal bone. Symptoms :—1, the end of the metacarpal bone projects in the palm ; 2, the proximal end of the first phalanx is found on the dorsum of the metacarpal, and the phalanx itself is bent backwards almost at a right angle. It must be remembered that one of the great obstacles to reduction of this dislocation is the fact that the head of the metacarpal bone is frequently "button-holed" by being thrust through the two heads of the flexor brevis pollicis. Treatment :—It is advisable to give an anæsthetic. The thumb being protected with lint, a clove-hitch (Fig. 60) is fixed on it. The metacarpal bone is then pressed forcibly into the palm and kept there, the phalanx being bent backwards and extension made. Rapid flexion will then



generally replace the bone. If reduction is not accomplished, it may be needful to divide all the resisting

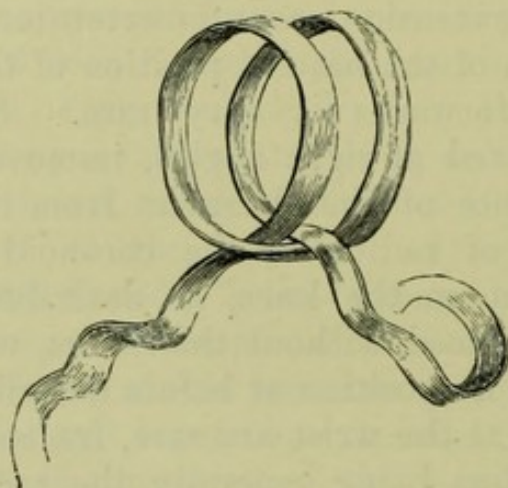


FIG. 60.

tissues with a tenotomy knife. Dislocation forwards may be reduced by bending the phalanx forwards towards the palm. In cases of considerable difficulty, a pair of forceps such as those shown in Fig. 61 are useful.

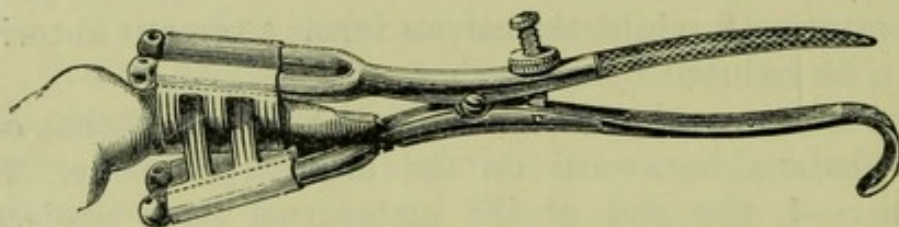


FIG. 61.

When the elbow-joint is laid open without further injury, it should be treated antiseptically (see chapter on Aseptic Treatment). The limb should be placed on an angular splint, and, if possible, ice kept constantly applied. When the bones are severely injured, as in gunshot wounds or crushes, if the vessels are not damaged, primary excision of the joint should be performed.

For this operation the following instruments are required:—1, scalpel; 2, blunt hooks and retractors; 3, lion forceps; 4, saw with moveable back (Fig. 53, p. 73);



5, bone forceps ; 6, pressure and artery forceps ; 7, raspatory (Fig. 62). The original wound may be enlarged, if



FIG. 62.

placed conveniently, or a straight incision may be made at the back of the joint, about five inches long. The centre of the incision should be over the top of the olecranon. If possible the triceps should not be divided, but it should be separated with the fascia from the olecranon by the raspatory, and held aside with a retractor. The periosteum should be raised from the bones with the raspatory as much as possible. The olecranon process should then be cut off with bone forceps. The end of the humerus is then cleared, the ulnar nerve being slipped forwards over the internal condyle, and held aside with a blunt hook. It must be remembered that in injuries to the elbow-joint the nerve is sometimes displaced, so that great care must be taken to avoid it from the very first. The entire condyloid surface of the humerus is then removed with the saw, and the end of the ulna, including the sigmoid cavity with the head of the radius. The section of the bones must be modified according to the injury they have sustained ; the usual mistake is the removal of too small a portion. Hæmorrhage being arrested, the wound is brought together, and the arm, slightly flexed, placed on a pillow, and if needful kept in position by short sand-bags.

If the injury to the soft parts and the vessels is so great that amputation is needful, it may be performed at, or in close proximity to, the joint. The best form of operation, both here and in the forearm, is the "mixed method" of skin-flap, with circular division of the muscles. The instruments required are—1, long bistoury ; 2, saw ; 3, lion and bone forceps ; 4, pressure and artery forceps. An oval flap of skin, large enough to cover in



the end of the stump and allow for shrinkage, is marked out with the bistoury, either in front, behind, or laterally, as the case demands; or two short flaps are cut, to meet over the end of the stump, one being somewhat longer than the other, in order to remove the cicatrix from the face of the stump. A circular sweep is then made through the muscles, about an inch below the base of the skin-flaps. The muscles are cleared upwards from the bone, and the section through the bones completed with the saw. If the amputation is at the joint, the bones are disarticulated previous to the section of the muscles.

In compound injury to the wrist-joint the joint must be treated in the same manner as the elbow- or shoulder-joint, the forearm and hand being placed on a straight splint. If the bones of the forearm protrude, and the tendons and blood-vessels are injured, amputation must be performed, the one just described being applicable.

Every attempt should be made to save any portion of the phalanges or metacarpal bone of the thumb. But if the injury renders this impossible, the phalanges may be removed by the incisions shown in Fig. 63, or the meta-

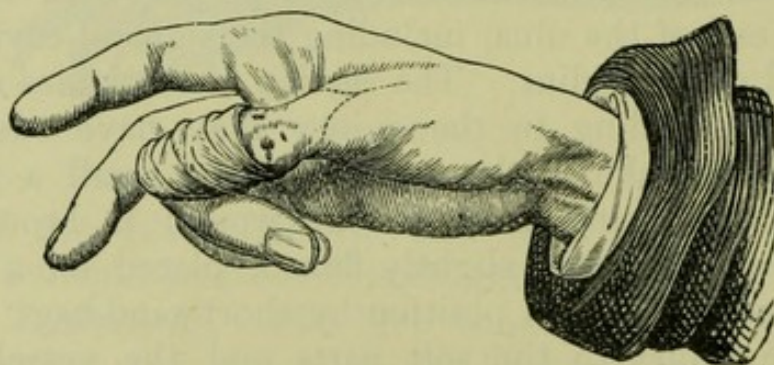


FIG. 63.

carpal bone by the incision marked in Fig. 64. A long narrow-bladed bistoury is carried through the soft parts, between the metacarpal bone of the thumb and index finger, up to the trapezium; it is then turned outwards, and the joint cut through, the incision being completed in the direction of the dotted line.



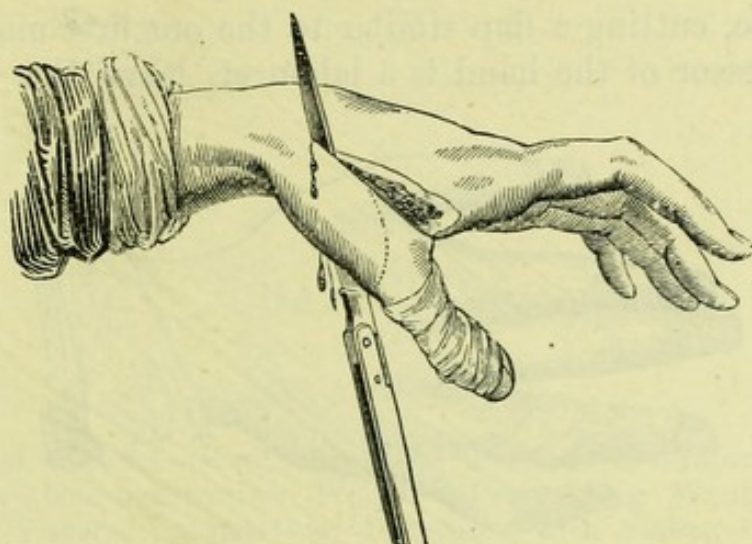


FIG. 64.

The index and little finger may be removed by incisions corresponding to the dotted line in Fig. 65. The point of

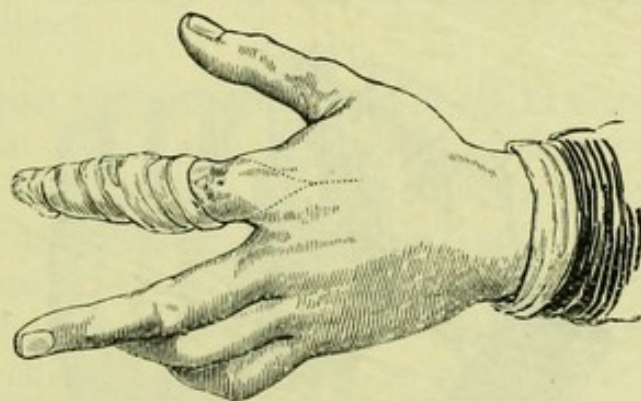


FIG. 65.

the knife is entered on the back of the metacarpal bone, and carried by the side, and underneath the finger, and up again to where it first entered. The soft parts are then dissected back, and the head of the metacarpal bone divided with the bone forceps. The other fingers are removed by an incision such as that marked in Fig. 66. The adjoining fingers being held aside by an assistant, grasp the finger firmly, and place the heel of the knife on the web of the finger. It is then carried upwards to the joint, through which it passes, and is brought out on the



other side, cutting a flap similar to the one first made. If the possessor of the hand is a labourer, leave the head of

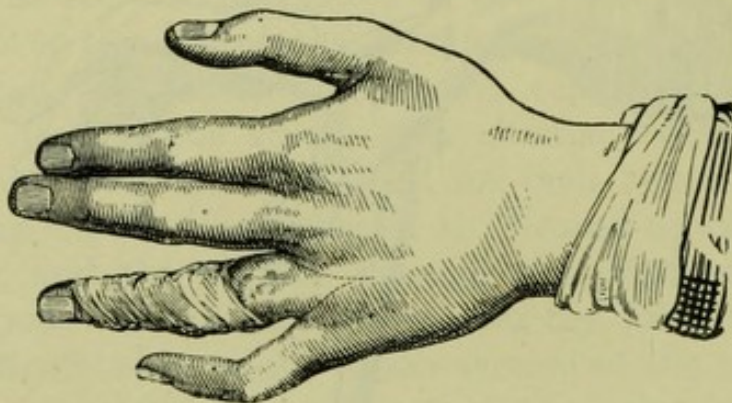


FIG. 66.

the metacarpal bone, else remove it with the bone forceps. The second or third phalanx may be removed as follows :— Bend the phalanx at right angles to the next (Fig. 67) ;

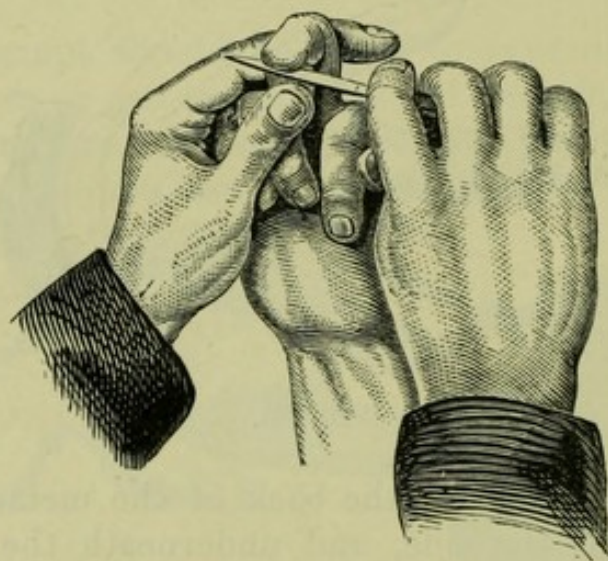


FIG. 67.

place the heel of a bistoury at the side of the joint midway in the thickness of the next phalanx, and draw the knife straight across the joint ; straighten out the fingers, and turning the edge of the knife forwards, cut a flap from the palmar surface.



## CHAPTER VI

## THE ABDOMEN

Rupture of Muscles—Rupture of the Peritoneum—Injury to the Viscera—Non-penetrating Wounds—Penetrating Wounds—Protruded Viscera, Constriction, Distension with Flatus, Gangrene, Wounds—Suture of Intestine—Washing out Abdominal Cavity—Protruded Omentum—Sutures in Wounded Parietes—Foreign Bodies—Obstructed, Inflamed, and Strangulated Hernia—The Taxis—Operation for Strangulated Hernia—Umbilical, Inguinal, Femoral, and Obturator Hernia—Acute Intestinal Obstruction; by Bands—Volvulus—Intussusception—Abdominal Section—Enterotomy—Colotomy—Resection—Murphy's Button—Lateral Approximation.

BLOWS upon the abdomen, even of slight character, may rupture the recti muscles. The symptoms are—1, sudden pain and swelling; 2, sometimes a palpable sulcus between the torn ends; 3, increased pain on movement. The treatment is—rest, in a position to relax the muscles, with the shoulders raised and the thighs bent on the abdomen. A large pad should be placed over the site of rupture, and retained by a broad roller.

The peritoneum may be ruptured by blows on the abdomen. The symptoms are—1, extreme collapse; 2, excessive pain, especially on movement and pressure; 3, thoracic respiration; 4, tense contraction of the abdominal muscles. If the peritoneum attached to the pregnant uterus, to the mesentery, or omentum, be torn, considerable hæmorrhage may occur, when all the symptoms of great loss of blood will present themselves. The treatment is perfect rest in the recumbent position, leeches to the abdomen, linseed-meal poultices sprinkled over with laudanum, and opium internally (see p. 93). All purgatives



must be avoided, and very light fluid diet administered. Ice must be applied to the abdomen, and the collapse of hæmorrhage counteracted by stimulants freely given. In all cases of severe blows, or crushing force applied to the abdominal wall, where collapse is present and injury to any of the viscera is suspected, perfect rest must be enforced, opium administered, poultices with laudanum applied, and purgation strictly avoided. If the stomach or intestines are probably ruptured, no food of any kind must be given by the mouth, but nutritive enemata, in small quantities, administered by the rectum every four or six hours. It is also advisable to empty the bladder with a catheter, especially if damage to the kidneys is suspected. The symptoms of injury to the various abdominal viscera are as follow :

*The Liver.*—Pain over its region and dulness on percussion from extravasated blood ; great collapse, bilious vomiting, and white stools.

*The Stomach.*—Bloody vomiting and great collapse. It is, however, possible for the stomach to be severely torn without the symptom of blood vomiting.

*The Spleen.*—Great collapse and symptoms of internal hæmorrhage ; pain over the region of the spleen, and dulness from extravasated blood.

*The Kidneys.*—Frequent micturition, bloody urine, pain in the lumbar region, and retraction of the testicle.

A wound or rupture of the intestine may be followed by emphysema, owing to the escape of flatus into the sub-peritoneal areolar tissue, and thence into the more superficial parts.

In non-penetrating wounds of the parietes, especial care must be taken to search for foreign bodies, and remove them. If there is much hæmorrhage, and the vessel cannot be seen, the wound must be enlarged and the vessel secured ; but if in punctured wounds the bleeding is not severe, it may be left, but the mouth of the wound must not be closed. In incised wounds of the epigastric region sutures must be inserted, as there is considerable



tendency to gape. If the muscular tissues are wounded, care should be taken to insert the sutures through the skin only, a buried layer of catgut sutures being inserted to bring the muscle together.

Penetrating wounds of the abdomen, especially punctured wounds, should be treated from the commencement with perfect rest and opium, even although at the moment no serious symptoms are present. If any of the viscera are wounded, the symptoms will be—1, collapse; 2, severe local pain, which soon becomes radiating; 3, vomiting, sometimes of blood; 4, rapid abdominal distension.

The various viscera are sometimes protruded through wounds in the parietes—"the small intestines most frequently, next the large, then the stomach, and lastly, the cæcum. Of the solid viscera, the omentum is by far the most common, and is often associated with that of the viscera" (Poland). When protruded through small wounds they are likely to be strangulated. If the protrusion be intestine, and it is uninjured, it must be thoroughly cleaned with a stream of tepid carbolised water and returned, care being taken to press it directly backwards, in order to avoid pushing it between the peritoneum and the muscles. If any constriction exists, the external wound must be enlarged, and the fibres of the muscle or fascia divided; but if possible the peritoneum should not be interfered with. If the bowel is so distended with flatus as to prevent its return, it may be punctured in three or four places with a grooved needle, and the air allowed to escape. If the intestine be gangrenous it must be opened, its contents allowed to escape, and then it must be fixed with one or two sutures to the edge of the wound. If the intestine has sustained a small punctured wound, the lips of the wound may be held together with a pair of forceps, and a fine silk or catgut ligature tied firmly round the orifice. The ends are then cut off close, and the intestine returned. Incised wounds involving a larger portion of the calibre of the bowel should be closed in the following



manner :—A small needle curved to a half-circle (Fig. 68) or a common No. 7 sewing needle is threaded with



FIG. 68.

the finest Chinese twist, and with a needle-holder is passed through the peritoneal coat only of the bowel, about half an inch from the cut edge. The needle is then carried to the opposite side of the wound and passed in a contrary direction through the peritoneal coat (Fig. 69). The

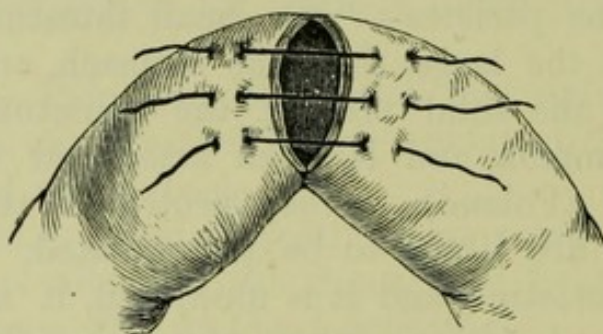


FIG. 69.

sutures should not be introduced further apart than one eighth of an inch. They are tied and cut off short; the bowel is then cleansed with carbolic lotion and returned. It will be noticed that by this method the cut edges are inverted and the two peritoneal surfaces brought in apposition.

If omentum is protruded through the wound, it should be carefully examined to ascertain that no intestine is enclosed in its folds. If it is quite healthy and free from laceration, it may be at once returned. But if it is dirty or lacerated, or great difficulty is found in returning it, a double ligature should be passed through the base, tied firmly, and the protruding portion cut off. The ligature may be cut short and returned with the omentum. The ligatures for this purpose should be of silk Chinese twist,



such as are used in ovariectomy, and should be previously soaked in carbolic solution (1—20).

When there is an incised wound opening the abdominal cavity, before finally closing it all blood-clots should, if possible, be removed from the abdominal cavity, with small pieces of sponge fixed on sponge-holders. The best form of sponge-holder is the one figured (Fig. 70). It is

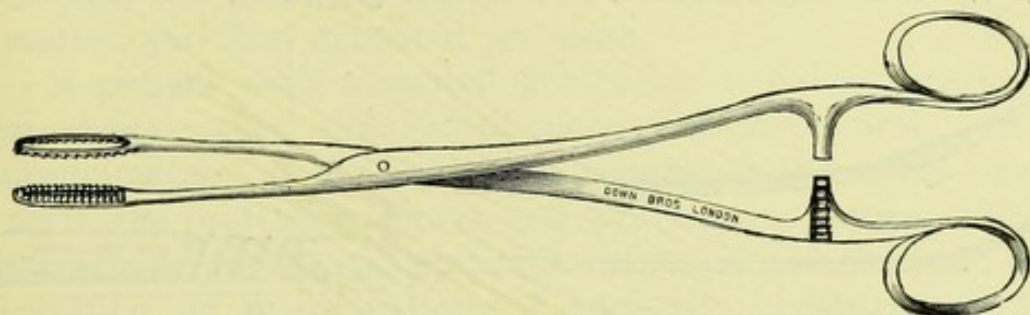


FIG. 70.

sufficiently long to reach the deepest recesses of the abdomen, and it also holds the sponge firmly.

If there is reason to believe that there is much blood-clot in the abdomen the cavity should be washed out. A sterilised solution of boracic acid (1—20) at a temperature of  $110^{\circ}$  should be used. In the absence of a proper apparatus, an ordinary washing-jug serves the purpose. The left hand should be introduced, and as the fluid is poured into the abdomen, the hand should be moved about in all directions, so as to free the blood-clots from the coils of the intestines and the mesentery. Especially attention should be paid to the flanks, the space under the liver, and the lowest part of the pelvis. When blood-clots no longer float out, the fluid remaining in the abdomen should be pressed out, and the residue mopped out with sponges on holders. If possible the patient should be covered by a large mackintosh sheet with an oval hole cut in the middle, the edge of the hole being coated with adhesive plaster. The mackintosh is arranged so that the wound lies about the middle of the oval of the sheet which adheres by its edge to the skin. The fluid is conducted by the mackintosh into a bath under the table.



Thus the patient is kept dry, and, what is also of great consequence, the temperature of the body is maintained. A flat sponge should then be slipped into the wound and arranged smoothly, for the double purpose of preventing protrusion of viscera and any further escape of blood into the peritoneal cavity. Sutures of silkworm gut should then be introduced. Cullingworth's needle (Fig. 71), or the largest size Elder's needle (Fig. 72), will be found

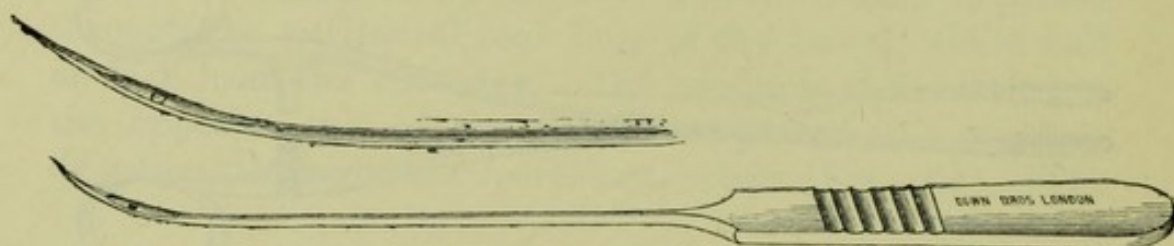


FIG. 71.

most convenient for this purpose. The needle is passed about two lines from the edge of the wound through all

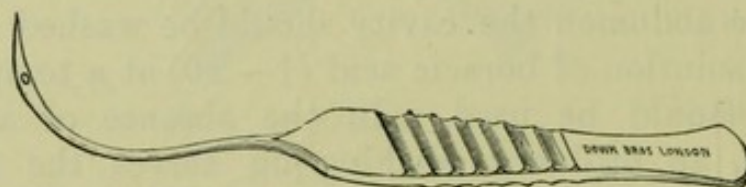


FIG. 72.

the layers of the parietes, including the peritoneum. It is passed from the right side from without inwards. Crossing to the left side, it takes up the peritoneal edge, and then is passed outwards through the rest of the parietes. When the point of the needle emerges through the skin, the silkworm gut is threaded on it and carried back with a slight jerk. As each successive suture is passed the loose ends should be temporarily secured by pressure forceps to prevent their slipping out. The sutures should be placed about one third of an inch from one another. When all the sutures are inserted the flat sponge must be removed. In tying the sutures great care must be taken



accurately to adjust the skin edges. It is important not to tie the silkworm gut too tightly, or suppuration in the stitch-holes is likely to take place.

When foreign bodies have passed from the œsophagus into the stomach, purgative treatment should be studiously avoided, and the diet should consist of as much solid material as can be conveniently taken, in order that the foreign body may be, if possible, embedded in solid fæcal matter, and thus extruded *per anum*.

A patient with a hernial protrusion is liable to certain accidents other than strangulation of the bowel. An accumulation of gas and fæcal matter may become pent up in the protruded bowel, and prevent its return. The symptoms are—1, pain; 2, distension of the tumour; 3, gurgling on manipulation; 4, generally constipation; 5, vomiting; 6, absence of the severe constitutional symptoms which indicate strangulation. The treatment consists of warm applications to the tumour, and a stimulating enema of castor oil, turpentine, and gruel. If the vomiting is not very severe purgatives may be given by the mouth. Manipulation of the tumour should be avoided as much as possible.

The previous condition may pass on into one of inflammation, or this may be set up by a blow on the tumour, the pressure of a badly fitting truss, the presence of a foreign body in the hernial protrusion, or by the extension of a similar condition in the rest of the alimentary canal. It is more likely to occur in an irreducible hernia, and where omentum is contained in the protrusion. The symptoms are—1, pain; 2, enlargement of the tumour; 3, if it be omental, increased hardness; if intestinal, increased elasticity, or fluctuation, from the presence of fluid in the sac. The treatment consists of rest, purgative enemata, and the application of ice to the tumour.

Usually the earliest symptom of a strangulated hernia is vomiting, first of the food contained in the stomach, then of yellow and green bile, and lastly of brown offensive stercoraceous matter. At the same time the hernial



tumour, if not recent, becomes tense, painful, and irreducible. The bowels are confined, and there is a feeling of dragging between the hernia and the bowel. Great prostration comes on, with quick respiration and feeble pulse; the surface is cold, and the countenance anxious. All these symptoms may exist when the intestine is inflamed, but not strangulated.

The rule is, that when the intestine is inflamed, but not strangulated, the local symptoms first supervene; but when strangulation comes first, and inflammation as a secondary result, the remote and constitutional symptoms are the first to appear, and the local ones afterwards.

When the local symptoms are urgent, and come on after the remote symptoms, it is a strong argument for immediate operation. When the remote symptoms are present, but no hernia is observable, the strictest search should be made for one. If a hernia exists in which no local signs are present, but which cannot be reduced, an operation should be performed; or it should be performed at the site of any tumour which might contain a hernia; or, in the case of double irreducible herniæ both should be operated on if, in the first, no obstruction is found.

The attempt to reduce a strangulated hernia by the taxis must be made with great gentleness. The following rules should be observed:—1. It should be very sparingly tried without an anæsthetic, which should be administered if the first attempt fails. 2. When the anæsthetic has been administered, the manipulation must be very gentle. If gentle manipulations fail, more forcible ones will only damage the bowel, without reducing the hernia. 3. The attempt, in a small hernia, should not extend over two minutes, and in larger ones not over ten minutes, at the outside. 4. It should not be made by more than one person. 5. It should not be repeated if it can be ascertained that it has been previously tried. 6. It is quite inadmissible if the strangulation has been for some hours, and if the constitutional symptoms, such as vomiting, collapse, and tender abdomen, are present; or if it



can be ascertained that the hernia has been habitually irreducible. Where taxis has been tried once and symptoms are not urgent, a good plan is to place the patient in bed with the feet of the bed raised on blocks and the pelvis raised high with firm cushions—an ice-bag being placed over the hernia. Reduction takes place in a large proportion of cases. If the symptoms are not very urgent, a grain of opium may be given, and the patient placed in a very hot bath, the taxis being attempted in the bath. If the hernia be not reduced, but no bad symptoms—such as severe pain, vomiting, or abdominal tenderness, are present—the patient may be placed in bed, and kept under the influence of opium, a strict watch being kept for the onset of any bad symptom. The rule of waiting is, however, a very exceptional one, and the condition of the patient must be very favourable to permit delay.

The description of the operation for strangulated hernia applies with little modification to the various forms of hernia met with. The instruments required are:—1, scalpel; 2, blunt-pointed curved scissors; 3, dissecting forceps; 4, straight director; 5, curved hernia-director; 6, hernia knife; 7, retractors; 8, needles, straight, and curved intestinal needles; 9, needle-holder; 10, pressure and artery forceps. An incision, the direction of which varies with the particular hernia, is made through the skin, and the superficial structures are divided until the sac is exposed. As a rule the whole of these tissues may be gently torn through with the two forefingers, or with a couple of dissecting forceps. If cutting is needful it is better done with a pair of curved blunt-pointed scissors, such as those used for extirpation of the eyeball (Fig. 24). The forefinger of the left hand is then passed up to the neck of the sac, and the nail insinuated beneath the stricture, if it be external to the sac. The hernia knife is next guided along the left forefinger and passed on the flat, by the side of the nail, beneath the stricture. The edge is then turned directly forwards, and the stricture



divided for about a quarter of an inch by a slight sawing movement. If the nail cannot be inserted beneath the stricture the hernia-director must be used and the knife passed up in the groove of the director.

The stricture being divided, an attempt must be made to return the bowel by very gentle manipulation. If the whole contents return with the characteristic gurgle, the surgeon may be satisfied that the stricture is relieved. If, however, reduction does not take place, or some portion remains behind, then the sac must be opened. In order to do this a small portion of the sac must be taken up with the forceps, and nicked through with the curved scissors. A small opening being made, one blade of the scissors is passed in, and the sac divided for a very small distance. The left forefinger is then inserted and the stricture sought for at the neck, and divided as above directed. If a director is used, great care must be taken not to pass it too far up, as it might perforate the intestine above the stricture. On using the hernia knife, the intestine must be gently pressed back with the left forefinger to prevent its bulging over the edge of the knife and being wounded. In doing this, however, great gentleness must be used, especially if the intestine is in a bad condition, as very little pressure will rupture it.

On opening the sac the contents must be carefully examined. If the intestine is quite dead, it must be left in the open wound, and freely laid open, the stricture above being undivided. The parts should be freely sprinkled with iodoform, and dressed with iodoform gauze. If the bowel is dark, mottled, and studded with lymph, or if there is a doubt as to its condition, it is better to return it to the abdominal cavity, especially if it is elastic and glistening. If there is a small rupture or perforation, and the gut surrounding the perforation appears gangrenous, the intestine should be fixed to the skin by sutures passed only through the serous coat. If the bowel about the perforation is sound, an elliptical portion of gut, including the perforation, should be excised, and the edges brought



together with sutures, as directed above (p. 92). If there are recent adhesions, they may be separated; old ones must be left without interference. If the bulk of the intestine is so large from distension with flatus as to impede reduction, it may be punctured with a grooved needle and the flatus allowed to escape. If omentum is present in a recent hernia, and is non-adherent, it should be returned with the intestine; if it is very adherent, it may be left in the sac. If there is much of it, and it is in a bad condition, it may be ligatured and cut off. The greatest care must be taken to examine omental protrusions, in order to discover if they contain, as they frequently do, especially in femoral herniæ, knuckles of intestine. Intestine so found must be carefully examined to ascertain if any omental bands are constricting it. In all cases it is well to pull down the loop of intestine, as it sometimes happens that the tight constriction at the neck of the sac has caused a ring of ulceration. If this is found, the intestine should be laid open and fixed to the adjacent parts. When the gut is returned, if the condition of the patient permits it, a radical cure should be effected, by separating the sac from below, ligaturing it with catgut as high up in the neck as possible, and cutting it off half an inch below the ligature. The wound is then closed with silkworm-gut, dressed with an aseptic dressing retained in its place by a firm spica bandage.

In umbilical strangulated hernia, the incision must be made in the median line, commencing two or three inches above the neck of the sac, and continued as far downwards as may be needful. An endeavour should be made to relieve the stricture without opening the sac. The point of strangulation is generally at the lower part of the neck of the sac. Sometimes the hernia is of huge dimensions, frequently occurring in corpulent women of middle age. The following operation is that suggested by Mr. Treves.

The parts are thoroughly cleansed, a most needful precaution in these cases. The mackintosh described at p. 93 should be used. An elliptical incision involving



the whole skin covering the protrusion is made, the long axis corresponding to the median line and extending above and below the protrusion. The incision is then deepened on one side until the abdominal aponeurosis is defined, and this carefully traced out all round the stalk or neck of the tumour. The sac is now opened at a convenient spot where it is free from adhesions. The hernial surface is enlarged, the gut freed from adhesions and returned, and the omentum excised if required, or returned. When the sac is empty the opening is plugged with a sponge. The whole of the sac with the elliptical bit of skin is then excised. The margins of the ring are then freshened, and closed with catgut sutures introduced with a curved needle. The sutures should be from four to six to the inch, and must include the peritoneum and all the aponeurosis. The sponge must be removed before the sutures are tied. The skin is then united with silkworm-gut sutures. For this, and many other purposes, a curved needle in a handle is very useful. They are made in four sizes, and should be kept fitted in a box to preserve their points (Fig. 72). It should be remembered that umbilical hernia often becomes obstructed, with very severe constitutional disturbance, and that aperient enemata frequently rectify this, without recourse to an operation.

Inguinal hernia protrudes from the abdomen above Poupart's ligament, the spinous process of the pubes being external to the neck of the tumour. In attempting the taxis, the patient should be placed with the pelvis raised, and the thighs close together, pressure being made upwards and outwards. The operation for the relief of strangulated inguinal hernia is performed as follows:—1st. An incision, from four to five inches long, is made through the integuments, in the axis of the tumour, commencing about two inches above the centre of the external abdominal ring. 2ndly. The margins of the external abdominal ring are exposed. 3rdly. The remaining tissues are divided down to the sac, which may be recognised by its



blue translucent appearance. 4thly. The tip of the forefinger is gently insinuated beneath the external ring, but if this is impossible, a director must be passed, and the ring incised with the hernia knife. The finger is then passed on and any constriction divided, when possibly the hernia may be returned. 5thly. If this cannot be done the sac must be opened, as directed above, and the forefinger carried up to the constriction, which is then divided, if needful, on the hernia-director. All the incisions for the relief of constrictions must be made in a line parallel to the linea alba, thereby avoiding the internal epigastric artery.

The above rules apply equally to direct inguinal hernia. It must, however, be remembered that the spermatic cord in the male is more prominent in direct than in oblique hernia, and that the deeper coverings are often much thinner, and therefore require greater care in their division.

The only differences between inguinal hernia in the female and in the male are, that the round ligament is substituted for the spermatic cord, and that the hernial protrusion is found in the labium.

In femoral hernia the protrusion is found below Poupart's ligament, the spinous process of the pubes being internal to the neck of the tumour. The abdominal ring will also be found unoccupied by any tumour. The symptoms of strangulated femoral hernia are generally much more severe than in inguinal. For the taxis, the patient must be placed on the back, the thighs flexed towards the abdomen, and the thigh of the affected side rotated inwards, and crossed over its fellow. The tumour must be pressed first downwards, then backwards and upwards. The operation for strangulated femoral hernia is as follows:—1st. An incision three or four inches long is made through the integuments, on the pubic side of the neck of the tumour, commencing an inch above Poupart's ligament. 2ndly. Poupart's ligament should be clearly defined, and Gimbernat's ligament felt on the pubic side. This may be slightly incised upwards, when, if the hernia



is recent, an attempt should be made to reduce it. This failing, the fascia propria must be divided on a director ; upon which a layer of fat will be exposed, which must not be mistaken for omentum. On clearing this, the sac is exposed and opened ; the finger must then be pushed up to Gimbernat's ligament, and that ligament divided in a line parallel to the linea alba. The incision must be very sparing. The obturator artery, as it comes off from the internal epigastric or femoral, lies close to the neck of the sac, and may be wounded. It should be felt for and avoided.

Obturator hernia appears in the thigh, in front of the capsule of the hip-joint, and below the horizontal ramus of the pubis. In front of it is the pectineus muscle, on the outer side the femoral artery and vein, and to the inner side the tendon of the adductor longus muscle. If well-marked symptoms of strangulated bowel exist, and a tumour is felt in this region, the supposition would be that it was a strangulated obturator hernia. But it frequently happens that no tumour can be felt ; then, if no hernia can be found at any of the other outlets, and pain is referred to the course of the cutaneous branches of the obturator and internal cutaneous nerves, also on rotation of the hip-joint outwards, and on pressure at the site of the obturator foramen, an exploratory operation is justifiable. The operation is performed by—1st. Make an incision through the integuments, commencing a little above Poupart's ligament, midway between the spine of the pubes and the femoral artery, and parallel with it. 2ndly. The fascia over the pectineus muscle being exposed and divided, the fibres of the muscle are separated, and the fat over the obturator externus exposed. 3rdly. If the tumour be not then found, the fibres of the obturator must be separated, and the tumour searched for with the finger at the obturator canal. If the hernia is discovered, the tissues round the neck are divided, and if not then reducible, the sac must be opened, and the constriction sought for and incised. Care must be taken to avoid the obturator nerve.



Acute intestinal obstruction is caused by—1, Strangulation by bands or through apertures; 2, Volvulus; 3, Intussusception.

The following table of symptoms I have compiled from Greig Smith's book on 'Abdominal Surgery.'

STRANGULATION BY BANDS OR THROUGH APERTURES.	VOLVULUS, GENERALLY AT SIGMOID FLEXURE.	INTUSSUSCEPTION.
1. In young male with history of former peritonitis.	In males after 40 with constipation.	Appears in children.
2. Sudden oncome.	Sudden oncome, but not so severe.	Acute pain in waves and subsiding.
3. Severe pain located at umbilicus.	Pain located at hypogastrium and back.	—
4. No tenderness on pressure.	Tenderness on pressure.	—
5. Early vomiting, frequent and copious.	Vomiting comes on late and not urgent.	Vomiting not urgent, sometimes absent.
6. No discharge of blood.	—	Discharge of blood from rectum.
7. No marked abdominal distension at first.	Rapid distension early.	Abdominal distension absent; abdomen sometimes retracted.
8. No tumour felt on palpation.	—	Tumour felt on palpation, and apex felt by rectum when lower bowel is affected.
9. Constipation complete from the first.	Constipation from the first.	Tenesmus and diarrhoea.
10. Collapse present from beginning; less marked after.	Collapse not extreme.	—



Volvulus of the small intestines presents very much the same symptoms as strangulation by bands.

The treatment of acute intestinal obstruction, to be successful, must be prompt. In no case must any purgative be given, and opium should be sparingly administered, only for the sake of obtaining refreshing sleep, and with care not to press it sufficiently to mask symptoms. A little ice by the mouth, and rectal feeding, with enemata, may be tried. Belladonna also may be pushed, but treatment of this kind should not be persevered with for more than forty-eight hours. If at the end of that time no improvement has taken place, the abdominal cavity should be opened and an attempt made to relieve the obstruction.

The ordinary rules for abdominal sections should be observed if possible (see p. 93). The incision should be median, and sufficiently large to admit the hand. Great care must be taken to avoid the protrusion of distended bowel, and if any escape it should be at once covered with warm flat sponges, or towels wrung out of hot boracic solution. The hand should be then introduced and the abdominal cavity explored in the following order. First, the cæcum should be explored, and if that is distended the course of the colon must be followed. Then the small intestines are examined. The object is to find collapsed bowel. It is not wise to persevere long with this manipulation. If then the seat of obstruction cannot be ascertained in this way, it is advised to inspect the intestine presenting at the wound. The most dilated and congested portion is fixed on and followed onwards in the direction of increased congestion. This will generally lead to the obstruction. Or the most distended part of the bowel may be allowed to escape on to a hot sponge or cloth. The part which comes out least readily and which is most congested will most probably lead to the obstruction. It is advised by Greig Smith in cases where there is great distension to open the bowel before it is returned, and to evacuate its contents. This is done by pulling the bowel well away from the wound and incising it trans-



versely to its axis with a scalpel, at a point furthest from the mesentery. The opening is held over a receiver and the contents expressed by an assistant kneading the sides of the abdomen. The opening is then cleansed and closed with a continuous suture of fine silk passed through the peritoneum and muscular coat only (Fig. 73), or by the ordinary Lembert's sutures (see Fig. 69).

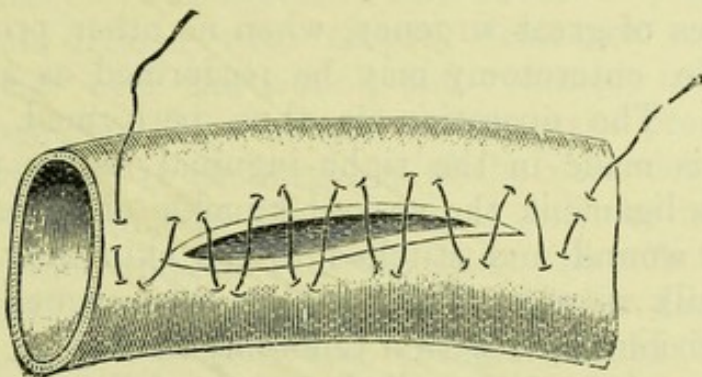


FIG. 73.

The cause of obstruction being found, it must be dealt with according to circumstances. If a band is found, it must be ligatured with fine silk at either end and divided. It must not be forgotten that more than one band may exist. If the bowel has slipped through an opening in the mesentery it must be withdrawn, and the opening sewn up with fine silk. If a volvulus is discovered, it will be found more difficult to untwist the distended bowel unless it is emptied as described above. If it cannot then be reduced, an artificial anus must be made in the bowel above the volvulus.

In the case of intussusception, the upper bowel must be grasped by the hand close to the point of invagination, the other hand grasping the bowel below the lowest point of invagination. Very gentle traction must then be made. On liberation the bowel must be carefully inspected to be sure that it is not lacerated or gangrenous. If this fails the bowel may be resected and the ends joined, or the ends brought out as an artificial anus. This can only



be accomplished in small intussusceptions. Or an artificial anus may be formed without resection.

If the obstruction is caused by a foreign body, such as a gall-stone, the bowel must be incised in its long axis, the opening being large enough to permit the easy removal of the foreign body. If the bowel over it is inflamed, the opening should be made higher up in healthy bowel. After removal the wound is closed as above.

In cases of great urgency, when no other proceeding is admissible, enterotomy may be performed as a palliative measure. The operation is thus performed. A short incision is made in the right inguinal region parallel to Poupart's ligament, the nearest knuckle of bowel is drawn into the wound and stitched to the skin only by a continuous silk suture. The bowel is then opened by a very small incision made with a tenotomy knife.

When colotomy is called for the following operation should be performed. (Left side.) An incision three inches in length is made through the skin and cellular tissue, one inch and a half from the anterior superior spine of the ileum at right angles to a line drawn from that point to the umbilicus. The muscles are divided to the same extent, a great deal of this work being done by the two forefingers. The peritoneum is now reached, and a fold is taken up with dressing forceps and nicked through with a fine pair of scissors. It is then incised with the scissors the whole length of the wound. All bleeding points should be secured with pressure forceps before the peritoneum is opened. As a rule the colon will be found presenting in the wound, and is immediately recognised by its longitudinal band. Should small intestines present, they must be pressed back into the wound by a small flat sponge attached to a pair of pressure forceps. When the colon is found it is drawn well out of the wound. The upper part is pulled down and passed on into the lower angle of the wound. This is continued until no more loose bowel can be pulled down from above. Two sutures of medium silk are then passed, one through one side of the



skin at the upper angle of the wound, taking in its passage to the other side a firm hold of the bowel by passing the needle through the longitudinal band. The other suture is passed in like manner through the lower angle. If it is possible to delay opening the bowel for twenty-four hours, a glass rod, or a thick bone crochet needle with the point cut off, is passed under the knuckle of bowel through the mesentery. The bowel is then covered by green protective and dressed with aseptic dressings, a firm pad being placed over the wound and retained in its place by an abdominal binder, and as an extra precaution a spica bandage. If the urgency of the case demands the immediate opening of the bowel, it will be needful to secure it more completely to the skin. To effect this the bowel must be turned over, and the lower longitudinal band exposed. Five or six sutures should be passed through the band and then through the skin one eighth of an inch from the edge. Turning the bowel over to the other side a similar number of sutures must be introduced, only in this case the sutures pass through the mesenteric attachment of the bowel. The best needle for the purpose is a small Alder's (Fig. 72, p. 94) or curved Hagedorn's needles with Hagedorn's needle-holder. All the sutures should be passed before any of them are tied. The parts being then protected as much as possible, a longitudinal incision is made in the bowel and the contents caught in a receiver. It has been suggested that a large rubber tube should be placed into the upper opening and passed out through the dressings into a receiver containing carbolic water. The skin should be well protected by lint spread with boracic acid ointment.

If the operation has to be performed on the right side the preliminary steps are the same. But in this case the cæcum presents. It is very easily drawn into the wound, but there is no mesocolon and no longitudinal bands, and the sutures must be carefully passed through the peritoneal coat of the bowel only. It sometimes happens that the condition of the bowel at the point of obstruction



is such as to require resection or enterectomy. If the bowel, for instance, is in a gangrenous condition this course must be pursued. The operation for the introduction of Murphy's button is as follows:—The loop of intestine is drawn well out of the wound, and is packed round with sponges. It is then emptied of its contents by finger pressure. A bit of india-rubber tubing is passed through the mesentery above and below the part to be removed, care being taken to place it well on to healthy bowel, leaving plenty of room for the insertion of the button. It is twisted round the bowel and secured by pressure forceps. The mesentery is divided along the whole course of the portion of bowel to be excised, and all bleeding points in it are secured with pressure forceps. The portion of bowel is then excised with scissors. The following is Murphy's description of the succeeding steps of the operation:—"A running thread is placed in position by a top stitch along the excised edge, beginning opposite the mesentery and continuing down to the mesentery; one return over-stitch is taken at the mesentery (Fig. 74), and then the top stitch is continued up the opposite

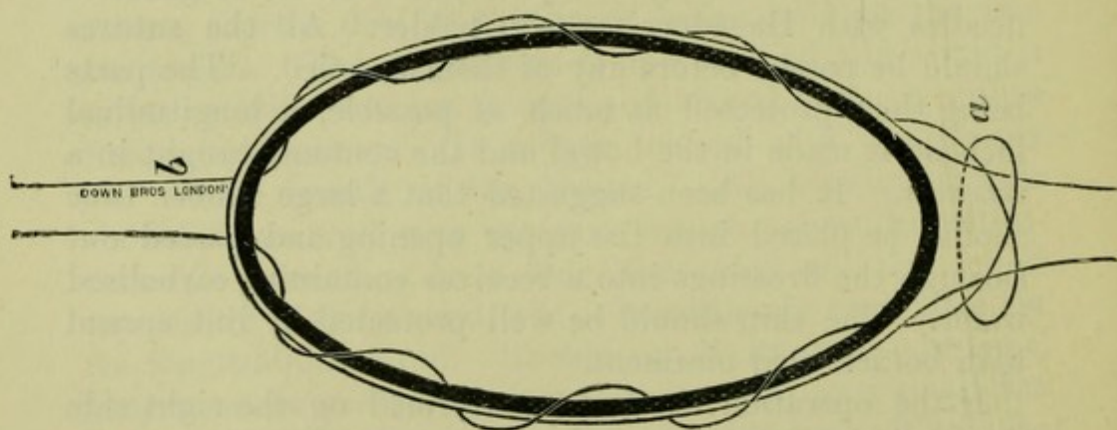


FIG. 74.

side to the starting-point; this constitutes the puckering string, and when tied round the stem of the button, which is then inserted, draws the cut edge within its clasp. Particular attention should be given to the return over-

stitch at the mesenteric  
tomeum overlap. The  
in the same manner  
together (Fig. 75).



The method of holding  
pressure forceps for



and 77. After the  
bowel, the forceps are



stitch at the mesentery, so that both layers of the peritoneum overlap. The other half of the button is inserted in the same manner, and the button is then pressed together (Fig. 75)."

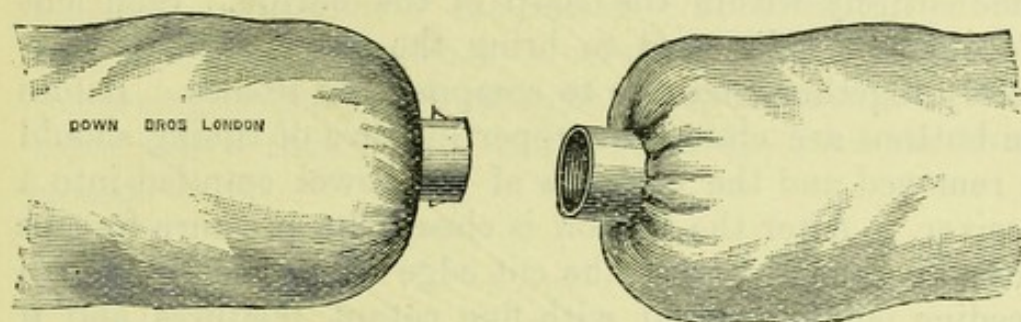


FIG. 75.

The method of holding the two halves of the button in pressure forceps for insertion is illustrated in Figs. 76

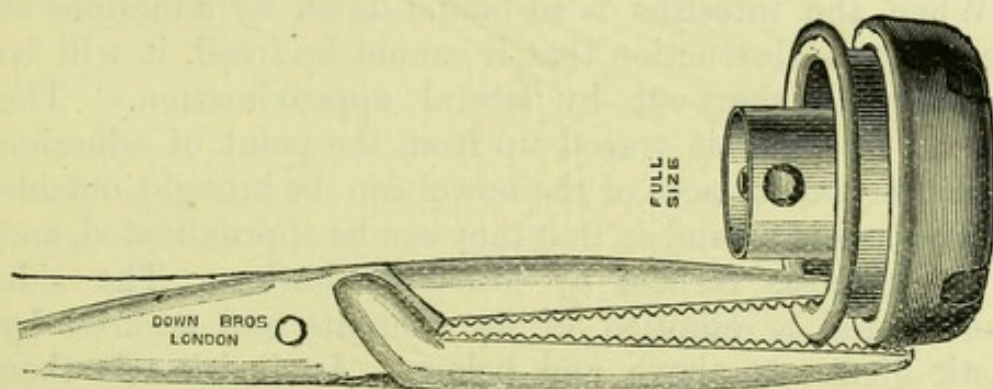


FIG. 76.

and 77. After the spring cup has been inserted into the bowel, the forceps are shifted on to the cylinder, and the

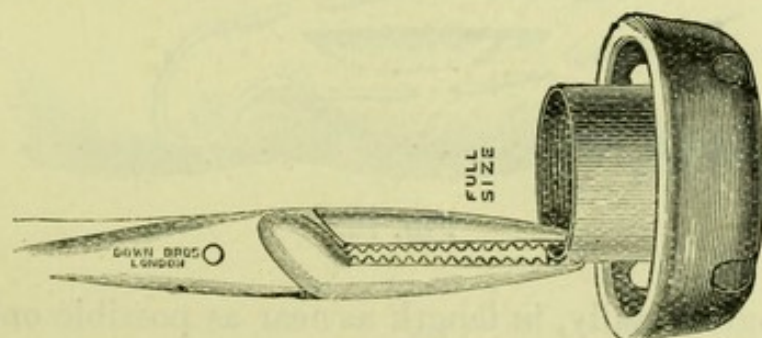


FIG. 77.



button is held in position until the ligatures are tied round the cylinder. The forceps are then removed ; each half of the button is held between the fingers and pressed together. Great care must be taken that the cut edges come entirely within the clasp of the button. Sufficient pressure must be used to bring the serous surfaces completely together, and also to compress the tissues. Before the buttons are closed the upper ligature of tubing should be removed and the contents of the bowel emptied into a receiver. After the button is closed the pressure forceps must be removed from the cut edge of the mesentery, all bleeding points secured with fine catgut ligatures, and if needful, the edges of the mesentery must be brought together with fine silk sutures. The sponges are then removed, the parts cleansed, and the abdominal wound closed in the usual way (see p. 94).

When the intestine is so bound down by adhesions at the point of obstruction that it cannot be freed, it will be necessary to short-cut by lateral approximation. The loop of intestine is traced up from the point of adhesion until the two surfaces of the bowel can be brought outside the abdominal wound so that they can be approximated, and an anastomosis formed by Murphy's button. The side first treated is emptied of its contents and secured by elastic ligatures above and below. An incision is then

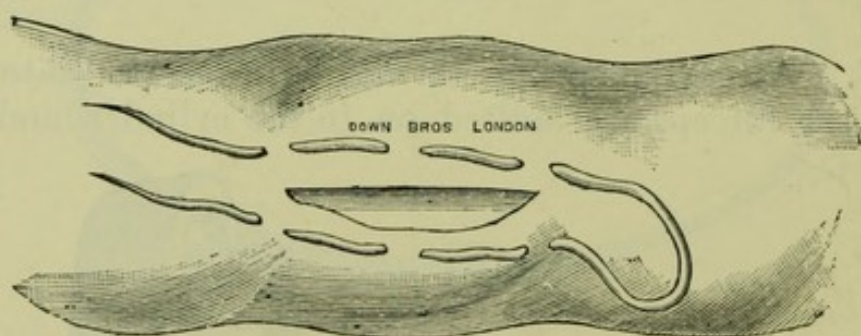


FIG. 78.

made longitudinally, in length as near as possible one third of the diameter of the button. The same needle and



length of suture are required. The stitch is inserted as shown in Fig. 78, and must be carried through all the coats of the bowel. One side of the button is then inserted as already described. Care must be taken not to push the mucous coat in front of the button. To avoid this the incision should be held open by a couple of fine forceps. The puckering thread is drawn tight round the cylinder. The other side is then treated in the same way, and the button closed.



## CHAPTER VII

## THE PELVIS

Fractures and Dislocations—Injury to the Bladder—Foreign Bodies in the Urethra and Bladder—Dilating the Female Urethra—Injuries to the Urethra—Retention of Urine—Use of Catheters—Puncture of the Bladder *per Rectum*; by Aspiration; above Pubes—Cceck's Operation for Perinaeal Section—Wheelhouse's Operation—Retention from Enlarged Prostate—Extravasation of Urine—Injuries to the Penis—Paraphimosis—Phimosis—Injuries to the Scrotum; Testicle—Rupture of the Vas Deferens—Injuries to the Pregnant Uterus; to the Vagina—Foreign Bodies in the Rectum—Hæmorrhage from the Rectum.

THE pelvic bones are fractured or displaced generally by crushing violence. A crush may cause separation at the symphysis pubis without fracture, a sulcus being felt externally. Pressure on the ilium, or any attempt to stand or walk, is attended with considerable pain. The urine passed is generally bloody. Such displacement is, however, generally accompanied by fracture of the rami, and also of the ilium. In fractures of the ischium the injury may be discovered by passing the finger into the rectum, or the vagina in the female; or the tuber ischii being grasped and moved laterally, crepitus may be felt. Fractures of the ilium are the result of falls from a height or crushing violence, and sometimes of muscular action alone. The spinous process may be broken off, the fragment being displaced downwards, and crepitation and motion being distinct. When portions of the wing of the ilium are broken off, movement and crepitation are easily obtained by placing the hands one on either ilium, and pressing the bones inwards. The broken fragment will thus be displaced. Fractures of the floor of the acetabulum are



caused, generally, by falls on the trochanter major, the head of the femur being sometimes thrust through the cavity in the acetabulum. The diagnosis is very obscure. The trochanter is driven in towards the pelvis, and pressure on it causes deep-seated pain. Crepitus is specially felt during the extension of the limb and its subsequent drawing up, but not on flexion and rotation. Symptoms of injury to the pelvic viscera are also usually present. The brim of the acetabulum is sometimes broken by the same force which causes dislocation of the femur on to the dorsum ilii. Added to the symptoms of the dislocation there is obscure crepitus, and inability to retain the head of the bone in the socket after reduction.

Treatment:—In all cases of injury to the pelvis one of the first things to be done is to pass a catheter and empty the bladder; if the urethra or bladder is lacerated, which may be suspected if the urine drawn off is bloody, the catheter must be retained, and it is advisable to attach an india-rubber tube to it in order that the urine may continually drain away into a vessel by the side of the bed. The patient should then be placed on his back, the knees bent and supported on pillows. In separation of the symphysis, or fracture of the ilium, the parts may be drawn together and kept in position by a pelvic band firmly buckled round the pelvis. If portions of bone are detached, as portions of the brim, or the anterior superior spine, they may be kept in position with a pad and strapping. If the injury is compound and the fragments have penetrated the abdomen, the wound should be enlarged and all the fragments removed, if possible. In fracture of the acetabulum with dislocation of the femur, the head of the bone should be replaced in the acetabulum and retained therein by the long splint and extension, as for fracture of the thigh.

Fractures of the sacrum may occur from falls on it, or by crushing violence. Simple fractures are rare, and may be detected through the rectum, the lower portion of the sacrum being carried forward. The symptom is pain at



the seat of injury, especially in the attempt to defecate. The principal treatment is rest on the back, with a firm cushion under the upper fragment to take off pressure from the lower one. The bowels should be kept open and a morphia suppository given occasionally to relieve pain. If the displacement forwards is very great it may be reduced by the finger in the rectum, and a tube having been passed up to provide for the escape of flatus, the rectum should be plugged round it.

The bladder is sometimes ruptured by falls, or by blows upon it when distended. The rupture may be intra-peritoneal or extra-peritoneal. When intra-peritoneal the symptoms are :—1, inability to pass water, although this is not always the case ; 2, a small quantity of bloody urine drawn off by the catheter, or if the instrument passes through the rent into the peritoneal cavity, a larger quantity of fluid is withdrawn partly bloody urine and partly serous effusion ; 3, rapid peritonitis. In the extra-peritoneal variety the symptoms are :—1, inability to pass water (see above) ; 2, no extra fluid drawn off by catheter ; 3, symptoms of extravasation rather than peritonitis. If an operation is decided on the following rules should be observed. The patient being placed on a table, and under the influence of an anæsthetic, the skin of the abdomen should be well cleansed with a 1—30 solution of carbolic acid. A mackintosh sheet should then be put on (see p. 93). A catheter is then introduced and retained during the operation. An incision about six inches long is then made in the median line commencing an inch below the umbilicus and extending to the symphysis pubis. All bleeding points being secured with pressure forceps, the peritoneum is then opened and the rent in the bladder sought. The bladder is then drawn well forward, a transverse incision in the peritoneum half an inch on either side much facilitating this step. The rent is stitched up with curved needles (Fig. 68, p. 92) and the finest carbolised Chinese twist, the suture being introduced through the peritoneal and muscular coats only (Fig. 69,



p. 92) and at intervals of not less than a quarter of an inch apart, care being taken to pass the first and last suture well beyond the limits of the rent to prevent leakage from the angle of the wound. It is a good plan to place a second line of sutures through peritoneum only, so as to bring a fold over the first line of sutures. The security of the suturing should then be tested by injecting the bladder with a warm solution containing some Jay's fluid, which renders it milky and easily distinguished if there is a leak. The abdominal cavity must be thoroughly washed out with two gallons of boric acid solution (1 per cent.) at a temperature of 110° F. The abdominal wound is then closed as described at p. 90. The catheter must not be retained in the bladder, but should be passed at intervals as required.

Foreign bodies are frequently impacted in the male urethra. Slate pencils, penholders, &c., may be pushed down the urethra; when an endeavour should be made to seize and extract the substance with a pair of urethra forceps, such as those made by Mayer and Meltzer (Fig. 79). These forceps are constructed with a double joint,

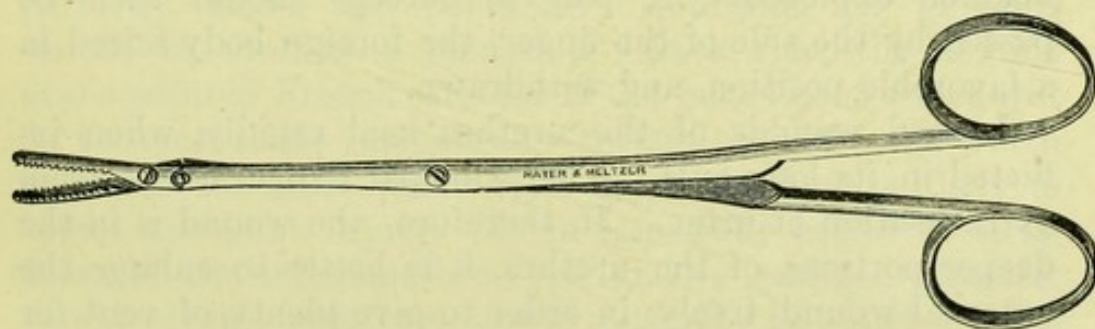


FIG. 79.

so that they open widely at the points, without largely distending the anterior portion of the urethra. A hairpin with the bent end foremost, has been passed down the urethra, and the ends springing apart, have become embedded in the urethra. To extract it, a tube should be passed down the urethra and the points of the pin pressed together and placed in the tube, where they become fixed,



when the tube and pin may be withdrawn together. Fragments of a calculus, or a small calculus, especially in children, may become impacted in the urethra; they may be removed by the forceps, or else pushed back into the bladder with a catheter. If a foreign body is impacted in the urethra, in front of the scrotum, and it cannot be removed by other means, the urethra must be incised. The incision should be made parallel with the long axis of the urethra, and must be longer externally than through the mucous membrane. There is no occasion for the use of sutures, nor for the retention of a catheter during the healing of the wound. Foreign bodies introduced into the female urethra quickly pass into the bladder. If they cannot easily be seized with forceps and withdrawn, the urethra may be dilated by introducing the blades of a long narrow pair of forceps, and slowly opening them, the patient being placed under the influence of an anæsthetic. In a few moments the urethra becomes dilated sufficiently to admit the point of the little finger, which should be gently but firmly passed in; then the index finger may be introduced in the same way, and the interior of the bladder explored. A pair of forceps should then be passed by the side of the finger, the foreign body seized in a favorable position, and withdrawn.

Incised wounds of the urethra heal rapidly, when inflicted in its long axis. The principal danger arises from extravasation of urine. If, therefore, the wound is in the deeper portions of the urethra, it is better to enlarge the external wound freely, in order to give plenty of vent for the urine.

The urethra is frequently lacerated, especially in youth, by such accidents as a fall on the perinæum, astride a rail. The immediate external signs are generally very slight: the chief symptoms are—bleeding from the urethra, retention of urine, pain at the point of injury, and extravasation of blood into the perinæum. An attempt should at once be made to pass a catheter into the bladder. It should be a silver one about No. 10, or as large as can be



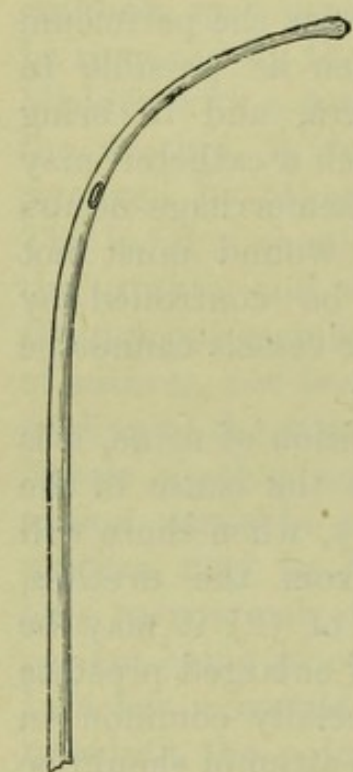
introduced ; when passed, and the water drawn off, it must be retained in the bladder. If, however, the catheter cannot be passed, it is better at once to incise the perinæum through the median raphe. It may then be possible to discover the divided ends of the urethra, and to bring them together with a suture, after which a catheter may be passed into the bladder. If much hæmorrhage occurs after the incision in the perinæum, the wound must not be plugged, but the bleeding must be controlled by digital pressure, provided the ends of the vessels cannot be secured.

When a patient is suffering from retention of urine, it is needful, as far as possible, to determine the cause of the obstruction. It may be (1) inflammatory, when there will be a history of purulent discharge from the urethra, which has probably suddenly ceased ; or (2) it may be the result of organic stricture ; or (3) of enlarged prostate gland ; or (4) impacted calculus—especially common in children. Whatever may be the cause, an attempt should be made at once to pass an instrument into the bladder. Before using the instrument it should be ascertained that it is perfectly clean and pervious.\* Carbolio oil (1—40) should be used as a lubricant. As a rule, the flexible probe-pointed French catheter is the instrument which will be the most easily introduced—certainly it is the one which produces the least pain in its use, and which is likely to inflict the least injury. It is essentially useful in strictures of the inflammatory type, and in enlarged prostate. In old organic strictures, it will generally be found needful to employ a metallic instrument. A probe-pointed catheter, invented by Sir Henry Thompson, and made by Coxeter, is a very useful instrument (Fig. 80). If the retention arises from enlarged prostate, and the French catheter fails, the usual prostatic catheter must be used, or a full-sized gum-elastic, which should be kept for the purpose on an over-curved stilette. If the first attempt to introduce an instrument fails, recourse must then be had to the

\* See Chap. XI on Sterilization of Catheters.



hot bath, and a full dose of opium ; or else—and this is the better course—chloroform should be administered,



and the attempt again made. The introduction of pieces of ice into the rectum has been recommended as a means of relief when all others have failed. Supposing failure again takes place, one of the following plans may be adopted :—Puncture of the bladder through the rectum, which is thus performed :—Place the patient in the lithotomy position ; then pass the left forefinger up the rectum, which must have been previously well cleared out by an enema of water. The point of the finger must be placed just behind the prostate, and as near the centre of the trigone as possible. A tap with the other hand on the hypogastric region will establish the fact of fluctuation. An assistant then supports the bladder externally, by placing the palms of his hands firmly on the lower part of the abdomen ; then pass the rectum trocar, withdrawn within the cannula, along the concavity of the forefinger in the rectum. When it is placed at the point where you intend to puncture press home the handle of the trocar with the palm of the hand, at the same time depressing it. Thus the point will be carried into the bladder, the direction being towards the umbilicus. Then withdraw the trocar, and fix the cannula in with tapes attached to the shield, and carried, two in front and two behind, and tied to a bandage

FIG. 80.

two in front and two behind, and tied to a bandage



round the loins. Puncture by the rectum is not admissible, when fluctuation cannot be felt, as will frequently be the case in old-standing cases of stricture, with greatly thickened bladder; neither is it to be used in very great enlargement of the prostate gland. It is also a questionable proceeding in cases where the circumstances lead to the conclusion that the cannula will have to remain for a longer period than two or three days.

The bladder may be punctured with an aspirating needle above the pubes. One of the finest needles must be passed into the bladder, just above the symphysis; and when a drop of urine appears, the needle is connected with the exhausted aspirator and the tap turned, when the urine will flow into the receiver. When this is full, it is emptied by the discharge-tap, again exhausted, and the process repeated until the bladder is empty. The needle is then withdrawn. The plan is admirably adapted for the immediate relief of a distended bladder; but unless there is a prospect of getting an instrument through the stricture, as may be frequently accomplished after the bladder is emptied, it is better to have recourse to an operation which will secure a permanent exit for the urine. This may be secured by puncturing the bladder above the pubes with a trocar. The operation is thus performed:—The pubes being shaved, place the patient in a semi-recumbent position; make a vertical incision two inches long through the integuments directly above the symphysis; dissect down through the fat, until the top of the forefinger can be placed upon the distended bladder; puncture the bladder with a straight, or slightly curved trocar, the direction being a little downwards; withdraw the trocar, and pass in through the cannula either a gum-elastic catheter, or else one of the india-rubber ones, which must be secured by tapes round the loins. In all cases where it is probable that the puncture will be made the exit for the urine for some period, this operation is the preferable one. It cannot, however, be performed in cases of greatly thickened bladder,



as the bladder does not rise sufficiently above the pubes to permit of its being punctured with safety.

When none of the above proceedings are admissible, it is needful to open the bladder through the perinæum; and for this purpose either Cock's operation or Wheelhouse's should be employed. The first one is devised in order to open the urethra behind the point of stricture, and is the most rapid. The instruments required are :—1, a broad double-edged knife (Fig. 81); 2, a large silver probe-pointed

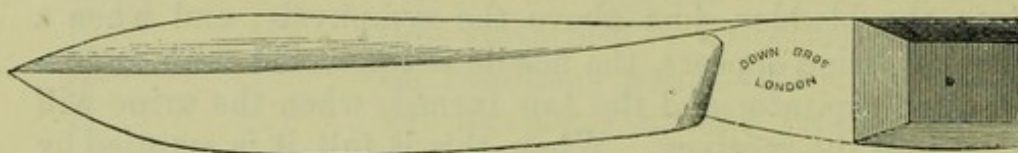


FIG. 81.

director with a handle, or better still Teale's gorget (Fig. 82); 3, a perineal catheter (Fig. 83); 4, pressure, dissecting,

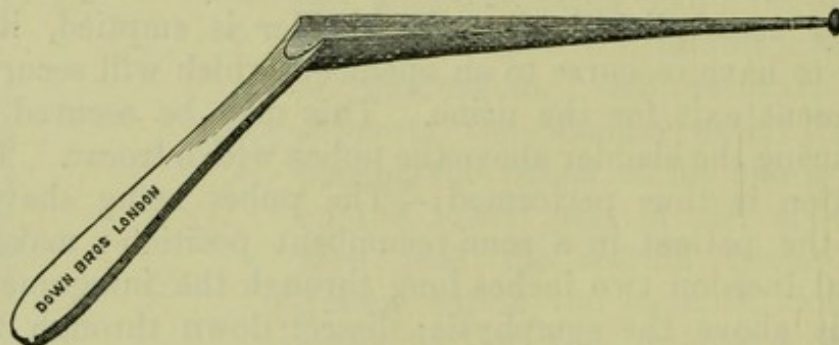


FIG. 82.

and artery forceps. The operation is thus performed :—Place the patient in the lithotomy position. A Clover's

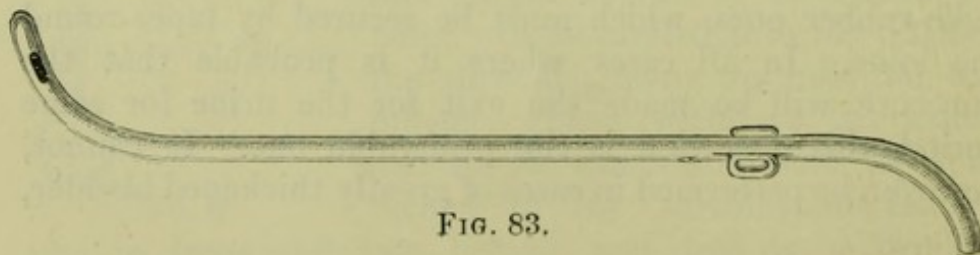


FIG. 83.

crutch (Fig. 84)  
with extra a



Introduce the left  
tip on the apex  
the median line  
steadily, without  
forefinger in the  
and downward on  
vertically in the



crutch (Fig. 84) will be found most useful, as it dispenses with extra assistants. Keep the pelvis perfectly even.

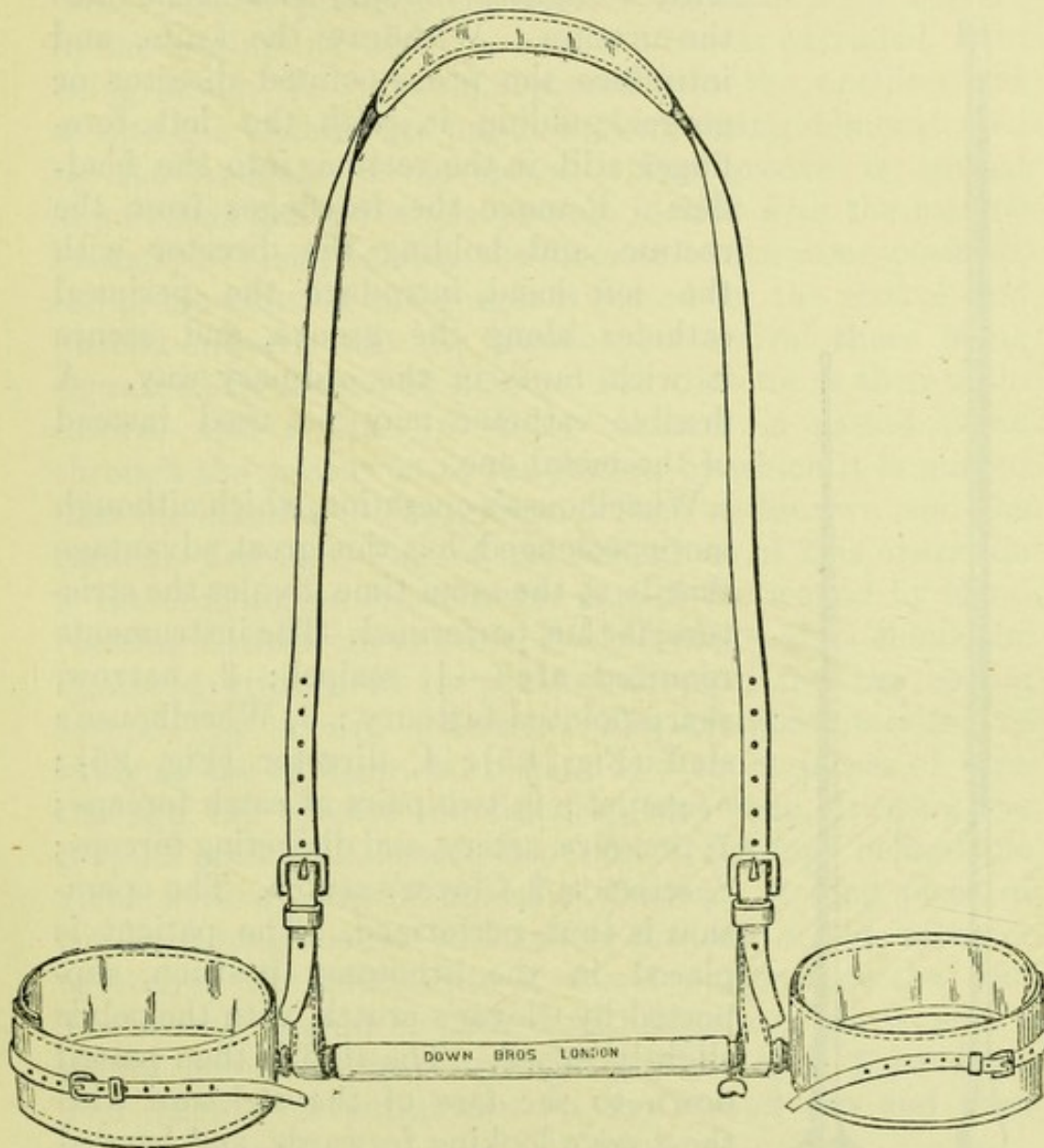


FIG. 84.

Introduce the left forefinger into the rectum, and place the tip on the apex of the prostate. Plunge the knife into the median line of the perinæum, and carry it forward steadily, *without any withdrawal*, towards the tip of the left forefinger in the rectum ; at the same time, by an upward and downward sawing motion, enlarge the external wound vertically in the median line. When the point of the

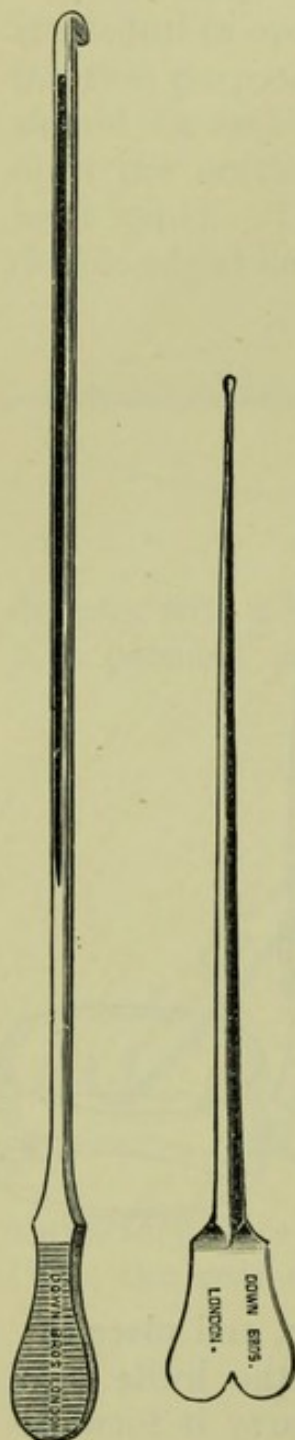


knife is clearly felt by the left forefinger to be in close proximity to the apex of the prostate, carry it forward with a slightly oblique movement into the urethra. Withdraw the knife, and introduce the probe-pointed director or gorget, guiding it, with the left forefinger still in the rectum, into the bladder. Remove the forefinger from the rectum, and holding the director with the left hand, introduce the perineal catheter along the groove, and secure it with tapes in the ordinary way. A flexible catheter may be used instead of the metal one.

Wheelhouse's operation, which although more prolonged has this great advantage that it at the same time divides the stricture, is thus performed. The instruments required are:—1, scalpel; 2, narrow, sharp-pointed bistoury; 3, Wheelhouse's staff (Fig. 85); 4, director (Fig. 86); 5, gorget; 6, two pairs of catch forceps; 7, pressure, artery, and dissecting forceps; 8, scissors; 9, Clover's crutch. The operation is thus performed. The patient is placed in the lithotomy position, supported by Clover's crutch, with the pelvis slightly raised. The staff is then passed down to the face of the stricture with the groove looking forwards, and handed to an assistant. The perinæum is then incised and the urethra opened on the staff one quarter of an inch in front of the stricture. The edges of the urethra are then held apart by the catch forceps.

FIG. 85. FIG. 86.

The staff is turned round and withdrawn slightly so that the hook at the end may catch the upper angle of the incised urethra. It is then made to hook up





the urethra and keep it on the stretch. The opening of the stricture is then looked for. It may sometimes be recognised by pressing the urethra forwards with a finger in the rectum, by which a drop of urine is extruded. On being found, the director is passed into the opening and so into the bladder, its presence there being demonstrated by the freedom of movement. The groove is turned downwards and the whole passage incised with the narrow bistoury. Then, holding the director in the same position, the probe point of the gorget is placed in the groove and pushed onwards into the bladder, its arrival there being signalled by a gush of urine. The director is then withdrawn, and a No. 10 silver catheter is passed down through the meatus on to the gorget, by which it is guided into the bladder. The gorget is then withdrawn and the catheter tied in. One of the difficulties of this operation is the obscuration of the lower part of the wound by blood running down from above. All bleeding points should be ligatured or secured by pressure forceps, and the oozing stopped by sponge pressure. The simplest method of tying in the catheter is to pass two short pieces of tape through the eyes of the catheter, and then, drawing the prepuce well back, secure the ends of the tape behind the glans with a strip of adhesive plaster. A long piece of rubber tubing should be fitted to the end of the catheter to convey the urine into a vessel underneath the bed. The wound should be packed with iodoform gauze, and a pad of iodoform lint secured in its place by a T bandage. The catheter is withdrawn on the second day and then passed daily.

When the bladder is distended from enlarged prostate, instruments specially adapted for use in such cases must be employed. A large-sized French probe-pointed catheter or a soft flexible india-rubber one—a French coudé catheter; the ordinary silver prostatic catheter, from twelve to fourteen inches long, and about No. 10; a gum-elastic catheter, kept for the purpose on an over-curved stilette, and a gum-elastic curved at the beak, like a sound for



stone, are all instruments which will be found useful in their turn. The first attempt should be made with the French probe-pointed catheter or the flexible india-rubber one. These failing, a French coudé catheter must be tried, which in a vast number of cases will succeed, and which is by far the easiest to pass. To pass the silver instrument, place the patient on his back, and standing on his left side introduce the point of the catheter into the urethra, the shaft being held parallel to the left groin. Carry the instrument on as far as it will go without elevating the handle, then bring it gently to the median line of the body, and at the same time raise it a little. By degrees bring it to the perpendicular, and then depress it between the patient's thighs, keeping the beak well against the roof of the urethra. If the point fails to enter the bladder, withdraw it a few inches, and then incline first to one side, and then to the other. If a silver catheter cannot be passed, the over-curved gum-elastic must be tried. Withdraw the stilette, and do not warm the catheter. Pass it over the left groin, pulling the penis well down over the groin, and proceed to pass it in the same direction as the silver instrument. This failing, try the gum-elastic curved at the back. To obtain this curve, put the point of the catheter into warm water, curve it to the desired extent, and then plunge it into cold water, which will fix the curve. In all these attempts, the left forefinger in the rectum will be found a great adjunct in tilting up the point of the instrument over the prostatic enlargement, and thus enabling it to enter the bladder.

A change in the position of the patient will sometimes enable you to pass an instrument; thus if your endeavours have failed with the patient recumbent, it is possible that you may succeed with him in the erect posture, or *vice versa*. As a rule it is well to at once administer a draught containing quinine gr. ij, and tinct. of opium  $\mathfrak{m}\mathfrak{x}$ , to be repeated every four hours.

Extravasation of urine generally shows itself first in the tissues of the scrotum, then on the penis, pubes, and ab-



domen. Free incisions must be at once made, especially in the scrotum, on either side of the middle line, and the patient should be well supported with alcohol, ammonia, and bark. The perinæum ought to be carefully examined, for extravasation sometimes takes place between the layers of the deep perinæal fascia. A deep-seated, obscure, brawny swelling may be detected, which must be at once very freely incised in the median line.

Incised wounds of the penis gape considerably, and must be drawn together with sutures. Effusions of blood from blows may cause prolonged priapism. They must be treated by rest and evaporating lotions. Children have a trick of tying a string round the penis. This causes great swelling, and at a later period ulceration. A careful search must be made for the ligature, which will be found sometimes deeply embedded in the tissues. The removal of the ligature, and water-dressing, soon brings about a cure.

Paraphimosis, both in adults and children, should be reduced without delay. The best way is to grasp the penis firmly in the palm of the left hand, whilst with the fingers and thumb of the right hand you steadily compress the glans penis, previously well oiled. The prepuce should be pushed forward with the left hand, and the glans penis pressed backwards with the right at the same time. Steady and prolonged pressure in this manner will seldom fail. In children chloroform should be given. If the attempt fails, the constricting band must be freely divided with a sharp-pointed curved bistoury, when reduction will be accomplished.

Phimosis, when acute, must be remedied at once. If, after a short fomentation and syringing out with warm water, the prepuce cannot be drawn back, the following plan will enable you to do so:—Take a blunt-pointed tenotomy knife, pass it down on the flat between the glans penis and the prepuce, then turning the edge towards the prepuce freely incise the mucous membrane. Do this in three places, and you will then be able to draw back the prepuce.



This is not to be a substitute for circumcision at some future period, should it be needful.

Incised or lacerated wounds of the scrotum are sometimes attended with extrusion of the testicle. Warm fomentations must be applied for a time to relax the tissues, and the wound must then be carefully brought together with sutures, over the testicle. A cold lotion should then be applied, the patient kept perfectly at rest on his back, and the scrotum raised on a small pillow or sandbag.

A blow or a squeeze will frequently cause the testicle to swell, and give excessive pain, both in the testicle itself, and in the inguinal region. Rest, leeches, hot fomentations, and opiates are the remedies. In some cases, if there is much fever, active purgatives, with small doses of tartar emetic, will be found useful.

A violent straining exertion will occasionally cause rupture of the vas deferens. The symptoms are:—1, a sense of something giving way in the groin, and great pain; 2, swelling of the testicle on the same side; 3, discharge of arterial blood from the penis; 4, clear and bloodless urine on use of catheter. The treatment consists of rest, leeching the testis and lower part of the abdomen, and opiates.

In wounds involving the pregnant uterus, if the foetus has escaped, an endeavour should be made to bring it through the os uteri. If, however, it presents at the wound, it should be removed and the placenta also. (See Cæsarean Section.) If a limb only protrudes, place it in the uterus, dilate the os uteri, and deliver as soon as possible.

Falls on broken crockery may cause severe hæmorrhage from wounds in the vagina. The internal pudic is the most likely source of hæmorrhage, and the cut ends of the vessel must be secured if possible, else digital pressure must be employed, or the wound plugged with lint dipped in perchloride of iron.

Foreign bodies such as fish-bones, or the husks of apple-



pips, cause considerable pain by sticking within the verge of the anus. Frequently, by getting the patient to strain well down, the offending body may be seen, and extracted with a pair of dressing forceps; remembering that in the case of bones or other sharp bodies descending from above, the traction should be made in an upward direction.

Severe hæmorrhage from the rectum sometimes occurs after the operation for piles, just when the ligatures are separating. The following is Allingham's plan for plugging the rectum;—Take a bell-shaped sponge of fair size. Pass a strong silk ligature up through the apex and back again. Having wetted the sponge and wrung it dry, cover it with powdered alum or persulphate of iron, and pass it five inches up the rectum, apex first, with a pen-holder or bougie. Fill up the cavity with cotton-wool impregnated with alum or iron. Then, pressing up the wool with one hand, pull down the apex of the sponge by the silk ligature with the other hand. This inverts the sponge, and fixes it in position. Introduce a catheter or tube by the side to allow flatus to escape. This plug may remain in a week or more.



## CHAPTER VIII

## THE LOWER EXTREMITY

Contusions—Rupture of Muscles—Sprains—Wounds of the Knee-Joint—Ligature of Superficial Femoral; of Posterior Tibial; of Anterior Tibial—Fractures and Dislocations of the Femur—Compound Injuries to the Shaft of the Femur and Knee-Joint—Excision of Knee-joint—Amputation of Thigh—Fractures and Dislocations of Patella; of Tibia; of Fibula; of both Bones; of Semilunar Cartilages—Compound Comminuted Fractures—Compound Dislocation of Ankle-joint—Fractures and Dislocations of Tarsal Bones; of Metatarsal; of Phalanges—Amputation of Leg—Chopart's Amputation—Hey's Amputation—Amputation of Toes.

CONTUSIONS about the hip-joint sometimes simulate impacted fractures of the neck of the femur. In a doubtful case, it is better to treat it from the first as a fracture with Liston's splint. This will provide the perfect rest necessary for the case, if it be only a contusion.

Some of the muscles of the lower extremity are subject to rupture, generally by a sudden and violent attempt to recover a lost step, or by some unexpected force being suddenly applied to a certain muscle. The symptoms are:—1, Sudden pain, like a sharp blow from a whip, and sometimes a distinct sound like snapping; 2, loss of motion in the part, or motion accompanied by very severe pain and spasm; 3, if the muscle is superficial, a distinct sulcus between the ruptured ends. The ligamentum patellæ, biceps, gastrocnemius, plantaris, and tendo Achillis are the most frequent sites of rupture.

In rupture of the ligamentum patellæ, which is caused by such movements as an attempt to prevent falling backwards, the patella is drawn up some inches. It must be treated in the same manner as fractured patella (see below)



and the effusion of blood dispersed by evaporating lotions. Rupture of the biceps may be caused by severe wrenches or attempts to lift heavy weights from the ground. The symptoms are severe pain on the outer and posterior part of the thigh, and inability to bear weight on the thigh. If the tendon is ruptured near its insertion, a depression will be felt near the head of the fibula. The treatment is to flex the leg on the thigh and fix it to an outside splint. If flexion cannot be accomplished, a straight Liston's splint must be substituted. The fibres of the gastrocnemius are sometimes ruptured, causing severe pain at the moment and swelling. The plantaris is ruptured in the act of raising the heel from the ground, especially when a heavy burthen is being carried on the back. The tendon sometimes snaps audibly. One of the principal symptoms is dragging and eversion of the foot. The heel must be raised and the knee bent, the treatment being the same as for rupture of the tendo Achillis.

The tendo Achillis is ruptured in the same manner as the plantaris. The treatment is to flex the knee and draw the heel up by attaching a strap to the heel of a slipper, as in Fig. 87. A simple apparatus for treating this accident may be formed by using a broad dog-collar for the strap above the knee, and attaching it with a bit of string to a loop sewn on to the heel of a slipper.

Sprains of the ankle-joint are of very frequent occurrence, and arise from "turning the foot over." Severe pain and rapid swelling supervene, and it is very difficult to decide in many cases whether the fibula is not broken. In cases of doubt it is better to act as if it were. In simple sprain of the ankle, the best treatment, if you see the case early, is at once to put on a dozen leeches, and let the bites bleed into a hot bran poultice for an hour or two. Then strap the joint firmly with soap plaster, and bandage it. The next day remove the strapping, replace it with a rubber bandage, and make the patient move about on the foot. If the ankle is too painful to bear this treatment, cold evaporating lotions must be used, or hot



fomentations if more agreeable to the patient. In gouty subjects an acute attack of gout in the joint and foot is very



FIG. 87.

likely to supervene. This, of course, must be treated by the ordinary constitutional remedies suitable for this condition.

The knee-joint is peculiarly liable to incised and punctured wounds. The principal symptom of wound into the joint is the flow of synovia. The synovia, if rubbed between the finger and thumb, feels oily and sticky. If any doubt exists as to the joint being opened, the treatment should be the same as if it were wounded; but probing the wound in order to solve doubts should be used as sparingly as possible.

The treatment consists in washing out all clots with a gentle stream of 1—4000 perchloride lotion. The external wound should be closed with silkworm-gut sutures if necessary, and dressed with aseptic or iodoform gauze. The limb must then be placed on a MacIntyre splint and



swung in a Salter's swing. A bag of ice or a coil of Leiter's tubes should be kept constantly applied. If a portion of a needle is run into the joint, it should be dissected out if possible, as its presence in the joint is sure to set up destructive inflammation. The after-treatment should be that just described.

The femoral artery, from its superficial position, is not unfrequently wounded. It is better at once to apply a tourniquet. The usual method of placing the pad of the tourniquet in Scarpa's triangle is a bad one. The proper place to compress the femoral artery is at the spot where it passes over the pubes, and the best instrument for the purpose is Signoroni's horseshoe tourniquet. The lower pad of the tourniquet is placed on the tuberosity of the ischium, while the upper one is screwed down upon the artery. A tourniquet may be readily made as follows :— Roll a bandage on the middle of a stick a foot long. Place the bandage on the artery, the stick being at right angles to the thigh ; then pass a strap and buckle behind the limb and over each end of the stick and tighten. A piece of india-rubber tubing two feet long passed tightly round the limb twice, and tied, is a good temporary method of arresting bleeding. In making digital pressure, the best plan is to lay the three middle fingers of the left hand over the artery, and then, with the right hand, to press down on them a large door-key with the handle well padded with lint or cotton wool. In this way pressure may be kept up for a considerable time without tiring the fingers.

The immediate hæmorrhage being restrained, the wound must, if, needful, be enlarged, and the wounded ends tied or twisted. The passage of a probe down to the bottom of the wound will be found a useful guide. The more freely the wound is enlarged, the greater will be the facility with which the vessel will be secured.

Supposing all other means fail to arrest the hæmorrhage the artery must be tied, and Scarpa's triangle will be the most probable spot for the operation. For instruments required, see p. 46. The operation is thus performed :—



The patient must be laid on his back, with the thigh slightly abducted and rotated outwards, and the knee bent and resting on a pillow. A line from the middle of Poupart's ligament to the inner side of the knee indicates the position of the vessel. 1st, make an incision through the skin four inches long, commencing two or three inches below Poupart's ligament, and carried obliquely across the line of the artery from within outwards. 2ndly, divide the fascia lata to the same extent, avoiding the saphena vein, which may appear on the inner side. Also any branch of the internal cutaneous nerve which may be found in front or deeper, and to the outer side of the artery the long saphenous nerve. 3rdly, with the handle of the scalpel or better with the two forefingers, define the edge of the sartorius, an assistant drawing it outwards with a retractor. 4thly, take up a bit of the sheath of the artery which now appears with the forceps, and nick it with the scalpel, cutting on the flat. 5thly, still holding the sheath with the forceps and making it tense, insert the aneurism needle into the opening, and pass it round the vessel from within outwards, making the point emerge at the same aperture in the sheath; or if any tissue appears on the point of the needle as it turns forwards, scratch it through with the nail of the forefinger, or gently nick it with the knife. 6thly, pass the ligature through the eye of the needle, and withdrawing the needle pull the ligature back with it. 7thly, first ascertain, by gently pulling up the ligature and pressing with your forefinger on the vessel, that you have the artery between your finger and the ligature, and then tie in the usual manner. 8thly, bring the edges of the wound together with several silkworm-gut or horsehair sutures, and apply a pad of iodoform gauze and a bandage.

In wounds of the leg, especially when inflicted by thin sharp instruments like a chisel, and between the tibia and fibula, it is sometimes impossible to secure the bleeding vessel. Ligature of the posterior or anterior tibial then becomes needful.



The operation on the posterior tibial is thus performed :—The patient must be placed on his back, the limb being laid on its outer side, with the knee bent and the heel raised. A line from the centre of the popliteal space to midway between the internal malleolus and the tendo Achillis indicates the course of the artery. 1st, make an incision through the skin four inches long, one inch from the inner edge of the tibia and parallel with it, commencing two inches above the junction of the upper and middle third of the leg. Avoid wounding the internal saphenous vein, which must be drawn on one side. 2ndly, divide the deep fascia, and having exposed the edge of the gastrocnemius, let an assistant draw it aside with a retractor. 3rdly, the soleus being thus exposed, divide its tibial origin along the whole length of the wound on a director. The glistening anterior surface of the muscle must not be mistaken for the fascia between the superficial and deep layers of muscles, which must be, 4thly, now divided, thus exposing the artery lying on the tibialis posticus. It will be found with its two veins, one on either side, and the nerve somewhat superficial and to the outer side. It is to be secured in the usual way, the needle being passed from the nerve.

The course of the anterior tibial is indicated by a line drawn from the head of the fibula to the base of the great toe.

The operation for ligaturing the vessel in the upper part of the leg is as follows :—1st, make an incision four inches long through the skin, midway between the spine of the tibia and fibula, commencing two inches above the junction of the upper and middle third of the leg. 2ndly, the deep fascia being thus exposed, a white line external to the tibia will indicate the septum between the tibialis anticus and the extensor longus digitorum ; these muscles must be separated. 3rdly, the anterior tibial nerve will now be seen in front of the artery, which lies on the interosseous membrane between its two veins, and may here be ligatured.



Fractures of the neck of the femur are either intra-capsular, extra-capsular, or extra-capsular impacted. The table on page 136, from Mr. Holthouse's paper in Holmes's 'System of Surgery,' gives the differential diagnosis in each case. In order the better to diagnose injuries about the hip-joint, Mr. Bryant has adopted a measurement which is illustrated in Fig. 88, taken from Heath's 'Minor

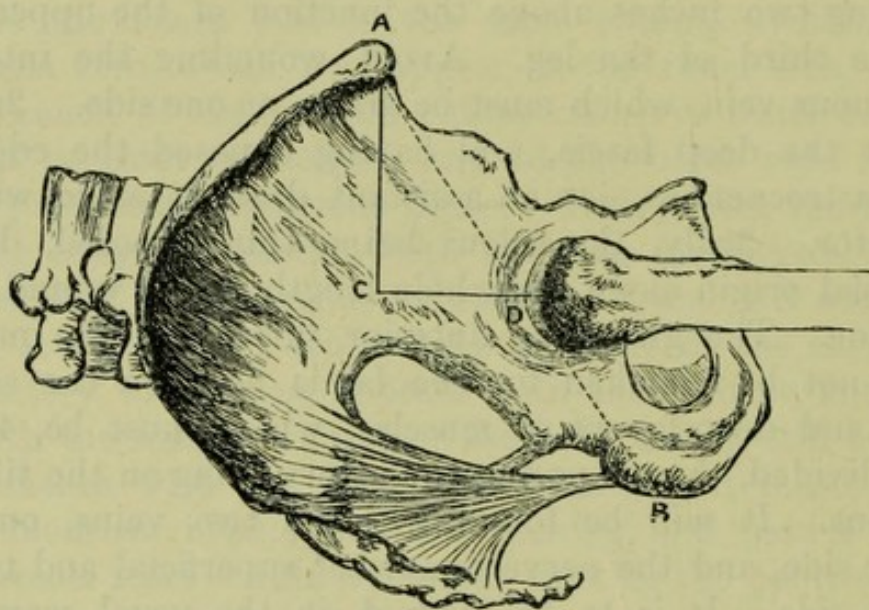


FIG. 88.

Surgery.' "The patient being recumbent, a vertical line (A C) is allowed to fall from the anterior superior iliac spine, from which the distance (C D) to the top of the trochanter can be measured at a right angle to it. If the neck of the femur be broken, and the trochanter drawn up, this line will necessarily be shorter than on the sound side." Fig. 89 shows the usual appearance of fracture of the neck of the femur.

There are some conditions likely to be mistaken for fractures of the neck of the femur. 1. Fractures of the pelvis (see p. 112). 2. Dislocation of the head of the bone on to the pubes (see p. 144). 3. Contusion of hip, where you may have every symptom of fractured neck, with the exception of shortening and crepitus; and as, in some cases



of fracture, there is hardly any appreciable shortening and no crepitus, the difficulty of diagnosis is very great.

Chronic rheumatic arthritis will give rise to symptoms of fractured neck. After a fall on the hip the limb may be found shortened, and pain on movement very great. Further examination will show that extension does not remove the shortening, nor can crepitus be produced. A previous history of rheumatic arthritis will also be elicited.

In all cases of injury about the hip-joint, the greatest gentleness must be exercised in making the examination. All violent attempts to procure crepitus are most injurious. For if the fracture is impacted, such attempts will probably disengage the fragments from one another; or, if it be intra-capsular, the capsule will very likely be torn across, and the fragments separated. If there are sufficient signs present to make you even suspect fracture, it is better to act on the

supposition that one exists. The treatment will vary with the condition of the patient. If the patient is very advanced in years, infirm, and has any tendency to bronchitic mischief, the complete recumbent posture is not applicable, and the limb had better be put up on a double-inclined plane. This can be easily formed with the aid of a round sofa-cushion and some ordinary pillows, the knee being bent over the pillows, and secured by strips of bandage, or kept in place by sand-bags. Frequently it will be found useful and more comfortable to the patient to place both limbs on the double-incline, and to fix the injured limb to the sound one. The patient should, if possible, be placed on a water pillow, with the shoulders well raised. Great care must

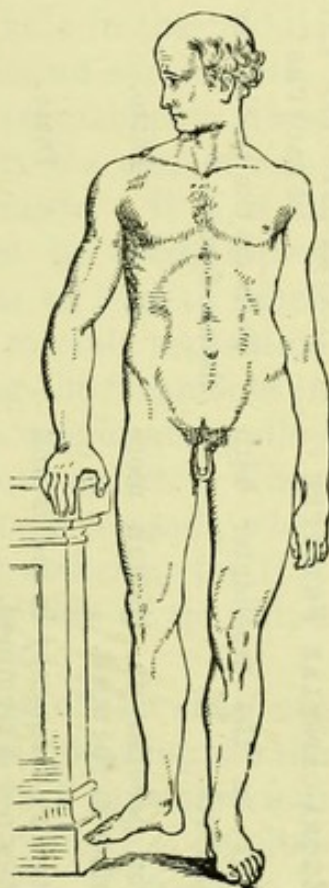


FIG. 89.



INTRA-CAPSULAR FRACTURE	EXTRA-CAPSULAR FRACTURE	EXTRA-CAPSULAR IMPACTED FRACTURE
1. Cause:—Often slight or indirect.	Falls on the trochanter with great force.	Falls on the trochanter with moderate force.
2. Age:—Rare before fifty.	Not peculiar to, though more common in the aged.	Ditto.
3. Sex:—More frequent in females.	Relative frequency in males and females not determined.	Ditto.
4. Shortening:—Not exceeding an inch. Can be removed by moderate extension, but recurs when this is remitted.	An inch and a half to two and a half. Ditto.	Not exceeding an inch. Cannot be overcome without using great force.
5. Position of the limb:—It rests on its outer side.	Ditto.	Inclination outwards less.
6. Position of trochanter:—Nearer the iliac crest than normal; moves in a small arc; head of the bone does not move with it.	Nearer the iliac crest; often detached; does not move with the shaft.	Nearer the iliac crest; moves with the shaft, and the head of the bone moves with it.
7. Crepitus:—Difficult to detect.	Crepitus readily detected.	None.
8. Helplessness:—Great.	Ditto.	Limb less helpless.
9. Pain:—Generally moderate.	Often severe.	Generally slight.
10. Bruising:—Generally none.	Frequently evident.	Not generally evident.



be taken to prevent any pressure on the heel. For this, and any similar purposes, the felt-plaster, made by Ewen of Jermyn Street, is admirably adapted. Or a small circular air-cushion, made of india rubber, with a hole in the middle to receive the point of the heel, will be found serviceable.

If the patient will bear complete recumbency, then Liston's long splint may be used; and if it is a case of non-impacted fracture extension should be made. If it is an impacted fracture extension must not be used, unless the impaction is in such a direction as to lead to much difficulty or deformity in walking, when forcible separation of the impacted ends followed by securing the fragments in good position is justifiable. Sometimes a weight and pulley will be found a useful substitute for the long splint. When required for extension, the weight must be increased; when only to steady the limb, it must be just sufficient for that purpose, sand-bags being placed on either side of the thigh and the leg.

Fractures of the femur in any portions of the shaft are generally caused by direct violence. The following are the symptoms:—1, shortening from half an inch to an inch and a half, and deformity; 2, eversion; 3, mobility; 4, crepitus on rotation; 5, pain and loss of power. If crepitus is produced on rotation without making extension, the fracture may be presumed to be oblique; if, on the contrary, crepitus cannot be produced without previous extension, the fracture is probably transverse. The ordinary treatment for fractures of the shaft is with Liston's long splint, and the perinæal bandage. The method of application is as follows:—The patient must be placed on a firm mattress, resting, if possible, on a small iron bedstead. A set of fracture-boards intervening between the mattress and the bedstead are a great adjunct to successful treatment. Each fracture-board should be about four or five inches broad, and long enough to reach from side to side of the bed. There must be a sufficient number of them to reach from the foot of the bed to within a few inches of the head. The outer and inner ankles and the tendo Achillis should



then be guarded with felt-plaster, and the foot and ankle bandaged with a few turns of the roller. The splint, well padded, is then to be applied to the outer aspect of the limb, and must extend from a point opposite the nipple to four inches below the foot, care being taken to make the outer ankle fit into the oval hole provided for it. The roller is then carried round the foot and splint, passing through the notches at the extremity of the splint, and being carried up a little above the knee. The perinaeal band should be made of a piece of bandaging sewn into a long narrow bag, and stuffed with cotton wool. It should reach from the middle of the groin to a corresponding point behind, and terminate in long tapes. The padded portion rests on the perinaeum, and the tapes are passed from within outwards through the two holes at the upper end of the splint. This being adjusted, extension is made until the length of the limb is ascertained to equal its fellow, when the perinaeal band is to be tightened, and the tapes tied in a bow on the outside of the splint: the upper part of the splint is then confined to the side by a few turns of a broad roller (Fig. 90). Another method

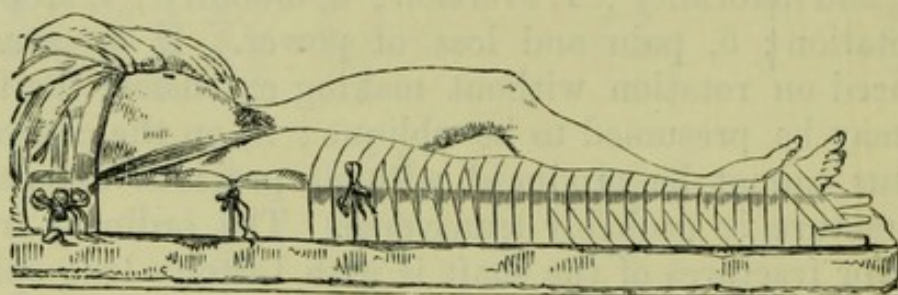


FIG. 90.

of treating this fracture is by the application of the long splint, the extension being made by weight (see Chap. XII). This obviates the necessity of using the perinaeal band, which frequently causes excoriations. In either case the limb should be supported on both sides by sand-bags to prevent rotation. If there is a tendency for the upper fragment to project, a broad bit of Gooch's splinting should be applied and retained in position by broad straps of



holland adhesive plaster. In fractures of the lower third Sir William Fergusson recommends the following ready method:—A long outer splint, and a shorter one for the inner side, rolled up on each side of a double tablecloth until there is just space enough in the middle to contain the limb. The bones being placed in apposition, the limb is then laid between the splints, and retained there by broad tapes or straps.

Fractures of the shaft of the femur in children are best treated with the extension apparatus described hereafter. Children are very intolerant of the long splint, and the perinæal bandage, being continually wetted, is sure sooner or later to cause excoriation. Mr. Pickering Pick suggests the use of the trellis-work ornament, which is sold in shops for flower-pots. It is cut down on the inner side, so that it may extend up higher on the outer side. The limb is bandaged with flannel and surrounded with cotton wool. The apparatus is then slipped on and secured with strap and buckle.

Fractures of the condyles of the femur or of the head

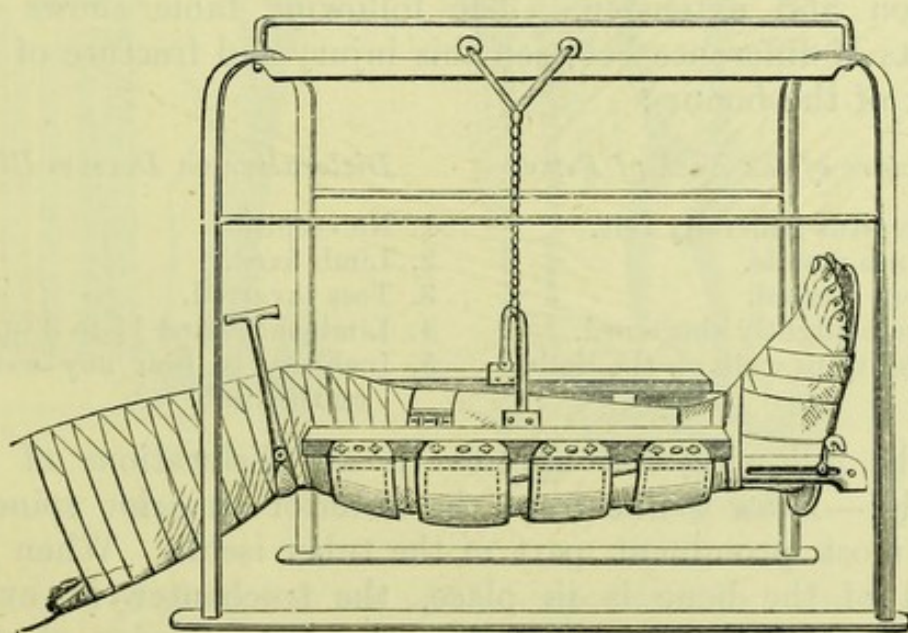


FIG. 91.

of the tibia necessarily involve the knee-joint. They are attended with considerable effusion into the joint, and



unless the case is seen immediately after the accident the swollen joint must be treated by evaporating lotions, ice, or Leiter's tubes and leeching if pain and swelling are very great. The limb should be laid on a pillow, and kept in place with sand-bags. If the case is seen early, and there is little swelling, it had better be put in a MacIntyre splint and swung in a Salter's swing (Fig. 91).

Dislocation of the head of the femur upwards and backwards on the dorsum ilii (Fig. 92) is caused by extreme violence, such as a fall from a height upon the outer side of the knee, a fall on the foot or knee when the thigh is adducted, or the fall of a weight on the pelvis when the body is bent forward. Symptoms:—1, shortening from one inch and a half to three inches; 2, adduction, rotation inwards, and slight flexion of the thigh, the great toe of the dislocated limb resting on the instep of the opposite foot; 3, approximation of the great trochanter to the anterior superior spine; 4, inability to abduct the limb; 5, in thin subjects the discovery of the head of the bone in its new position, where it may be felt moving in flexion and extension. The following table shows the points of difference between this injury and fracture of the neck of the femur:

*Fracture of the Neck of Femur*

1. Crepitus generally felt.
2. Limb mobile.
3. Toes everted.
4. Limb slightly shortened.
5. Ability to walk on the limb.

*Dislocation on Dorsum Ilii*

1. No crepitus.
2. Limb fixed.
3. Toes inverted.
4. Limb shortened  $1\frac{1}{2}$  to 3 in.
5. Inability to bear any weight on the limb.

The following test applies to all dislocations of the thigh:—Draw a line from the anterior superior spine to the most prominent part of the tuber ischii. When the head of the bone is in place, the trochanter in every position of the limb touches the lower border of this line. When the thigh is dislocated the trochanter is found above this line. The line A B, Fig. 88, p. 134, illustrates this test.



Dislocation upwards and backwards into the great sciatic notch is caused in a similar manner to the last, only the limb at the time of the accident is more nearly at a right angle with the body. The symptoms are very similar to dislocation on the dorsum, but the shortening is not more than half an inch, the flexion is generally less, and the tip of the great toe of the dislocated limb touches

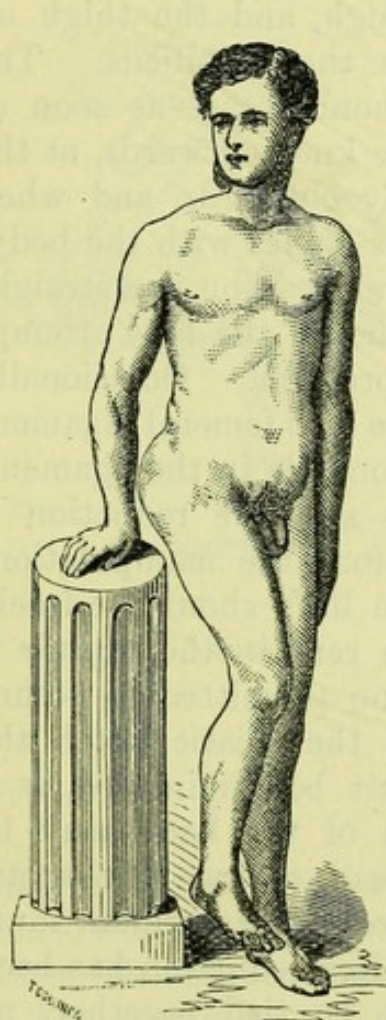


FIG. 92.

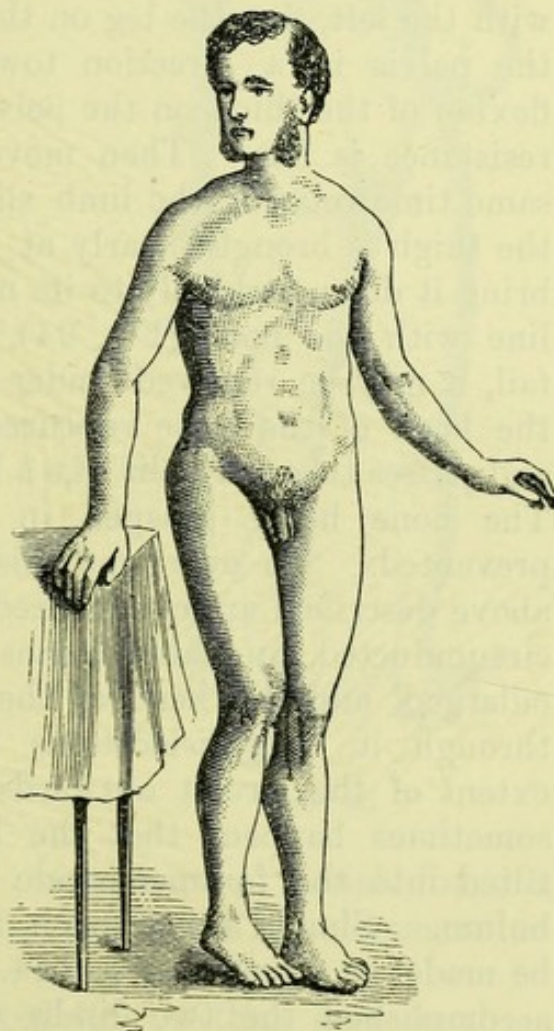


FIG. 93.

the ball of the great toe of the opposite side. In Fig. 93, showing the deformity in this dislocation, the right great toe is not drawn sufficiently forward.

The treatment in both these forms of dislocation is very much the same. It is directed not so much to overcome



muscular rigidity, which has little or nothing to do with the difficulty in reduction, as to relax the ilio-femoral ligament. To accomplish this an attempt should be made to reduce the dislocation by manipulation. This should be tried at first without chloroform. The operation is thus performed :—Place the patient on his back on a mattress laid on the floor. Supposing it to be a right limb, grasp the ankle with the right hand and the knee with the left, flex the leg on the thigh, and the thigh on the pelvis in a direction towards the umbilicus. The flexion of the thigh on the pelvis should cease as soon as resistance is felt. Then move the knee outwards, at the same time rotating the limb slightly outwards, and when the thigh is brought nearly at right angles with the body, bring it down suddenly to its natural position in a straight line with the body (Fig. 94). Should the first attempt fail, it may be renewed under chloroform. Occasionally the head of the bone ruptures the ileo-femoral ligament and passes through a slit like a button-hole in the ligament. The bone being grasped in this slit, the reduction is prevented. To overcome this, before the manipulations above described are commenced the limb should be freely circumducted, by which means the rent in the capsule is enlarged, and the head of the bone permitted to return through it. In dislocations into the sciatic notch the extent of the circuit outwards must be diminished, as it sometimes happens that the head of the bone may be tilted into the foramen ovale instead of into the acetabulum. Should this happen, the reverse movement must be made, as directed at p. 144. After reduction has been accomplished the two limbs must be tied together, no splints being required.

Dislocation downwards and forwards into the foramen ovale (Fig. 95) is caused by such violence as the fall of a weight on the back of the pelvis, the thigh being at the moment abducted and the body bent. Symptoms :—1, lengthening of the limb by from one to two inches ; 2, bending forward of the body on the thigh ; 3, advance of



the dislocated limb in front of its fellow, the toes pointing directly forwards ; 4, flattening of the hip, and approxi-



FIG. 94.

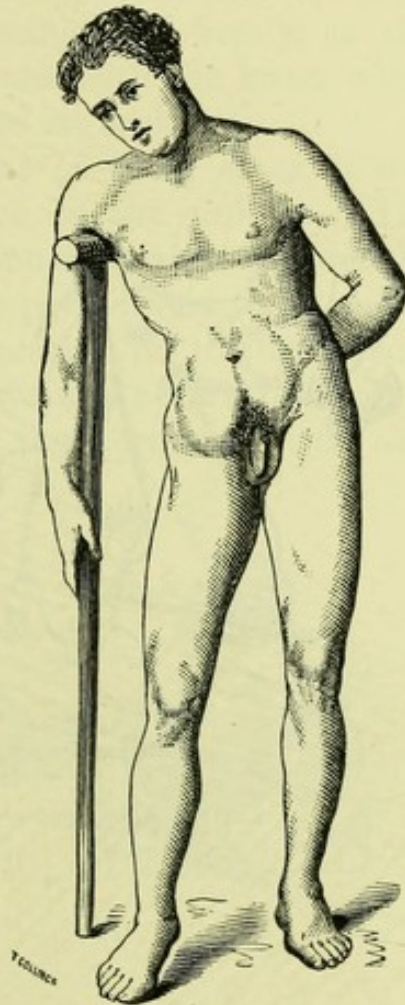


FIG. 95.

mation of the trochanter towards the mesial line ; 5, tension of the adductors, the head of the bone being sometimes felt beneath them.

The treatment by manipulation is thus performed :— Grasping the limb as before described, the knee is carried upwards towards the abdomen until resistance is felt. The limb must then be made to describe an arc inwards, and be suddenly brought down to the straight position (Fig. 96). When the knee is just opposite the pubes the thigh should be gently rotated inwards, which helps to tilt the head of the bone into its acetabulum. It may further



be assisted into the place by a band placed round the upper part of the thigh and pulled on by an assistant.

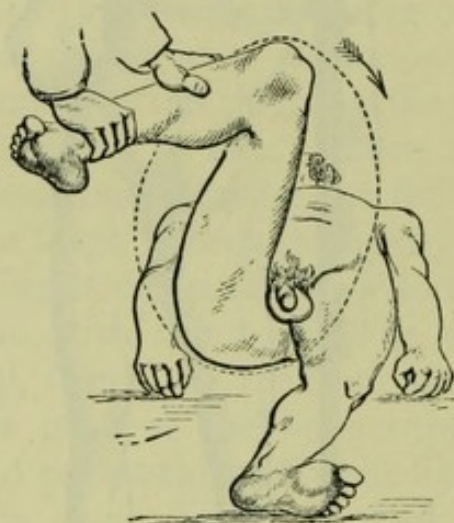


FIG. 96.

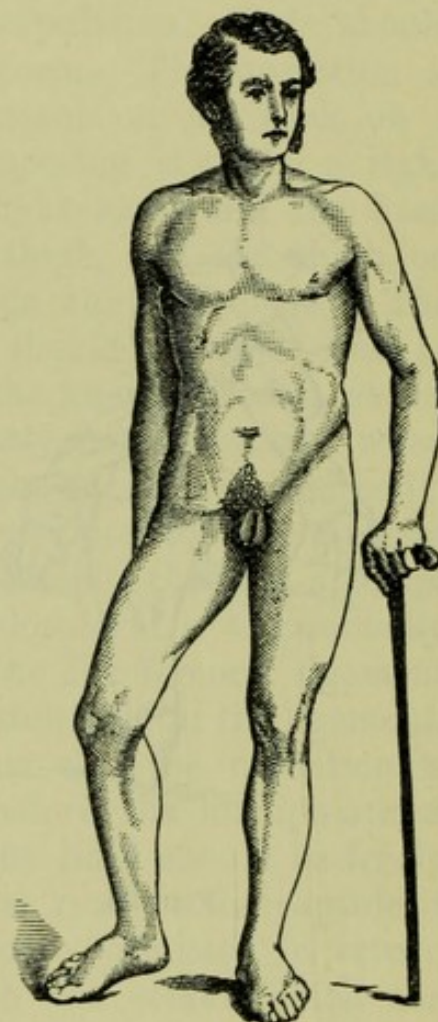


FIG. 97.

Dislocation upwards and forwards on to the pubes (Fig. 97) is caused by falls on the foot, when the leg is thrown backwards behind the centre of gravity. Symptoms:—1, shortening, abduction, slight flexion and rotation outwards of the thigh; 2, rotation inwards of the trochanter and flattening at its usual situation; 3, the discovery of the head of the bone in its abnormal position. The treatment by manipulation is as follows:—Seize the limb by the foot and knee, and rotate the thigh well outwards. Flex the leg on the thigh and bend the knee well over the opposite knee, keeping the heel elevated and the knee firmly



pressed down. Continue the motion by carrying the thigh over the sound one as far up as the upper part of the middle third. Then carry the limb directly upwards by elevating the knee, the foot being held firmly, at the same time making gentle oscillations with the knee, when the head of the bone will drop into its socket.

Should manipulation fail in any of these cases, it will then be needful to have recourse to the pulleys. The patient, being laid on a mattress, must be placed under the influence of an anæsthetic, and the parts likely to be galled well protected. In cases of dislocation on to the dorsum or into the sciatic notch, the pulleys will be arranged as in Fig. 98, care being taken to pad the perinæum well and

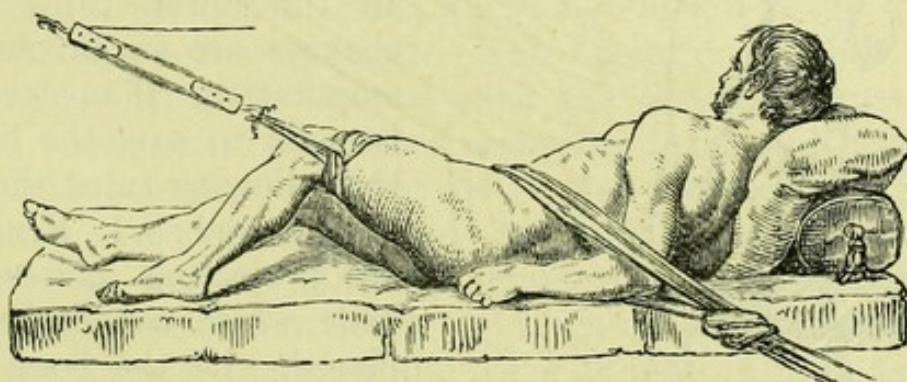


FIG. 98.

to bandage the lower part of the thigh above the knee. The traction must be very gradual, and the trochanter must be watched as it descends. Reduction may be assisted by traction with a long towel placed round the upper part of the thigh in a transverse direction. In dislocation into the foramen ovale, the pulleys must be arranged as in Fig. 99. Less force is required, and the reduction is facilitated by drawing the foot of the dislocated limb towards its fellow, using the strap of the pulley as a fulcrum on which to lever the bone into its socket.

Compound fractures of the thigh are the frequent accompaniments of gunshot wounds. The result of Hamilton's experience may be summed up as follows:—Gunshot frac-



tures of the head and neck of the femur always terminate fatally under amputation, excision, or when an attempt is made to save the limb without recourse to the knife. In

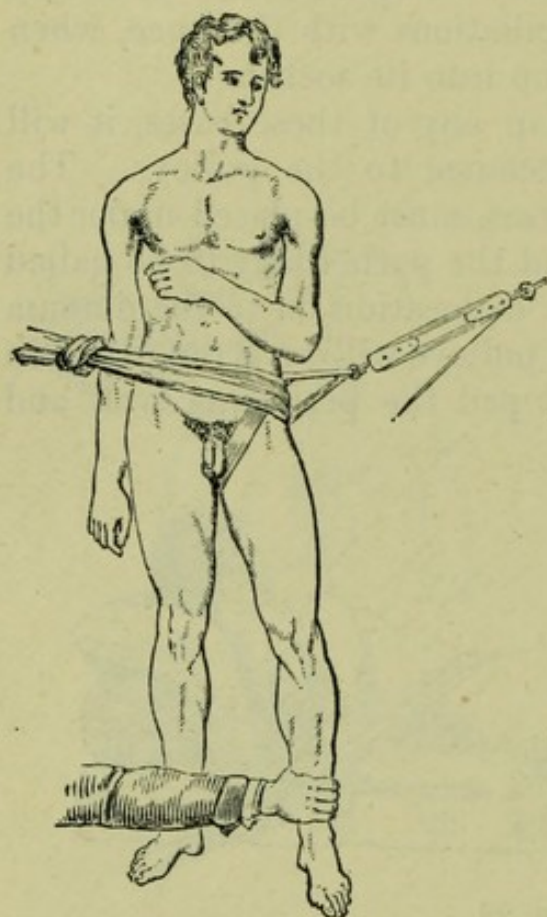


FIG. 99.

the upper third the results are nearly the same, but if the main artery and the principal nerves are uninjured, there is a slight balance in favour of attempting to save the limb. In the middle third the chances between amputation and the endeavour to save the limb are equal. In the lower third the chances are in favour of amputation. If an attempt is made to save the limb, the following rules should be observed:—1. Remove all projecting pieces of bone which cannot be replaced, with the bone forceps or saw. The lion forceps and the small saw figured at p. 73 will facili-

tate this. Remove also all detached portions of bone and all foreign bodies. 2. All portions of muscle or fascia and tendon blocking the wound must be freely divided. 3. Every possible facility must be given for free drainage by counter-openings and the insertion of drainage-tubes if necessary. 4. The wound should be plugged round the drain-tubes with iodoform gauze, and closed by pads of the same. 5. The limb should be put up on an extension apparatus.

Compound injuries of the knee-joint are frequently the result of gunshot wounds. The treatment must be entirely guided by the damage to the soft tissues, by the extent of



the fracture, and by the presence, or otherwise of injuries to other parts. If the soft parts are not much lacerated and the fracture is confined to the joint ends, the patient being of fit age, it is quite admissible to excise the joint (see below). But if the soft tissues are much lacerated, and the fracture extends up into the shaft of the femur, amputation must be performed (see below).

In performing the operation of excision of the knee-joint the following instruments and appliances are required:—1, a long, strong bistoury; 2, a saw with a blade at least three and a half inches broad; 3, lion forceps; 4, retractors; 5, stout scissors, cutting on the flat; 6, several pressure forceps, dissecting and artery forceps; 7, an excision splint; 8, a Salter's swing; 9, four strips of adhesive plaster, three inches broad, and long enough to go twice round the limb and splint. The operation is thus performed:—Make an incision with the bistoury across the joint, which must be modified according to the condition of the integuments, but must be carried through the ligamentum patellæ into the joint; the joint being well flexed, divide the lateral and crucial ligaments. Having cleared the end of the femur, lower the thigh on to the table, the leg hanging over the edge, and being supported by an assistant, and proceed to remove the condyles of the femur with the saw, another assistant steadying the bone with the lion forceps. The section through the bone must be modified by the direction of the fracture; thus, if one condyle alone is involved, remove it by an oblique section, sawing off only the articular surface of the other. The thigh must then be raised from the table, and the head of the tibia thrust well upwards, cleared with the knife, and a section removed with the saw. The patella must then be dissected out, the vessels secured, and the limb adjusted on the splint, and retained there by straps of plaster and bandages. The wound is then closed with sutures.

When amputation of the thigh becomes needful, it should be performed as low as possible. It is better to risk making a poor stump than for the sake of getting per-



fectly sound tissue for flaps to amputate higher up in the thigh.

For amputation at the hip-joint the following instruments are required :—1, an elastic tourniquet or Davey's lever ;

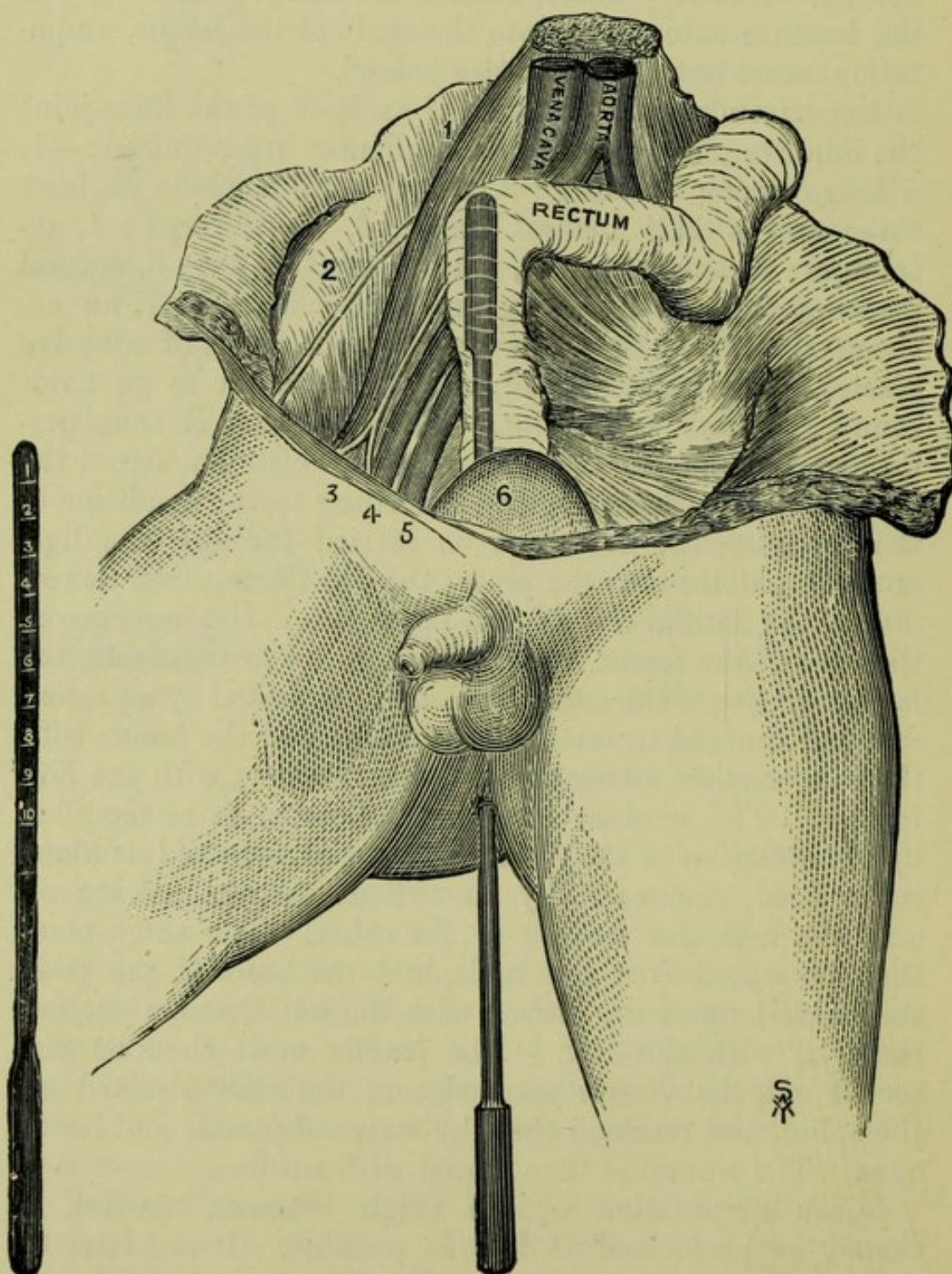


FIG. 100.

FIG. 101.



2, a long straight bistoury ; 3, an amputating knife, twelve inches in the blade ; 4, lion forceps ; 5, tenacula ; 6, artery, dissecting, and pressure forceps ; 7, scissors ; 8, needles. The operation is thus performed :—Place the patient with the buttocks well over the edge of the table, and compress the common iliac artery with the elastic tourniquet or Davey's lever. If the elastic tourniquet is used, it is applied as described by Mr. Jordon Lloyd :—The limb is emptied of blood by elevation. Two yards of rubber bandage doubled is placed with its centre midway between the tuber ischii and the anus. An ordinary calico broad roller is laid lengthways over the external iliac artery. The ends of the rubber bandage are then drawn upwards and outwards to a point above the centre of the iliac crest. The front part of the bandage runs parallel to Poupart's ligament, and passing over the compress occludes the external iliac. The back half runs across the great sacro-sciatic notch, and prevents bleeding from the branches of the internal iliac. It is held in this position by an assistant. Davey's lever (Figs. 100 and 101) is thus applied :—The rectum having been washed clean and bladder emptied, inject f3j of sweet oil into the bowel, and with much care introduce the lever into the rectum, allowing it to pass on for about nine inches in the mesial line ; roll the lever over the sacro-vertebral arch to the right or left side (as required), and so cross the axis of the artery ; compress the vessel by elevating the handle of the lever in a line parallel to the sound thigh. Note then the absence or presence of femoral pulsation. The lever and its application are shown in the woodcuts.\* The further steps of the operation are as follows :—1st, make an external semicircular skin-flap, commencing the incision with the bistoury at the centre of the groin just external to the femoral vessels, and carrying it down in a circular direction about four inches below the great trochanter, and up to the tuberosity of the ischium ; retract

\* I have to thank Mr Davey for having kindly written this description of the use of his lever,



this flap and expose the joint. 2ndly, the limb being if possible forcibly adducted by an assistant, open and disarticulate the joint. When, as is usually the case in traumatic amputations, the bone is shattered very high up, the neck of the femur must be firmly laid hold of with the lion forceps and pulled inwards. 3rdly, lay aside the bistoury, and make the internal flap by transfixing with the amputating knife, entering the point in front at the upper angle of the external flap, and bringing it out at the lower angle in front of the tuberosity of the ischium. Cut out through the adductors, and thus form the internal flap; with a few touches of the knife divide any tissues remaining uncut, and secure the vessels as rapidly as possible.

In amputation of the thigh in the upper third, anterior and posterior skin-flaps, with a circular sweep through the muscles, form the best amputation. In the lower third a long anterior skin-flap and a short posterior are best.

In some cases of severe injury of the leg, amputation at the knee-joint, or through the condyles, is useful. The operation is thus performed:—The instruments required are 1, a bistoury; 2, a catling or amputating knife; 3, an excision saw; 4, lion forceps; 5, tenacula; 6, pressure, dissecting, and artery forceps. Standing on the right of the limb to be amputated (supposing it to be a right limb), 1st, enter the point of the bistoury at the inner side of the knee-joint just below the internal condyle of the femur, and bring it round through skin and fat in a circular direction below the tuberosity of the tibia, to a corresponding point at the outer side of the joint below the external condyle; 2ndly, dissect up the skin-flap, taking as much cellular tissue as possible; 3rdly, flex the knee and open the joint; 4thly, lay aside the bistoury, and with a long knife cut a short posterior flap, passing the blade of the knife close behind the head of the tibia, and cutting outwards through all the tissues; secure the popliteal and other vessels. If it is needful to amputate a



little higher, the condyles of the femur may be removed with the saw, an assistant steadying the bone with the lion forceps. In either case the patella need not be removed.

Fractures of the patella are caused either by muscular action or by direct blows. Symptoms:—1, inability to stand or extend the leg on the thigh; 2, in transverse fractures, which are the most usual, separation of the fragments; 3, rapid effusion into the knee-joint. Blows on the patella frequently cause longitudinal or comminuted fractures. The immediate treatment of fractured patella must be guided by circumstances. If the effusion is very great, the limb must simply be placed in the horizontal position, and leeches, ice, or hot fomentations applied. The removal of the effused fluid by aspiration will sometimes enable the fragments to be at once placed in apposition, and the limb may be immediately placed on Wood's splint (Fig. 102). The fragments are approximated

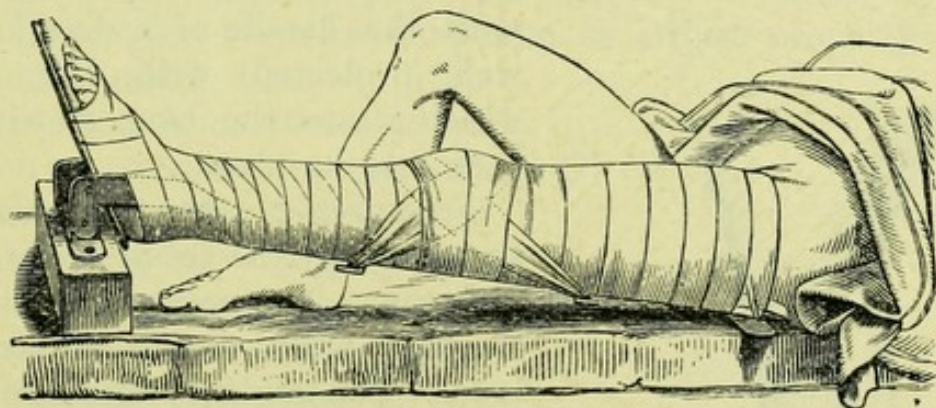


FIG. 102.

by a figure-of-eight bandage carried round the hooks on the under surface of the splint, and the entire limb carefully bandaged from the toes upwards. A bag of ice should be kept constantly applied to the joint. Compound fractures should be treated in a similar manner.

Dislocations of the patella are caused by muscular action, and occur especially in knock-kneed persons and in women, by twisting the thigh inwards, the foot being



fixed. Sometimes the accident is caused by direct violence.

Dislocation outwards is the most common form. Symptoms:—1, limb slightly bent but immoveable; 2, breadth of knee increased; 3, projection of internal condyle; 4, patella can be felt on the outer side; 5, great pain. Treatment:—Seat the patient on a chair, and, kneeling before him, place his foot on your shoulder. In the act of raising the limb the patella will frequently slip into place; if not, a little manipulation with the fingers will cause it to do so. Dislocation inwards, except that the patella is reversed in position, presents similar symptoms, and requires the same treatment.

Dislocation of the patella on to its edge is rare; the projecting edge of the bone is sufficient to show the nature of the injury. Treatment:—If the above plan does not answer, forcible flexion and extension must be tried, with rotation of the tibia on the femur. At the moment of extension the lower edge of the bone should be pressed on with the handle of a door-key, well protected with lint, by which means the bone is tilted back into its place.

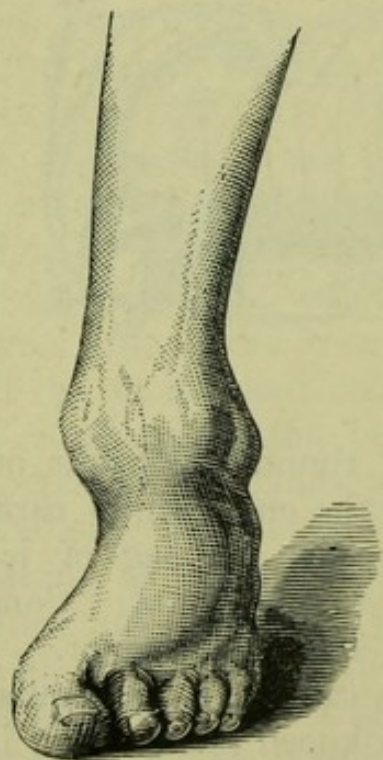


FIG. 103.

Fractures of the tibia alone are generally the result of direct violence. The nearer the joint, the more transverse is the fracture. The tendency to displacement is very slight, and the treatment simple. A plaster-of-Paris bandage is perhaps the most effective when there is not much swelling (see Chap. XII).

Fractures of the fibula alone are caused either by direct violence, or by turns of the foot. In the upper two thirds it is generally fractured by direct



violence, in the lower third by indirect violence. Fracture in the lower third is usually accompanied with eversion of the foot, and dislocation inwards of the tibia. Fig. 103, taken from a cast in King's College Museum, shows the deformity. Treatment:—If the external malleolus is alone fractured, or if the fracture is in the middle or upper third, simple rest on a pillow, or a plaster-of-Paris bandage, will suffice. If, however, the foot is twisted, with displacement of the tibia, indicative of fracture in

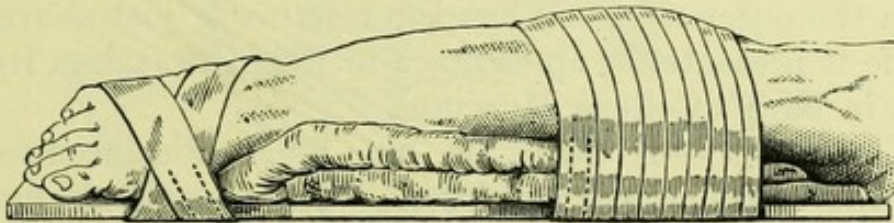


FIG. 104.

the lower third, the case had better be treated with Dupuytren's splint (Fig. 104).

This splint requires some care to adjust properly. It should reach from a little above the knee down to an inch or so below the toes, and must be applied to the inner side of the leg. A pad, two or three inches thicker at its lower than its upper extremity, must be fitted to the splint, so that the lower end rests on the tibia just above the internal malleolus. Fix the upper extremity of the splint with a few turns of a roller, and then inverting the foot, secure it to the lower extremity with a figure-of-eight bandage, taking especial care not to carry the bandage

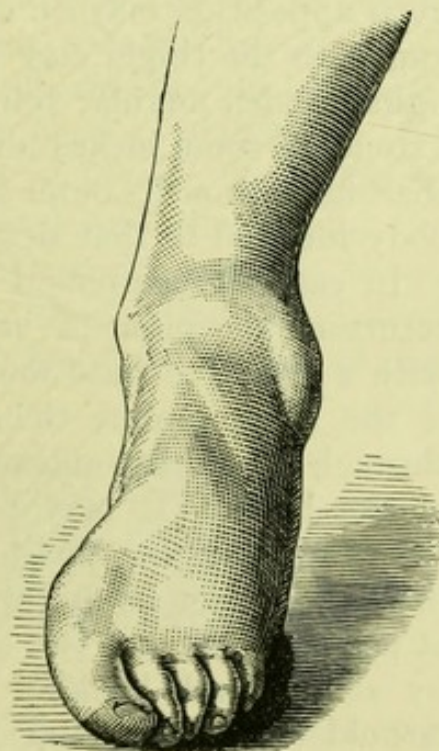


FIG. 105.



above the external malleolus. Bend the knee, and lay the leg on its outer side on a pillow.

Fractures of both bones of the leg are generally the result of direct violence. Muscular action and falls on the feet will also cause fracture of both bones. The lower third is the most frequent site for fracture of the tibia, the fibula being fractured at the same time frequently somewhat higher. The fractures are almost invariably more or less oblique, the upper fragment of the tibia riding in front of the lower, and more upon the inner than the outer side. When the fracture is just above the ankle it presents the appearance in Fig. 105 (taken from a cast in King's College Museum).

Treatment:—If there is not much displacement, a MacIntyre splint will be of use. The foot should first be bandaged to the footpiece, which should then be drawn down a little, and fixed with the screw in order to make slight extension. The upper part of the leg and the thigh may then be fixed, and the limb swung in a Salter's swing. In oblique fractures with much displacement, good apposition may be secured by flexing the leg at right angles to the thigh, and keeping it in that position by a light wooden angular splint applied on the outer side, and extending some inches above the knee. The limb must then be laid on its outer side, on a pillow, and the patient's body inclined to that side.

In cases of compound fracture, if there is difficulty in returning the point of bone beneath the skin, endeavour, with a probe, to raise the inverted edges of the skin; and if the bone cannot then be returned make an incision through the skin sufficiently large to admit of the return of the bone. It may be needful to remove a portion of the protruding bone with the bone forceps or saw. The limb had better be put upon a back splint, with a footpiece at right angles, and two side splints, which can be secured by straps and buckles. The splint made by Messrs. Arnold (Fig. 106), and used at St. Bartholomew's, is a very useful one. It is thus applied:—Place the leg on the



back splint of iron, which must be well padded, carefully fitting the heel into the opening made for it. Secure the

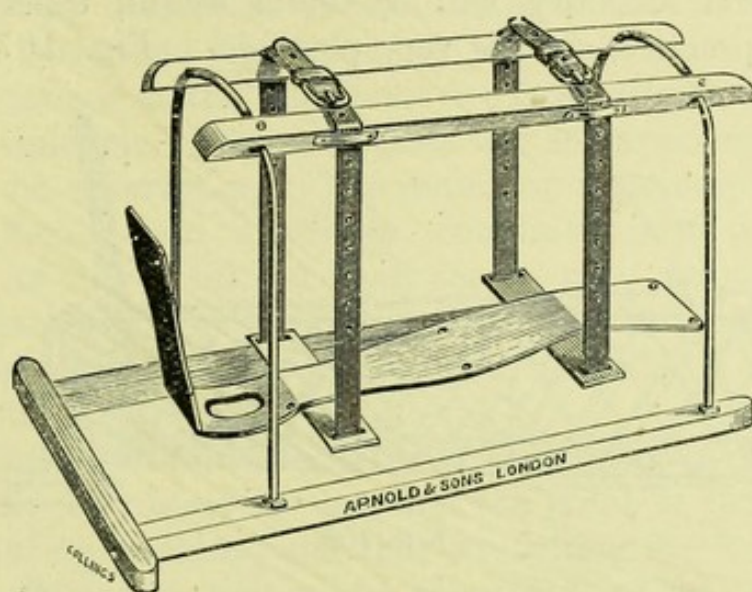


FIG. 106.

foot to the footpiece with a thick piece of gutta percha moulded to the dorsum, coming round the edges of the footpiece, and fastened with tapes passed through holes bored in the gutta-percha. Some flannel should be placed between the foot and the gutta-percha, and the latter should be punched with a number of holes for ventilation. Take care that the ball of the heel and the ball of the great toe are well against the footpiece; and, as in all other methods of setting a fractured leg, that the ball of the great toe is in a line with the inner border of the

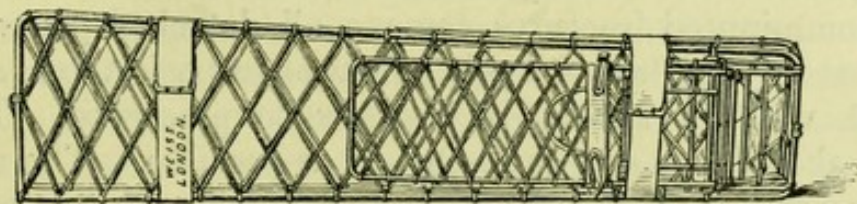


FIG. 107.

patella. Then apply the side splints, securing them to the knee with a mould of gutta percha, and further fixing



them in place with straps and buckles. Swing the limb to a cradle with leathern straps passed through the two cross-bars of the back splint. The wire splint, invented by Surgeon McNalty, will be found useful, especially in country practice, as it is very portable. Fig. 107 shows

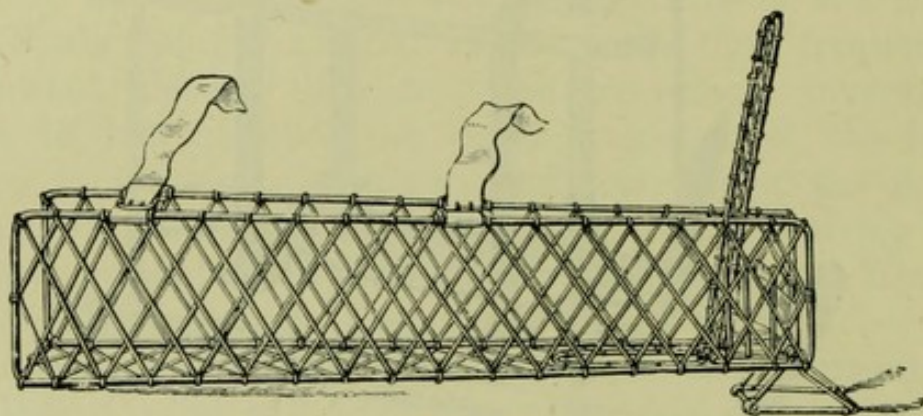


FIG. 108.

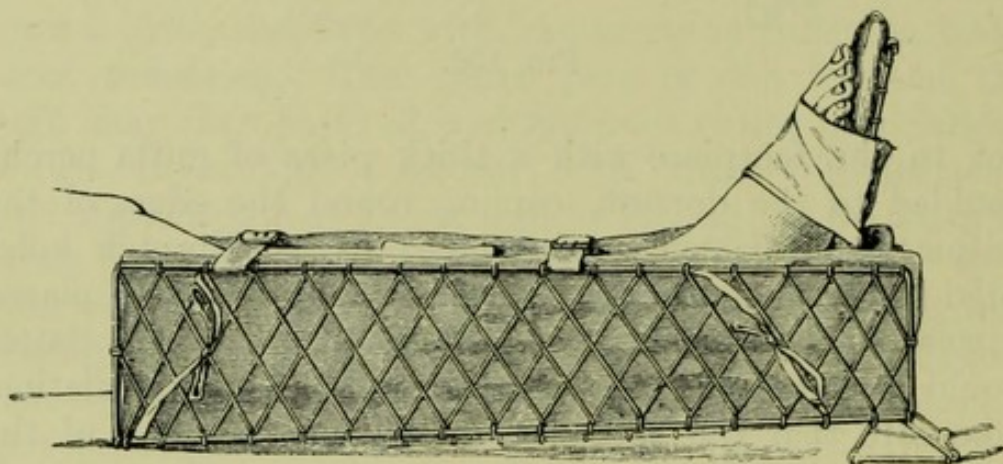


FIG. 109.

this splint folded up ; Fig. 108 shows it open ; and Fig. 109 represents the limb placed in it.

In comminuted fractures remove all detached pieces of bone, but any fragments firmly adherent to periosteum, and covered with it, should if possible be preserved. The wound should be as little disturbed as possible. The surrounding skin should be thoroughly cleansed with soft soap and water, and then further rubbed with ether. If the wound is deep and large it should be plugged with a tampon of iodoform gauze, and then closed with a pad of



the same gauze and a bandage (see Chap. XI). As a general rule, if the temperature and sensation of the foot are natural, an attempt should be made to save the limb. If the contrary conditions prevail, amputation had better at once be performed (see below).

Dislocations at the knee-joint are generally the result of severe violence. The symptoms are so pronounced as to require no description. The reduction is accomplished by forced flexion and extension, combined with a rocking motion of the joint. Sometimes it may be needful to apply extension by pulleys, and to make firm pressure on the prominent dislocated bone. An anæsthetic should be administered if possible.

Displacement of the semilunar cartilages of the knee-joint may be caused by catching the point of the toe in a stone during walking, and thus wrenching the knee-joint; or by a patient turning in bed, the weight of the bedclothes on the toes twisting the knee. Symptoms:—1, sudden severe pain; 2, the joint fixed in the semi-flexed position; 3, sometimes the patient falls suddenly to the ground; 4, the presence of a lump corresponding in shape to a portion of the semilunar cartilage either on the inner or outer side of the knee. Treatment:—Flex the leg as much as possible, and then suddenly extend it, at the same time pressing on the lump. If the first attempt fails, repeat it with a rocking motion of the joint. Reduction is attended by immediate cessation of pain and return of free motion to the joint.

Dislocation of the tibia at the ankle-joint inwards, combined with fracture of the fibula, has been described at p. 153. Dislocation outwards is frequently associated with fracture of the internal malleolus. Fig. 110, taken from a cast in King's College Museum, shows this deformity. Treatment:—Grasp the foot firmly with both hands, and draw on it gently, at the same time rotating the foot outwards.

Dislocation forwards (Fig. 111) is caused by violent extension of the foot. The fibula is frequently fractured.



Treatment:—Flex the leg on the thigh; and whilst an assistant makes extension from the foot, press the tibia backwards and the heel forwards. As the bones begin to

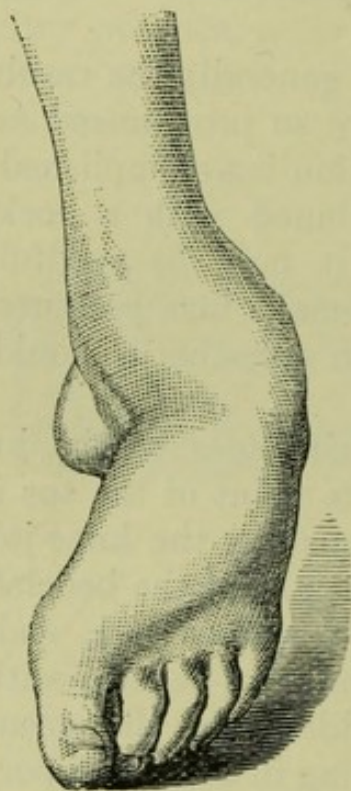


FIG. 110.

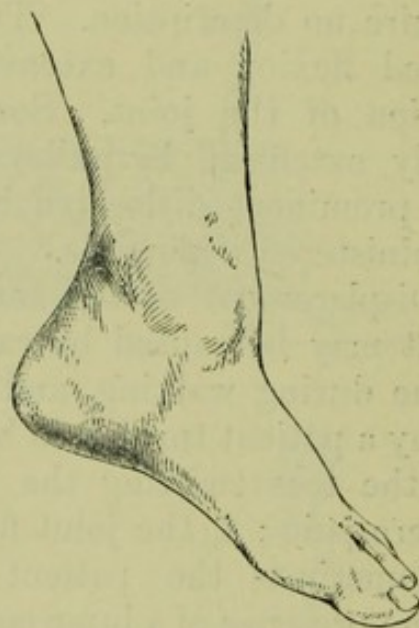


FIG. 111.

slide into place, forcibly flex the foot on the leg. Great difficulty is found in keeping the bones in place, and it may be needful to divide the tendo Achillis, after which the limb should be fixed to an outside splint, and laid on its side on a pillow in the semi-flexed position.

Dislocation backwards is very rare (Fig. 112). It is usually accompanied by fracture of one or both malleoli. It is caused by any force which produces extreme flexion of the foot. Treatment:—The tendo Achillis will probably have to be divided before reduction can be accomplished. Steady extension, with alternate flexion and extension of the foot on the leg, must be employed.

In compound injuries to the ankle-joint every attempt should be made to save the limb, and unless the soft parts are very severely damaged, amputation should not be



performed. If the protruding ends of the bone cannot be replaced, they should be removed, the extremities being

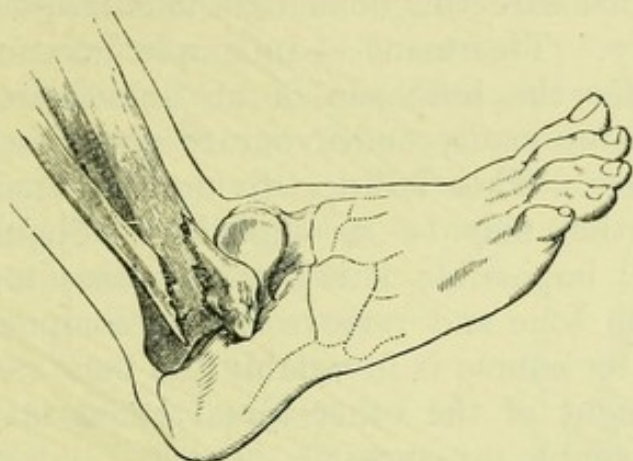


FIG. 112.

firmly held with the lion-forceps, and the section made with the small saw figured at p. 73. For the antiseptic treatment see Chap. XI.

The astragalus and os calcis are sometimes broken by falls on the feet, and occasionally the latter is broken by muscular action, as in jumping on the toes, the posterior portion of the bone being separated by the tendo Achillis. The other bones of the tarsus are generally broken by crushing violence. Symptoms:—The only prominent symptom in fracture of the tarsal bones is crepitus, and this is not always present. When the posterior part of the os calcis is separated, the fragment is drawn upwards by the tendo Achillis, and the heel is shortened. Treatment:—There is little to be done beyond rest and evaporating lotions. If the os calcis is fractured posteriorly, the case should be treated as in rupture of the tendo Achillis (Fig. 87, p. 130).

The astragalus may be dislocated in various directions by falls on the foot from a height accompanied by violent twisting of the foot; or it may be dislocated by a direct blow. Symptoms:—1, great prominence of the bone in the direction of the dislocation; 2, lateral deviation of the foot; 3, shortening of the leg; 4, in the backward dislo-



cation the position of the foot is not much changed, but its dorsal aspect is shortened. So great is the force needful to dislocate this bone that it is frequently a compound injury. Treatment:—In simple luxation place the patient under the influence of an anæsthetic, and firm extension being made, endeavour to press back the bone into its place. This failing, divide the tendo Achillis, when reduction may be accomplished. Should it, however, be still impossible, it is better at once to divide the skin over the bone and remove it. In compound dislocation this latter course is invariably the best.

Displacement of the other tarsal bones may be easily reduced by simple pressure.

In fractures of the metatarsal bones the usual displacement of the fragments is upwards. They must, if possible, be pressed backwards into position, and retained by a gutta-percha splint, moulded to the dorsum. In fractures of the phalanges it is very often better to amputate, as the attempt to save the end of the toe is frequently the cause of considerable irritation. If the fracture is to be treated, a broad gutta-percha splint moulded to the sole of the foot, and supporting all the toes, is better than a narrow one for the broken toe alone.

One or more or the entire row of metatarsal bones may be dislocated from the tarsus. The direction is generally upwards and backwards. Treatment:—To reduce a single bone, pressure on the head is the most effectual method; but if the whole row be displaced, extension must then be made, in addition to pressure on their heads.

The phalanges are generally displaced backwards. The reduction may be accomplished by combined extension and pressure on the head of the bone.

In amputation of the leg the best operation is by lateral skin-flaps, with a circular amputation through the muscles. Make two lateral flaps of skin sufficiently long to cover the end of the stump, retract the flaps, and divide the muscles one inch below their base by a circular sweep



down to the bone; make the section of the bones with the saw on a level with the base of the skin-flaps.

The various amputations through the foot are indicated in the adjoining diagram (Fig. 113) from Bryant's 'Surgery,' and will be referred to in the following descriptions.

Chopart's amputation is thus performed on the right foot:—Grasp the fore part of the foot with the left hand, placing the forefinger on a point one inch behind *H*, the prominence of the metatarsal bone of the little toe, and the thumb on *A*, the tubercle of the scaphoid. Make a curved incision between these two points through the skin, and a second incision through the tendons down to the bone; forcibly bend down the foot, and open the articulations between the os calcis and the cuboid and between the astragalus and scaphoid. Keeping the knife close to the bones, cut the plantar flap as far down as the roots of the toes.

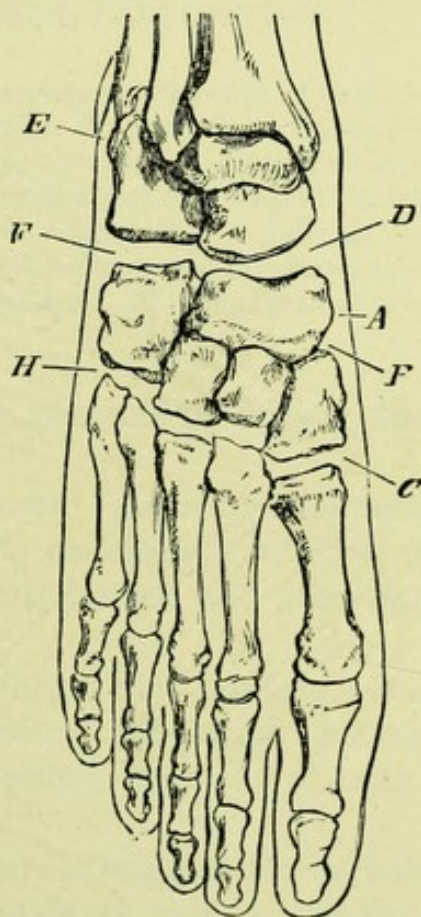


FIG. 113.

When all the toes require removal, Hey's amputation must be performed. Operation on right foot:—Grasp the foot with the left hand; commence the incision on the dorsum, half an inch in front of the point *H*, the projection of the metatarsal bone of the little toe, and carry it with the convexity downwards to a point half an inch in front of *C*, the base of the metacarpal bone of the great toe; make the plantar flap by two lateral incisions, carried from the base of the dorsal flap along the metatarsal bones, and joined by a curved incision a little beyond the ball of the great toe; reflect



this flap, and with a saw divide the metatarsal bones just in front of their articulations with the tarsus.

The rules for amputation of the toes are precisely similar to those given for the fingers at pp. 86—88. The head of the metatarsal bone should never be removed if it can be saved.



## CHAPTER IX

## EMERGENCIES CONNECTED WITH PARTURITION

Signs of Pregnancy—Accidental Hæmorrhage—Placenta Prævia—Retained Placenta—Flooding—Induction of Premature Labour—Cæsarean Section—Craniotomy—Symphysiotomy—Embryulcia—Decapitation—Cephalotripsy—Displacements of the Gravid Uterus—Mal-presentations—Twin Labour—Abnormal Condition of Fœtus—Turning—Prolapse of the Cord—Puerperal Convulsions—Rupture of the Uterus; of the Bladder; of the Perinæum—Inversion of the Uterus.

THE following are the signs of pregnancy during the successive months :

*First Month.*—Cessation of menses ; morning sickness, sometimes profuse salivation ; soft, cushiony condition of cervix ; circular form of os ; vagina hotter and secreting more mucus.

*Second Month.*—Breasts become larger and tender ; veins slightly enlarged ; nipples swollen ; sebaceous matter found in the follicles round the nipple ; secretion of milk ; abdomen becomes flat.

*Third Month.*—Slight abdominal enlargement ; areola round nipples darker ; os raised higher in vagina ; in thin people the uterine bruit may be detected by pressing the stethoscope over the brim of the pelvis on to the fundus of the uterus.

*Fourth Month.*—Enlargement of abdomen more marked ; uterus felt two inches above the pelvis ; mother feels the sensation of quickening ; foetal heart may perhaps be detected beating from 130 to 150 per minute.

*Fifth Month.*—The patient being placed in the upright position and the finger introduced into the vagina



and pushed against the uterus, ballottement may be obtained.

*Sixth Month.*—The fundus reaches the umbilicus.

*Seventh Month.*—Umbilical depression removed; the os is close against the sacrum, and the cervix drawn up much higher.

*Eighth Month.*—The fundus reaches midway between the umbilicus and the ensiform cartilage; foetal movements plainly felt by the hand on the abdomen.

*Ninth Month.*—The fundus reaches the ensiform cartilage; the cervix is obliterated.

Accidental hæmorrhage may occur before delivery from disease of the passages such as cancer of the vulva or cervix, or erosion of the cervix. Sometimes a wound of the genitals, which in advanced pregnancy are full of largely dilated vessels, may cause tremendous and fatal hæmorrhage. The patient must be placed in the recumbent position and the parts firmly plugged. It is more commonly caused by separation of the placenta, the result of falls, blows, violent mental emotions, jars in driving over a rough road, or railway travelling. The symptoms are pain at the seat of injury, sense of distension, quick feeble pulse, fainting, and all the ordinary signs of loss of blood. It is possible that no blood may escape externally, but often the quantity which is lost is enormous. If labour is in progress, the flow will be arrested during a pain, or when faintness comes on. The following are the distinguishing points between accidental hæmorrhage and placental prævia:

#### *Accidental Hæmorrhage*

1. Discharge arrested by labour-pain.
2. Membranes felt, with a portion of the child presenting.  
  . The os thin.
4. History of injury.

#### *Placenta Prævia*

1. Discharge increased by labour-pain.
2. The placenta felt as a soft substance.
3. The os very thick and pulsating.
4. No history of injury; bleeding coming on of itself.



Treatment :—If the hæmorrhage is slight, rest in bed and astringents, such as the acetate of lead two grains with half a drachm of dilute acetic acid in water every four or six hours, or five grains of gallic acid with half a drachm of the liquid extract of ergot, should be administered. Give no stimulants, but nourish well with milk and strong beef tea. If the hæmorrhage is very excessive, delivery must be expedited. Puncture the membranes, give ergot, and put on a firm binder, and wait. If, however, the case is at full term and the os does not dilate, it must be stretched with the finger and the membranes ruptured. A dilating bag must then be introduced. The most recent form of bag is Champetier de Ribe's, and its introduction is thus described by Dr Herman in his book 'Difficult Labour' :—"The bag is made of waterproof silk *not elastic*, so that it will hold about seventeen ounces of water and no more. The shape is that of an inverted cone, the apex of the cone lying in the internal os, and having a tube attached to it so that water can be pumped into it. When full the base of the cone measures about three inches and a half across, so that when it can pass out the os uteri is so dilated that you can deliver immediately. A pair of forceps is sold with it. Having first blown out the bag and washed it well with 1 in 1000 sublimate solution, fold it longitudinally as small as you can, and grasp it with the forceps (Fig. 114). Lubricate liberally with sublimate glycerine the bag held by the forceps, and pass it into the uterus. When the whole of the bag is within the uterine cavity, disarticulate the forceps and remove each blade separately. Then with an ordinary syringe slowly pump water into the bag until no more can be got in (Fig. 115). Then turn the tap and leave the bag in the uterus. When the dilatation is complete the bag will be expelled from the uterus, and afterwards from the vagina. If pains are infrequent and feeble, you can hasten dilatation by pulling on the bag." When the os is fully dilated, if uterine action is not strong deliver with forceps, or you may turn and bring down a foot.



In placenta prævia, hæmorrhage generally comes on about the seventh or eighth month. It is a sudden discharge, and also stops suddenly, to be repeated again pro-

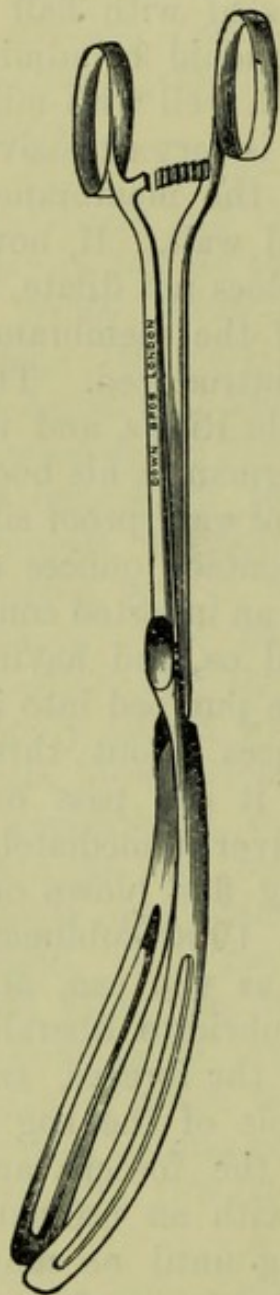


FIG. 114.

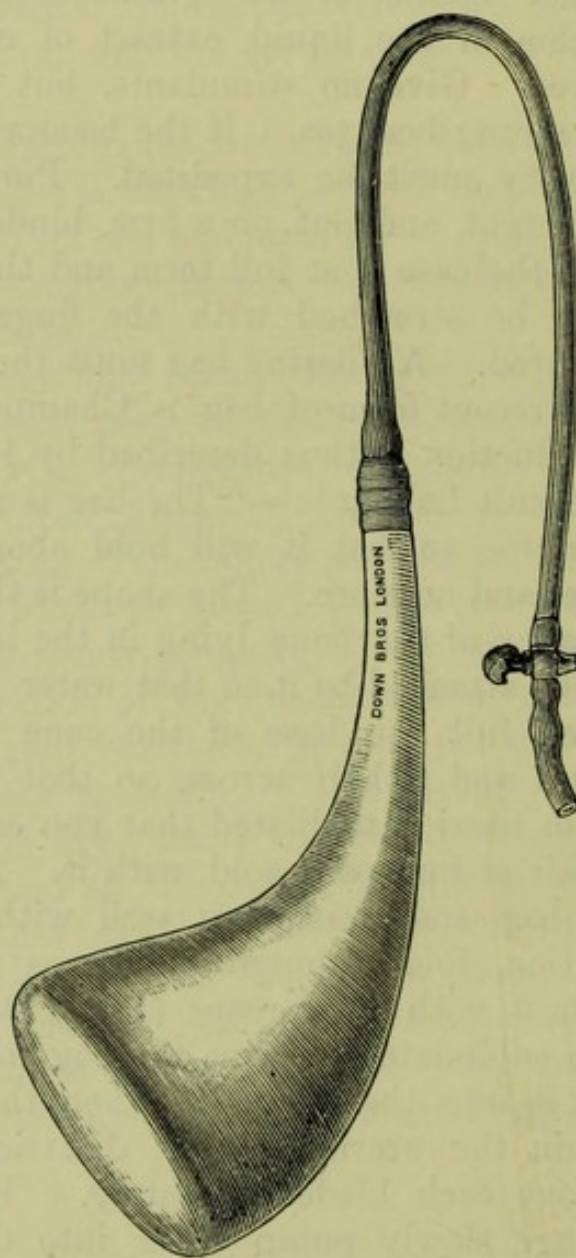


FIG. 115.

bably in a week or a fortnight. The other symptoms are given above. Treatment:—If the hæmorrhage is slight, keep the patient cool and in the recumbent posture: give the acetate of lead, and opiates, if there be uterine action. If the hæmorrhage is severe, the sooner labour is commenced



and terminated the better. If the os is not dilated the fingers should be gradually introduced, or a sponge tent well lubricated with sublimate glycerine. Another may be introduced by its side. As soon as two fingers can be introduced the placenta must be separated from the uterus all round as far as they can reach. If the fingers can be passed beyond the edge of the placenta on to the smooth membranes, the child must be turned by the bimanual method until a foot is felt. Then rupture the membranes, bring down the foot and put a tape on it. The presence of the thigh in the os stops hæmorrhage. If the edge of the placenta cannot be reached, the fingers must be thrust through it and the proceeding above described carried out. Or the case may be treated by Champetier's bag, which as soon as the os is dilated sufficiently to admit the finger can be introduced either over the edge of the placenta, or if that cannot be felt, through it. It is then filled with water, and labour is left to its natural course.

Retained placenta from adhesions to the uterine walls may be diagnosed by the fact that uterine action continues after the birth of the child, without expelling the placenta, the uterine contractions being generally accompanied by gushes of blood. On digital examination the placenta will be found closely adherent to the walls of the uterus. Treatment:—Introduce the hand into the cavity of the womb, the other being placed on the fundus; feel along the cord for the centre, and thence for the edge of the placenta and gently peel it off. If it is impossible to remove some portions without the risk of damage to the womb, it is better to leave them.

When the placenta is retained from uterine atony, give ergot, apply pressure with the hand on the fundus, and dash cold water on the vulva. Hour-glass contraction of the uterus may have enclosed the placenta in the upper segment above the contraction. In such a case if there is no urgency it is well to wait for a time, when the uterus will generally expel the placenta. If, however, hæmor-



rhage is going on, the hand must be introduced into the uterus with the tips of the fingers pressed together. The body of the uterus is then grasped with the other hand and pushed downwards and backwards, the tips of the fingers of the other hand being at the same time steadily pressed upwards so as to dilate the constriction. When the hand can be passed through the constriction the placenta is grasped and drawn out. Chloroform is of great assistance.

Hæmorrhage into the cavity of the womb after the expulsion of the placenta is the result of uterine atony. In order to prevent this it should be a golden rule on no account to deliver the child in the absence of uterine contraction, and not to pull away the placenta without waiting for uterine contraction and to keep the uterus well grasped with the other hand on the abdomen. Treatment :—Place the patient on her back, and give stimulants freely ; grasp the uterus with one hand externally, and with the other in the cavity of the womb clear out all clots ; inject hot water, in which you can just bear your hand, into the cavity of the uterus. Inject six minims of solution of ergotine deep into the buttock (see p. 194). If these means fail, remove all clots and inject four ounces of *Liquor Ferri Perchloridi Fortior* (B. P.), diluted with twelve ounces of water. A Higginson's syringe with a uterine tube attached may be used ; and the injection must be gently sent well up to the fundus, great care being taken to inject no air. The hand should be introduced into the uterus and the point of the syringe carried well up to the fundus. Another method is to plug the cavity of the uterus with iodoform gauze. Herman advises above all other means continuous compression. His method is as follows :—Bend the fingers of the left hand into the palm and pass it into the vagina outside in front of the uterus. Then grasp the uterus through the abdominal wall with the right hand and press it firmly downwards and forwards on to the left hand in the vagina. By this means all the clots are squeezed out, and the uterus firmly



compressed. As a last resource, saline infusion may be had recourse to (see Chapter XII).

The induction of premature labour is required as an emergency in cases of placenta prævia, of pulmonary or cardiac disease, or of convulsions. In each of these conditions no time has to be lost. The best plan is to avoid if possible the rupture of the membranes, and to dilate the os with Champetier's bag as described at p. 165. If the bag be not at hand, the membranes should be separated from the uterus with the finger as far as it can reach round the os, or a No. 10 bougie thoroughly cleansed and lubricated with glycerine sublimate is introduced into the os and very gently pushed up into the uterus until the button end lies in the external os; there it is allowed to remain until labour commences. Labour may not come on until after the lapse of several hours.

Cæsarean section may be called for as an immediate proceeding in cases of sudden death of the mother, provided it can be ascertained that the child is viable, and the stethoscope determines that it is living. If the mother has died of hæmorrhage or asphyxia, it is probable that the child too is dead. Twenty-five minutes after the mother's death is the longest period that can elapse with the chance of saving the child. In opening the uterus care must be taken not to wound the child, and in removing the child it should be grasped so as to bring out the head or the breech first. When Cæsarean section is performed with a view of saving the mother's life as well as that of the child, the following are the directions for the operation. The instruments required are—1, large strong bistoury; 2, director; 3, retractors; 4, dissecting forceps; 5, several straight and curved needles threaded with Chinese twist; 6, catgut or fine Chinese twist ligatures, a number of pressure forceps; 7, sponge holders. The rectum and bladder being emptied, place the patient on her back with the shoulders raised and the pelvis elevated. She should be well clothed and the abdomen covered by a mackintosh sheet with an oval cut in the centre as



for ovariectomy. The skin of the abdomen should be thoroughly cleansed with soft soap and water and the pelvis shaved. The first incision, which should extend for six or eight inches from the umbilicus to within a short distance of the pubes, should be carried down to the aponeurosis of the muscle, remembering that the tissues under the circumstances are much thinned. Make the incision exactly in the linea alba. On reaching the peritoneum pick up a fold with forceps and divide with scissors, taking care to arrest all hæmorrhage with pressure forceps before opening the peritoneal cavity. The peritoneum is then divided the whole length of the wound with scissors, on the fore and middle fingers. The uterus is now exposed. Feel on its surface with your hand for the thrill indicative of the position of the placenta, and if possible avoid that spot. The parietes should now be well pressed back against the uterus, to prevent any fluid getting into the abdominal cavity, by an assistant with a hand on both sides of the wound. Make an incision into the body of the uterus, five inches long, avoiding the fundus and the neck. Should the placenta be met with, thrust it aside, extract the child if possible by seizing the nearest knee. Immediately the child is extracted, the assistant should press the parietes back behind the uterus so as to extrude it from the abdomen. Then the membranes and placenta are extracted. If the uterus does not contract, press it with the hand, or insert a lump of ice into its cavity, or apply galvanism. Clear out all clots, and see that the os is perfectly free. The uterine wound must now be closed. This is done by inserting two rows of sutures, one deep the other superficial. The best needle for the purpose is a full-sized Elder's needle (Fig. 72, p. 94). The needle is entered at right angles to the wound and half an inch from its edge. It is then carried deeply into the uterine tissue and brought out near the bottom of the cut surface, great care being taken that it does not enter the uterine cavity. It is carried across to the other side and made to emerge through the peritoneal coat half an inch from the



wound. It is then threaded with No. 5 Chinese twist and withdrawn. A deep suture should be placed at every one third of an inch. These sutures are then tied, care being taken to invert the peritoneal edge so as to bring the peritoneal surfaces in contact. The superficial sutures should be of fine silk and continuous, the peritoneal coat only being punctured. The abdominal cavity is then cleansed with sponges, or even washed out if required, and the abdominal wound closed as described at pp. 93, 94.

Craniotomy may be required immediately, in convulsions, rupture of the uterus, or hæmorrhage, when the forceps cannot be used, or when they have failed to deliver. As little delay as possible should be made. The operation is thus performed:—Empty the bladder and rectum, and place the patient in the usual obstetric position. An assistant pressing on the fundus, pass two fingers of the left hand up to the head, and upon them guide the perforator (Fig 116). Do not perforate through a suture

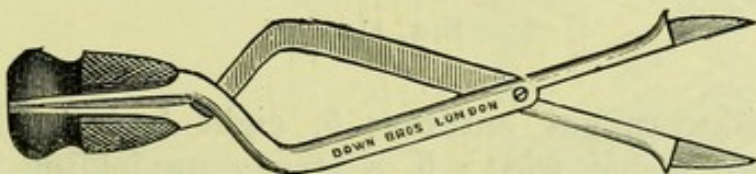


FIG. 116.

or fontanelle, but placing the point of the instrument perpendicularly to the bone at the most dependent point of the head, push it by a gentle semi-rotating movement through up to the shoulder or cutting notch. Open the blades to the full extent, thus cutting an opening in the skull. Repeat this proceeding in the opposite direction, thus making a crucial opening. Thrust in the perforator, and break up the brain. If you have no perforator, make an opening through a fontanelle with a strong pair of scissors. Wait to see if uterine action will expel the head. If it does not, then apply the craniotomy forceps (Fig. 117), one blade being placed within the skull and the other external to it. As an alternative plan the ope-



ration of symphysiotomy has lately been reintroduced. For the operation the following instruments are required:—

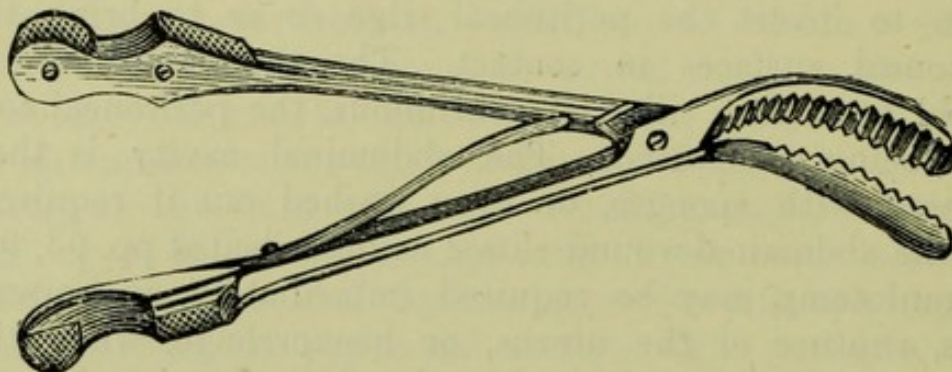


FIG. 117.

1, scalpel ; 2, strong blunt-pointed bistoury or Galbiati's knife (Fig. 118) ; 3, dissecting and pressure forceps ; 4,

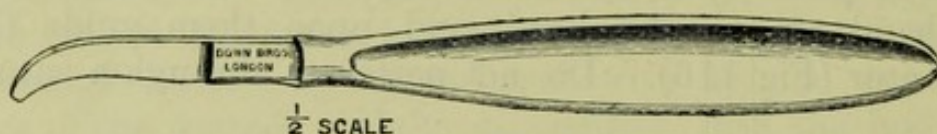


FIG. 118.

needle, silkworm-gut sutures ; 5, eight feet of Holland plaster two inches wide ; 6, a strong unyielding belt or binder. The operation is thus performed :—The patient is placed in the lithotomy position. An incision is made in the middle line commencing two inches above the symphysis and extending down nearly to the clitoris. The muscles are then divided laterally close to the bone half an inch in either direction. The section of the symphysis is then made either with a stout bistoury or with the special knife indicated above. Great care must be taken of the bladder behind and the urethra below. As soon as the section is complete the bones will fly apart. The wound should be stuffed with iodoform gauze and the head at once delivered with forceps. The bones are then pressed together, sutures applied to the skin, and the whole kept in place by broad bands of strapping and a belt or binder.



In case of arm presentation, the liquor amnii having escaped, and the child being jammed down into the pelvis so that turning is impossible, the operation of embryulcia may be used. This consists in thrusting the perforator through an intercostal space, and cutting through the ribs, if needful, with a pair of long-pointed scissors. The contents of the thorax are then evacuated. Decapitation is best performed with a long pair of sharp-pointed scissors. These are thrust into the neck, and the spinal column divided. The head being separated from the trunk, the latter is brought down, the former being afterwards extracted with the forceps.

Cephalotripsy is an operation which may be substituted for craniotomy, and is probably easier of performance. The cephalotribe (Fig. 119) is the instrument used. It is

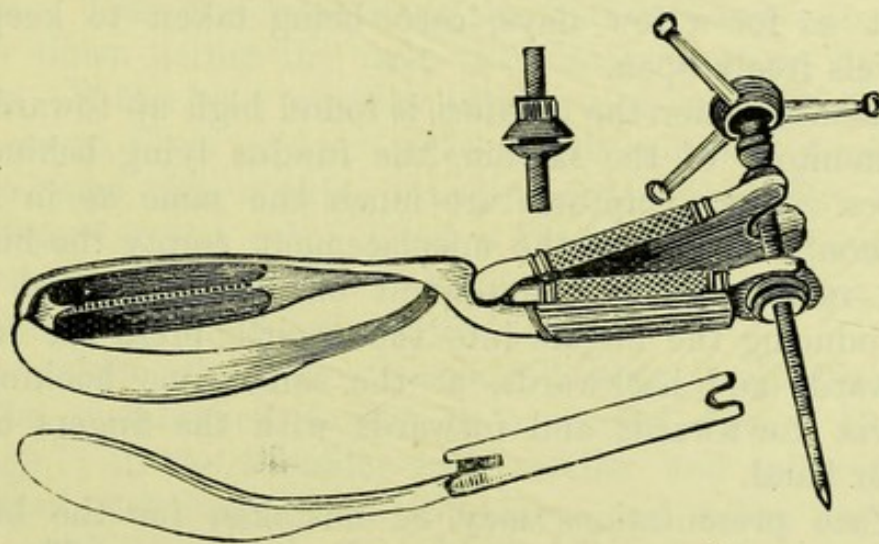


FIG. 119.

applied in the same way in which the long forceps are put on—the head being first perforated with the perforator. When the blades of the cephalotribe are applied, the crushing force is then commenced by slowly turning the screw. It may be needful after the first crushing to re-apply the instrument in another direction, and again crush the head. The head is then withdrawn by the



instrument, care being taken to preserve the soft parts from injury by spiculæ of bone.

The gravid uterus is subject to sudden displacements, generally retroversion or anteversion. In retroversion there is difficulty in passing water, sometimes complete retention—a frequent desire to empty the bowels, and violent bearing-down pains. On examination the cervix is found tilted forward behind the pubis, the vagina being drawn up with it out of its usual axis. Posteriorly, filling the sacrum, the globular fundus will be felt. In order to reduce the deformity the rectum and bladder must be emptied. Place the patient on her elbows and knees, with the pelvis higher than the rest of the body, and then passing the fingers into the vagina, press the fundus upwards and forwards into its natural position. The patient must then be placed in the recumbent position and kept so for a few days, care being taken to keep the bowels freely open.

In anteversion the os uteri is found high up towards the promontory of the sacrum, the fundus lying behind the pubes. The symptoms are much the same as in retroversion. To reduce the misplacement, empty the bladder and rectum, place the patient on her back, and then, introducing the fingers into the vagina, press the fundus upwards and backwards, at the same time hooking the cervix downwards and forwards with the fingers of the other hand.

Face presentations may be mistaken for the breech. The distinctive mark is the bridge of the nose. The malar bone and the eye may also be felt. The treatment required is not special, except that in some cases of delay it may be needful to apply the forceps.

A breech presentation is diagnosed by the plump, round feel of the buttocks, the anal aperture, and the sharp point of the coccyx. The tuberosities of the ischium may be mistaken for the malar bones, but the absence of the bridge of the nose will correct this error. The presence of meconium is no sure test, as it may occur in head



presentations. The treatment is simple. The nates being born, it is better to retard rather than assist the birth of the trunk, in order that the contraction of the uterus may keep the chin well pressed down on the chest. This is the best safeguard against pressure on the cord. If a portion of the cord is seen, a loop should be pulled down to prevent stretching. If the nates do not descend for an hour or two after the os is fully dilated, pass the hand up into the uterus with the palm towards the child's abdomen. Seize an ankle and bring down a leg. Chloroform should if possible be given. Then gentle traction can be made. When the trunk is born it is necessary to deliver the arms as soon as possible. Pass up the hand and hitch a finger first round one elbow and pull it down and then the same with the other. If the arms are extended by the sides of the head it is difficult to hook down the elbows. Pass the hand along the humerus and press the elbow down across the face, then hook it down by the elbow. If the head remains unborn, and pulsation in the cord ceases, place a finger in the mouth and make traction, at the same time making traction on the shoulders with the fingers of the other hand. Pressure from above by an assistant through the abdominal walls may assist. If this fail, apply the forceps without delay.

A shoulder presentation has the following peculiarities :—  
1, The membranes project in a conical form "like a sausage"; 2, the shoulder feels smaller and softer than the head, but larger than the elbow, and it has not the two prominences with the groove between, characteristic of the knee; 3, the scapula with its spine, the neck, and the ribs, may be felt. The shoulder is generally the first presenting part of the upper extremity, but it may be succeeded by the arm and hand. The hand is distinguished from the foot by the greater length of the fingers, the irregularity of their length, the distance the thumb may be stretched away from the fingers, the being able to close them on the palm, and the absence of the heel. The treatment is to turn as soon as the os is sufficiently dilated.



If the membranes rupture before the os is dilated, this must be accomplished by steadily introducing the hand, at the same time preventing the presenting part from descending. When the os is rigid, chloroform will be of great assistance.

Hands and feet, and with them the cord, sometimes present during the progress of labour. The presentation will become one either of hands or feet alone. If possible draw down the feet, and terminate the labour as in a breech.

When the hand and head present, an attempt should be made to return the hand. If there is then delay in the descent of the head, the forceps must be applied, or turning or craniotomy resorted to.

In twin labours complications are sometimes met with. If both heads present, the second head may impinge on the neck of the first and block its advance. Bimanual examination will reveal the second head as a round globular mass. It must be pushed on one side and the first head delivered with forceps.

If the first child is a breech presentation, after the trunk has been delivered the head of the second child may interlock with the head of the first. If this interlocking cannot be remedied, the first head must be decapitated, as this child is the most likely to be asphyxiated. The second head must then be delivered with forceps. The first child may be a head or a breech presentation, and the second child a transverse presentation. If possible the second child's position must be rectified by the bimanual method, or if pulsation in the cord of the first child has ceased, the trunk may be detached and the second child delivered by turning.

Abnormal conditions of the foetus are sometimes a bar to delivery. The foetus may be so large that when the head is delivered the shoulders cannot be brought down. Traction on the head must be made, pulling it well backwards. A finger should at the same time be passed up and hooked round the axilla, and an attempt made to get



the shoulders under the pubic arch. If all endeavours fail, evisceration must be had recourse to.

The foetus is sometimes affected with anasarca, or when dead with emphysema. In either case evisceration is the treatment. Hydrocephalus, although rare, is a great danger to the mother. As soon as it is clear that the head cannot be delivered, craniotomy should be performed. The foetus may be distended by ascites, by a distended bladder, or by cystic disease of the kidneys. In each case perforation of the trunk to lessen the size is the treatment.

The operation of turning is thus performed:—If the right hand and arm present, pass up the right hand on the left of the pelvis, along the right side of the child until the fundus is reached. Then, if the membranes are not previously ruptured, break through them with the fingers, and search for a foot. Be sure and make no mistake between a foot and a hand (see above). Seize the foot, and by gentle traction bring it down, when the arm will recede within the os. During the whole of this process, steady the uterus with the other hand on the fundus. If the left arm presents, introduce the left hand on the right side of the pelvis. The feet must be brought down over the abdomen, and not over the back. Protect the cord from pressure by pushing it aside to one or other sacro-iliac synchondrosis. If the head is long in being born, apply the forceps. It is sometimes possible to change the position of the foetus by external manipulation if the liquor amnii has not escaped. If the foetus is lying transversely, the patient being placed on her back and the knees flexed, one hand is placed on the head, which may be felt in one iliac fossa. The other hand is placed on the breech. The head is then pressed towards the pelvic inlet whilst the other pushes the breech upwards towards the median line. If it be desired to produce a breech presentation, this manipulation is reversed. When the head or the breech is placed well over the pelvic inlet, a firm binder should be applied.

Prolapse of the cord requires either its immediate



replacement within the uterus, or the delivery of the child. The first may be accomplished by raising the patient's hips very high on pillows, the waist being on a much lower level. The cord may then by the force of gravity slip back into the uterus, and a pain will force down the head, and prevent the re-prolapse. If this does not succeed, it may be slipped up beyond the vertex with the fingers. That failing, the loop of cord should be attached by a bit of tape to the eye of a soft catheter, and gently pushed back into the cavity of the womb. The catheter may be left in until the child is born. No steps need be taken if the pulsation in the cord has ceased, and the stethoscope still further confirms the death of the child.

Puerperal convulsions present all the ordinary features of epileptic convulsions. The treatment is:—1, evacuate the contents of the bowels freely with scammony and jalap; 2, shave the head, and apply ice or evaporating lotions; 3, empty the bladder, or at any rate pass a catheter to be sure that it is empty; 4, wait until the os is sufficiently dilated, and then apply the forceps and deliver the child as soon as possible. Chloroform should be given, both to allay the violence of the convulsions, and also to facilitate the delivery; 5, give chloral hydrate in thirty-grain doses. If the patient is unable to swallow, administer it by the rectum. If the uterus is rigid, and the labour does not advance, the convulsions being constant, perform craniotomy.

The symptoms of rupture of the uterus are:—1, Violent and continued uterine action without corresponding descent of the child; 2, sudden agonising pain of a crampy character; 3, a sensation of something having given way; 4, cessation of all uterine action; 5, sickness, clammy sweats, small pulse, and anxious expression; 6, recession of the child beyond the reach of the hand, its limbs being felt through the abdominal wall; 7, hæmorrhage from the vagina; 8, vomiting of a coffee-ground appearance. The treatment is at once to deliver the child. If the head can be reached, the forceps may be applied; if not, the hand and arm



being passed up into the uterine cavity, an attempt to turn must be made. If this cannot be done, it is better at once to perform the Cæsarean section as the best chance of saving the life of the child. Very free administration of stimulants throughout is needful.

Rupture of the bladder presents many of the symptoms of rupture of the uterus ; but, 1, there is no hæmorrhage from the vagina ; 2, no recession of the child, or indication of its presence in the abdomen ; 3, uterine action is not arrested. The belly, however, becomes rapidly swollen and tender. The treatment is, first of all, as rapidly as possible to deliver the child by the forceps or turning. A gum-elastic catheter must then be introduced into the bladder, and retained. One of the soft india-rubber catheters would be the best, if at hand. The patient must be placed under the influence of opium as rapidly as possible, and turpentine stupes applied to the abdomen (see p. 114).

Rupture of the perinæum is often the result of too speedy delivery, especially when the forceps are used. It is of little consequence, unless the sphincter ani is torn through. If this be the case, the better plan is at once to bring the parts together with interrupted sutures. It is not needful to use the quilled suture. Pass three or four sutures of silkworm gut through the deep parts with an Elder's needle, some superficial ones of fine silk, with an ordinary needle, being inserted between. The patient should be kept on her side, with the thighs tied together. The water must be drawn off with a catheter, and the bowels confined for a few days.

Inversion of the uterus is sometimes the result of precipitate labour, and sometimes it is spontaneous, occurring after labour, or as the result of violent coughing, or straining of any kind. The symptoms are :—1, Great pain, of a dragging, bearing-down character, with a sense of nausea and sinking ; 2, a round, hard tumour is felt per vaginam, whilst, on examining the abdomen, the uterus cannot be felt. The treatment is to return the womb to its proper position as soon as possible. To accomplish this, firmly



grasp the uterus, so as to empty it of blood, at the same time pressing firmly on the fundus with the palm of the hand. As the organ returns, follow it with the hand, which should not be withdrawn until the uterus firmly contracts upon it. If the placenta is attached, it must be removed before reduction is attempted.



## CHAPTER X

## POISONING

Poisoning by Sulphuric Acid—Carbolic Acid—Nitric Acid—Oxalic Acid—Salt of Sorrel—Hartshorn—Potash and Soda—Phosphorus—Arsenic—Scheele's Green—Orpiment—Simpson's Rat Paste—Corrosive Sublimate—Sugar of Lead—Blue Vitriol—Tartar Emetic—Chloride of Zinc—Cantharides—Paraffin—Mussels—Opium—Godfrey's Cordial—Dalby's Carminative—Paregoric Elixir—Mrs Winslow's Soothing Syrup—Prussic Acid—Cyanide of Potassium—Essential Oil of Bitter Almonds—Hydrate of Chloral—Alcohol—Chloroform—Tobacco—Strychnia—Battle's, Butler's, and Gibson's Vermin Killers—Hemlock—Water-Hemlock—Monkshood—St Jacob's Oil—Deadly Nightshade—Fungi—Bryony—Colchicum—Blair's Gout Pills—Laburnum—Camphor—Rubini's Solution—Spirits of Camphor—Camphorated Oil—Cocaine—Iodoform—The Use of the Stomach-pump—Table of Strengths of Subcutaneous Injections.

POISONING by strong sulphuric acid is accompanied by intense burning pain in the throat, gullet, and stomach, coffee-ground vomiting mixed with shreds of mucus and blood, vomited matters strongly acid in reaction; weak pulse; extreme collapse; mucous membrane of mouth white. Treatment:—The administration of any alkali at hand, such as lime or magnesia, soap and water, Dinneford's fluid magnesia, and of demulcent drinks. The use of the stomach-pump is contra-indicated in the treatment of all corrosive poisons.

The symptoms of poisoning by nitric acid are the same as those above, and the remedies are also the same.

Carbolic acid.—Poisoning by carbolic acid is usually accidental; several cases of death are reported as the result of its external application. In its concentrated form



it is a corrosive irritant, but it acts on the brain as a narcotic poison. There is intense burning pain; pupils contracted; urine very dark, sometimes suppression. Treatment:—Oil to allay pain; stimulants. Half an ounce of sulphate of magnesium, and half an ounce of sulphate of soda in half a pint of warm water. Five minims of solution of apomorphine (1—50) injected subcutaneously as an emetic. Wash out stomach with warm alkaline solution. The subcutaneous injection of atropine is recommended—4 to 12 minims. In this and all other doses of drugs given subcutaneously I advise the use of Huggett's permanent solutions. The strength of each solution referred to is given in a table at the end of the chapter.

Oxalic acid is sometimes taken in mistake for Epsom salts. The symptoms are—burning sensation in the throat, great collapse, and vomiting of dark green matter. Death is usually rapid from collapse. Treatment:—Give simple emetics, and then chalk or magnesia. Lime is the best antidote, oxalate of lime being insoluble. Water should not be given, as it increases the solubility of the acid, and aids to more rapid absorption. Salt of Sorrel, or essential salt of lemons, is used for bleaching straw and removing ink stains; it consists of acid oxalate of potash, and, if taken, produces all the symptoms of oxalic acid poisoning, and must be treated in the same way. Fatal dose, half an ounce.

Poisoning by “hartshorn and oil” is not uncommon. The symptoms are—intense burning sensation in the throat, gullet, and stomach, smell of ammonia in the breath, and, when vomiting occurs, which is not always present, the vomited matter is mixed with blood of a dark brown colour. The immediate remedy is to give vinegar, lemon-juice, and demulcents.

Potash and soda are commonly met with as pearlash (carbonate of potash), and soap-lees (carbonate of soda). The symptoms of poisoning by them are—an acrid, caustic taste in the mouth and throat, collapse, purging, and fre-



quently vomiting, with severe abdominal pain. Treatment : —Emetics, dilute acid liquids, oil and demulcents.

Phosphorus paste is sometimes taken as a poison. The symptoms of phosphorus poisoning are those of an irritant poison. There is intense thirst, nausea, severe pain, and an odour of garlic in the breath and vomited matter. The treatment is to administer emetics, and give magnesia : the best results are obtained by giving French Oil of Turpentine, ℥xxx frequently repeated. Oils and fats are not to be given.

Various powders for the destruction of vermin, &c., contain arsenic, and are frequent sources of poisoning. The symptoms come on about half an hour after the dose has been taken, and are—nausea and burning pain in the stomach, violent vomiting, intense thirst, purging, and pain in the epigastrium on pressure. The treatment is to excite vomiting as much as possible by the administration of a scruple of Sulphate of Zinc and Ipecacuanha and plenty of warm water, and to apply the stomach-pump as soon as possible. Apomorphia five to fifteen minims, given hypodermically, is a good emetic. The Hydrated Peroxide of Iron, given in large quantities, is also useful, and it may be readily prepared by mixing two or three ounces of Liquor Ferri Perchloridi B.P., with about a quarter of an ounce of Magnesia B.P. This preparation does not act unless a *solution* of arsenic has been taken. A mixture of linseed-meal, castor-oil, and water, made to the consistency of treacle, may also be given to protect the stomach. When the acute symptoms have subsided, 8 minims of solution of Morphia may be given.

Scheele's Green, or arsenite of copper, is met with in a variety of pigments and paper-hangings. Symptoms of poisoning by it are those of arsenical poisoning, and must be treated in the same way.

Orpiment, or sulphide of arsenic, is also employed in the arts as a yellow colouring, and may produce arsenical poisoning. Simpson's Rat Paste contains about 40 per cent. of arsenious acid.



Corrosive sublimate, or Perchloride of Mercury, when taken in poisonous doses, produces a metallic taste in the mouth, pain, vomiting of white matter, and profuse diarrhoea. Treatment:—Give simple emetics followed by white of eggs, and flour water.

Sugar of Lead, or Acetate of Lead, is frequently taken as a poison, although it is seldom fatal except when given in very large doses. The symptoms are:—Pricking sensation in the throat, dryness, thirst, vomiting, and colic. Treatment:—Emetics of Sulphate of Zinc, diluents, and Sulphate of Soda and Magnesia, and Phosphate of Soda.

Blue vitriol, or Sulphate of Copper, when taken, causes such severe vomiting as to be an antidote to itself. When this is not effectual, the symptoms are—headache, abdominal pain, purging, and sometimes convulsions. Treatment:—Encourage vomiting with warm water, and give milk, flour and water, and coffee; white of egg also is useful.

Tartar emetic has been taken in mistake for Epsom salts. The symptoms are—collapse, with livid countenance, violent pain in the stomach, spasmodic contraction of the muscles, particularly of the arms and abdomen, violent vomiting and purging. Treatment:—Excite vomiting, and use the stomach-pump; give infusions of gall-nuts or cinchona, or strong tea.

“Sir W. Burnett’s Fluid,” which is a solution of chloride of zinc, is not unfrequently the cause of poisoning. The symptoms are—astrigent metallic taste, burning pain in the gullet, painful vomiting, purging and collapse. Diluents must be freely given, and milk, white of egg, sedatives (opium) and alcohol. Phosphate of Soda should be given freely diluted, as it forms an insoluble phosphate. The fatal effects are generally of a secondary character.

Cantharides, either in powder or tincture, is sometimes administered in poisonous doses for criminal purposes, frequently producing abortion in pregnant women; one or two drachms of the powder will cause burning in the throat, pain in the abdomen, vomiting of bloody mucus,



incessant desire to pass water. Treatment:—Emetics and demulcents (*not oil*), opium and stimulants: wash the stomach out thoroughly.

Poisoning by paraffin is not unfrequent: Symptoms:—Burning of mouth and throat, collapse, intense drowsiness. Treatment:—Emetics, stimulants and demulcents. Amyl Nitrite subcutaneously—10 to 15 minims of a solution 1 in 10.

Poisonous mussels produce uneasiness and weight in the stomach, numbness in the extremities, dryness in the throat, cramps in the limbs, swelling of the eyelids, and eruption of nettle-rash, with great exhaustion. Emetics must be freely given, and diffusible stimulants, with opiates to allay pain.

In poisoning by opium the symptoms are:—Stupor, from which the patient may be roused, but at once relapses; pulse small and irregular; skin warm and livid; pupils contracted in the early stage, but dilated at a later period; occasionally the odour of opium in the breath. The symptoms usually commence about half an hour after the poison has been taken. Treatment:—Immediate use of the stomach-pump, Zinc emetics, animal charcoal, infusion of galls or Tannic Acid, cold affusion to the head, galvanism, and strong coffee. The subcutaneous injection of 4 to 12 minims of a solution of atropine is also useful. The patient must be kept in continual motion, the surface of the body being flapped with wet towels. Lastly, when all else fails, artificial respiration should be kept up for a considerable time.

Godfrey's Cordial is made of infusion of Sassafras, Treacle, and Tincture of Opium. It contains about one drachm of the latter in six ounces, or half a grain of Opium in an ounce. Half a teaspoonful has been known to cause the death of an infant.

Dalby's Carminative is composed of essential oils, aromatic tinctures, Carbonate of Magnesia, and Tincture of Opium. It contains one-eighth of a grain of Opium in every ounce. Forty drops have been known to kill an infant.



Paregoric Elixir is a preparation of Alcohol, Opium, Benzoic Acid, and Oil of Anise and Camphor. It contains one grain of opium in every half ounce. Half a teaspoonful has been fatal to an infant. Mrs Winslow's Soothing Syrup contains morphia. The "Mother's Friend" contains opium.

Prussic Acid when taken in a large dose is generally immediately fatal. In smaller doses (about thirty minims of the weak acid) the symptoms are, weight and pain in the head, giddiness, nausea, quick pulse, loss of muscular power, foaming at the mouth, strong odour of bitter almonds. Treatment:—Alternate hot and cold affusion to the head and spine, artificial respiration and galvanism. Carbonate of Ammonia internally, inhalation of chlorine gas, or small doses of Chloride of Lime or Soda. The chemical antidote, if there is time for its administration, is the moist Peroxide of Iron. Atropine may be given hypodermically, as a respiratory stimulant; from 4 to 12 minims of the solution.

Cyanide of Potassium, much used by photographers, when taken produces all the symptoms of poisoning by prussic acid; and the treatment is the same. So also the essential oil of bitter almonds, used as a flavouring, has been known to destroy life in a dose of seventeen drops. It is from five to eight times as strong as the acid of the Pharmacopœia.

Hydrate of Chloral. This is a powerful sedative and narcotic: several deaths are reported from an overdose, the patient becoming rapidly insensible. Treatment:—Stomach-pump, coffee and stimulants, galvanism, and the subcutaneous injection of 4 to 8 minims of a solution of strychnia.

The symptoms of poisoning from Alcohol come on in the course of a few minutes, and soon proceed to coma. Insensibility may, however, not come on for some time, and then suddenly. Intoxication, concussion of the brain, and poisoning by Opium are likely to be confounded. Usually in intoxication the smell of the breath is decisive. If this is absent, it may be presumed that the case is not one of



intoxication. In alcoholic poisoning the face is generally flushed and the pupils dilated ; in opium poisoning the face is pale and the pupils generally contracted. The temperature in alcoholic poisoning is generally below normal. The contents of the stomach will usually reveal the true state of affairs. Treatment :—Immediate use of the stomach-pump, cold affusions to the head, and artificial respiration if the breathing is affected. The subcutaneous injection of 2 to 5 minims of a solution of cocaine is recommended.

In threatened death from Chloroform, the tongue should be immediately pulled forwards with hooked forceps and the epigastrium forcibly pressed up ; artificial respiration by Sylvester's method (see p. 48) should be resorted to without delay, and galvanism : the patient should be placed in a current of cold air, and the chest and extremities flapped with a wet towel. The head, if the face is pale, should be lowered ; if turgid, should be raised. The lower jaw should be kept well pressed up. Artificial respiration should be kept up for a long period, even after all appearance of life has ceased. Inhalation of nitrite of amyl may be tried, or a subcutaneous injection of 10 to 15 minims of a solution ; laryngotomy may be required.

The symptoms of poisoning with Tobacco are, faintness, vomiting, giddiness, delirium, coldness of the surface, and convulsions ; death rarely results. The treatment is the administration of stimulants, strong coffee, and the application of warmth to the surface.

Poisoning with Strychnia shows itself at variable periods after the dose has been taken. The sixteenth of a grain has been known to kill a child, and half a grain an adult. The symptoms are, twitchings of the head and limbs, tetanic convulsions, opisthotonos, livid face, with complete retention of the intellectual faculties. The patient either dies or recovers within two hours of the commencement of the attack. The treatment is to inject into the stomach large quantities of powdered charcoal suspended in water. If the spasms have set in, chloroform should be given, or



large doses of chloral. The subcutaneous injection of 10 to 20 minims of curara is advised.

Battle's Vermin Killer contains 23 per cent of strychnine mixed with sugar, flour, and Prussian Blue. Butler's Vermin Killer contains about three grains of strychnine in each packet. Gibson's Vermin Killer contains half a grain of strychnine in each packet.

Hemlock, or *Conium maculatum*, has been taken in mistake for parsley. The symptoms are, loss of power in the upper and lower extremities and of deglutition, partial paralysis of sensation, and fixed pupils. The two plates, Figs. 120, 121, exhibit the difference between the leaves of hemlock and parsley.



FIG. 120.—HEMLOCK.

The water-hemlock has given rise to fatal accidents, its roots having been mistaken for parsnips. The symptoms are, dimness of sight, difficulty of breathing, burning pain in the stomach, vomiting and convulsions.



Monkshood, or *Aconitum Napellus*, has frequently been the cause of poisoning, the root being mistaken for

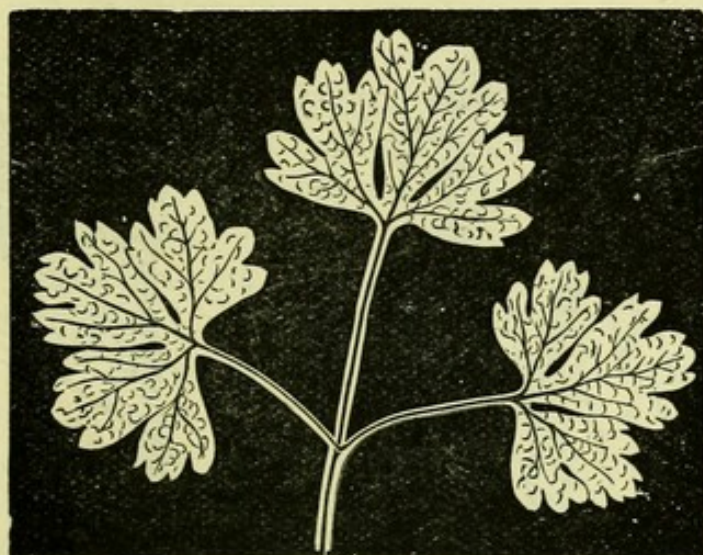


FIG. 121.—PARSLEY.

horseradish. Fig. 122 shows the difference between the two roots. The symptoms of poisoning are, tingling and numbness in the throat and limbs, frothing at the mouth, severe pain in the stomach, vomiting and purging, dimness of sight, dilated pupils, and livid skin. St Jacob's oil is said to contain aconitine.

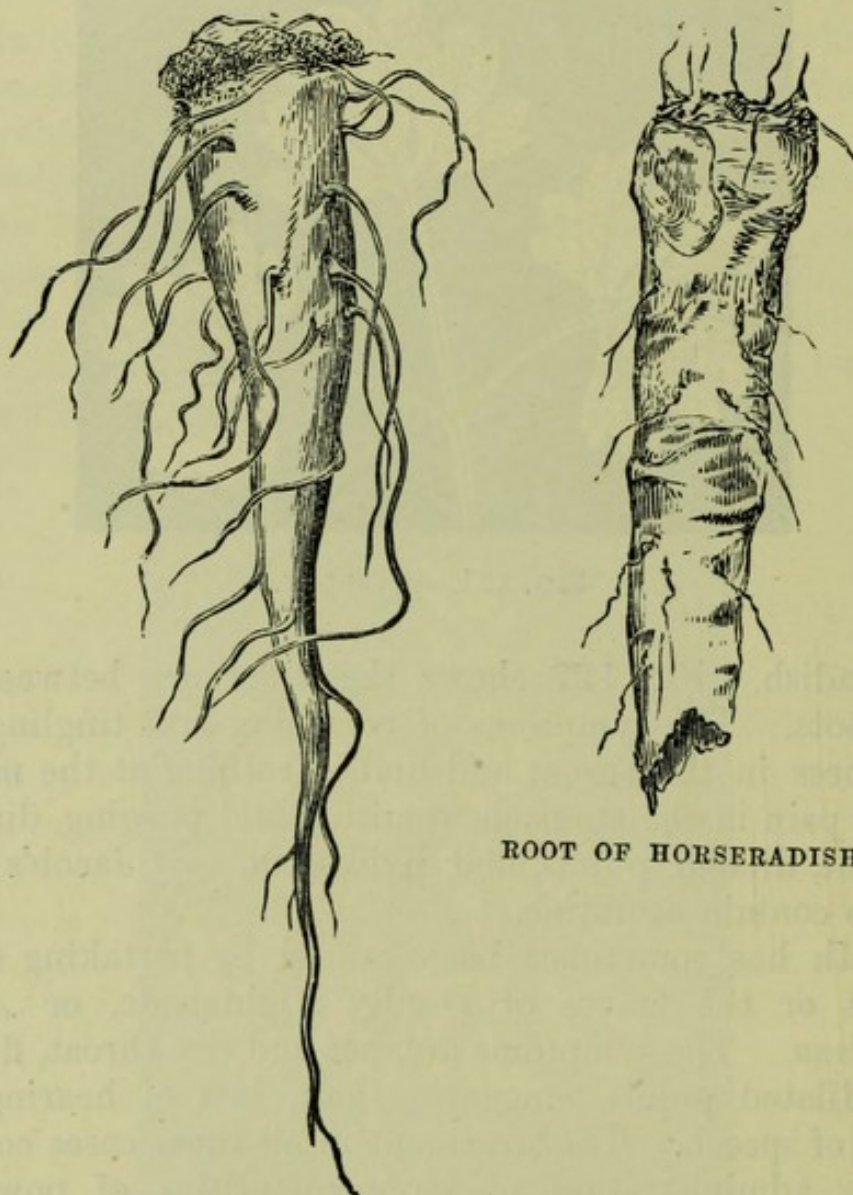
Death has sometimes been caused by partaking of the berries or the leaves of Deadly Nightshade, or *Atropa belladonna*. The symptoms are, hot and dry throat, flushed face, dilated pupils, staggering gait, loss of hearing and power of speech. The treatment in all these cases consists in the administration of large quantities of powdered animal charcoal, suspended in water, and afterwards a Zinc emetic and purgatives. Opium is an antidote.

The red berries of Bryony are frequently taken by children. The symptoms are delirium, vomiting, diarrhoea, dilated pupils, coma. Treatment:—Emetics and free stimulation.

Colchicum in overdose causes pain, vomiting, purging with bloody stools, thirst, dilated pupils, muscular twitchings.



Mental faculties clear, but sometimes delirium. Treatment :—Stomach-pump, emetics, tannic or gallic acid in half-drachm doses frequently. Stimulants. Morphia.



ROOT OF HORSERADISH.

ROOT OF ACONITE.

FIG. 122.

Blair's gout pills contain colchicum, and have produced symptoms of poisoning.

Laburnam : All parts of the plant are poisonous. Symptoms :—Purging, vomiting, drowsiness, convulsive twitchings. Treatment :—Stomach-pump, emetics of mus-



tard or sulphate of zinc. Stimulants. Injection of a pint of strong coffee into rectum.

The treatment of poisoning by Fungi is to produce vomiting by tickling the fauces with a feather, and to inject four drops of the solution of Atropine hypodermically, repeating the injection at short intervals if required.

Camphor. Symptoms :—Odour in breath, giddiness, faintness, delirium, convulsions. Treatment :—Stomach-pump and emetics. Free stimulation. Warmth and rubbing. Alternate hot and cold douche to head and chest. Rubini's Solution is a saturated solution of camphor in alcohol. Spirits of camphor contain 1 in 10. Camphorated oil 1 in 5.

Cocaine. Serious symptoms have been observed after the injection of cocaine—faintness, giddiness, dyspnoea, nausea, weak pulse, pain in the lumbar region, delirium, convulsions. Treatment :—Free stimulation and the inhalation of nitrite of amyl.

Iodoform, when used in surgery sometimes produces the following symptoms :—Delirium, drowsiness, high temperature and rapid pulse. These symptoms are more usual when it is used with carbolic acid. The treatment is to withdraw the dressing and syringe out all sinuses into which it has been placed with oil of eucalyptus.

The stomach-pump should be used as follows :—Bend the extremity of the long tube rather abruptly at its point, and oil it ; pass it to the back of the throat, and when the tube touches the back of the pharynx, bend the patient's head a little forwards ; slight pressure will then make the tube pass on to the back of the larynx, when it will be arrested, but gentle pressure will overcome the difficulty. When the tube has reached the stomach, inject some water ; in order to do this, fill the pump with water from a basin by steadily drawing out the piston (Fig. 123), the lever connected with the stop-cock being not pressed down. The pump being filled with water, press down the lever with the thumb of the left hand, and gently press in the piston with the right, thus propelling the water into the stomach.



When enough has been injected reverse the action. If the tube becomes blocked, again reverse, and so eject the

FIG. 122.

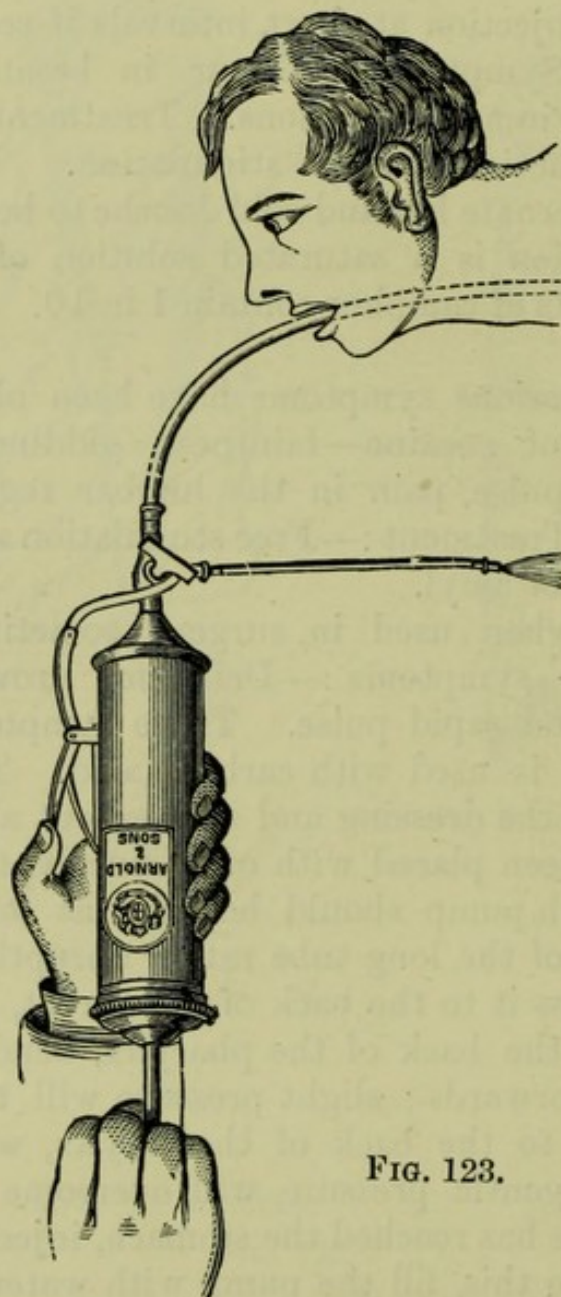


FIG. 123.

fragment blocking the eye of the tube. If the patient is unconscious or unruly, the mouth must be opened with a screw-gag, and kept open with a wooden gag supplied for the purpose with the stomach-pump.



A far simpler and less expensive form of stomach-pump is that introduced into the profession by Mr Tosswell, of Exeter.

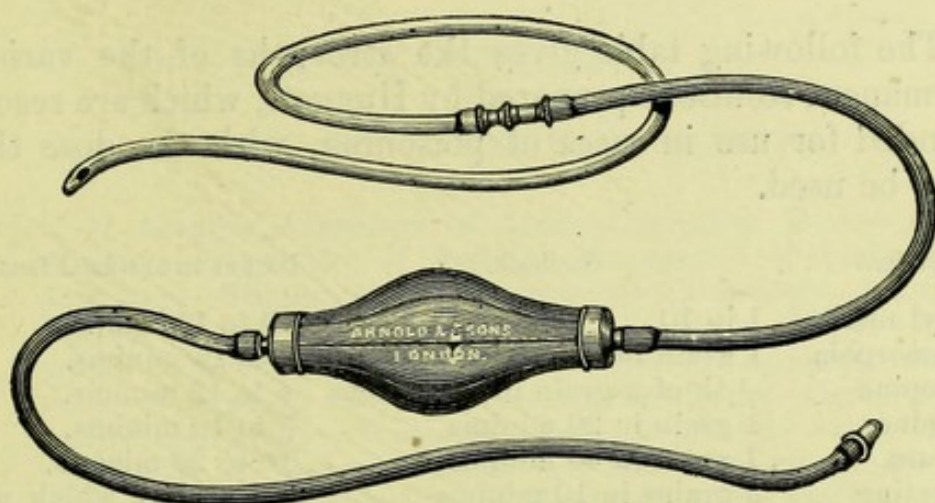


FIG. 124.

The long flexible india-rubber tube is passed to the back of the mouth, and then its passage down the œsophagus is effected by twisting it round and round in the hand until it reaches the stomach. One end of the tube is then fixed to the apparatus, which consists of a Higginson's syringe without the valve, and the other end is placed in a jug of water. Then the tube is pinched up by the finger and thumb at a point between the ball and the mouth, the ball being at the same time compressed by the other hand and the air in it expelled. The ball then becomes filled with water, and on raising the jug above the patient's head and discontinuing the pinching of the tube, the water flows in a continuous stream into the stomach. When enough has been introduced, the tube must again be pinched between the ball and the mouth, the end of the tube taken out of the jug and placed in a basin, below the level of the stomach, when upon discontinuing the pinching of the tube, the fluid will flow in a continuous stream from the stomach into the basin. Should the stomach tube become choked, it can be freed by pinching the tube between the ball and the jug, and compressing the ball with the other hand, when



the fluid contained in it will be pressed out and the tube freed. A still more simple apparatus is the ordinary rubber stomach-tube with a small glass funnel. With this, fluid can be poured into the stomach and then syphoned out.

The following table gives the strengths of the various permanent solutions prepared by Huggett, which are recommended for use in cases of poisoning, with the dose that may be used.

Solution.	Strength.	Dose as an Antidotal Remedy.
Amyl nitrite	1 in 10	10 to 15 minims.
Apomorphia	1 grain in 60 minims	5 to 15 minims.
Atropine	$\frac{1}{20}$ th of a grain in 12 minims	4 to 12 minims.
Cocaine	1 grain in 20 minims	5 to 10 minims.
Curara	1 grain in 40 minims	10 to 20 minims.
Ergotine	3 grains in 10 minims	10 minims, which may be increased.
Morphine	1 grain in 16 minims	4 to 8 minims.
Strychnine	$\frac{1}{20}$ th of a grain in 12 minims	4 to 8 minims.

Messrs. Maw, Son, and Thompson are the agents for these solutions, and they provide cases containing the various tubes with a subcutaneous syringe.



## CHAPTER XI

### ASEPTIC AND ANTISEPTIC TREATMENT

Object of Asepsis—Avoidance of Dust—Operating Room—Asepsis of Skin—Preparation of Patient—Preparation of Surgeon and Assistants—Sterilisation of Instruments—Dressings—Sutures—Ligatures—Sponges—Drain-tubes—Sterilised Water—Antiseptic Solutions—Treatment of Wounds—Temperature Indications—Emergency Cases: Antiseptic Treatment—Carbolic Acid—Antiseptic Gauze—Gauze Bandage—Boric Acid—Salicylic Acid—Chloride of Zinc—Iodoform—Oil-Silk Protective—Drainage-Tube—Abscesses—Precautions before and during an Operation—Dressing after Operations—Compound Fractures—Dressing in Compound Fractures—Operation on parts affected with Sinuses—Abscess by the side of Rectum—Superficial Sores—Corrosive Sublimate—Double Cyanide Gauze.

THE great object of aseptic surgery is to prevent poisonous germs from entering wounds. The idea that wounds are infected by air has been much modified. It has been proved that the micro-organisms which are the agents of wound infection are not found in the air in any appreciable numbers. Hence the use of the carbolic spray has been universally abandoned. To prevent infection by the air we must avoid the presence of dust, or the stirring up of any dust that may be unavoidably present.

The room in which an operation is about to be performed should be as far as possible denuded of any dust-catchers in the shape of curtains, carpets, &c. ; and all cornices on which dust can settle should be well wiped over with a damp cloth. If possible, for an hour or two before an operation the room should be closed so as to allow all particles of dust floating in the air to settle.

The great object of asepsis is to prevent infection by contact. One of the most fertile sources of bacterial infection



is the human skin and mucous membrane. It is therefore of the utmost importance that the skin both of the patient and the surgeon and his assistants should be rendered aseptic. Previous to all major operations, especially abdominal cases, the patient should be well bathed once or twice if possible. The skin in the neighbourhood of the operation should be thoroughly well scrubbed with soft soap and a brush, and then shaved, not only to remove hairs, but also to scrape off the superficial layers of the epidermis. It should then be well rubbed with alcohol. If the skin is very dirty, a preliminary scrubbing with ether is advisable. The parts are then covered with a cloth wrung out of a 1 in 20 carbolic acid solution. In operations on mucous membrane the process of cleansing is much more difficult. Simple irrigation with 1 in 1000 solution of sublimate is of little use, and may be harmful, especially in vaginal or rectal cases. The only useful method is by mechanical wiping with sterilised gauze and a weak boric solution. In all operations on the alimentary canal, copious evacuations obtained by castor oil or Epsom salts should be produced daily for some little time before the operation. Before operations on the stomach it should be daily washed out with boric solution. It is needful that everything used for cleansing should itself be free from infective material. All the water should be sterilised by boiling, and for surface use should have added to it sublimate in the proportion of 1 in 1000 or 1 in 2000. It is important to remember that sublimate solutions should if possible be prepared at least twenty-four hours before use. If gauze sterilised by steam cannot be obtained, towels fresh from the laundry may be used. Brushes should be new, should have been boiled in water and kept in a sublimate solution 1 in 2000; without these precautions they are worse than useless. The hands and arms of the surgeon and his assistants should be rendered aseptic, first by being scrubbed with soap and hot water; they are then dried and well rubbed with sterilised gauze, particular attention being paid to the folds of the skin and the space under the nails. They are



to be finally washed in a 1 in 2000 sublimate solution. All metal instruments should be sterilised by boiling for five minutes in water containing one per cent. of carbonate of sodium. Cutting instruments should remain only one minute, or they will blunt. The water should have been previously boiled for some time. By this method the instruments do not rust. On removal from the boiler they should be placed in dishes, previously boiled in the soda solution, and filled with a cold soda solution, or a solution of carbolic and soda of each one per cent. During the operation soiled instruments which are to be used again in the same operation should be washed in cold water and again placed in the boiling soda solution. After the operation the instruments should be well rinsed in cold water, scrubbed with a hot solution of soda and soap, and finally dried and rubbed with alcohol and a piece of chamois leather.

An elaborate apparatus for sterilisation is unnecessary. A small fish kettle with its drainer will answer most purposes, and for small operations not requiring many instruments, an ordinary saucepan will suffice.

A very useful portable steriliser is made by Messrs. Down. It consists of a boiler into which fits a wire tray for the instruments. The cover of the boiler forms the cooling tray into which the wire tray is lifted after the instruments are sterilised. When it is closed up for carrying about, the spirit lamp is placed inside; there is room also for many instruments as well. The apparatus is shown in Fig. 125.

The sterilisation of catheters is very important. Metal catheters may be sterilised by boiling in a soda solution, and should be kept in air-tight tin boxes. Rubber instruments may be disinfected by steam or in a boiling soda solution. They do not stand the repetition of the process frequently. Gum elastic and silk web catheters can be made quite clean by vigorous rubbing with sterilised gauze and sublimate solution. In order to thoroughly clean the inside, a sublimate or carbolic solution should be syringed through them. In selecting catheters those with solid



ends should be chosen, as the hollow tube below the eye of the ordinary catheter is a favourite deposit for decomposing matters.

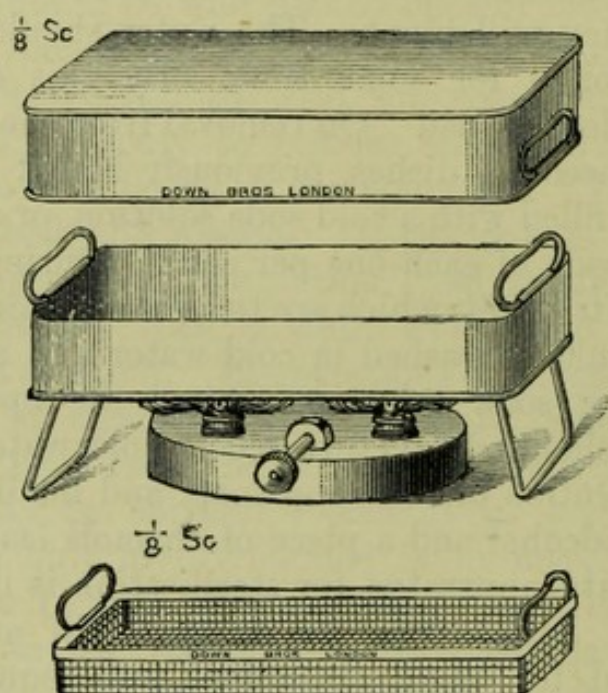


FIG. 125.

Aseptic dressings must be absorbent, sterilised, and such as will prevent decomposition of the secretions absorbed. The best material is gauze, and the next to it, turf moss, either sewn up in gauze bags or in the shape of moss felt, prepared by compressing damp moss. For the purposes of sterilising dressings, bandages, towels, &c., a special apparatus is needful. Fig. 126 is the simplest. It consists of a double cylinder. The space between the cylinders is filled with water about one third full through the funnel A. The height of the water is indicated by the glass gauge B. The material to be sterilised is placed in the cylinders and the top screwed down. The gas is then lighted, and the escape tube C placed in the condenser D, in which a few inches of water is placed, enough to cover the end of the tube. After the temperature, as indicated by the thermometer, has risen to  $100^{\circ}$  C., the materials should be subjected to that heat for three-quarters of an



hour. They come out quite dry. If it is required to keep the dressings for some time, or to take them any distance,

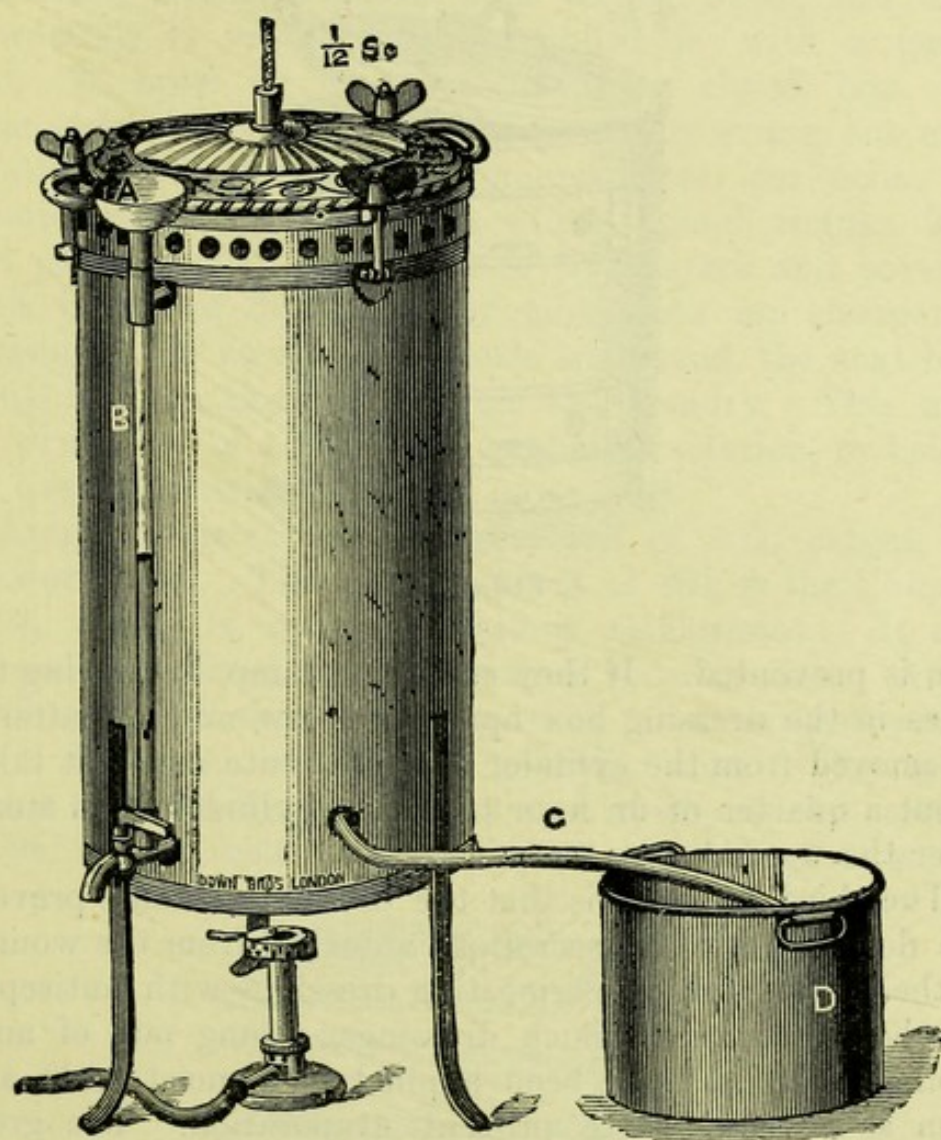


FIG. 126.

they should be placed in a dressing box (Fig. 127) before going into the cylinders.

The holes in the upper and lower part are opened by slides to allow the steam to permeate. On removal from the cylinder these apertures are closed. The dressings may be preserved by being simply wrapped up in Gamgee tissue. In order to prevent the materials from getting wet by the steam condensing on them, which it does if they are cold,



they should be placed in the cylinder before the steam is fully generated. They then become warm, and condensa-

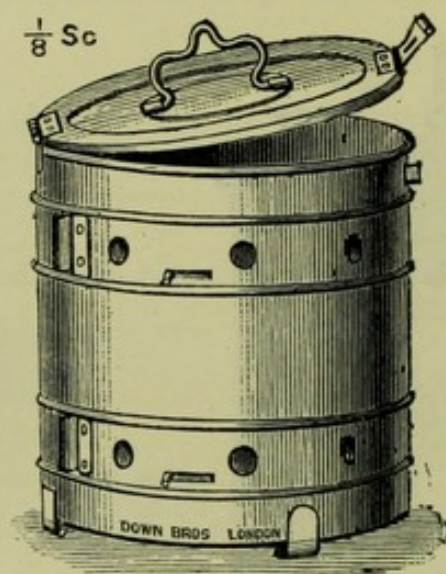


FIG. 127.

tion is prevented. If they come out damp, by leaving the holes in the dressing box open for a few minutes after it is removed from the cylinder they get quite dry. It takes about a quarter of an hour to fill the cylinder with steam after the water begins to boil.

The third necessity is that the dressings should prevent the decomposition of secretions absorbed from the wound. Hitherto the plan of permeating dressings with antiseptic has been the rule. Such dressings, wrung out of antiseptic solutions, have been applied in a moist state and then so covered as to prevent evaporation. The great object of an aseptic dressing should be to promote evaporation. It should be placed dry upon the wound and kept as dry as possible by evaporation. If the discharge comes through the dressing it may be allowed to dry by exposure to the atmosphere. If the dressing is much soaked with discharge, the superficial layers only should be removed and fresh dressing applied. In ordinary cases it will not be needful to change the dressing for seven or eight days. In some cases where wounds are foul and the discharge is too thick for absorption by the gauze, or



where there are cavities which have to be plugged, the best dressing is iodoform gauze. This is prepared by sprinkling sterilised gauze with boiling water, and then powdering it with iodoform rubbed in with a gauze pad. It must be kept for use in a closed box. In some cases of very foul discharge gauze wrung out of a solution of acetate of aluminium three per cent., or chloride of zinc one per cent., will be found useful. The wet gauze should be laid on in thin layers and covered with layers of dry gauze or moss. As an emergency dressing when no sterilised gauze is at hand, the next best thing is clean linen fresh from the laundry. This may be wrung out of a 1 in 1000 sublimate solution, or boiled for a few minutes in water.

Aseptic sutures and ligatures are of silk, catgut, or silkworm gut. The best material of silk is the Chinese twist, which is made of various thicknesses. It can be easily sterilised by boiling in a soda solution. After sterilisation it should be placed in a watertight vessel in a 1 in 20 solution of carbolic acid. The most useful form of ligature holder, one which can be carried about in an instrument bag without leaking, is made

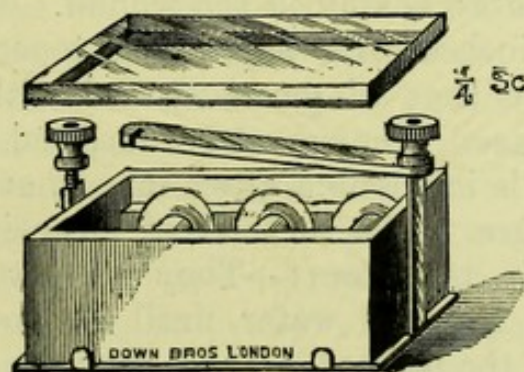


FIG. 128.

by Messrs. Down (Fig. 128). The finer silk may be used for ligatures and for suturing intestine, the medium for sutures, and the stronger for ligaturing the pedicle in ovariectomy, &c. The ideal ligature, if it can be obtained in perfect order, is catgut. Hitherto the pro-



cess has not been successful. The following plan is stated to be as near perfection as possible. The catgut is first soaked in ether for twenty-four hours to remove all fat. It is then placed in the following solution :

Sublimate	.	.	.	.	.	10·0
Absolute alcohol	.	.	.	.	.	800·0
Distilled water	.	.	.	.	.	200·0

This solution is renewed in twenty-four hours and again in forty-eight hours. The gut is then placed in alcohol, absolute if a very stiff material is required, or diluted with 20 per cent. of glycerine if a softer form is wanted. It can be kept in these solutions in stoppered bottles or in special bottles provided with reels. Silk-worm gut is a very good material for surface sutures, as it is absolutely non-absorbent. It only requires to be soaked in a warm carbolic solution to make it soft and pliant, just before use. It should be kept in a 1 in 20 solution of carbolic acid.

Asepticity in sponges is of the highest importance. Whenever it is possible it is better to use as a sponge something that can be at once destroyed. It must be absorbent, capable of making pressure and such as will not leave any fibre behind in the wound. Gauze cut into squares eight inches each way, folded together and rolled into a ball, or bags of gauze stuffed with moss, make excellent sponges. They must be sterilised with the other dressings. It is impossible altogether to avoid the use of ordinary sponges. The method of cleansing them after an operation is as follows :—They are first rinsed out in cold and then in warm water, until all blood-clot, &c., is removed from the meshes. Then they are put in a linen bag and placed in soda solution just at the point of boiling (sponges will not stand boiling) for half an hour. They are then well washed out in boiled water and put into a 1 in 1000 sublimate solution for keeping.

Drain-tubes are for ordinary purposes best made of india rubber, as they stand heat and can be easily sterilised. For abdominal cases glass tubes are needful. For drain-



ing cavities by capillarity, strips of sterilised gauze or iodoform gauze may be used.

Water can be sterilised by boiling for five minutes. It is important in making antiseptic solutions that sterilised water should be used, as weak antiseptics such as boric and carbolic acids do not destroy dangerous germs. Sublimate, however, is a strong germicide, and in from fifteen to twenty minutes will destroy all suppurative germs. It should be remembered that ordinary water is often rich in alkaline earths which have the effect of precipitating the sublimate in an insoluble combination. To avoid this, equal parts of common salt and sublimate should be added to the water. Angerer's pastilles are formed on this principle; one to a litre of water forming a 1 in 1000 solution. Many of the solutions used for subcutaneous injections contain numberless bacteria. The addition of a few drops of liquefied carbolic acid will protect them from invasion.

The treatment of operation wounds by the aseptic method is briefly as follows:—Every possible point of hæmorrhage is ligatured with catgut. Capillary bleeding is stopped by pressure with gauze sponges. When the wound is absolutely dry, the sutures of silk or silkworm gut are inserted and left to be tied until the last moment. If there are any pockets or cavities, drain tubes should be inserted and fixed in their place by a stitch to the skin, or prevented from slipping back into the wound by a sterilised safety-pin passed at right angles to the tube. No irrigation by aseptic fluids is needful. The sutures are now tied, the skin wiped clean, and a dressing of twenty layers of sterilised gauze applied, which must pass considerably beyond the operation area. This is covered with absorbent cotton-wool, previously sterilised, and retained in its place by a light bandage. Under ordinary circumstances this dressing need not be removed for seven or eight days. Sometimes owing to continuous oozing it is impossible at once to close the wound. It should be packed with strips of iodoform gauze which can be removed in forty-eight hours, and the wound then closed by sutures. In



the case of operations for necrosis of bone, excision of the upper jaw, excision of the rectum, and in cranial surgery, the use of iodoform tampons is invaluable. The wound may be firmly plugged, and the tampon need not be removed for many days.

With regard to temperature after operation, it has been observed that in a large proportion of cases what is called aseptic fever will set in on the evening of the operation, the temperature rising sometimes as high as  $102^{\circ}$  or even  $104^{\circ}$ . This is no sign of infection. If, however, a high temperature sets in on the second or third day, it is a sign of septic infection and should give anxiety. In the treatment of emergency wounds, all examination of the wound by the finger or the probe should be avoided, as also should all irrigation. The first object should be to seal the wound by some aseptic material. If aseptic gauze is not at hand, a towel fresh from the laundry will suffice for the moment. In wounds of large vessels hæmorrhage should be restrained by an india-rubber tube secured round the limb, and the wound temporarily closed until the patient can be removed home or to hospital. In compound fractures with small wounds, an aseptic dressing should be applied with temporary splints for removal. In bullet wounds the same treatment as to dressings should be observed. In treating extensive wounds, tampons of iodoform gauze should be applied.

It will be seen by the foregoing that the method of asepsis differs materially in many respects from the usual antiseptic precautions at present used by many English surgeons. It is more than probable that a combination of both methods may be found useful. The following remarks by the late Dr Bishop and Mr Watson Cheyne which appeared in the last edition of this book still hold good in many respects.

Pure carbolic acid, remarkable for its power of destroying low forms of life, is, on the whole, the most efficient antiseptic for general purposes. Its energetic action on the epidermis makes it the best agent for cleansing pur-



poses. In the form of one in twenty watery solution, it is used for purifying the integument of the part to be operated upon, and the sponges, instruments, &c. As a one in forty solution, it is used for washing sponges during an operation, for the hands of the operator and assistants, and for the changing of dressings.

The volatility of carbolic acid renders it invaluable for dressing hollow wounds and abscesses. It is the active constituent of the ordinary dressing—antiseptic gauze<sup>1</sup>—which is applied in eight layers, of size proportioned to the expected amount of discharge. A piece of thin mackintosh cloth (technically called hat lining) is interposed beneath the outer (eighth) layer of gauze, to prevent the discharge from soaking directly through the centre of the dressing, washing out the portion of acid there stored up, and thus giving putrefactive organisms direct access to the cavity. Further, as carbolic acid is given off very slowly by the gauze at the ordinary temperature of the air, it is quite possible that septic organisms, accidentally adherent, might be conveyed to the wound in a living condition by the surface of the dressing itself. To guard against this mishap, a small piece of gauze wrung out of the one in forty solution is applied before the ordinary eight-fold dressing.

The antiseptic gauze is convenient in the form of bandage, which not only applies itself, and retains its position better than a calico bandage, but is often a valuable addition to the antiseptic quality of the dressing. In the case of stumps, in which there is a tendency to retraction of the soft parts, the antiseptic bandage enables the surgeon to overcome what would otherwise be a considerable difficulty in the treatment of the case.

Boric acid is a valuable antiseptic, but its non-volatility prevents it being used for the dressing of hollow wounds. It is bland and unirritating as compared with carbolic acid, and is therefore particularly useful as a dressing for superficial wounds and sores. It is employed in the form of a

<sup>1</sup> The gauze is now prepared with one part of pure carbolic acid to four parts of resin and four parts of pure paraffin.



saturated watery solution ; as boric lint, which contains about half its weight of the crystals of boric acid ; and as an ointment, which may be prepared by mixing one part of powdered boric acid with five or ten parts of a mixture of vaseline and paraffin (1—2), according to the strength desired.

Salicylic acid, which was introduced into surgical practice by Professor Thiersch, of Leipzig, at the suggestion of Professor Kolbe, has not been adopted by Sir Joseph Lister as an ordinary dressing, having been proved by him to be inferior to carbolic acid in its power of destroying bacteria, though very efficient in preventing chemical fermentations. He has, however, found salicylic acid to be of great use in certain exceptional cases, where irritation of the skin occurs after a gauze dressing has been left on for several days. The form of eczema thus arising was formerly attributed by Sir Joseph Lister to the irritating effect of carbolic acid on sensitive skins, but the invariable disappearance of the affection after one or at most a few applications to the inner layer of the gauze dressing of a small quantity of salicylic acid suspended in one to forty carbolic acid solution has shown the irritation to be due to an alteration in the effused serum brought about by some other agency. The salicylic wool is very valuable as a dry dressing.

Chloride of zinc has the remarkable peculiarity among antiseptics of producing such an effect upon the tissues of a recent wound, when applied in a watery solution of about forty grains to the ounce, that, as the result of a single application, the cut surface, though not presenting any visible slough, is rendered incapable of putrefaction for two or three days, notwithstanding its exposure to the influence of septic material. The patient is thus tided over the dangerous period preceding granulation, during which the divided tissues are most prone to inflammation and the absorption of septic products. Hence this salt, though very irritating and non-volatile, and therefore not adapted for general use, is of the highest value in circumstances



which render it impossible to exclude septic organisms in the after-treatment ; as, for example, after the removal of tumours of the jaws, or excisions in parts affected with putrid sinuses. The solution is freely applied to all textures, including bones, by means of a piece of lint held in dressing forceps. Sinuses are injected at the conclusion of the operation by means of an ordinary brass syringe.

Iodoform, which has the advantage over chloride of zinc of not causing pain, has lately been sprinkled over the surface of putrid ulcers, in order to purify them prior to the application of the antiseptic dressing.

In order to obtain the best results from the antiseptic treatment it is desirable to protect the healing parts from the irritating influence of the antiseptic itself, which, in the case of carbolic acid, would often prevent cicatrisation altogether, and which even with the much blander boric acid is better avoided. This protection is effected by interposing a layer consisting of some material unirritating in itself, and as far as possible impervious to the antiseptic agent.

The protective commonly used is composed of thin oil-silk, varnished with copal and then coated with a layer of dextrine. The dextrine allows the oil-silk to become uniformly wetted by the antiseptic solution, into which it is dipped at the moment of application. It is obvious that the antiseptic dressing proper must extend a considerable distance beyond the protective, or putrefaction may spread under the latter in spite of the dressing which is above it. A thoroughly aseptic sponge, wrung out of the one in twenty carbolic acid solution, is often a useful addition to the first dressing when uniform pressure is desired after an operation. The sponge should be placed above the protective and beneath the large eight-fold (or outer) dressing.

The application of antiseptics to the raw surfaces of a wound causes a certain amount of irritation, and leads to an unusually abundant discharge of serum ; hence, in order that this may not be pent up, and occasion inflammation from tension, a very free outlet must be provided. This



is effected by means of Chassaignac's drainage-tubing, of which the red is preferable to the black variety. Four sizes are used, having an external diameter of  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ , and  $\frac{1}{8}$  inch respectively. Large holes are cut in the walls to allow the discharge to reach the interior of the tube; and two loops of silk thread, knotted at the ends, are attached to opposite sides of the margin of the outer extremity of the tube to prevent its displacement. The outer end is cut either transversely or obliquely, according to the direction of the cavity, so that the orifice of the tube may be flush with the integument.

When abscesses are opened, a drainage-tube should be used, of a length equal to the depth of the cavity, and of a calibre proportioned to the quantity and thickness of the pus discharged. The tube should be shortened from time to time as the cavity becomes smaller.

Horsehair which has been soaked for a few minutes in one to twenty carbolic acid solution constitutes an efficient drain for operation wounds, &c. As the discharge of serum diminishes, the drain may be lessened by removing a few hairs at each dressing. The drain may be partially drawn out of the wound and shortened when expedient. In large operation wounds it is often desirable to use both drainage-tubes and drains of horsehair. In these circumstances the tubes are discontinued before the horsehair.

## DIRECTIONS FOR SPECIAL CASES

### I. *Abscess*

This is the simplest case for antiseptic treatment, the antiseptic not being applied at all to the affected tissues, but being used merely to prevent the access of septic mischief from without.

Carefully select the spot for incision, with special attention to its distance from a source of putrefaction,<sup>1</sup> so that

<sup>1</sup> So important is this that it might lead to the refusal to operate, *e.g.* in a case of spinal abscess pointing near the anus.



the dressing may extend freely beyond the incision in every direction. The skin, the knife, and the operator's fingers having been cleansed with one in twenty carbolic acid solution, after shaving off hairs from the integument, if necessary, make an incision in the selected position, and of such a size as will easily admit the drainage-tube; press out the pus;<sup>1</sup> insert the drainage-tube, and extend the loops of silk in opposite directions; apply over the incision a small bit of gauze wetted with carbolic acid solution; cover this with a large dressing consisting of eight folds of gauze and the enclosed piece of mackintosh, as above described; and, lastly, secure this with a well-adjusted gauze bandage and with safety-pins, which must not penetrate the centre of the mackintosh, or its efficiency will be destroyed. When the abscess is situated in a part where the dressing is particularly liable to disturbance from the movements of the patient (as at the groin, in case of psoas abscess), great additional security is afforded by the employment of a turn or two of elastic webbing applied over the edges of the dressing, but not so tightly as to occasion uneasiness or oedema of the limb. This elastic bandage follows the movements of the patient, and ensures the constant application of the dressing to the skin. If it is desirable to explore the abscess-cavity with the finger, special care must be taken that the latter be well cleansed about the nail and elsewhere with carbolic acid solution immediately before introduction.

Next day let a hand be placed so as to keep the dressing in position whilst the pins are being removed and the bandage is being cut. Cautiously raise the dressing and remove the drainage-tube;<sup>2</sup> cover the incision with a guard; wash the drainage-tube and the skin with one in forty carbolic acid solution; remove the guard, insert the tube, and dress as above described.

<sup>1</sup> In strumous abscesses it is often advisable to apply a sharp spoon to the walls of the cavity.

<sup>2</sup> Usually it is best to leave the drainage-tubes undisturbed during the first three or four days, otherwise there may be difficulty in re-inserting them.



As the discharge diminishes, dress the case every two, three, four, five, or six days as required, the general rule being that the dressing is changed, if discharge is found to have made its appearance beyond it at the usual time of the surgeon's visit, a week being the longest time that a carbolic gauze dressing is left unchanged. Give the same amount of care to every dressing until cicatrisation is complete; this being the only trustworthy evidence that the sinus is closed. In cases of chronic abscess, due to caries of vertebræ, or to morbus coxæ, keep the patient in bed six weeks after the abscess is closed. In the latter cases keep on the long splint during the whole period.

## II. *Operations on Parts where the Skin is unbroken*

These cases come next in the order of simplicity of treatment, the essential object being, as in abscesses, to prevent the introduction of septic organisms during the operation.

Prepare the skin, the hands of the operator, and the instruments as above; conduct the operation as usual.

After securing the vessels, adjust a drain, and stitch up the wound; then dip into the solution a piece of protective large enough just to cover the incision, and lay it upon the wound; over this apply a piece of gauze wetted with the solution, a sponge if required,<sup>1</sup> and then the usual well-overlapping dry gauze dressing. Change the dressing next day, and afterwards dress daily, or less frequently, according to the amount of the discharge. As a rule, the dressing should not be left on longer than a week, otherwise putrefaction might occur after the evaporation of the carbolic acid from the gauze.

In amputations apply a gauze dressing large enough to envelop the limb, and to turn up over the face of the stump, like the wrapping at the end of a parcel.

In primary amputations, and in amputations through limbs above the seat of putrid discharge, cover the con-

<sup>1</sup> It is often useful to secure the deep dressing by means of one or two turns of gauze bandage.



tused or putrid parts with a towel wrung out of one in twenty carbolic acid solution, so that the sound parts may not become contaminated during the operation.

### III. *Accidental Wounds, including Compound Fractures and Dislocations which do not require Amputation*<sup>1</sup>

Here, opportunity having been afforded for the entrance of septic material either in the infliction of the injury, or subsequently before the case is seen by the surgeon, the antiseptic must be applied to all the recesses of the wound in order to counteract the mischief which has so entered. For this purpose a strong antiseptic solution must be used, but while it must be introduced among the blood-clots in the recesses of the wound, it is very undesirable that it should pass unnecessarily into the cellular tissue. In ordinary circumstances the one in twenty carbolic acid solution is employed, but instead of forcing it into the wound generally, by means of a syringe, a better plan is to apply it to the various irregularities of the injured part by a flexible catheter adapted to the syringe with caoutchouc tubing. When many hours have passed since the infliction of the injury, Sir Joseph Lister has for several years used a still more powerful solution, viz. one part of carbolic acid to five parts of methylated spirit.

These operations require that the skin should be cleaned with the one in twenty carbolic acid solution. If a fragment or an end of a bone is projecting, it is well washed with the same solution and returned, in some cases after sawing off its extremity; but reduction is never effected until the depths of the wound have been injected, and, of course, loose fragments and foreign bodies extracted.

It is difficult to assign the precise limit of time when antiseptic treatment must be regarded as hopeless in such injuries. Success has sometimes been obtained as late as thirty-six hours after the accident.

<sup>1</sup> Experience will soon teach the surgeon that he may save, under the antiseptic treatment, many cases that would require amputation without it.



The introduction of stitches should always be avoided in this class of injuries, whilst in some cases a drainage-tube should be inserted; and if the wound is very small, it should be enlarged to prevent tension from the accumulation of serum.

The dressing is then applied, as in the last class of cases, the folded gauze being made to envelop the limb for a considerable extent above and below the injured part, in accordance with the large amount of bloody and serous discharge to be anticipated. A gauze padding for the splints in the vicinity of the injury is also often valuable as an additional precaution.

The dressing should always be changed on the following day; but afterwards, if all proceeds satisfactorily, the intervals between the dressings are to be increased as the discharge diminishes. It must, however, be borne in mind, that from the very nature of these cases, as some organisms in the recesses of the wound may occasionally elude the action of the antiseptic, success cannot be reckoned on with certainty as in the two former classes.

#### IV. *Operations through Parts affected with Putrid Sinuses*

These cases present the greatest degree of complexity in the antiseptic treatment. It is hardly to be expected that the putrefaction which exists in the recesses of the sinuses can always be completely eradicated; but in a certain proportion of cases this is effected by the practice recently adopted of scraping away all granulation material from the tracks of the sinuses and elsewhere by means of the sharp spoon, after the example of Professor Volkmann, of Halle, and injecting the solution of chloride of zinc at the conclusion of the operation.<sup>1</sup> The chloride of zinc solution

<sup>1</sup> At one time Sir Joseph Lister recommended the injection of the sinuses before the operation was commenced; but though this is the most effective mode of introducing the solution, it has been abandoned for several years in consequence of inconveniences having in some cases followed from the solution becoming diffused into the cellular tissue of the part.



is at the same time applied to the cut surfaces, and by this means the patient is saved a great deal of pain and danger, as above alluded to, even should putrefaction ultimately show itself.

The usual external antiseptic dressing is employed in the hope of an aseptic result, while it also protects the atmosphere of a hospital ward from foul emanations in case putrefaction should occur.

In these cases of the recurrence of putrefaction, a dressing of boric lint, or of boric ointment, may often be advantageously substituted for the gauze dressing.

#### V. *Abscess threatening Fistula in Ano*

This particular kind of abscess is of such importance as to deserve special notice here. In consequence of the vicinity of the anus preventing the skin around the wound from being overlapped by the dressing to a sufficient extent to ensure absence of putrefaction, the gauze cannot be employed. But the difficulty may be overcome by applying to the anal orifice and surrounding parts a mass of lint soaked with a solution of carbolic acid in ten parts of olive oil, to be retained in position by a T-bandage; the patient being directed to draw the pad of lint slightly towards the affected side before defæcation, so that the evacuation may be effected without exposing the wound, and to cleanse the anal outlet with the oily solution before readjusting the pad. The oiled lint is changed about every four hours during the first day; but when the discharge becomes very slight, every twelve hours is sufficiently often. The abscess is opened as usual, after washing well with the one in twenty watery solution of carbolic acid; and instead of a drainage-tube, a bit of lint soaked in the carbolised oil is inserted to prevent primary union. Fætor of the pus on evacuation of the abscess must not discourage the surgeon from continuing the antiseptic measures, for experience has shown that in such circumstances, as well



as when the pus is odourless, the usual results of the antiseptic system applied to abscesses may be attained, all further suppuration ceasing, and fistula being averted.

#### VI. *Superficial Sores*

If there are sloughs, boric lint moistened with the boric acid solution is often employed, after the manner of the water dressing. When the sloughs have separated, the granulating surface is dressed with protective and boric lint, or with boric ointment spread on thin calico. In either case the dressing is to be dipped into the solution before it is applied. In cases of putrid chronic ulcer, the integument is cleansed with one to twenty carbolic acid solution, iodoform is sprinkled over the surface of the ulcer, to which is then applied a dressing of protective and boric lint. The application of iodoform may be repeated at the next dressing should it be found that putrefaction has not been eradicated by the first application.

#### VII. *Corrosive Sublimate*

The foregoing practical details of the antiseptic method of treatment described by the late Dr Bishop in 1880 are still the best when carbolic acid is the antiseptic employed, and the use of carbolic acid in the manner detailed above is probably the safest method of procedure. Attempts have been made of late years to simplify the treatment, chiefly in two directions, viz. to do away with the spray and to be able to leave the dressings longer unchanged. If the spray be not employed it is apparently necessary to irrigate the wound during the operation, and as long as carbolic acid was the best antiseptic at our disposal this was not practicable on account of the irritation caused. Recently, however, Koch has shown by his beautiful experiments on antiseptics that corrosive sublimate is a much more powerful and certain antiseptic than carbolic acid, while experience has taught that a dilute watery



solution which is thoroughly efficient as an antiseptic may be applied copiously to a wound without causing any appreciable irritation. That being the case, irrigation may in most cases be substituted for the spray, care, however, being taken that before stitching up the wound the sublimate solution is removed by sponging so as to avoid the risk of absorption and poisoning. The strength of the solution used for this purpose varies from 1—2000 to 1—5000, but it is well before closing the wound to apply a stronger solution (1—500 or 1—1000) to the whole surface. The irrigation of the wound may be managed by means of an irrigation apparatus providing a steady flow of the fluid during the whole of the operation, or by pouring a little solution into the wound from time to time. Where the abdominal cavity is opened this must not, of course, be done, for a poisonous quantity would soon lodge in the interior, and cause serious results. For the disinfection of the instruments the 1—20 carbolic solution must still be employed, for the sublimate would spoil the steel. For disinfecting the skin over the seat of operation and the hands of the operator and the assistants it is well to use the carbolic lotion first, and then afterwards the sublimate solution. The sponges, which are kept, when not in use, in a jar filled with 1—40 carbolic lotion, should be wrung out of the carbolic lotion, and then washed in 1—2000 sublimate solution. As a dressing various preparations of mercury salts may be employed, the fault of them being that they are apt to cause great irritation of the skin. Gauze or wool impregnated with a sufficient quantity of the plain corrosive sublimate is not suitable, and chloride of sodium is usually added to diminish the irritating effect. Sir Joseph Lister has of late taken up this subject, and is still at work trying to find some means of rendering the salt less irritating. The first plan which he tried was to combine it with blood-serum, gauze being impregnated with a mixture of 1 part of corrosive sublimate and 100 parts of blood-serum. He has since found that sal alembroth, a double salt of corrosive sublimate, and



chloride of ammonium, is more easy to employ, and probably less irritating than the serum sublimate, and he hopes to obtain some material still less irritating. Gauze and wool are impregnated with a watery solution of this salt and dried. As it is apt to irritate, especially at the margins of the dressing where the serous discharge has not penetrated, and where, therefore, there is only a solution of the salt in the sweat it is well to wash the salt out of the deeper layer of the gauze by immersing it in a solution of bichloride of mercury (1—2000) before applying it. Where there is no irritation caused, these dressings if sufficiently large may be left unchanged for a long time. In using the sublimate dressing, then, the steps would be as follows: wash the skin, hands of operator, &c., first with 1—20 carbolic lotion, and then with 1—500 corrosive sublimate solution; put the instruments to soak in 1—20 carbolic lotion; arrange towels soaked either in the carbolic or sublimate solution (1—2000) around the seat of operation, so that instruments when not in use may be safely laid down on them; have at hand a basin of 1—2000 sublimate solution in which the operator and his assistants may from time to time wash their hands, instruments, &c., and with which they may irrigate the wound. As the operation proceeds a sponge soaked with this 1—2000 solution is from time to time squeezed over the wound, and when the operation is finished, but before the stitches are inserted, the surface of the wound is sponged with the 1—500 sublimate solution; as the stitches are being inserted, 1—2000 sublimate solution is poured over the wound from time to time; a piece of alembroth gauze, which has been well washed in the 1—2000 solution, is then applied over the wound; the parts in the vicinity are cleaned, and more gauze is applied, and outside it a mass of alembroth wool; the dressing is fixed on with a sublimated bandage.

Since the above was written Sir Joseph Lister has discovered a more satisfactory dressing in the shape of gauze impregnated with mercurio-zinc cyanide. It goes under the



name of double cyanide gauze, and is probably at present the most popular antiseptic dressing in use. The first layer is wrung out of a 1—20 carbolic solution and applied to the wound. Other layers of dry gauze are then placed on it and the whole covered with wood-wool, which consists of finely comminuted pine wood rendered antiseptic by sublimate. The use of iodoform still holds its own. It is powdered on the wound before the dressings are applied, and many surgeons prefer gauze impregnated with 20 per cent. of iodoform to any other kind of dressing. It is certainly preferable in all cases in which urine is likely to come in contact with the dressings, as in such cases the double cyanide gauze is liable to cause much irritation.



## CHAPTER XII

## APPARATUS AND DRESSINGS

Extemporary Apparatus—Conveyance of Injured Persons—Esmarch's Cloth—Swing for Patients in Bed—Pasteboard Splints—Plaster of Paris—Gum, Chalk, and Starch—Glue—Gutta-percha Splints—Extension by Weight—The Use of the Aspirator—Transfusion of Blood—Transfusion of Saline Fluid—Esmarch's Bloodless Operation—The Elastic Tourniquet—Method of Opening Deep-seated Abscesses—Counter-openings—Burns and Scalds.

EXTEMPORARY splints may be manufactured on the moment from various substances nearly always to be found in the neighbourhood of the accident. For fractures of the lower extremities two bundles of reed, cut the length of the limb and rolled up in a coat or rug, one on either side of the limb, and secured by two or three straps, make an admirable splint, or, failing these, walking-sticks or umbrellas. Or the injured limb being secured to its fellow, both are placed on a backboard padded with some material.

For a fractured thigh place a long splint (the bar of a gate) on the outer side from the hip to the ankle, and another splint on the inner side, a short one being placed in front of the thigh, and secure all with straps or handkerchiefs. The injured limb should also be secured to its fellow. For fractures of the upper extremity, splints of reed, of pasteboard, or made from an old hat or bonnet box, will serve the temporary purpose. Stirrup leathers, bridles, and traces may be utilised in various ways.

Various stretchers may be extemporised for conveying



an injured person home or to hospital. Take a blanket and have a loop sewn on at each of the four corners. Bring the two loops at each end together and pass a long pole through the four loops. A ladder may sometimes be found useful, or the stretcher here figured from Surgeon-Major Porter's 'Surgeon's Pocket-book' may easily be extemporised if the materials are at hand (Fig. 129).

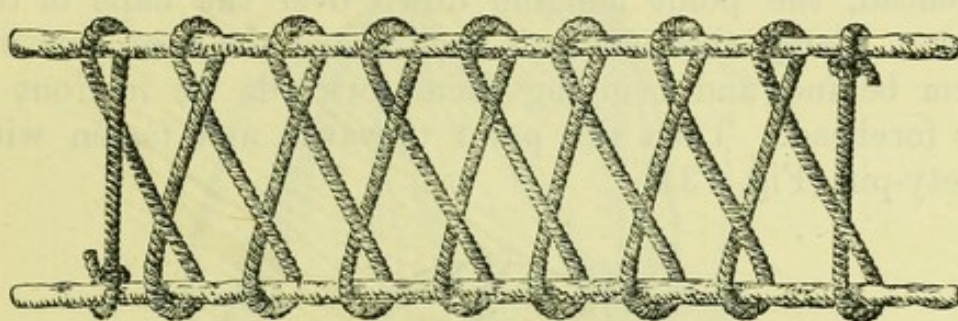


FIG. 129.

The bearers of a stretcher should not walk in step. That is to say, that if the front man steps off with the left foot the rear man should step off with the right. They should march with a steady and equal step, and should avoid a springy gait, planting the foot firmly on the ground, and not rising on the toe. The patient should be carried feet foremost, and as nearly as possible on a level. The stretcher should never be carried on the shoulders.

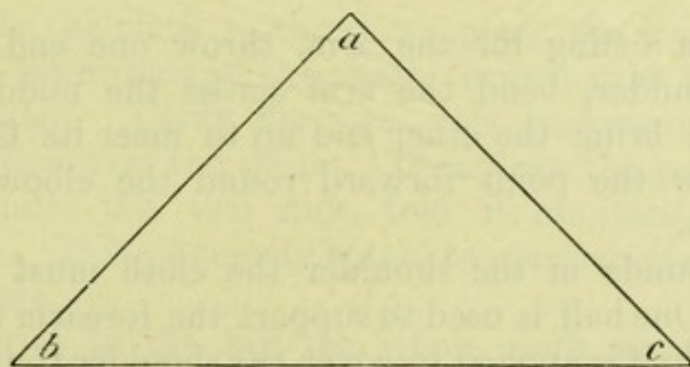


FIG. 130.

The use of a triangular cloth introduced by Professor Esmarch for the immediate dressing of wounds or the



support of fractured limbs is as follows :—A piece of unbleached calico forty inches square is cut into a triangular shape (Fig. 130), and in the following description the border from *b* to *c* is called the lower and the two others the side borders. The corner *a* is called the point, and the two others, *b* and *c*, the ends.

To apply it to the head place the lower border across the forehead, the point hanging down over the nape of the neck. Carry the two ends back above the ears, crossing them behind, and bringing them forwards tie in front of the forehead. Turn the point upwards, and fasten with safety-pin (Fig. 131).

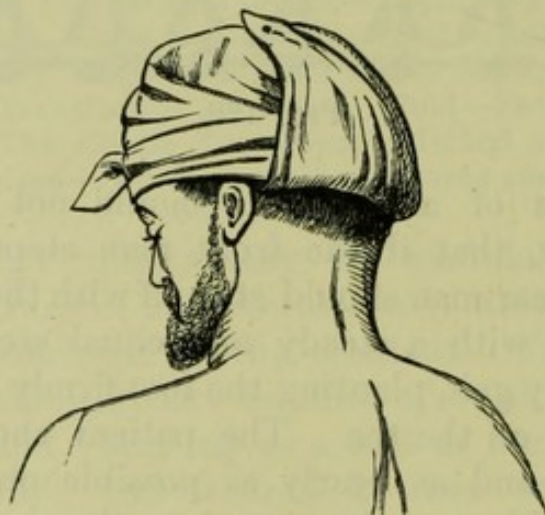


FIG. 131.

To form a sling for the arm, throw one end over the sound shoulder, bend the arm across the middle of the cloth, and bring the other end up to meet its fellow, and tie. Draw the point forward round the elbow, and pin (Fig. 132).

For wounds of the shoulder the cloth must be cut in halves. One half is used to support the forearm as a sling, the other half is applied to cover the shoulder thus :—Place lower border on the middle of the outside of the upper arm, the point lying upon the side of the neck. Carry the two ends round the inside of the arm, cross, bring forward, and tie on the outer side. Slip the point under



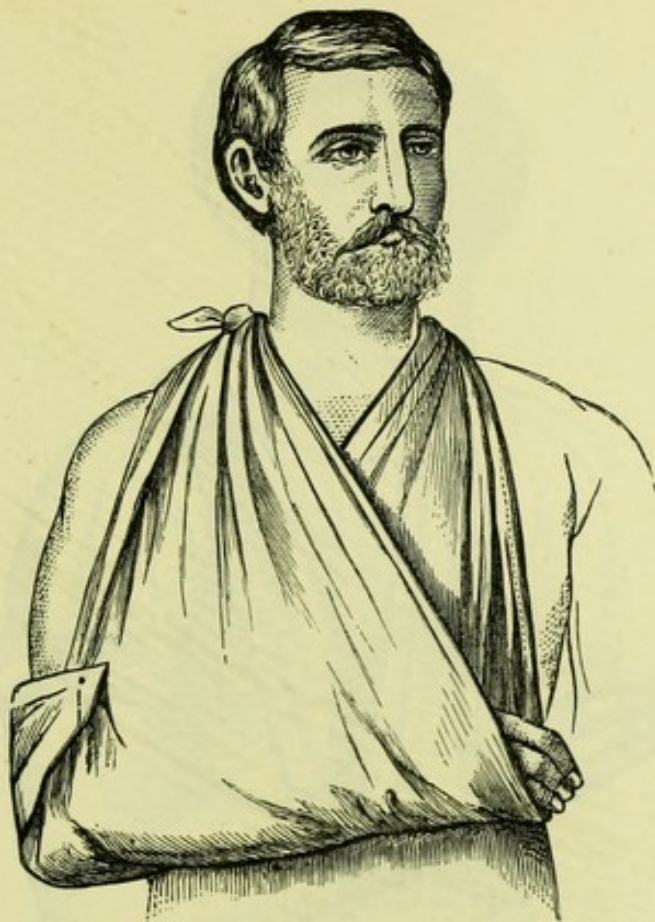


FIG. 132.

the sling, fold it back on itself, and fasten with a pin (Fig. 133).

To apply the cloth to the chest, place the lower border across the lower part of the chest, throwing the point over one shoulder. Carry the two ends backwards and pin them together over the spine. Then draw the point down, pass it under the two ends, fold it on itself, and pin (Fig. 134). It is obviously better to pin than tie as shown in the figure.

In injuries to the hip the whole cloth must be used. Place the middle of the lower border in front of the upper part of the thigh, the point lying upwards on the abdomen. Carry the ends backwards behind the thigh, cross, and bringing them forward pin them together. A waist-belt



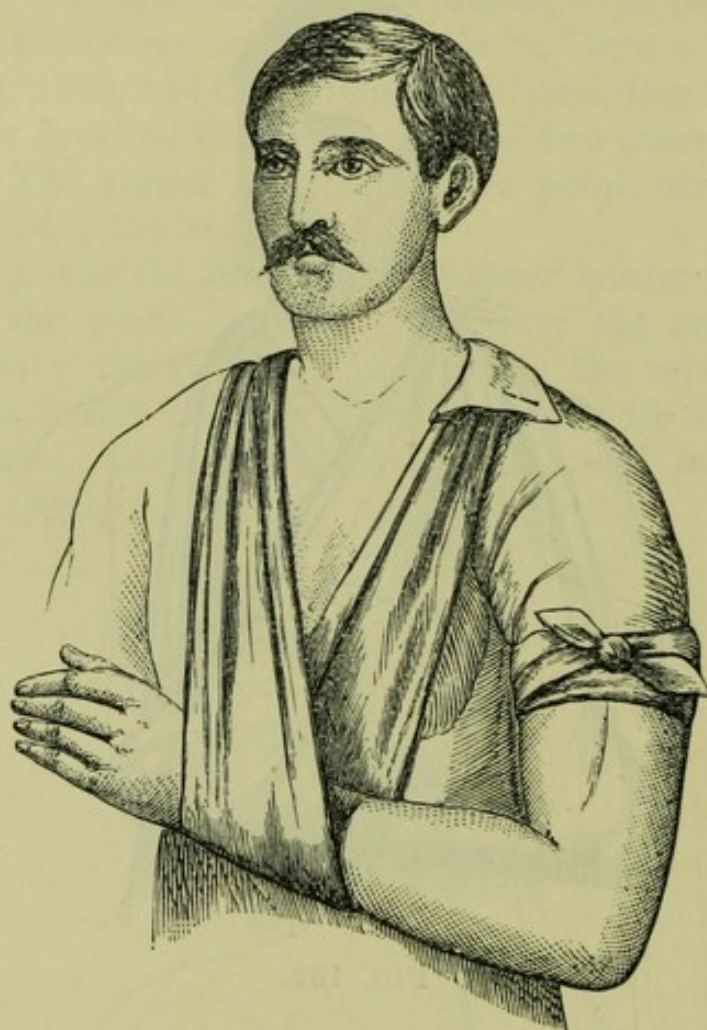


FIG. 133.

must be put on and the point passed under it, folded on itself, and pinned (Fig. 135).

In dressing the hand or foot only half a cloth is required. To apply it to the hand, place the centre of the lower border across the wrist. Turn the point up over the fingers on the back of the forearm, and tie the ends over it (Fig. 136).

To apply to the foot, place the sole of the foot in the middle of the cloth, turn the point up over the toes, and passing the ends round the ankle carry them down and tie on the sole (Fig. 137).

In severe compound injuries of the lower extremities or



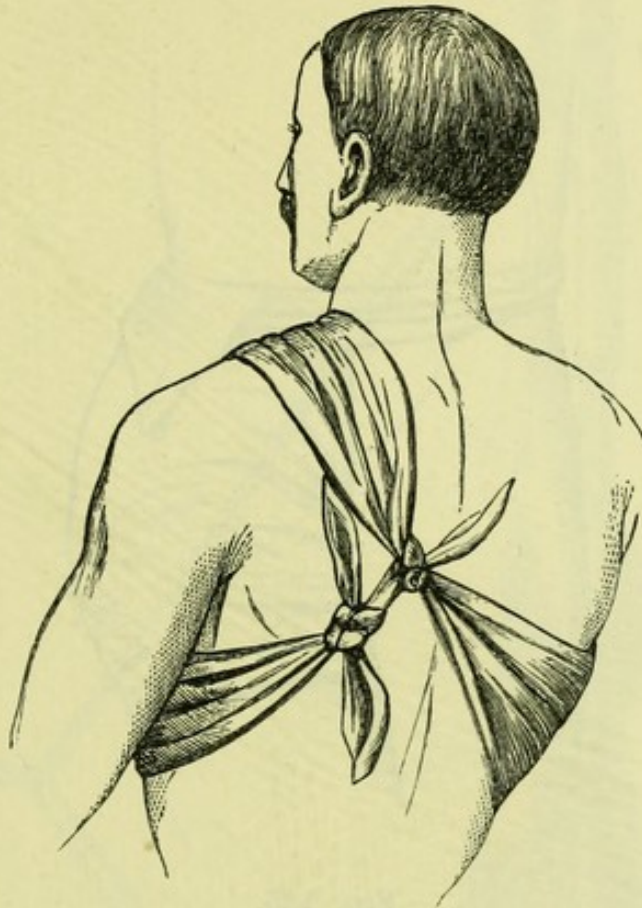


FIG. 134.

of the spine or pelvis the swing here figured (Fig. 138) is invaluable for raising the patient from the bed with the smallest possible disturbance. It consists of two poles, which are slipped through the broad hems of the three pieces of canvas represented in the woodcut, and which are placed under the patient as he lies in bed. The ends of the poles are then connected together and kept asunder by a light rod of iron at the upper and lower end. Two ropes, each having a loop at either end and one in the middle, are then attached to the poles by slipping the loops at either extremity over their ends. The central loops are then attached by a hook to a multiplying pulley, which in its turn is connected by ropes to a hook fixed in the ceiling, or to a framework erected over the bed. By



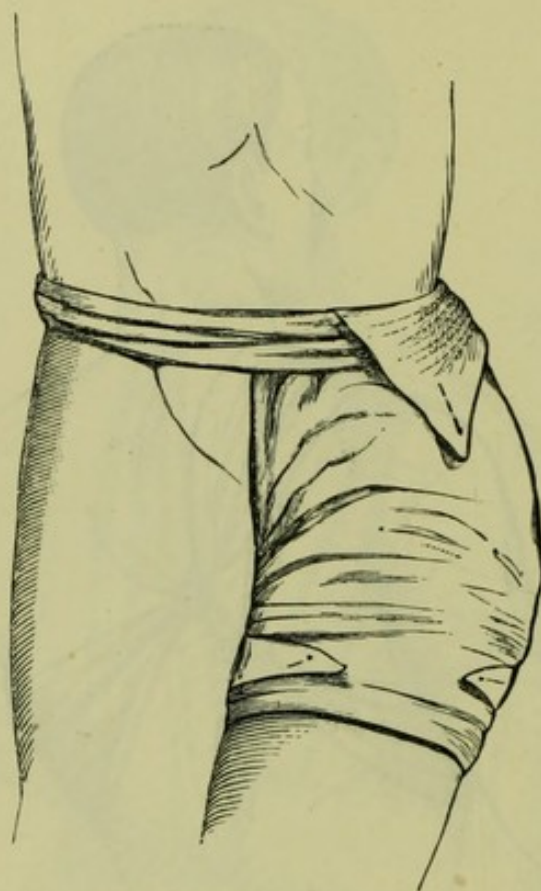


FIG. 135.

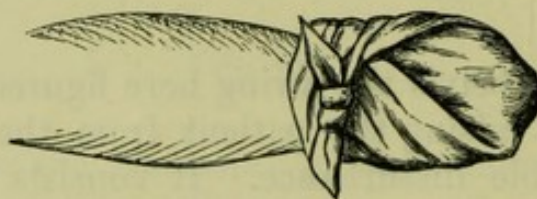


FIG. 136.

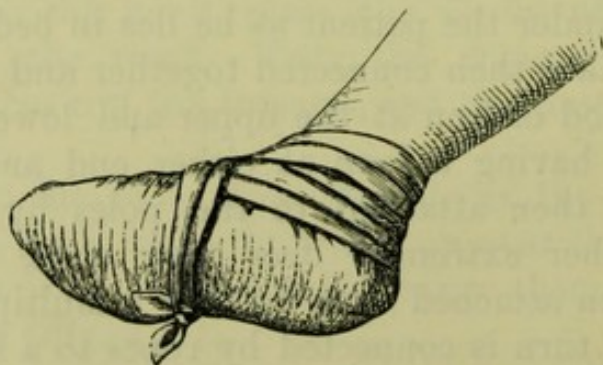


FIG. 137.



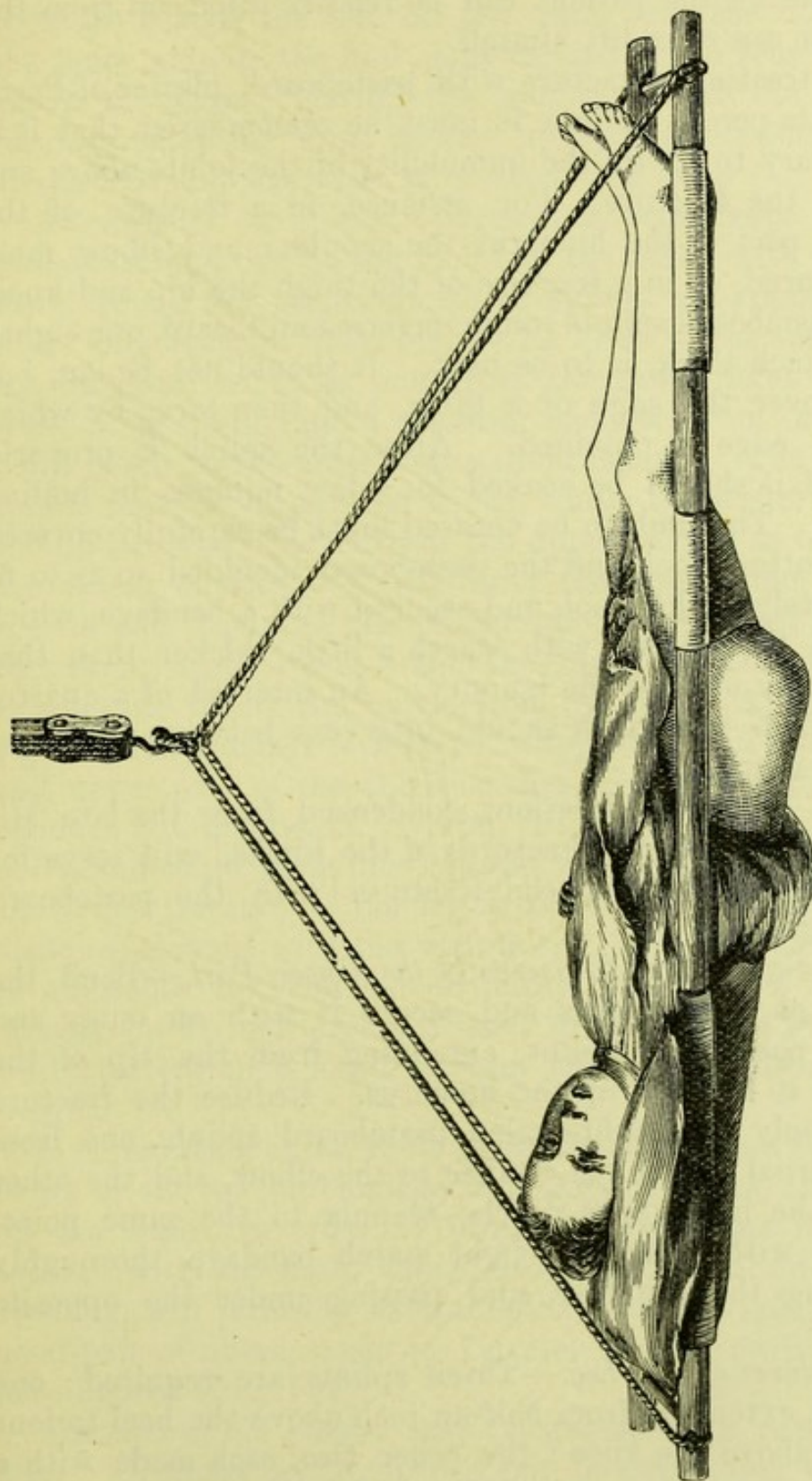


FIG. 138.



this means the patient can be readily lifted up from the bed, or can even lift himself.

In treating a fracture with pasteboard, plaster-of-Paris, or gutta-percha splints, it must be remembered that it is necessary to secure the immobility of the joints above and below the fracture. For instance, in a fracture of the upper part of the humerus the shoulder and elbow must be secured, or in a fracture of the thigh the hip and knee. For pasteboard splints rough unglazed millboard, one eighth of an inch thick, is to be used. It should not be cut, but bent over the edge of a table, and then torn, by which a soft edge is obtained. After the splint is properly shaped it should be soaked for a few minutes in boiling water. The limb to be encased must be carefully covered with cotton wool, and the pasteboard moulded so as to fit accurately to the wool, and secured with a bandage, which should be smeared with starch a little thicker than that ordinarily used in the laundry. An interval of a quarter of an inch to an inch should intervene between the edges of the splint.

The following directions, condensed from the late Mr. Gamgee's book on 'Fractures of the Limbs,' will serve for the treatment of special fractures with the pasteboard apparatus.

*Fractures of the Humerus in the Upper Part.*—Bend the elbow at right angles and secure it with an outer and inner pasteboard splint, extending from the tip of the fingers to halfway up the humerus. Reduce the fracture and apply two right-angled pasteboard splints, one from the sternal end of the clavicle to the elbow, and the other from the inner edge of the scapula to the same point. Secure with a figure-of-eight starch bandage, thoroughly covering the shoulder, and passing under the opposite axilla.

*Fractures of the Leg.*—Three splints are required: one behind, extending from half an inch above the heel to four inches above the knee; the other two, each made with a foot-piece, which is moulded round under the sole of the



foot, are placed the one on the outer and the other on the inner side of the limb, and carried up to four inches above the knee. During the application of the starch bandage extension must be kept up by two assistants, one at the foot and the other at or above the knee.

*Fractures of the Femur.*—Extension being kept up by two assistants, one at the foot and the other with a jack-towel round the perinæum, three splints are applied; an inner one from a little below the knee to the ramus of the ischium, an outer one from the same point to the crest of the ilium, and a posterior one also from the same point below to the crest of the ilium behind. The lateral splints must be of uniform width, whilst the posterior one should increase in breadth at the upper part so as to cover the whole buttock. To facilitate the application of the splints and bandages, the patient should be raised a little by passing a jack-towel under the loins, two assistants by this means lifting the pelvis from the bed. A figure-of-eight starch bandage is then to be applied round the pelvis and upper part of the thigh, taking care so to spread the bandage out behind as to cover the entire buttock. The pelvis and thigh being thus encased, the apparatus described above for fracture of the leg is to be applied below and made continuous with the splints and bandage above. It is advisable to keep up extension during the drying process by fixing a perinæal band to the head of the bed, whilst extension is kept up from the foot by means of a weight.

It is necessary in all these cases, after the lapse of a day or so, to slit up the bandage with cutting pliers, and pare off the edges, in order to bring the apparatus in close contact with the limb, which, owing to the subsidence of swelling, will probably have receded from the splints. A good pair of pliers, made by Coxeter for the purpose, are here figured (Fig. 139).

*Fractures of the Fingers* may be treated with paper and gum. Ordinary writing-paper, cut in strips long enough to extend from the tip of the finger to a couple of inches



above the head of the metacarpal bone, should be placed in front and behind, and eight or ten layers, well gummed

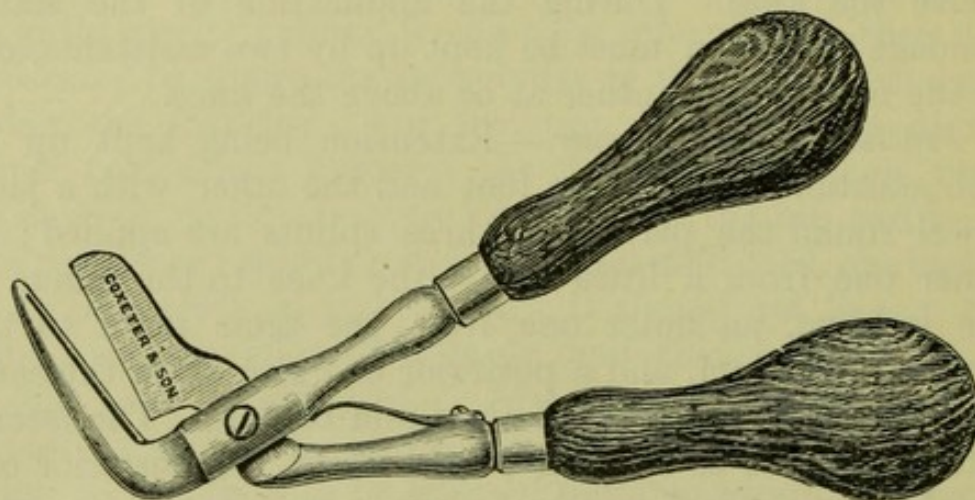


FIG. 139.

together, will form a sufficient splint, which must be secured by a narrow bandage. The finger should first be cased in cotton wool.

The plaster-of-Paris bandage is best applied as follows:— Pour a small quantity of water into a basin, and sprinkle into it perfectly fresh and dry plaster of Paris until a thin paste is formed. Take an ordinary unbleached calico bandage of the required breadth, previously saturated with water, and unroll and re-roll it under the paste, so as to impregnate the whole bandage with the plaster paste. The bandage must then be rapidly applied to the limb, which should be first covered with a flannel bandage. If possible no turns should be made in the bandage, and some of the paste will be laid on with the hand between the layers. If the plaster is fresh and dry, the bandage will set in five minutes, when it may be painted over with white of egg, to prevent its crumbling. The addition of a little gum to the plaster of Paris renders the bandage less brittle when dry. The following is a good formulary:— Gum mucilage (B. P.)  $\mathfrak{z}\text{j}$ , water  $\mathfrak{z}\text{viiij}$ , plaster of Paris  $\text{lbj}$ . The plaster of Paris is sprinkled into the mixture of gum and water.

Gutta-percha splints are made, as a rule, about t on



eighth of an inch in thickness. The gutta-percha is obtained in sheets, and the best method for cutting out the splint is to trace the outline with the point of a knife. Then bending the gutta-percha, and drawing the point of the knife successively along the original line, the gutta-percha will give before it, and a clean cut will be effected in the exact direction required. It is then to be placed flat in a tub of boiling water, and retained long enough to make it quite soft. The limb must be well oiled, and the gutta-percha being moulded to it should be retained in place for a few minutes by a bandage. When it is sufficiently hard it may be removed, the edges pared, the inner edge being bevelled off, and the inside covered with flannel stuck on with paste. The splint must then be well perforated with small holes made with a punch. If the splint requires strengthening at any point, this may be accomplished by putting on to the parts requiring extra support strips of gutta-percha softened in boiling water.

A very excellent and stiff bandage is made with gum and starch, of each  $\mathfrak{z}\text{iv}$ , chalk  $\mathfrak{z}\text{viiij}$ , water  $\mathfrak{z}\text{viiij}$ . These ingredients are mixed well in a mortar and run through a hair sieve, to make the mixture perfectly smooth. The addition of methylated spirits  $\mathfrak{z}\text{iv}$  prevents the mixture spoiling, and it can be kept in a bottle ready for use. The bandage should be rolled in the mixture immediately before application. Its removal is very readily affected by immersing the limb in hot water for a short time, which softens the bandage, when it can be simply removed by unrolling.

Glue is sometimes used instead of starch. A strong solution of the best French glue is made, to which is added one eighth part of methylated spirits of wine. The limb being cased in wool is then bandaged, the glue being painted on with a stiff brush. Successive layers of bandage and glue may thus be applied.

The method of applying extension to the lower extremities by weight is as follows :

A thin piece of board, from three to four inches long



and two and a half broad, is used as a foot-piece, to prevent the strips of plaster pressing on the malleoli. This foot-piece is bored in the centre with a hole, through

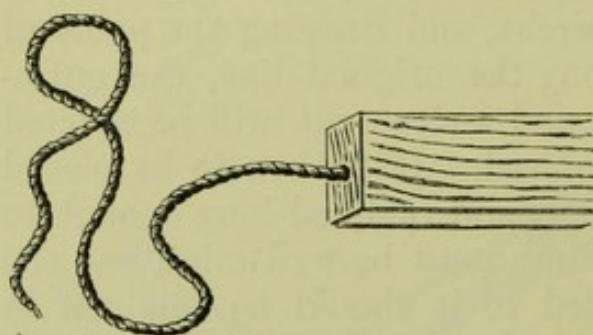


FIG. 140.

which is passed the cord attached to the weight (Fig. 140). The plaster is to be cut in the shape shown in Fig. 141, and of the following dimensions:—Five and a half inches wide in the centre, and two and a half inches wide at the narrowest points, gradually widening again to four inches at the extremities. The two ends are slit down for about two thirds of their length, as shown in the figures. The total length of the strip for an adult is about four feet eight inches, sixteen inches for the central portion, and twenty inches for each tail. The foot-piece is laid on the central portion of the strip, and the edges are folded over it (Fig. 142). The plaster is applied to the leg, one tail on the outer side, and the other on the inner side of the limb, the foot-piece being kept about two inches below the sole of the foot. The strip is further secured to the limb by a bandage, which should be applied from the toes upwards, as shown in Fig. 143. It is advisable to protect the tendo Achillis and the instep with cotton wool. The amount of extension required for an adult is about

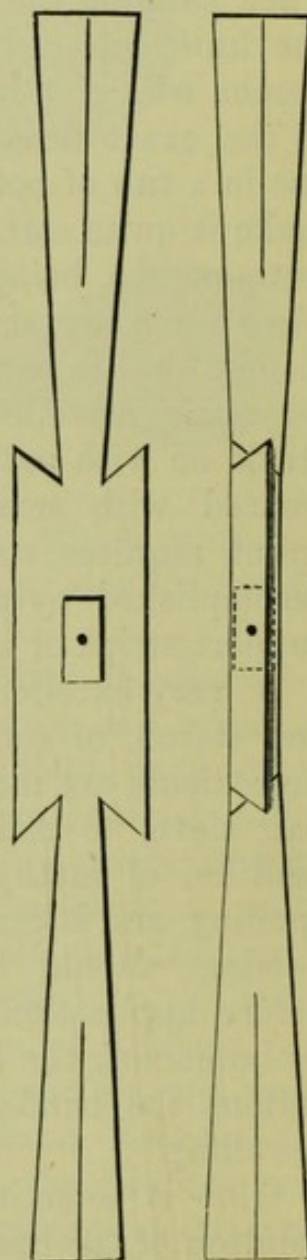


FIG. 141. FIG. 142.



eighteen or twenty pounds, and this may be applied at once. If a lesser weight is found sufficient to keep the fracture in place and prevent twitching of the muscles, it

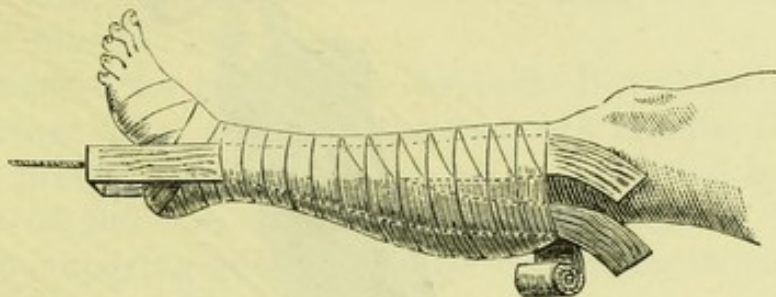


FIG. 143.

is advisable to use it; ten pounds is often enough. A pillow placed under the popliteal space, raising the knee, relieves the pain produced by the dragging on the hamstring tendons. In very muscular patients it is sometimes advisable to apply the extension when the patient is under the influence of chloroform, as the muscles are then perfectly relaxed. For children, the rule as to weight is to add a pound for each year up to twenty.

The use of the aspirator has been alluded to in the previous pages. The following description of the aspirator, and its method of use, is published by Messrs. Weiss, whose aspirator is here figured (Fig. 144).

The aspirator consists of—

1. A glass bottle or reservoir, A, mounted with a two-way stopcock, B, and having an opening at the bottom for the insertion of the tube C.
2. An exhausting syringe with elastic connecting tube, D, H.
3. A series of tubular needles to be attached to the reservoir by an elastic tube, as shown at E, F.

*Directions for Use.*—Adjust the aspirator as figured in the diagram with the stopcock B turned vertically—that is, open to the bottle; close the stopcock in the tube C, and form a vacuum by a few upward and downward movements of the piston of the exhausting syringe D.



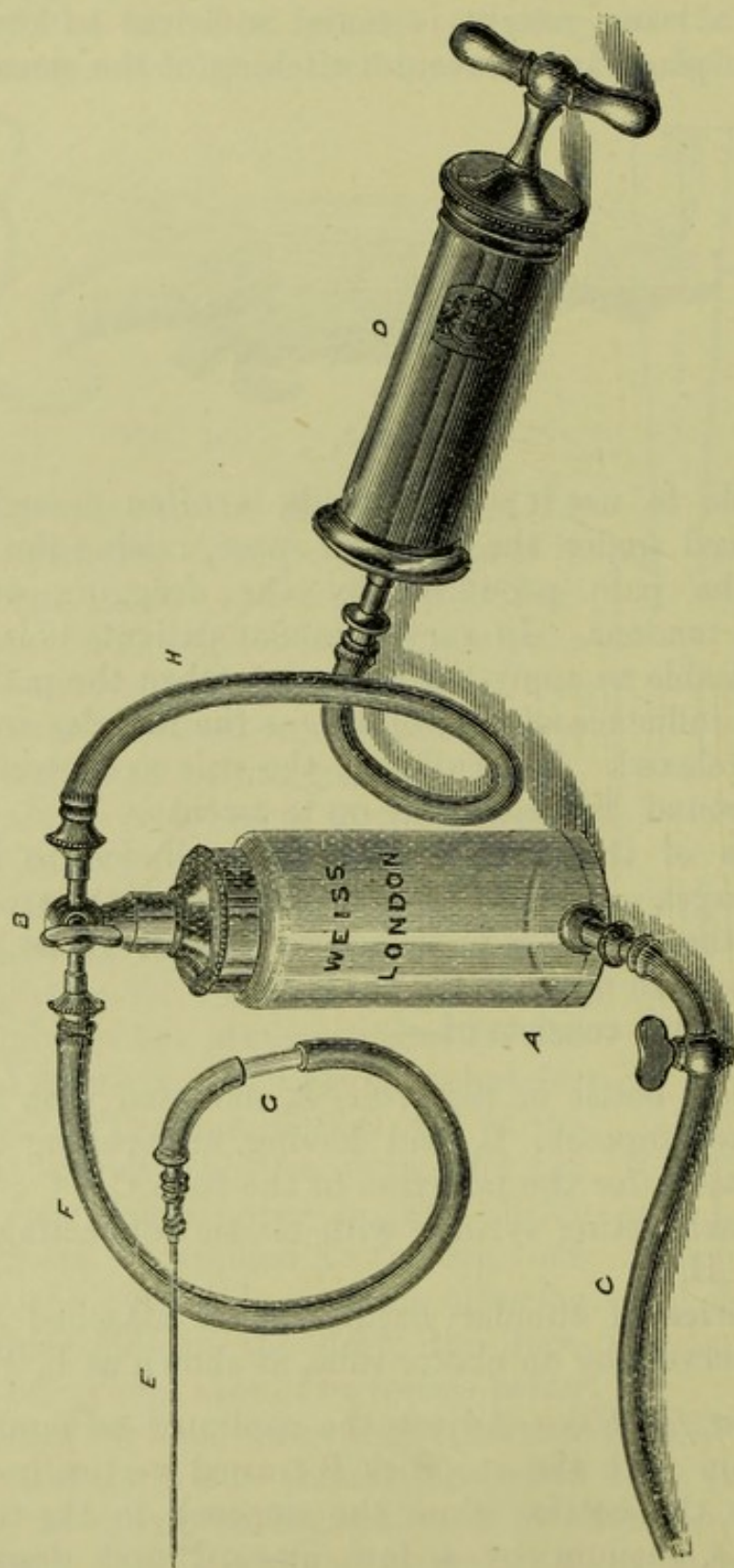


FIG. 144.



Insert one of the needles beyond the two eyes, attach tube F to it, turn the stopcock B towards the needle—namely, horizontally, and continue the insertion of the needle until fluid is seen to flow through the short glass tube G into the reservoir.

To empty the latter turn stopcock B vertically, detach the syringe tube, and open the stopcock in tube C.

The presence of fluid having been established by the use of one of the fine needles, it is recommended for more quickly emptying the cyst to use one of the larger needles or trocars.

✓ The introduction of the needle into the tissues requires some precautions. In place of endeavouring to penetrate by pressure, as with an ordinary trocar, it is preferable to combine pressure with rotation, by taking the needle in the forefinger and thumb, and rolling it between them. Such a manœuvre is rendered necessary by the extreme fineness of the needle, which would be liable to bend or twist if driven in by direct pressure. Before using a needle it is well to be assured of its permeability.

In cases requiring transfusion of blood, the best method is that described by Dr Aveling. His instrument, made by Messrs Krohne and Sesemann, is here figured (Fig. 145), and the mode of operating is thus described :

First, place the apparatus in a basin of warm salt and water, and while completely under the water, to fill it and insure its cleanliness, compress the bulb until all the air is expelled.

The patient having been brought to the side of the bed, and the arm bared, a fold of skin over a vein at the bend of the arm should be raised, transfixed, and divided. The flattened vein now brought into view should be seized with a pair of fine forceps, raised while an incision is made in it, and the bevel-pointed silver tube inserted. In taking the tube out of the basin, it should be kept full of salt and water by placing the tip of the thumb over its larger opening. While the operator is doing this, an assistant should prepare the arm of the blood-donor, as in ordinary



bleeding, making an incision directly into the vein, and passing the round-pointed tube into it, with its point

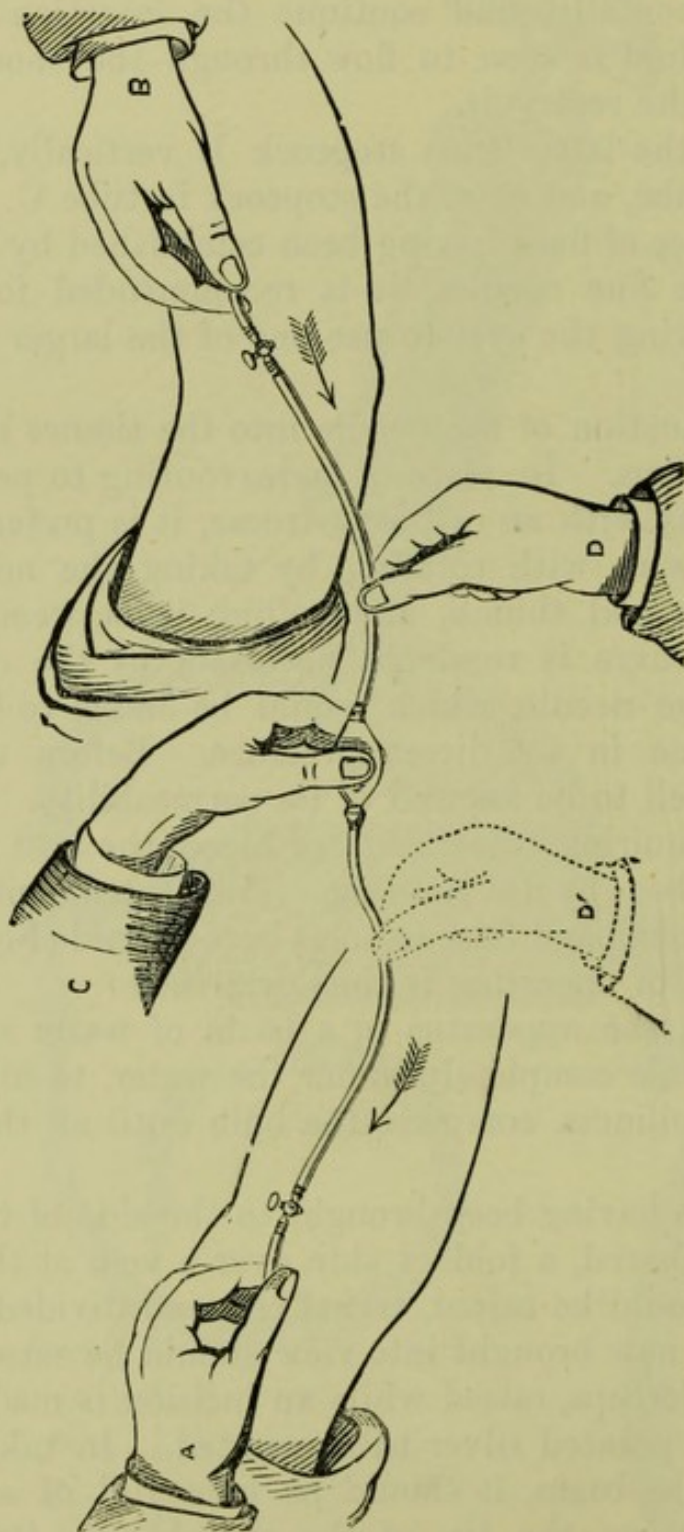


FIG. 145.

towards the fingers. This person should then be brought to the bedside of the patient, and seated in a chair. It is



better not to secure the tubes in the veins by ligatures. B represents the hand of an assistant holding the efferent tube and the lips of the small wound together, and A shows the afferent tube secured in the same manner. The india-rubber portion of the apparatus, filled with salt and water, and kept so by turning the cock at each end of it, is now fitted into the two tubes. The cocks are then turned straight, and the operation commenced by compressing the india-rubber tube on the efferent side D, and squeezing the bulb C; this forces two drachms of water into the afferent vein. Next shift the hand D to D' and compress the tube on the afferent side, then allow the bulb to expand slowly, when blood will be drawn into it from the efferent vein. By repeating this process any quantity of blood can, at any rate, be transmitted, the amount being measured by counting the number of times the bulb is emptied.

Another plan, where Aveling's instrument is not at hand, is as follows:—A vein at the bend of the elbow of the recipient is exposed, and a double ligature passed beneath it. The ligature is divided, and the distal end of the vein ligatured. The vein is then opened and a small cannula inserted with a bit of india-rubber tubing attached. Round the point of the cannula the upper ligature is tied in a single knot. In the meantime blood is taken from the donor to the amount of six ounces, and allowed to flow into a glass vessel containing two ounces of a 1—20 solution of phosphate of soda. The mixture is kept at a temperature of 100° F. by standing in hot water, and is constantly stirred with a glass rod. The fluid is then injected through the cannula with a three-ounce glass syringe, which must be kept warm by being wrapped in a hot flannel. Six ounces at a time is sufficient. On the completion of the injection the cannula is withdrawn, and the vein tied with the ligature.

A more frequent proceeding is to transfuse a saline fluid. A simple apparatus for this (Fig. 146) is made by Messrs Downe. The vein being exposed, a double ligature is passed beneath it with an aneurism needle.



The ligature is divided, one half is tied on the lower end of the vein. The vein is then opened by a longitudinal incision, the point of the cannula introduced,

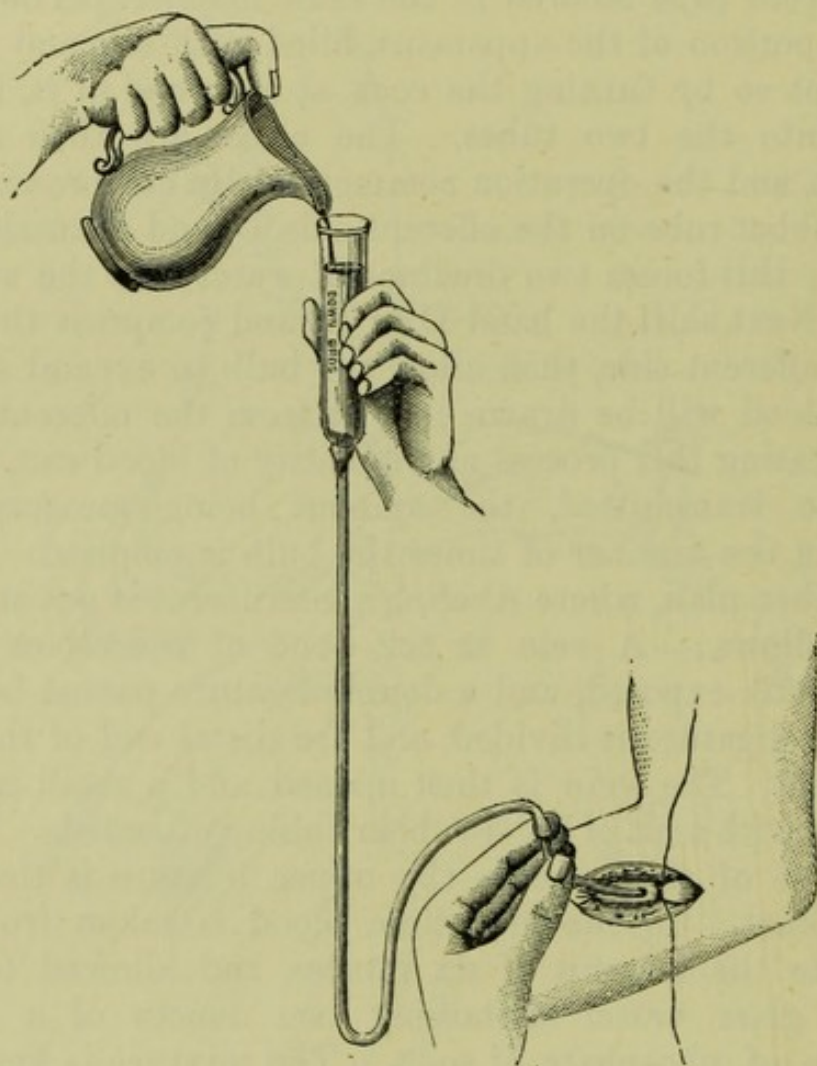


FIG. 146.

and the upper ligature tied round it. The rubber tube filled with solution is then attached to the cannula, the funnel raised, and the solution slowly poured in. The fluid consists of boiling water cooled down to  $102^{\circ}$  with a teaspoonful of common salt to each pint. The amount of fluid transfused will vary with the requirements of the case. As much as six pints has been injected. When the transfusion is completed the cannula is withdrawn and the ligature tied round the vein. It is important to keep the funnel always above the level of the cannula, and never



to allow it to get quite empty. It should be held about  
1 three feet above the cannula, at which height about a pint  
flows in every four minutes.

The method of bloodless operations introduced by Esmarch may be carried out by two methods. One consists of an elastic bandage, which is applied firmly from the extremity of the limb to be operated on to a point above the site of the operation. A thick india-rubber cord is then wound very tightly round the limb just above the edge of the elastic bandage, which is then removed. The limb below the india-rubber cord will then be found perfectly blanched and empty of blood. A second method is described by Mr Cripps, in the 'Lancet' of October 11th, 1873 :

"The following is a simple modification of Esmarch's arrangement, by which many yards of elastic bandage may be dispensed with, and it can be easily and quickly applied.

"To apply this to the arm, three or four complete turns of the elastic ring (Fig. 147) are wound tightly round the

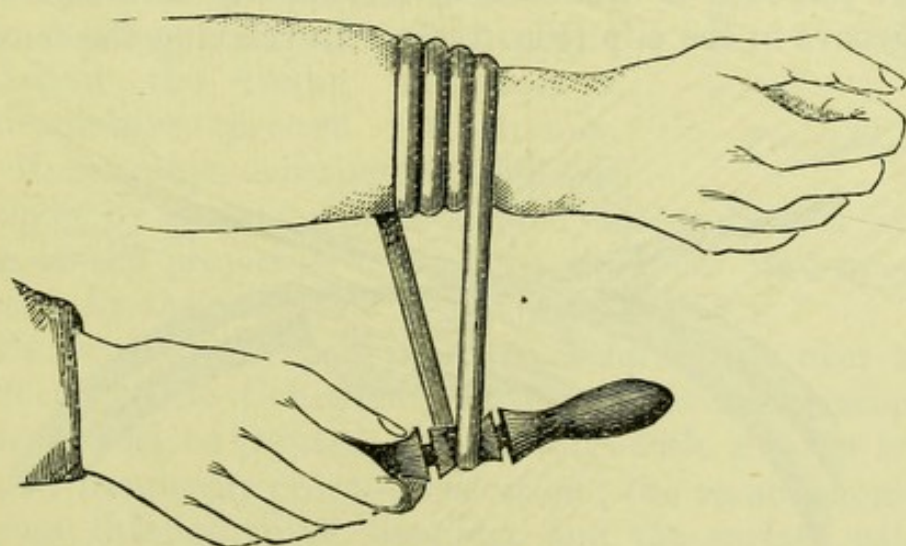


FIG. 147.

hand in such a manner as to include the fingers and thumb, care being taken that the turns lie even and do not cross one another. The reel is then put up under the free portion of the ring connecting the upper and lower coil.



The reel is passed round and round the limb in an upward direction : thus each coil is unwound from below as another is added above. In this way four tight coils of india-rubber are carried up the limb to any distance required. The degree of tightness can be regulated with the greatest nicety by the distance the reel is drawn from the limb by the bandager.

"This method of driving blood from the limb answers perfectly in the arm and in the lower part of the leg ; but in carrying the bandage over the popliteal space the flexor tendons prevent the artery being effectually compressed. A firm pad in the space would probably answer the purpose.

"It may be unrolled by reversing the action of the wheel to remove the bandage."

As a substitute for the usual elastic cord the following very admirable and simple instrument may be had recourse to, or it may be used simply as a tourniquet. It consists of a thin piece of elastic tubing and of a boxwood clip. To apply it, embrace the limb twice with the cord, and whilst the cord is in a state of tension slip both ends into the groove in the clip (Fig. 147). In relaxing the tension

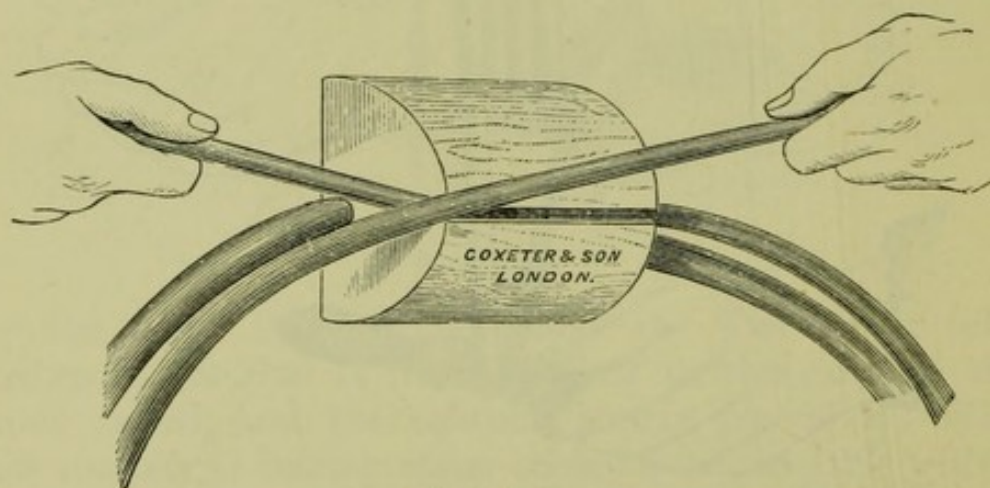


FIG. 148.

they become firmly fixed. To remove the tourniquet stretch the ends and lift them out of the groove. Fig. 149 represents the tourniquet in position with a roller bandage slipped under the clip and resting over the artery. This



tourniquet is made by Mr Coxeter, of Grafton Street, London.

In opening a deep-seated abscess in the neighbourhood of important parts the best plan is to make an incision through the skin only, and then thrust in a director until the cavity of the abscess is reached, which will be known by the pus welling up along the groove of the director. Then pass the blades of a pair of dressing forceps along the director, and on opening them a free exit will be given to the matter. A drainage-tube may be then inserted. To make a counter-opening in dependent parts is frequently a difficult and dangerous proceeding. I have found great help from the use of a rectum trocar and cannula. Pass the cannula, with the trocar withdrawn within it, down to the point where the counter-opening is desired; make it project underneath the skin, and then rapidly push the trocar through; withdraw the trocar, and pass a drainage-tube through the cannula, or, if desirable, enlarge the counter-opening by passing a blunt-pointed bistoury down by the side of the projecting end of the cannula. (To open an abscess by the antiseptic method, see p. 208.)

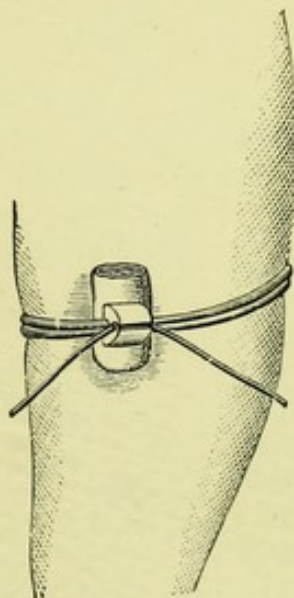


FIG. 149.

By far the best local application for burns over small surfaces is the Collodion Flexile of the Pharmacopœia. This should be painted on smoothly with a large brush. It will frequently prevent vesication; the serum should be let out through small openings, and the surface painted over with the collodion. A solution of soda applied to the injured surface immediately abates pain. In extensive burns, vaseline thickly smeared over the injured parts is a good application. The injuries are accompanied by considerable shock. The heat of the body must be maintained, and stimulants freely given, with opiates to relieve pain.







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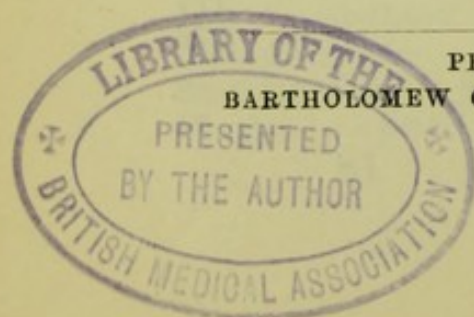
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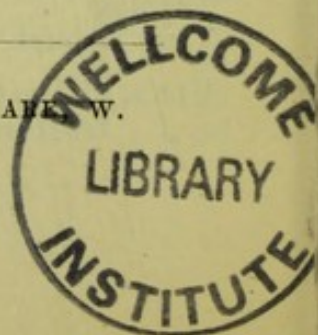
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