Illustrations of the great operations of surgery, trepan, hernia, amputation, aneurism, and lithotomy / [Sir Charles Bell].

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ILLUSTRATIONS

OF

THE GREAT OPERATIONS

OF

Surgery,

TREPAN, HERNIA, AMPUTATION, ANEURISM, AND LITHOTOMY.

BY

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PREFACE.

THERE is no design of pleading the difficulty of the undertaking, in laying these Illustrations of Surgery before the Public. They are not the result of study, strictly speaking, but of opportunity. The Author has arrived at his conclusions in the course of years, and the Illustrations are drawn from what has accidentally presented from time to time. He has had little more trouble with the engravings than to select drawings, some of which have been in his portfolio for twenty years; and there are few days in which, of late, he has not risen to as severe a task as composing one of these numbers, and yet the work is the result of long observation, not of temporary exertion.

It is in this manner, where the demonstration is presented to the eye, that knowledge is most easily conveyed, and especially to those who possess that mechanical and graphic talent, which is so well suited to the Practice of Surgery.

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situation in which a man requires a thorough devotion to the principles of honour and right conduct, to preserve him from the commission of error. These are the considerations which should make it the interest of Society to hold the Profession in respect, and which make it the duty of every member of it to keep it pure.

I shall place the matter before you in another light. If we go into a court of law, we see the bench occupied by the learned judges; before them are counsel, skilled in the law, and a jury of twelve honest men, to hold the balance betwixt the severity of the law and the weakness of human nature. What are they met to decide? Perhaps a matter of money or of succession. Even if it should be a criminal court, what a contrast have we with the situation of the Surgeon, on whose single decision the life of a fellow-creature depends; one, perhaps, bearing all the relationships of society; having all the ties which bind a man to existence, and the virtues which make his life dear. The Surgeon cannot lean upon the judgment of others, nor say, for this the wisdom of the legislature has provided. He has to examine an evidence, often strangely perverted; he must judge, unaided by friendly counsel; and, to determine upon what is right to be done, when the life of a friend hangs on the issue, and where the execution depends on his own dexterity, is a thing of the greatest difficulty.

When we thus consider the weight of responsibility, it is not surprising, that so many shrink from the performance of the duties which belong to our Profession; the more especially that success in it draws no sympathy. If there be some eminent men who esteem our Art, and express themselves differently, yet it must be acknowledged, that the Public consider him, who deserves the first honors of the Profession, as only more eminently divested of common feeling.

That the Surgeon, in order to do his duty, must be divested of the common feelings of Humanity, is a vulgar error. Let my lady's maid still suppose, that he must be a brute whose occupation soils his hands with blood. It is not supposed that she can have very accurate notions of the difference of his service who inflicts the wound, and of his who closes it; but for a reasonable man, and most of all, for one educated to Surgery, it is very ridiculous to assign as a reason for not doing his duty, that his feelings prevent him. These feelings are not for his patient! Instead of having a true compassion for the wounded or for the diseased, instead of neglecting his first painful impressions, and being happy to render assistance, he stands, like the foolish maid, who holds her apron betwixt her pretty eyes and the object of her horror. Let no man boast of feelings, until they are of that genuine kind, and amount to that degree, that he can forget himself, in the desire to give aid to another.

In performing the operations of Surgery, this neglect of yourself is very necessary. Why simplicity should be so rare a virtue in Operators, is very remarkable; since it requires but this one rule, — think only of your patient. Any thing like a flourish on such an occasion, does not merely betray vanity, but a lamentable want of just feeling. It is as if a man said — Look at me now — see how unconcerned I am, while the patient is suffering under my hand! Simplicity is always becoming; often a great excellence; but, in regard to operations performed on a fellow-creature, it is a moral obligation.

In truth, the anxiety of a Surgeon, before an important operation, is the greatest any man can suffer, where there is not a consciousness of crime; and do not suppose that this belongs to a Surgeon in his early practice only, or to such feeble spirits as cannot summon resolution to do their duty. The greatest Surgeon this country has produced, the celebrated Chesselden, was, even in his later days, anxious to sickness, before the performance of a severe operation.

These are the considerations which incline me to believe, that our Profession has not been sufficiently honored; and that men are esteemed, only in proportion to the emoluments they have drawn from it. It depends on the conduct of those who are now entering their Profession, whether Surgery will continue to be confounded with meaner arts, or rise to be the very first in estimation; as requiring great abilities and long study to attain the knowledge of it, and purity and the strictest honor in the practice of it.

PREPARATIONS

FOR A

GREAT OPERATION,

ADDRESSED TO

THE ASSISTANT SURGEON OR HOUSE SURGEON OF AN HOSPITAL.

THE Junior Surgeon, Assistant, or House Surgeon, ought to look to the following preparations, when an operation is expected; and let him reflect that every thing, even the meanest article, is dignified by an occasion, when the life of a fellow creature is at stake. The articles are here enumerated, in such a manner that he may run his eye rapidly over them.

See that a strong table be placed in a good light; a blanket upon it, and pillows. A dish with sand or sawdust beneath.

To one side a table with the instruments, covered with a cloth, to preserve the edges of the cutting instruments. On it we expect to see

1. A large cushion with tenacula, needles, pins, and forceps.
2. Ligatures of every variety, well arranged.
3. Adhesive straps; well made, and not requiring heating. But if they should, let a chafing dish be at hand.
4. Lint; compresses; flannel and calico bandages; double and single headed rollers; tow; cerate spread on lint. Let there be no want of sponges, so that when the surgeon calls for a sponge, you have not to seek for it among the patient's clothes; and when a sponge falls among the sand, let it not be necessary to touch the face of the wound with it.
5. Wine and water, and hartshorn.
6. A kettle of hot water; a stoup of cold water; basins; bucket; plenty of towels; apron and sleeves.

Consider, also, where and how the patient is to be laid after the operation. Ought he to lie on a firm mattrass; is a cradle required; or oil-cloth; or should the sheets be doubled under him and rolled?

The patient should be brought in with a loose dress, proper to the nature of the operation; and those various preparations should be concealed from him.

And, lastly, look to the right arrangement of the instruments appropriate to the operation about to be performed; and see that, by consultation with the surgeon, you know exactly what is intended, and the order of the operation. Let there be no occasion for the surgeon to ask for any thing; but when he motions with his hand, be ready to give him the instrument. At each short interval of the operation, you ought to be ready to clear the wound from blood, with a sponge well squeezed out of tepid water.

One word more. If it be a great operation, and especially if the assistants and nurses are not habituated, be careful to appoint them their places and their duties; for nothing tends more to the right performance of an operation of magnitude, than that composure and quietness which result from arrangement.

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ILLUSTRATIONS OF THE OPERATION

OF

TREPAN.

THE FIRST PLATE exhibits the INSTRUMENTS used in performing the Operation of Trepan. In preparation for the operation the following instruments are laid on the side-table:

Fig. 1. *Trephines.* * Of these there ought to be three at least of different sizes, and a trephine cut down on one side and of the form of fig. 13.

Fig. 2. *Cranium Saws* of different forms. †

Fig. 3. *Perforator.* ‡

Fig. 4. *Trepan forceps.*

Fig. 5. *Brush.*

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* The teeth of the trephine should be so set, that the incision of the bone shall be somewhat wider than the cylindrical part of the instrument. By this means the instrument works better, and the Surgeon can incline it so as to cut more on one side than another; a circumstance necessary to the safety of the dura mater in perforating the skull, when there are inequalities of surface.

† The saws should be longer, heavier, and with smaller teeth than represented in fig. 2.

‡ The perforator (fig. 3.) is improperly put out of the modern case of trepanning instruments; for although it is not needed for the application of the trephine, it is useful on other occasions. See observations on Plate III. It should be formed so as to slip into the handle of the trephine, fig. 1.

Fig. 6. *Rasparatory.*
Fig. 7. *Lenticular.*
Fig. 8. *Elevators;* two of these at least.
Fig. 9. *Elevator* with reverted point.
Fig. 10. *Tooth punch.*
Fig. 11. *Small strong forceps.*
Fig. 12. *Flat probe,* and *quill.*
Fig. 13. *Semicircular trephine.*

Let the bed or couch on which the patient is lying be turned to the light — have the head shaved — put a wax-cloth on the pillow — let the pillow be firm, to support the patient's head. Put tow or sponge by the side of the head — let there be a stout assistant to hold the patient's head firmly, and let others put their hands on his arms and knees.

The surgeon will expect the instruments to be handed to him in this succession — the scalpel; the rasparatory; the trephine; the brush, the quill, and probe, from time to time; the elevator, the forceps, the lenticular.

EXPLANATION OF PLATE II.

Fig. 1. This first figure exhibits the wound after the operation has been performed, the trephine having been applied, and the shattered bones removed.

A, The lower flap of the integuments.
B, The upper flap.
C, The cranium.

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D, The dura mater, exposed by the removal of the fractured portions, and of the circular portion cut by the trephine.

Fig. 2. Sketch of the fractured bone, exhibiting the plan of the operation which was performed in fig. 1. The fracture consists of three portions, *A*, *B*, *C*. Their edges are depressed; and, being sharp, and pressing on the *dura mater*, the object of the operation is to take them out; they must be taken out, and not merely *elevated* to the level of the skull, because they are insulated. The *pericranium* is separated from them by the blow. The shock has at the same time shaken the dura mater from their inferior surface, and the fissure completely insulates the depressed portion. If these pieces of bone be left, being deprived of their vitality, they will irritate the brain and its membranes like the presence and contact of a foreign body. The elevator cannot be used, because there is no hold or purchase to be obtained. It is to gain this advantage that the trephine is applied. The perforation being made by planting the trephine at *D*, the broken pieces of bone are then elevated and picked away, and the wound assumes the appearance *D*, fig. 1.

Fig. 3. Here are two portions of a cranium, cut out by the trephine. They exhibit a very remarkable difference in the thickness of the skull. From observing these, the necessity is obvious of proceeding with caution through the whole operation of perforating. The Author has seen some Surgeons commence this operation with all due precautions, but grow weary of it, and urge the intrument at last with a dangerous degree of freedom.

Fig. 4. A portion of bone exfoliating after the operation of the trephine.

Fig. 5. The circular piece of bone cut out to show the tables.

THE OPERATION,

AS ILLUSTRATED BY THE FIRST AND SECOND PLATES.

INTEGUMENTS.

The flap *A* was laid down by the blow, so that the skull was uncovered. It was only necessary to enlarge the wound towards the temple, and dissect up the flap *B* a very little.

Note, When the bone is suspected to be fractured, and it is necessary to divide the integuments, take care to avoid making angles; for they shrink during the cure, and leave the bone bare. Take care how you press the edge of the knife perpendicularly upon the bone, for it may enter a fissure. If possible, avoid taking up the arteries of the scalp. Let the assistant put a piece of lint upon the mouth of the vessel, and hold it during the operation. If the artery must be secured, it ought to be taken up with the tenaculum. It is a barbarous practice to push the needle through the scalp, and include a part of the integument in the ligature.

PERICRANIUM.

When the scalp is opened the surgeon receives the Rasparatory [fig. 6. Pl. I.], with which he takes off the Pericranium from the part of the bone on which he intends to plant the Trephine.

Note, This should be done with great precaution. The Pericranium is most valuable to the safety of the patient. By taking it off, you deprive the bone of the support of its vessels; you endanger exfoliation, and that is a tedious process.

Observe, further, that very often, from the violence of the blow, the Dura Mater is already shaken from the inner surface of the bone, and if the bone be also deprived of its covering of membrane, then it exfoliates; and before a piece of bone, like that represented in fig. 4. Plate II. is separated, the wound is kept open for many months. The patient is consequently exposed to all those influences which are apt to cause a bad action in an open wound: and, in a wound such as this, erysipelas and sloughing will endanger the life.

SAWING THE BONE.

The Surgeon receives the Trephine (fig. 1. Plate I.), and plants it on the place selected (*e. g.* fig. 2. *D.*) The centre pin or pivot is down when he receives it. This part of the instrument serves the purpose of the perforator. The Surgeon presses it against the bone, and turning the instrument, he sinks the point until the teeth of the circular saw begin to work upon the surface of the skull. The Surgeon raises the instrument, and bringing it to the level of his eye, he takes care to depress the pivot until it just projects so far beyond the teeth of the circular saw, that, when replaced upon the skull, it will enter into the central perforation, and keep the circular saw steady in its motions. The Surgeon now works the instrument upon the bone, withdrawing it from time to time and brushing the teeth. When the circular cut into the bone is sufficiently deep to preserve the instrument in its place, the pivot is to be drawn quite up.

Note, By neglecting this precaution the point has been carried through the Dura Mater!

Note, When the Surgeon has cut through the outer table of the bone, the sawings are more bloody, and the teeth of the instrument are more clogged. This marks the progress through the Diploe.

Note, Do not look for this distinction in the tables of the skull of a child. The difference of the substance of the bone will not be distinguishable in a very old skull.

While the instrument is cutting into the substance of the bone, the Surgeon begins to move his hand more lightly. He withdraws the instrument often, and, receiving the flat probe or the quill, he feels along the circle, and will be able to distinguish betwixt the bone, which, not being yet cut through, resists, and the more elastic and yielding Dura Mater. If the probe or quill go through at one part of the circle, when he resumes the trephine, he is careful to press the instrument on the opposite side, and to avoid touching the Dura Mater with the teeth of the saw. The circular saw may perforate the bone sooner on one part than another, if the lower surface of the bone be irregular. This it often is. In Plate III. fig. 5. and 7., such irregularities were experienced. In such cases it is impossible to cut the bone through in the whole circle without endangering the membrane beneath; and, therefore, the circular piece is to be broken up, before the saw has entirely perforated the inner table. This practice is, however, to be avoided, when possible, for fear of Spiculæ of bone being left, or for fear of injuring the membrane by the violence.

ELEVATING THE BONE.

When the circular piece of bone is cut, and the membrane is felt by the probe in a considerable part of the circle, the Surgeon takes the Elevator or Lever (fig. 8. Plate I.), and, entering upon one side of the circular

portion of bone, he poises it up; but as yet gently, watching whether it moves; and he shifts the point of the instrument round the whole circle, poising up the bone until it is loose. He then takes the Trepan Forceps (fig. 4. Plate I., the blades of which are segments of a circle, corresponding exactly with the trephine, and, consequently, with the circular cut in the bone); with these he grasps the circular portion firmly, and brings it out. But if the circular portion of bone be so firm that the forceps are insufficient for its elevation, he presses the end of the lever under the edge of the bone, and applies, at the same time, another lever on the point diametrically opposite. The use of the second lever is to prevent the edge of the bone on the opposite side from being depressed. By the combined operation of the two levers the loose bone is raised.

ELEVATING THE FRACTURED PORTIONS.

The perforation being completed, and the circular portion removed, the Surgeon proceeds to elevate and take away the broken portions (*A. B. C.* Plate II.) This is done by passing the lever under the shattered portion; and care must be taken to raise the whole equally, for if he poise up one side of the bone, the opposite side will be pressed down upon the membranes of the brain. One portion of bone being raised, facilitates the raising of another. And now the opening of the bone resembles what is presented in fig. 1. where the Dura Mater *D.* is exposed.

USE OF THE LENTICULAR.

It is now the especial duty of the operator to feel and examine the edges of the bone which touch the Dura Mater; for if they are rough and sharp, or have acute points, they must be rounded off and blunted. The assistant hands to him the Lenticular (fig. 7. Plate I.) for this purpose, and we may observe, that it has a

round, button-like head, which is to be placed against the Dura Mater; while, with the sharp edge of the instrument, the inequalities of the bone are cut off.

THE TREPHINE USED TO PERFORATE A DEAD PORTION OF BONE.

It has not been thought necessary to have a plate for the explanation of this case. When the Trephine is used to evacuate matter which lies under the bone, the operation is to be performed with the same precaution as in that explained above. Observe, however, that in cutting through the bone, there are no bloody sawings, to mark the middle stage of perforation; for the bone is dead: but the teeth of the instrument move softly. There is sometimes pus within the cells of the bone; and the offensive smell, upon perforating the first table, both indicates that we have reached the Diploe, and proves the propriety of the operation.

THE PERFORATION OF THE BONE WHEN BLOOD LIES UNDER IT.

In this case the operation requires the least delicacy of hand; for the Dura Mater is separated from the bone by intervening blood. But as we cannot be absolutely certain that there is extravasated blood under the bone, and as no advantage is gained by rapidity in this operation, the bone should be perforated, in all cases, with the precautions already recommended.

Note, in the case of extravasation under the bone, as the Dura Mater is separated below, we ought to be the more careful of saving the Pericranium upon the upper surface. When the circumstances of the wound and the symptoms indicate the propriety of perforating in order to dis-

PLATE III.

Drawn by T. Landseer.

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charge the blood, the place best suited for the application of the trephine, is on the lower part of the parietal bone, towards the temple.

EXTRACTING THE BLOOD FROM UNDER THE BONE.

When the circular portion of bone is removed, the blood appears a dark coagulum, firmly adhering to the Dura Mater; it is no longer fluid in any part, and no fresh blood flows from the opening. The coagulum must be broken down with the finger and the probe bent so as to go under the bone; and then washed away with the syringe and tepid water. It is a favourable circumstance, when the Dura Mater rises in proportion as the blood is evacuated. When the quantity of blood is very great, and when it extends far under the bone, the case is desperate; the instances of recovery are few.

EXPLANATION OF PLATE III.

This plate is intended to illustrate a variety of circumstances regarding the use of the TREPHINE, the ELEVATOR, and the CRANIUM SAW.

Fig. 1. A skull with various examples of fracture. Although these are all illustrated on the drawing of one skull, they are, nevertheless, all accidents in actual practice.

A, A triangular portion of the Os Frontis, fractured and depressed.

B, Three perforations made with the trephine, which were found to be necessary to the elevation and extraction of the portion of bone. This may suggest a very important question. If the object had been merely to elevate the bone, when one of these perforations was made, the elevator might have been used to poise up the edge, or even to elevate the whole portion to the level of the cranium. But the fractured portion was to be *extracted* altogether. The edge of the Tabula Vitrea of the fractured portion being always broken off more largely than the outer table, it was found here to shelve under the edge of the skull; therefore a second and a third perforation were necessary. In consequence of this mistake in the manner of applying the trephine, when these three circular portions were cut out, and the large depressed portion taken away, a very large and formidable gap in the skull was left. In the end, the Dura Mater gave way, and the patient died of Fungus Cerebri.

C, A fissure and fracture of the Os Frontis. * Here the Surgeon put on the trephine at *D* on the sound part of the skull. The bone could not be raised; a second perforation was made on the sound part of the skull, a little higher up; still the bone could not be extracted; a third perforation was made at *E*, and then the bone was lifted out. This third perforation should have been the first and only one.

F, is a fracture with depression at the lower angle. The trephine was placed at *G*. It ought to have been a large one, and placed at *H*, by which a portion of bone would have been saved, and a more favorable form of opening obtained. By the perforation *G* an acute angle of bone was left betwixt *G* and *F*.

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* The *C* is indistinct, from the darkness of the Engraving; but the Reader will readily distinguish the fracture on the right side of the Os Frontis.

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USE OF THE PERFORATOR.

The Perforator (fig. 3. Plate I.) of the old trepanning set is very improperly omitted in the cases of modern instruments. It is an instrument very useful on many occasions. In a fracture of the skull like this, (fig. 1. Plate III.) by working the perforator a little at certain points, we gain a purchase for the point of the lever; and thus avoid the necessity of using the trephine. We may also require to use this point, to make an impression on the edge of a bone, so that the lever may be introduced under it, to keep it steady during the action of the trephine.

Fig. 2. represents, accurately, a portion of the cranium removed from the Os Frontis. If this be carefully observed, it will explain much of the principle of applying the trephine. At its extreme angles the inner table is seen to project beyond the outer table. This is almost always the case with the fragment of the cranium, *at the edge most depressed*. (For example, at *F*, fig. 1.) It is on this account, that the trephine applied at *G* is very often useless; the bone can only be raised to the level of the cranium, but not brought away.

Fig. 3. A portion of the cranium which was fractured and depressed; and elevated by the trephine.

Fig. 4. The portion of the bone cut by the trephine, for the purpose of elevating fig. 3. If these two portions be compared, they will explain a circumstance very important to the safe performance of the operation. The Surgeon begins his operation, working boldly on the firm edge of the skull (*e. g.* at *B*, or *D* or *G*, fig. 1.) But when he has cut through the outer table, he presses, inadvertently, on the inner table of the loose portion of bone: (fig. 3.) It is loose, and moves with the motion of the instrument, and chafes and cuts the Dura Mater!

Fig. 5. A portion of bone cut out with the Trephine having a remarkable inequality on its lower surface. This will be the case, in operating upon the skull over the Sinus; in operating where there is a Fovea on the inner surface.

Fig. 6. The portion brought out by the Trephine; having a considerable portion of the inner table attached to it. This must be the case when the Surgeon is under the necessity of breaking up the circular portion.

Fig. 7. A portion of bone taken out by the Trephine, very unequal on its lower surface, from the instrument having been planted over the spine of the upper part of the occipital bone. This makes the operation as difficult as the circumstance represented in fig. 5. does. The instrument must be inclined, in order to avoid cutting the Dura Mater on that side where the bone is already perforated. But this is not always practicable; and in such a case the instrument, (fig. 13. Plate I.) will prove of much service.

THE USE OF THE CRANIUM SAW.

The Cranium Saw may sometimes be substituted for the Trephine, *e. g.* in the event of a triangular portion of the skull being fractured and depressed at one angle, (as *F*, fig. 1. Plate III.,) instead of applying the trephine at *G*, or even at *H*, the saw may be used to cut across the base of the triangular portion, in the line of the fissure. That it is not so safe, nor so effectual as the trephine, in this case, must be acknowledged; there is more danger to the Dura Mater. When the section is completed, there is still difficulty in introducing the Elevator; and it cannot be pushed under the bone to elevate it directly upwards.

The next occasion for the use of the saw, is to cut off an angle of bone, as at *K*, fig. 1. Plate III. To use the trephine here would make two corners of bone instead of one; and still leave an opening of a very unfavorable form.

There is another case where the saw may be used with advantage, and so as to save a considerable portion of the skull. Let us suppose that the central perforation is made with the trephine at *B*, fig. 1., and that the fractured portion cannot be brought out; if, instead of making two more perforations with the trephine, the saw had been used to cut across the loose portion of bone, in the direction of the dotted line, then the lever, introduced at the trephined hole, would have burst up the bone without violence; the portion of bone, fig. 2., would have been brought out in two portions; the dotted line would have been their division; and then the points, and shelving edges of the Tabula Vitrea could have been withdrawn from under the sound bone. Two large perforations of the skull by the trephine would have been avoided. It may give some force to this remark, to assure the reader, that fungus of the brain sprung from this perforation of the skull; (*A*, *B*, fig. 1.;) and this accident I attributed to the unnecessarily large size of the opening.

EXPLANATION OF PLATE IV.

The principal figure of this plate exhibits the terrible consequence of the rupture of the Dura Mater —the rapid formation of a tumor springing from the brain itself.

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The tumor is by some called FUNGUS CEREBRI; by others it is called HERNIA CEREBRI. With this interesting subject of Pathology we profess to have nothing to do; our business is with the dressing, by which this alarming occurrence is to be prevented, or the tumor repressed, when it has arisen. I may just add, what cannot be expressed by the pencil — that the eye is insensible; that there is froth working from the mouth; that the features are convulsed, and that the opposite side of the body is paralysed. *

Fig. 2, 3. represent the form of the dressings.

The pieces of bone, fig. 4. are those taken from the wound; and their small size and number sufficiently indicate to the experienced that they were broken by a musket ball. Some of these pieces had their sharp angles driven through the Dura Mater. When this is the case, there is always the most imminent danger of what took place here, FUNGUS CEREBRI.

DRESSING AFTER TREPANNING.

The patient should be raised and supported in bed in a sitting posture. In dressing the wound it must be the care of the Surgeon to keep the integuments in contact with the bone, so as to secure the life of the latter. In the progress of the cure, if care be not taken to keep the flaps well over the space from which the bone has been taken away, they will be united by adhesion to the remaining surface of the skull, and continue furled up in ridges; leaving the space of the skull operated upon covered only with a thin membrane instead of the proper scalp.

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* The drawing of the face in this plate will appear incorrect, unless the paralytic affection of the side of the face be recollected.

Another object of this dressing is to prevent the rising of the Dura Mater. For if it rise, it must press against the edge of the bone; and then, by the incessant pulsation of the brain, it will ulcerate, and give way. It will be necessary to moderate the pulsation of the brain by general bleeding, and to press down the flap of the integument on the Dura Mater. But this will not always be possible; and then against the pulsation of the brain the membranes must be supported *by the mode* of dressing.

Cut slips of fine lint of the exact size of the opening of the bone; dip them in oil, and place them successively on the Dura Mater, until they be equal to the thickness of the bone, and rise a little above its level.

Place a slip of the mildest dressing under the integuments and over the slips of dressing. It must lie loose, and not confine the matter. Over the integuments, and upon the edge of the flap, place lint. Over this a soft compress. [This compress is made by laying some soft tow, or lint, or cotton, on a square piece of lint, and folding the corners over.]

The bandage for the head is made by a double-headed roller. Place the middle of the roller on the compress, and carry the ends on both sides to the temples. On one side turn the head of the roller, so that it encircle the forehead and occiput, and pass above the other part of the roller. An assistant holding fast the circular roller: that which hangs over the temple, is to be returned over the head. On the opposite side it is again to be held down by the finger of the assistant, until the circular roller be brought round to embrace it. And then, twisting the two rollers, make that which encircles the head pass over the head, and that which passed over the head encircle the head; and thus alternately, until the dressings on the wound be sufficiently supported, and the whole head be covered by a neat cap, made of the interlacings of the two extremities of the roller.

See that on the whole the bandaging of the head be not too firm — let it be light withal, for much bandaging will keep the head too hot, and is, therefore, improper. Wet the bandages, if there be excess

of heat. But never apply cold suddenly to the head: And see that the patient with a wound of the head be not exposed to a stream of cold air, for he will be in danger of erysipelas.

If, during the dressing, you observe a strong pulsation of the brain, and the Dura Mater very tense and convex, as I have said, it indicates bleeding. A cough should be by every means subdued; for it drives the blood with such violence to the head, as to endanger the bursting of the Dura Mater. For the same reason, the patient is to be pacified, if possible, and not held; for his struggling is dangerous; it may force the brain from the trepanned hole, especially when the dressings are off.

DRESSING THE WOUND IN THE CASE OF FUNGUS.

When the Dura Mater is cut, in consequence of the bone being forced in upon the brain, of aukwardness in using the elevator, of the clumsy use of the trephine, or of the force internal, then the patient is in extreme danger; and his chance of recovery depends on the mode of dressing.

If a soft mass of a dark claret colour project from the cut of the Dura Mater, a fungus is about to rise; and to this danger we must oppose a careful dressing, as described above. When things are in this state, the crying of the child, or the struggle of the delirious adult, may produce rapidly a true hernia cerebri.

When the tumor has arisen, and projects much above the bone, it may be too much to repress it forcibly and suddenly.

Cut the straps of adhesive plaister in the form of fig. 2. Open the centre of the strap with a snip of the scissars, (which is intended to permit the discharge to escape,) taking the strap by the two ends; and place the middle of it directly on the tumor; keep the strap tense; and press for some time on the tumor; then lay down the ends of the strap on the scalp, and fix them there. Take a second strap and lay it

on the tumor, and across the first one, holding it tense, and pressing it upon the tumor for some time; then fix it, like the former, to the scalp. Another strap may be necessary. Over these adhesive straps, place a soft compress, and then apply the bandage.

When this dressing is renewed, it may be necessary to hold aside the tumor, and facilitate the discharge of matter; for an abscess is sometimes combined with the fungus.

When the tumor is very large, and the hole in the skull through which it projects very small, it will be better to proceed in the following manner. Form a web of lint into a circular pad (fig. 3.); place this around the tumor, elevating the pad nearly to the level of the fungus. Over the pad and surface of the tumor, place slips of dressing and soft fleecy lint, (charpic,) then apply the double-headed roller with great exactness, pressing down the surface of the tumor to the level of the padding. Here the degree of pressure used upon the tumor will depend upon the greater or less elevation of the padding.

The most favorable appearance is, when the granulations are encroaching upon the base of the tumor and choaking it. Therefore the flap, and the granulations which arise from the pericranium, are to be attended to, and guarded by the careful application of dressings. The wound ought to be dressed morning and evening; for matter may be confined, and the changes on the fungus are very rapid and momentous.

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THE OPERATION

FOR

STRANGULATED HERNIA.

SINCE I am about to describe all the niceties and difficulties of the operation for Strangulated Hernia, I must in the first place declare, that it requires more knowledge and experience to decide upon the right time of performing it, than to do it well. I shall neither review the course of symptoms, nor describe the actual appearances that denote the propriety of the operation; but, purposely omitting these very important subjects, recommend them in the strongest manner to my reader's attention.

INSTRUMENTS.

Scalpels; bistouries; dissecting forceps; curved and common directory; winged directory; blunt hooks; tenacula; ligatures; needles; large syringe and pipes; sponges; adhesive straps; dressing; compresses; roller. If the operation is to be done at night, there should be abundance of wax candles.

Note, The common instruments are not well adapted for this operation; some securities are required against accidents; for example — The common directory is, for the most part, too large and

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ing them up on one side of the tumor, whilst your assistant does the same on the other side; there is thus a fold of the skin raised across the tumor; with the scalpel you divide it in the middle. When the skin is let loose, it resumes its situation, and a masterly incision reaches over the tumor, and the most painful part of the operation is already performed.

But in a large Hernia, as here represented, the scalpel must be cautiously drawn over the face of the tumor, cutting through the integuments only. In doing this, you have to think of the difficulties of the latter stage of the operation, and so calculate the length of the incision, that the most critical part of the operation may be done with advantage. 1. Do not cut too far down upon the scrotum, so as to open the vaginal coat of the testicle. 2. Cut in such a manner as to disclose the ring fully, and afford freedom for the operation on the stricture. *

When a tumor is to be extirpated, the incision must be in proportion to the magnitude of the body to be taken out. But this principle does not hold in the operation for Hernia; the object of the operation being essentially the same whether the size of the Hernia be great or small, viz. the cutting the stricture. † I should be inclined to say this is an obvious thing, had I not often seen a contrary practice, as exemplified in Plate VI. If the Hernia be a *Bubonocele*, then the incision must reach from an inch above

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* " Beginning just above the place where the intestine passes out from the belly, and continuing it quite down to the lower part of " the scrotum" — no; this is quite wrong: — you have to begin high, that the stricture and the ring may be made distinct; but you will carry the incision down, not in proportion to the size of the tumor (a large Scrotal Hernia for example), but only to such an extent as will enable you to expose the intestine, and introduce your finger into the neck of the sac.

† See page 32. from the top.

the tumor to its base at the lower part, and in a small Scrotal Hernia the incision must be nearly in its whole length. *

OF RAISING THE LAYERS OF FASCIA AND CUTTING THE SAC.

When the operation has advanced to the stage represented in Plate V. you proceed to raise a succession of layers of cellular membrane. † And do not affect to do this part of the operation rapidly; but raise each layer in succession with the same care as if you were in contact with the true sac. Pinch up the membrane with the forceps; cut it, by carrying the knife horizontally; introduce the directory; and slit up the membrane, by running the knife or bistoury along the groove.

In thus exposing the true sac, do not dissect the tumor quite bare, nor expose its whole convexity; for that will endanger the sloughing of the sac, and an unfavourable state of the wound at the latter period of the treatment.

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* The external pudic artery bleeds on making the first incision. It is proper to stop a little, and let the surface be clear of blood before you proceed to the more delicate part of the operation. If the vessel bleeds so freely as to make it possible that it may burst out after the dressing is put on, it should be taken up with the tenaculum in this early stage of the operation. It is a very unfortunate accident to have the wound filled with extravasated blood after the dressings are applied.

† It is of little use to distinguish these by name during an operation. The *Cremaster muscle*, no doubt, enters into the composition of the principal membrane, which is exterior to the proper sac; but it appears like a layer of simple cellular texture, condensed by pressure and inflammation.

In laying bare the surface of the sac of a Scrotal or Inguinal Hernia, consider the possibility of its being of that kind which is called *Ventro-inguinal;* for in that case the spermatic cord may have been split by the descent of the tumor, and the *Vas Deferens* may present on the fore-part of the sac, instead of running behind, its usual place. This is another reason for making the first part of the operation a cautious dissection.

At length, after a cautious *Dissection*, the true sac is exposed; it is to be opened by pinching it up, and cutting it; and when this is done, the serum escapes, sometimes in a jet; and by this escape of fluid it is indicated, that it is not one of the layers of membrane, but the proper peritoneal sac which you have opened. Here, however, I must point out what accidents the Operator may meet with.

1. There may be adhesion of the omentum to the sac; and instead of finding a fluid; instead of discovering the smooth surface of the gut; you may continue to dissect through the Omentum!

2. There may be no serum, and the surface of the gut may be in contact with the sac. This is what prescribes to us all these cautions in opening the sac; for were there always fluid, there would be no occasion for precaution.

3. The surface of the intestine may be in adhesion to the inner surface of the sac. It is sufficient comment on this fact, that I have seen a Surgeon prosecute a cautious operation, lifting the membranes carefully in succession, until flatus and fæces escaped! You will understand by this, that he did not make sufficient distinction betwixt the coats of the intestine and the layers of the sac. When you have a suspicion that you have actually penetrated the sac, without finding the cavity, prosecute the dissection higher or lower on the face of the sac, as the circumstances may point out.

4. When the serum spouts out, on cutting a membrane, it may be only a vesicle or hydatid; they occur especially on the sac of the Femoral Hernia.

5. The serum may be pure and limpid, and this augurs well; it indicates that the intestine has suffered

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no considerable injury. The fluid effused may be dark-coloured and offensive; this indicates danger from too long delay of the operation. *

To proceed with the operation, the sac is opened by the bistoury introduced upon the directory; and the slit is made sufficient to let the finger be introduced. The finger being introduced, and passed upward within the sac, you next place the probe-pointed bistoury, with its flat side on the finger, and so, slipping it under the membrane, you first raise the edge of the instrument, by turning it laterally, and then elevate the handle; and so divide the membrane, and fully disclose the gut. See fig. 2. Plate VI.

EXPLANATION OF PLATE VI.

Fig. 1. This figure represents a SCROTAL HERNIA, in which the first part of the operation has been performed: the intestine fully disclosed: and the Operator's finger introduced to feel the state of the stricture. This figure is not meant to represent what ought to be the mode of operating; but, what very often occurs, in following the method described by authors. I have thought I could not better fulfil the object I had in this work, than by representing the Surgeon embarrassed by having many turns of intestine rising out of the sac, and turning over the very part, the neck of the sac and stricture, where the most

* See further, on the subject of the gut, under the head of *Femoral Hernia*.

critical step of the Operation is still to be performed. I have repeatedly seen the bowels thus exposed, in the operation for Scrotal and Congenital Hernia, and always with fatal consequences, if there were many convolutions exposed.

I quote the following words. " The place to make the incision in the hernial sac, is about an inch " and a half below the stricture, and the opening need not be larger than just to admit the end of the " Operator's finger: the forefinger introduced into this aperture is the best of all directors. The sac must " be divided quite up to the opening of the tendon, and down to the bottom of the scrotum." If on this advice our Operators proceed, out rolls the intestine, and the appearance represented here is exhibited. How have I been mortified when this has occurred in my operation, and when I have heard the students whisper — a very fine display of the parts in Hernia! Truly if display be the object of the operation, the success is perfect.

In a small Hernia, a Bubonocele, the sac must be slit open from the top to the bottom; because, with the fullest disclosure of the contents of the Hernia, you have no more than room to proceed with the operation; but it is a most inconsiderate proceeding with a large hernia of any kind; therefore,

WITH A LARGE SCROTAL HERNIA,

proceed in this manner. Having exposed three inches of the face of the sac, and by a careful dissection of the exterior membranes, having disclosed the proper peritoneal coat, — pierce it near the upper part of the incision; do this by pinching up the membrane; and through the hole thus cut, introduce the directory upwards. The directory being raised with some strength, and bearing consequently against the sac, you may cut directly down upon the groove with the scalpel; or run the probe-pointed bistoury along

it. This incision should be of sufficient length to admit the little finger. The finger being introduced, it is pushed gently upwards, betwixt the neck of the sac and the intestine. If you find that your incision through the sac is near the place of the stricture, pass the directory over the finger and under the edge of the sac; introduce the point of the directory into the stricture; and then divide the constricting edge with the probe-pointed bistoury. Withdraw the instruments, and, introducing the finger, (still in the most tender manner, in consideration of the probable condition of the intestine) feel the state of the stricture. Probably a thick firm edge is still to be felt; this is to be cut in the same manner. You naturally enquire, what is the measure of these incisions? The edge is to be cut until the end of the little finger can be passed without violence by the side of the gut.

It will probably happen, and especially in your early operations, that when you have pierced the sac, as you think, near the stricture, you find yourself, in fact, far from it. In that case, the finger is to be introduced in a direction towards the ring: on the point of the finger, make a perforation of the sac higher up than the first one, and just under the stricture in the neck of the sac; through this second perforation introduce the directory, and divide the stricture, as I have described.

Now, in the gentlest manner possible, embrace the whole tumor with the hand and fingers, and compress it *; the fluid contents of the included portion of the intestine will flow upwards, the empty gut will be left in the sac; this presently will be drawn into the belly, with very little assistance of your finger; and, I need not add, the less the better.

An experienced author has said — "Divide the sac and scrotum down to the bottom. It is true, that "upon such division, the quantity of intestine will seem to be increased, and an ignorant by-stander may

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* See below what is said of the treatment of the intestine.

" be alarmed at this fallacious appearance, which is produced merely by the confined, compressed gut " being set free, and not by the addition of any more." In contravention to this advice, I must represent the matter correctly.

When three or four turns of the intestine are steaming among the fingers of the Surgeon, it is not only an appalling sight " to the ignorant by-stander," but to those, especially, who look forward to what follows. First, there is much difficulty in repressing the distended intestine, so as to expose the stricture, and to cut it. The intestines must be rudely repressed for this purpose, and they are in danger of rising over the edge of the bistoury. Then we see the Surgeon, I may say, struggling with these volumes of intestine, in an ineffectual attempt to empty them. When, at last, he succeeds in reducing them, it is thus — he must compress a portion of the gut, at about two inches from the seat of the stricture: he must press up the fluid contents of this portion, preventing them from flowing backwards, and forcing them into the part of gut that is within the belly. After this first portion of intestine is empty, he must let in more from the over-distended intestine below; and this he must do many times in succession, until the whole of the distended bowels are empty and flattened; during this process, he must necessarily knead and pinch, repeatedly, every portion of the protruded gut! What is the consequence? [I have seen it on dissection,] that portion of the intestine which was down in the Hernia, and which, during the operation, appeared natural and free from all disease or inflammation, being subjected to this severe process of squeezing and handling, inflames; and is seen lying among the other turns of the intestine, distinct in colour, inflamed, and glued into a knot; it is the cause of death. All this is the consequence of disengaging the intestine from the compression of the peritoneal sac, and exposing it in the manner expressed in Plate VI.

THE STRICTURE.

There is another important circumstance to which this sixth Plate may serve to direct your attention. The finger is introduced up into the neck of the sac, in a very dangerous manner; because if the finger be pushed into the stricture with violence, the intestine is necessarily crushed and injured. On this part of the operation, I refer to what is said in explanation of Plate VIII. There was an operation of dilating the stricture, instead of cutting it, recommended by authors of a former age; and, in some kinds of Hernia, it is still recommended by some of our modern authorities. It is obvious, on the slightest consideration, that it is impossible to stretch the stricture with an instrument, without, at the same time, drawing the neck of the sac and stricture tighter about the strangulated gut. Let me press this as an absolute rule upon you, on no account to attempt stretching the stricture with the directory or probe; far less with any contrivance of a particular instrument; for by this, you will bruise the inner coats of the intestine, although, owing to the resistance made by the peritoneal coat of the intestine, the surface will present no appearance of injury.

EXPLANATION OF FIG. 2. PLATE VI.

The finger introduced up to the neck of the sac: the directory passed into the stricture; where, as yet, the finger must not follow. The probe-pointed bistoury is represented as conveyed along the groove of the directory. This figure demonstrates the manner of cutting the sac; and shows the necessity of taking care to repress the intestine. It shows that the finger is not to be introduced into the stricture, in the first instance, but only the directory.

THE OPERATION

IN

VERY LARGE SCROTAL HERNIA,

WHERE THE NECK OF THE SAC IS WIDE.

A LARGE Scrotal Hernia, which hangs low, and has a wide neck, may become strangulated: either in consequence of congestion in the intestine: or by a considerable further descent of the intestine and mesentery: or by the falling down of a new turn of the intestine. *

It may, in this case, occur, that the sudden distention of the neck of the sac is not resisted by the sac itself, but by the surrounding tendon. In operating, therefore, our first object should be, to cut and thereby relieve the stricture of the tendon, without penetrating the sac or exposing the intestine.

Make an incision of three inches in length, upon the fore-part of the neck of the tumor. Take the forceps and scalpel, and dissect through the superficial aponeurosis. The filaments of the tendinous ring will be found dispersed upon the neck of the sac in such a manner, that the sac and the abdominal tendon will appear like one continuous surface; but, by passing the directory under the dispersed fibres, you will

* This is the case, to attempt the reduction by long continued gentle compression, which will often succeed, when more forcible attempts fail.

get the instrument betwixt the tendon and the peritoneal sac. When the directory is thus passed under the tendon, the bistoury is to be introduced along the groove, and, by raising the latter instrument, the firm tendinous fibres which embrace the neck of the sac are divided. And now an attentive eye may observe some lesser threads of the dispersed tendon, which may be also divided, either by passing the sharp point of a bistoury under them, and lifting them up from the sac, and dividing them, or by dissection with the edge of the scalpel.

When this is done, the instruments are to be laid aside, and a reduction is to be attempted by grasping the scrotum, and in short performing the operation of the Taxis. *

If this should fail, you may proceed with the operation, by piercing the sac near the neck, and introducing the finger, and dividing the stricture of the sac, as already described.

THE INTESTINE MAY BE ADHERING.

These adhesions are slight, if they have been formed by the last attack of inflammation, and then they may be undone by the handle of the knife. If they have been produced by former attacks, they require to be cut; and in doing this, we must rather encroach upon the sac than interfere with the coats of the intestine. But it is a worse occurrence when the intestine adheres firmly to the neck of the sac, as we cannot dissect up the whole of these connections without great danger to the patient. We relieve the stricture, and let the gut remain down.

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* This is the operation proposed by *Monro* in common cases of Strangulated Hernia. The objections to it, in any case but those of very large Hernia, are, in my opinion, decisive; viz. the tender state of the intestine, engaged in a narrow stricture, and the probability of the stricture being in the neck of the sac.

OPERATION

ON

THE CONGENITAL HERNIA.

EXPLANATION OF PLATE VII.

THIS is an accurate representation. It may be said, where is the sac? I answer, I drew accurately, yet the question leads to some necessary explanation.

The incision through the integuments of the scrotum cannot be mistaken.

A. is the intestine much inflamed.

B. is the adhesion of the intestine to the testicle.

C. is the body of the testicle, lying in the same sac with the intestine, and that sac the vaginal coat.

1. In operating for the Congenital Scrotal Hernia the incision and the dissection necessary in the first stage of the operation must be done very carefully, for the true sac is often very thin and transparent. *

* The reason I conceive to be, that there is no protrusion, or violence done to the peritoneum in this kind of Hernia. The sac, my reader will recollect, is a natural process of the peritoneum.

PLATE VII.

London. Published June, 1830, by Mess.rs Longman, Rees, Orme, & Brown.

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tents of the sac have been occasionally reduced, and there be no reason to suppose that there is adhesion, then the stricture at the neck of the sac should be cut by a small incision of the integuments, (as represented in PlateV.), and, if possible, we ought to avoid the exposure of the intestines, and the necessity of handling them.

5. In the Congenital Bubonocele we have sometimes to trace the symptoms, not to stricture so properly, as to inflammation. To understand this we must recollect, that the intestine often adheres to the testicle before the descent of that body; and that, either owing to this circumstance, or to some imperfection in the testicle, it never fully descends into the scrotum. The testicle and the intestine lying in the groin, are exposed to injury by bruises, and, consequently, to inflammation. From such a cause I have seen peritoneal inflammation spread, and destroy the patient in three days. A lesser degree of injury forms adhesions, which greatly embarrass the Surgeon in the event of an operation being required; for when he has freed the intestine from its adhesions, it is so much inflamed that it does not act, and the symptoms of obstruction continue.

6. When it is necessary, in the case of Congenital Inguinal, or Congenital Scrotal Hernia, to cut those adhesions betwixt the testicle and the intestine, we must pay most regard to the latter, and cut, at all events, in such a manner as to save the coats of the intestine.

7. You will not forget the observation made above, that the stricture is often in a sharp, firm band of the neck of the sac, and that it requires the utmost nicety to cut it, and to extricate the bruised portion of the intestine.

Fig. 1.

Fig. 2.

London, Published June, 1831, by Scott Greenham, Ward, Rose, Green, & Brown.

FEMORAL HERNIA.

EXPLANATION OF PLATE VIII.

Fig. 1. represents the intestine exposed in the Femoral Hernia.

A, *B*, The extremities of the external incision.

C, The sac of the hernia opened and laid back.

D, The fore-finger of the operator pressing down the gut to examine its condition under the stricture.

E, The edge of the sac cut up close to the edge of the crural arch.

F, The edge of the crural arch.

Let me here observe what must have taken place before the parts could be presented in this stage.

INCISION.

Some Surgeons have recommended a crucial incision in the Femoral Hernia; but I have not found this necessary. Begin the incision one inch above the upper margin of the tumor, and a little towards the spine of the ilium. Continue it, obliquely downwards over the face of the tumor, in a direction slightly semicircular, and let it terminate half an inch below the tumor, on the integuments of the thigh.

The least painful, and the most expeditious manner of making the incision, is to pinch up the integuments, so as to make a fold obliquely across the tumor, and to cut this doubling of the skin through at once with the scalpel. By the manner in which the skin is held, the incision will be obliquely or

directly across the face of the tumor; and by the manner in which the cut is made upon this fold, the incision will be straight or semicircular. Proceed to dissect the face of the tumor bare, and raise up the inner and upper flap a little, in such a manner as to expose the neck of the sac and the edge of the tendon. *

FIRST MEMBRANE.

A fascia, somewhat confused by the mixture of fat and cellular membrane, comes down from the abdominal tendon, and covers the tumor. This must be divided by a slow and cautious dissection, taking care to put aside the glands of the groin that may be attached to it. When this first membrane is divided, the tumor rises from its confinement, and becomes more distinct, circumscribed, and prominent. In consequence of this, the neck is covered by the body of the tumor, and the latter must be gently pressed downwards.

SECOND MEMBRANE.

The Hernia is still covered by a fascia or membrane, which, however, is so accurately moulded to the contents, as to appear like the peritoneal sac itself. This membrane is to be pinched up with the dissecting forceps, and opened by a slight horizontal cut of the scalpel. The directory is next to be introduced, and the membrane divided.

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* If it shall be found necessary, there can be no objection to an incision of the edge of one of the flaps, that is, an incision perpendicular to the first, and made on that side where the Surgeon finds it necessary to disencumber himself of the skin.

But on this head I must make one more observation, and on a circumstance which authors have forgotten in writing pages on the question: — The incision should be made in such a manner as to disclose the neck of the sac. It should also be made in such a manner, that when the compress is put down, the flap of the integument may fall over the passage into the abdomen. This is well effected by the recommendation I have given to make the first cut semicircular, and to dissect up the upper edge, so as both to disclose the neck of the sac and the crural arch; and when the operation is finished, the flap will fall down over the neck of the sac, which will permit the operator to place the compress in such a manner as to prevent the gut falling again into the sac.

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from the Poupart ligament. Here the stricture will be felt. The instrument cannot be introduced without care and patience. You must press down the gut cautiously, to observe if it has suffered and become tender by the pressure of the stricture. No attempt at this time is to be made to push up the gut, nor yet to empty it by pressure. You use the finger, as expressed in the Plate, to hold down the gut, and then cautiously introduce the directory under the edge of the sac, and consequently under the edge of the ligamentous arch. Now pass the straight bistoury a little way into the groove of the directory; raise up the handle of the bistoury, while the point rests in the groove, and thus cut what resists in a direction upwards.

A very slight incision prepares for what follows; gently attempt to draw down the intestine; solicit, as it were, a little further descent of the gut. The object of this is to draw the part of the gut which has been long embraced, and is therefore tender, from under the sharp edge of the tendon.

Having accomplished this, attempt to pass the point of the finger through the stricture: you cannot, at any rate, do not, force, nor squeeze the point of the finger in; for, as the intestine is also embraced by the stricture, it would be bruised and irrecoverably injured.

Again the directory and the bistoury are to be introduced, and this time the directory is to be distinctly pressed inward, till the probe-point of it is within the cavity of the abdomen. When there is no longer any doubt of this, the assistant holds down the intestine; the probe-pointed bistoury is a second time introduced upon the groove, and the handle is raised as before, the points of the instruments still being kept in contact. The instrument being withdrawn, we try again to introduce the point of the little finger, and if it pass without violence, this essential step of the operation is accomplished.

You are now to press the gut with all the fingers, gently discharging its contents, and flattening it. When it is emptied, you use the fore-fingers of both hands, and gently introduce that part of the gut which

came last through, taking care not to double the gut upon itself, which is apt to injure the intestine, and which would be stuffing it through the neck of the sac.*

STRICTURE DEEP IN THE MOUTH OF THE SAC.

If the intestine be not freed by such a division of the stricture as I have described, and if the intestine cannot be brought down, it is possible that the neck of the sac may have formed a stricture opposite to the inner edge of the Poupart ligament.

Let the assistant hold open the integuments at the upper angle of the incision, or let him raise the upper flap of the integuments, and, at the same time, repress the gut. The Surgeon is to take the scalpel and the forceps, and dissect up the lower edge of the Poupart ligament. If he be operating on a man, he will find, immediately above the ligament, and lying in its embrace, the soft substance of the spermatic cord. This he is to hold up with the blunt hook, and, giving the hook to an assistant, he resumes the directory and the bistoury; he puts the fore-finger within the sac, and the directory betwixt the finger and the sac; he carries forward the point of the directory through the remaining stricture, and then divides it in a direction upwards with the probe-pointed bistoury, in the manner above described. There is another method of cutting the deep stricture in the mouth of the sac; that is, by passing the point of the finger as deep as possible, without hurting the gut, and then introducing the probe-pointed bistoury, with its flat side along the finger. (This must be the bistoury that is sharp only for a very little way near the extremity.) When the point has passed under the stricture, the edge of the bistoury is to be turned up, and the incision made to the extent of the breadth of the blade. I am happy to add, this operation, on a deep stricture, will be very seldom necessary.

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* I am sorry to see some contemporary authors, whose works are excellent in many respects, neglect these precautions, which appear to me so essential to a safe operation.

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you may find the several portions have adhered; if the adhesions be slight, they are easily undone. Perhaps it bleeds slightly, as you separate the parts. In these circumstances, you may proceed to reduce it; and it ought to be done by gentle efforts, pushing up the portion nearest the stricture with the fore-fingers. You must, at last, lodge it fairly in the abdominal cavity

But it will sometimes occur, that you have this membrane accumulated into a ball, so firm that it cannot be separated without doing violence to its texture, &c. It cannot be reduced in this condition. The stricture cannot be slit up so largely as to admit the whole mass; therefore we must let it remain where it is; only taking care to relieve it of the compression of the stricture.

During the reduction of this membrane, we may feel it giving way among the fingers, at each attempt. In this case, it is improper to persevere. It is better to let it remain in the sac.

The omentum may be gangrenous; of a dirty yellow colour, and offensive; giving out no blood, when torn or cut. In that case, the dead portion should be cut away, and the remainder left in the neck of the sac. On reviewing the practice of my contemporaries, they appear to me to make too great an object of the reduction of the omentum into the cavity of the abdomen. Unless it be in a perfectly natural condition when returned, it is apt to produce peritoneal inflammation. If it be reduced, with some small vessels oozing blood, this blood is a source of danger. On the other hand, when the omentum is left in the sac, it quickly forms adhesions, and closes the abdominal cavity, which I conceive to be essential to the safety of the patient. In the process of the cure, it granulates in the wound, becomes condensed and universally adherent; and is not attended with any inconvenience.

THE OPERATION WHEN THE GUT IS MORTIFIED OR BURST.

There are two conditions of the strangulated intestine to which I beg my reader's attention. The portion below the stricture is mortified, dead; or the stricture has cut the intestine, that is, the intestine has ulcerated where it was opposed to the stricture, and burst.

The ingenious student admires the variety of inventions he reads of and the modes of sewing the divided gut; and he readily makes up his mind to practise that which is the most curiously complex and fanciful. The practical Surgeon knows that these experimental enquiries into the mode of preventing or remedying the anus at the groin, are absolute nonsense, or pregnant with mischief.

These projects fail, after all, for want of imagination in their inventors. For they do not conjure up before them the true circumstances of the case, which is always necessary, before invention can be of any use: they make experiments on brutes, and would persuade us to imitate them in operating on the human body, forgetting the very different conditions of the parts.

The first object, in all cases where the gut is mortified or ulcerated, is to procure a free discharge from the wounded intestine. It should never be forgotten, that the immediate danger of the patient is from the accumulation of matter in the portion of the canal betwixt the stomach and the stricture. This must be discharged, or there can be no amelioration of symptoms.

The next object is to lay a foundation for the operation of closing the gut, and preventing a permanent fistula or anus here, which operation is not to be done *now!* By confounding these two objects, and by proposing to accomplish them both at the time of performing the operation for Strangulated Hernia, the greatest extravagancies have been written.

INTESTINE MORTIFIED.

The integuments over the tumor have assumed a dark-red colour; the cellular membrane is soft and emphysematous: air and fœtid fluid escape on cutting the sac; the intestine is found flat and burst. It is adhering to the neck of the sac, and is covered with coagulable lymph.

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The other will close, and be lost, if we do not preserve the communication. It cannot be done more effectually or more simply, than by introducing a bougie into it, with a cord attached; and preserving the bougie in its place by due attention in the dressing.

Let us suppose that the intestine is not gangrened and burst, but that it is ulcerated and cut, by long pressure of the sharp edge of the stricture. We have, in this case, to find out, if the intestine adheres in the passage? If it does, we proceed as before.

But if the intestine be ulcerated, and at the same time loose in the sac; and if, when the stricture is cut, it can be drawn down, a different operation may be performed; the ulcerated edges may be pared and united by the interrupted suture; after which, the intestine is to be reduced. Such, at least, is the operation which experiments on brutes, and the authority of a very eminent Surgeon, would induce us to perform. But, for my own part, I see in all this, only multiplied dangers.

Let us consider another practical question, — one which is much more important, from its frequent recurrence, and we shall return better prepared for this. "If, (says one of our first authorities,) a gangrene or "sphacelus have taken possession of the intestine, and consists of a small spot, which, by casting off, might "endanger the shedding its contents into the belly *," then he recommends the intestine to be tied to the upper part of the wound, until the spot sloughs away. It is very difficult to state the rule of practice, without entering at large upon the principle; such an advice as this could only proceed from one who had entirely neglected, or was ignorant of the nature of strangulation, and the cause of death. Is it to be expected, in the condition of the gut here represented, that the overloaded intestines shall discharge themselves into that portion which is included in the sac; that the contents, after circulating there, shall ascend again, and pass off through the lower portion of the canal? This is not to be hoped for; the accumulation in the

* What is it that causes mortification? Is it not the stricture? and does not the stricture act generally on the included portion of intestine? Are not these spots he speaks of, portions of coagulable lymph?

bowels must, therefore, continue; the distress, and all the bad symptoms, must, therefore, continue, until the hernial portion of the intestine burst, and there is a copious discharge of fæces permitted. And fortunate it will be if this occurs, in these circumstances of the case. My reader should be aware of the necessity of proceeding on a just principle in these operations. The author who gives us the above advice, sees nothing in the operation for Hernia, but the necessity of taking off the stricture from the intestine!

Let us then suppose, that there is no such mortified spots as the above authority speaks of, only that the portion of the intestine is very dark red, and the coats tumid, and somewhat bruised in the stricture. Let us suppose the stricture to be removed, and the intestine reduced: what consequences usually follow this condition of the intestine? The symptoms are not ameliorated by the operation, and evacuations are not procured, until a few hours before death. When I consider how very frequently I have been thus disappointed in procuring evacuations, after the reduction of the gut, I feel convinced, that we often return portions of gut because they are alive, which are, notwithstanding, in consequence of the injury they have sustained, incapable of taking up that succession of actions on which the course of the aliment depends. Yet, when I state this, I do not mean to propose any other operation than that of reduction of the intestine, *when it is loose and alive.* But I am at liberty to argue, if such a portion of intestine, when entirely reduced, is incapable of dilating and contracting, can we suppose, that, when in a worse condition, when left in the sac, and making that double acute turn which it must do, while situated there, it will be capable of performing its function?

The case is, therefore, desperate; the circumstances altogether alarming; and ninety-five of a hundred will terminate in death, when the intestine is reduced to the condition above described. In short, this is the common sense of this matter: — either do one thing or another decisively; that is, either reduce the intestine altogether within the belly; or, if you keep it in the hernial sac, open the intestine freely, and remove the stricture; procure an evacuation of the confined fœculent matter; and provide for the ultimate re-union of the portions of the intestine, if the patient should give promise of recovery.

OPERATION

FOR

EXOMPHALOS, OR UMBILICAL HERNIA.

It is impossible to illustrate the operation for Umbilical Hernia by a drawing; for when it is well performed there is nothing to be seen. This is the manner in which I have done it with success: — Let an assistant press aside the tumor as much as it will bear, and in that direction in which it yields with most ease. By this means the angle formed betwixt the belly and the Herniary tumor is exposed. On this angle make your incision. Begin on the side of the tumor, and continue the incision down in an oblique direction, so as to cut about an inch of the skin of the abdomen, the whole extent of the incision being about three inches; yet, I ought to say, it should vary with the thickness of the integuments. — The second part of the operation is a careful dissection of the tumor near its base, until you perforate the sac. By drawing the knife repeatedly over the firm resisting base of the sac, the tense fibres being divided, the finger at last enters, pushing the omentum before it. In doing this, observe two things; *first*, that the sac of the Umbilical Hernia is very irregular, sometimes very thick, especially at the base; often very thin, and sometimes, especially on the most prominent part, deficient altogether. *Secondly*, the intestine is always covered

with the omentum; so that you must take especial care to distinguish that membrane from the fat and cellular membrane external to the sac.

When the sac is penetrated, and a passage made for the point of the fore-finger or little-finger, you must then bend it downwards, and feel for the stricture betwixt the omentum and intestine on one side, and the stricture on the other: it will not, perhaps, be possible to insinuate the finger; neither can the common directory be used. You should use the curved directory, with the bistoury proper to it; and with these divide the edge of the stricture. I have performed this part of the operation with the common curved probe-pointed bistoury directed by the point of the finger. * All this is done more by feeling than seeing. When the stricture is cut, lay aside the instruments, and commence a slow and gradual reduction of the tumor, as in the common operation of the taxis, without handling or exposing the intestine.

The advantage of this operation is, that, when the parts are reduced, you have no difficulty in keeping them so; for the integuments over the mouth of the sac are entire, and the common bandage or truss can be applied. The wound can be daily dressed without displacing the apparatus for confining the viscera.

But into what difficulties do the loose expressions of authors bring the young Surgeons, who do not think for themselves, nor make the proper distinction of cases. One author says merely, "When the "operation becomes necessary, it consists in dividing the skin and hernial sac, in such a manner, as shall set "the intestine free from stricture." Another, and later authority, expresses it thus: "The operation is "very simple: an incision is made from the upper to the lower part of the tumor." — "In other in-"stances," says the same author, "the incision was in the form of the letter T, the top of which crossed

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* The bistoury should have the edge covered with adhesive plaster, leaving only half an inch of the cutting part near the point.

" the middle of the tumor." Neither * of these are the proper modes of proceeding. The consequences may be such as I now assure you happened. Two young Surgeons, proceeding as they had authority for doing, drew the knife over the whole hemisphere of a large Umbilical Hernia; before they were well aware, they had the whole bowels among their hands. Reduction was impossible; the integuments would no longer cover the distended intestines! the friends of the patient saw they were confounded with what they had done; the intestines could not be reduced, could not be contained within the belly, and the woman died of inflammation of these intestines.

The different kinds of large VENTRAL HERNIA may be operated on in the manner I have described the operation for Exomphalos.

OF THE DRESSINGS AFTER THE OPERATION FOR HERNIA.

When the Surgeon has ascertained, by passing his finger into the abdomen, that the intestine is entirely reduced, and that the bleeding of the wound has entirely stopped, he brings the integuments together, and, pressing them against the neck of the sac with his three fingers, he sustains the part until his assistant makes preparation for dressing. The parts are sponged clean and dried with a towel; then the slip of adhesive strap is put down on one side of the incision, and brought very accurately over

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* In looking into the very last work on Surgery, I find every thing that industry can collect from books; but not what judgment or experience would sanction. "The method of proceeding is not materially different from that which has been recommended in Inguinal or Crural Hernia." This is exactly the conclusion to which any industrious student would come to, after reading the works on this subject; yet, I am convinced, it is the most clumsy, inartificial, and dangerous mode of performing this operation.

the lips of the flaps: three or four of these strips of adhesive plaster are then in succession put down; and each time, the Surgeon, with a dry towel over his fingers, covers and supports the upper part of the wound. When the wound is thus closed, a slip of dressing is put over the straps, and in the length of the incision; and then a compress of lint; and, finally, a longer compress of folded linen is put upon the wound. The roller, being now fixed about the loins, is brought down, and, with a form of the spica bandage, supports the dressing. The Surgeon then takes the hand of the patient, and, placing it over the wound, he tells him to press there gently upon making any effort; *e. g.* as they carry him to bed; as he attempts to turn himself, or to raise himself; when he goes to stool, or coughs, or sneezes, or does any thing by which the hernia may be again forced down.

In the second and all after-dressings, let the patient be in a position completely to relax the abdomen; let him be cautioned against making any effort while the bandages are off. In dressing, the Surgeon is to begin by taking off the uppermost strap, and placing another in its stead; and, before he proceeds to take away and replace the others, he makes his assistant place his hand on the upper part of the tumor and opposite to the neck of the sac.

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THE OPERATION

OF

AMPUTATION.

A FEW distinct rules are to be attended to, in performing the operation of amputation of a limb; and these are general rules, applicable to all cases of Amputation.

Preserve the periosteum on the extremity of the bone; have the bone deep buried in the muscular substance of the stump; leave sufficient skin to cover the muscles, and let the edges fall neatly together.

When these things are attended to, the union of the surfaces, or at least the healing of the wound, takes place quickly, and there is a fleshiness in the extremity of the stump; the bone is well covered; and the patient can bear, without pain, on an artificial leg.

But if these circumstances be not attended to; and simple and obvious as they appear, they frequently are neglected, the flesh is left uncovered by the skin; it wastes and shrinks, and exposes the bone. The bone projecting, undergoes a tedious process of exfoliation; the stump is kept long in an ulcerating and

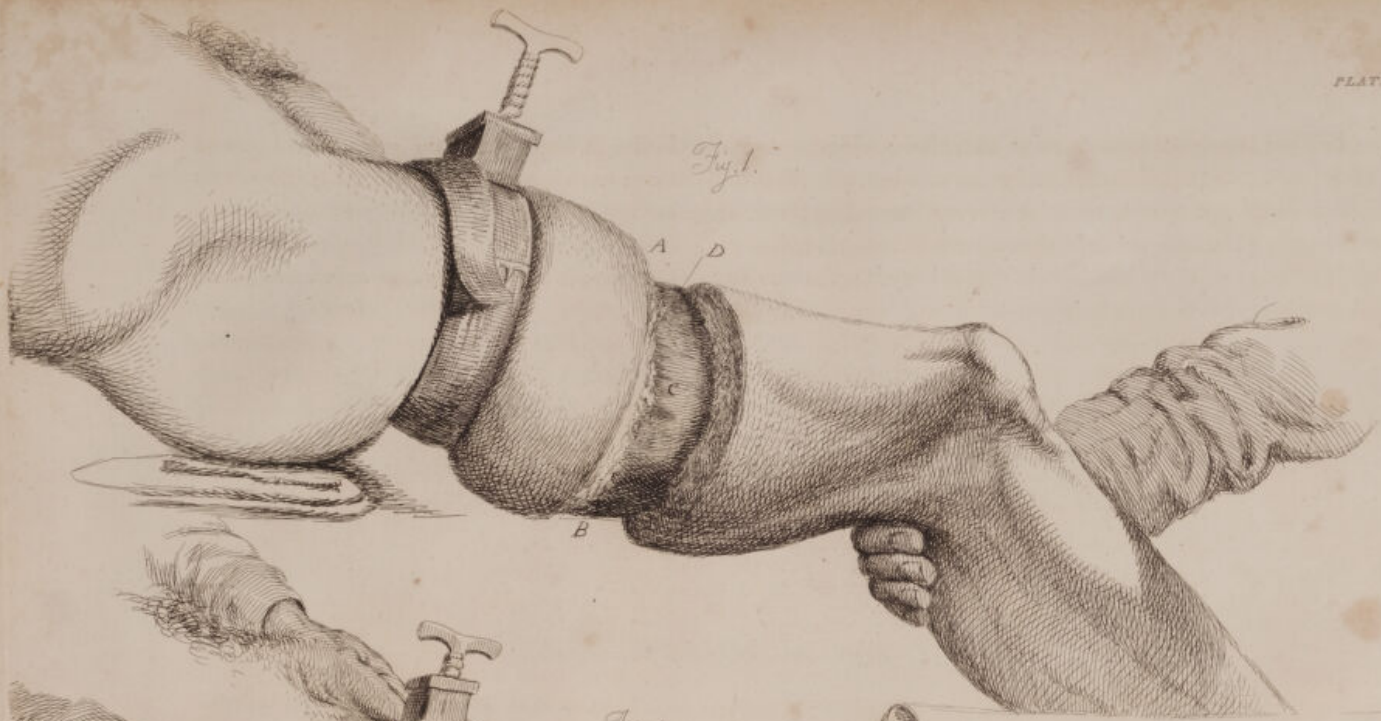
tender state. It heals, at last, of a conical form; it is tender, and incapable of sustaining the weight of the body.

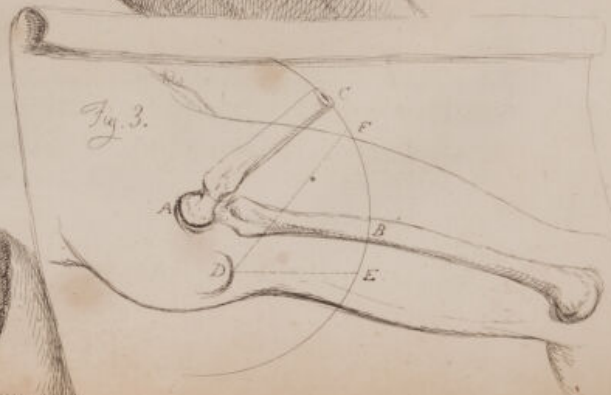
A public operation, where young Surgeons are attending, ought to be done, not only in a manner that shall be safe to the individual who suffers, but exemplary to those who are to learn. On the other hand, occasions may arise, when the correctness of manner, the method and the complication of apparatus, may be dispensed with. Often, in the field, essential things only can be attended to. Then, to seize the shattered arm; to compresss the brachial artery with the point of the middle finger, and, at the same time, to draw up the skin; to cut through the skin and muscles at once; to saw the bone; and, finally, to seize the artery; and to do all this within the minute, and without an assistant, may be meritorious, in certain circumstances. But what may be right in one place, and, on urgent occasions, is pure charlatanerie, where there is time and opportunity to do every thing with correctness and propriety.

I shall give, as a general example of the operation, the

AMPUTATION OF THE THIGH.

THE Surgeon turns his eye to the PREPARATIONS; there he expects to see the INSTRUMENTS and DRESSINGS, viz. tourniquets — two for amputation, and a field tourniquet; compress for the artery; large amputating knife; one of a second size; a catling; a large straight-edged scalpel; a smaller scalpel; the amputation saw; a small light saw; bone nippers. — Besides the USUAL APPARATUS, tenacula; ligatures; sponges; charpie; lint; dressings; proper compresses for the end of the stump; adhesive straps; Malta cross; split cloth for retractors; and broad rollers of calico.





London, Publish'd June 1st 1816, by Mess.rs Longman, Hurst, Rees, Orme, & Brown.

Let the assistant look next to the table, and the position of the patient. Seat the patient on a strong table, with a folded blanket under him. Let him recline in the arms of an attendant; place a dresser on a low stool before him. — Is the end of the roller fastened round his loins? *

EXPLANATION OF PLATE IX.

In this plate are three views, illustrative of the operation of amputation at the thigh.

Fig. 1. represents the position of the patient, the hip resting on the edge of the table; the assistant holding the limb; the tourniquet applied, and the first incision made through the integuments.

In respect to the *tourniquet*, I may observe, that it is usual for the assistant to apply it. Remembering the course of the artery, perhaps feeling it beat, he places the *compress* directly over it. 1. Let him take care that the bit of roller attached to the compress be not too tightly applied; for this is one of the little *awkwardnesses* to be avoided: (see below.) 2. Look to the working of the tourniquet, and that it does not run down; that the buckle does not interfere. 3. That the screw is not nearly exhausted before commencing the operation. 4. Let the garter be slack, until the moment that you require the artery to

* Attend particularly to the concluding remarks. See p. 3.

be compressed; and do not keep the limb too long deprived of circulation. * 5. In the Figure, the tape of the tourniquet has sunk deep: attend to this; for there is sometimes an œdematous condition of the limb, that does not permit the operation of the tourniquet, or not without injury to the limb. I have seen the fluid escape from cell to cell, and from under the compress, in a manner to make the tourniquet loose just at the moment the artery was cut across! †

FIRST INCISION.

An assistant Surgeon, standing on the opposite side to the Operator, stoops forward, and steadies the limb, by grasping the thigh with both his hands; he does not yet draw up the skin. To make the incision represented in Fig. 1., *A*, *B*, *C*, *D*, the Surgeon passes the large amputating knife under the thigh, bringing it round until it is placed horizontally; the edge touching the fore-part of the thigh at *A*, and the back of his hand towards the thigh.

Pressing and drawing the knife at the same time, he cuts to the surface of the fascia; and, with a steady, uniform motion of the hand, the wrist yielding as the knife is brought round, the incision is made to terminate where it began, on the fore-part of the thigh.

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* I may here observe, that by the management of the tourniquet blood may be lost or gained. If the garter or strap of the instrument be applied so tight as to prevent the return of the blood, and yet not to compress the artery, the limb becomes gorged with blood. But if, on the contrary, the limb be uniformly rolled before amputation, the veins are emptied into the general system, and blood is saved instead of being withdrawn. In a very exhausted state of the patient, it may be of service to attend to this.

† If we must amputate in this very unfavorable condition of the limb, we must put aside the tourniquet, and trust to compression with the thumb at the groin.

I vary this mode a very little. On first setting on the knife, I incline the point a little upwards; and as I carry the knife round on the inside of the thigh, I give it a semicircular sweep; taking care that this semicircle terminates on the back part of the thigh, at the point counter to where it began. Again, in drawing the knife round on the outside of the thigh, I incline the knife in a similar manner, so as to make another semicircular cut of the skin. *

RETRACTION OF THE SKIN.

The assistant, having hold of the thigh, as described above, is now to draw the integuments forcibly upwards, so that the edge of the skin *A B*, is considerably separated from the skin below. In doing this, portions of the cellular membrane, as at *D*, will require to be touched again with the edge of the knife to admit the free retraction. And at the point *B*, that is at the lower part, the cellular membrane will require a freer division, being firmer and more compact. By this manner of operating, the edge of the integuments from *A*, to *B*, will be slightly semicircular, and the fascia *C*, will be largely exposed. †

Fig. 2. The second figure represents the second incision completed, and the retracting cloth applied. To bring it to this, the assistant has drawn the skin as far up as he can, leaving an interstice of something

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* This mode of operating does not prolong the operation or increase the pain, for the edge of the knife is never raised, nor the sweep interrupted. The advantages are visible when, after the amputation, the edges of the skin are brought together.

† If inflammation has produced condensation of the cellular membrane under the skin, it may be necessary to carry the scalpel under the skin close upon the fascia, and to turn the edge of the skin back; but, if possible, avoid this practice.

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buried in the muscular substance. But when the limb is separated, and the stump is raised, which immediately takes place by an effort of the limb scarcely to be controuled, then the bone projects! *

Suppose that the thigh bone *A B*, fig. 3., is cut across in amputation, while the thigh is held down; that it is then raised, as it naturally will be, into the position *A C*, the muscles and the integuments must shrink from it in proportion to its elevation; for *D*, being the origin of the posterior muscles, they must be drawn from the bone, in the proportion that the line *D E*, is shorter than *D F*. So it is obvious, that, in the elevated position of the stump, although the integuments on the fore-part are hanging over the bone, the integuments, and the muscles on the back, or lower part, are too short.

I am far from expecting that Surgeons, who have been accustomed to do this simple operation wrong, will do it differently from any demonstration of mine. I only hope they will not be surprised, when I recommend it to be done, or perform it, thus:—

SAWING THE BONE.

When the retracting cloth is put over the face of the muscles, the assistant who holds the leg, should raise it, until the thigh bone is nearly perpendicular. This is, comparatively, a position of ease to the patient, and there is less trembling. The saw is to be laid close to the retractor, and, of course,

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* Look to the position of the patient when he is laid in bed; does the stump lie in the position of the thigh before operation? No; it is with difficulty kept down; and, if not restrained, would be directed upwards, making an angle with the body. In fact, it does stick up, and in proportion as it does so, the bone projects.

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will be the more posterior, in reference to the centre of the femur. It should be fairly transfixed with the tenaculum, and brought out of its sheath. * The lesser arteries will be discovered betwixt the muscles. The more carefully they are picked from their sheaths, and separated from the nerves, the more effectual and secure will the ligatures prove, and the sooner and the more easily will the threads separate. The tourniquet being slackened, to discover the lesser arteries, the femoral vein will often spout out blood. But, before it be tied, see that this does not depend on the tightness, either of the tourniquet, or the band of the compress; for if the artery be free, and the veins even slightly compressed, the great vein must bleed. † Therefore, when the vein bleeds, or when there is a considerable oozing of dark blood from the face of the muscles, press a sponge on the face of the stump, and lay all loose, and make it quite certain, that there is no pressure on the thigh. If a redder stream of blood is seen trickling through the darker venous blood, it will direct you to the orifice of an artery, which should not be neglected. ‡

The vein has been mistaken for the artery, and tied accordingly. § It is inexcusable to tie in the nervus longus with the artery, for it does not lie in the sheath of the artery, but removed a little from

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* The sheath has been mistaken for the mouth of the artery, and the ligature put on it! The consequence was, secondary hæmorrhage. It is advisable to draw the artery out a little, and to see that no remarkable branch be given off, immediately behind the ligature; for this also is a source of secondary hæmorrhage. See Hospital Reports, vol. i.

† It is the fear of inflaming the vein that makes us unwilling to tie it. That the ligature inflames the vein is an opinion which very generally prevails.

‡ The oozing of blood after the dressings are put on, destroys our hopes of early adhesion, and gives rise to an unfavorable suppuration. When you do not see a bleeding vessel, and yet have reason to believe that there are arteries which ought to be secured, look for a red spot of extravasation betwixt the muscles, and brush the coagulum of blood away. The artery beneath will then be free to bleed, and show itself.

§ This is in consequence of the Surgeon forgetting the greater thickness of the coats of the vein in the lower extremity, and from the circumstance of the artery retracting and leaving only the vein prominent.

it. If there be an oozing from the bone, delay dressing the stump for a short time. Twist the ends of the ligatures together, so as to make a small firm cord; distinguish each ligature and throw a knot on the principal one; arrange them so that they shall not be entangled, and let them be brought out at the lower part of the stump.*

DRESSING THE STUMP.

The Surgeon, standing before the patient, embraces the integuments with both his hands, and draws them over the face of the stump, making the line of their union from above downward. And now the roller, which is around the body of the patient, is brought down, and the thigh rolled to within a hand's-breadth of the edge of the integuments. In doing this, the face of the stump should be supported equally with the upper part of the thigh, or the veins will re-commence bleeding. The Surgeon next brings the lips of the integuments into contact, taking care to repress the portion of fat, and bring the edges of the skin exactly together. Then the assistant places the adhesive strap, not clumsily putting it at once on the face of the stump, but he places one end on the side of the thigh, and bringing it up to the corresponding edge of the integument, he sees that the contact of the edges is perfect, and then he lays it down on the other side. The Surgeon, having a dry towel in his hand, holds the integuments firm, and supports the

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* If a ligature be high on the face of the stump it may be brought out direct, and betwixt the higher straps; but it is better to bring the greater number out below. If the ligatures are not brought out below, a little bit of dressing should be laid betwixt the lips of the wound at the lower angle.

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COMPRESSION OF THE ARTERY.

An assistant, standing by the side of the patient, compresses the artery with his thumb, as it comes out under Poupart's ligament.*

There is here nothing to occasion anxiety; if the thumb or compress be fairly placed upon the artery, as it passes over the os pubis.

FIRST INCISION.

The first incision will be formed, according to the place of the tumor or the wound. If the wound, or its consequences, have destroyed the mass of flesh on the inside of the thigh, then a flap must be made of the outside. If, on the contrary, the outside has been carried away, the flap must be formed on the inside of the thigh. Let us suppose, that the latter is the mode to be preferred.

Grasping the integuments and flesh of the inside of the thigh, cut them with the great amputating knife, obliquely down to the bone, so as to form a great flap. You will have divided the great artery; therefore turn up the flap, and secure the artery.

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* Or he may wrap a roller round the screw of the tourniquet until he makes a ball fit to be used as a compress, and having the body of the tourniquet in his hand, he can rest his whole weight bearing the compress against the artery.

Now place the knife in the situation it was in, on finishing the first incision. Then change the direction of its edge, so that it shall be perpendicular to the bone, and make one decided semicircular sweep, cutting through the integument and muscles, down to the bone on the outside.

The decision requisite for this operation, makes it less severe, than the common operation; and, indeed, a better stump is formed. The retraction of the muscles must be carefully made, the Surgeon still taking care to cut the insertions of the muscles into the linea aspera, without which the muscles cannot be retracted enough. The smaller vessels are to be taken up; and when all is completed, the flap falls against the face of the stump, and is secured by the usual means.

The AMPUTATION AT THE HIP JOINT has been performed with success. I cannot approve of its performance in the cases which have come to my knowledge; and, unless I felt myself authorised to enter on that very difficult question, I must omit the description of the operation here.

AMPUTATION BELOW THE KNEE.

Plate XI. fig. 2., represents the face of the stump, after amputation below the knee.

A, The Tibia.

B, The Fibula.

C, The integuments turned back. *

D, The mass of muscles, chiefly the gastrocnemius and soleus, cut across behind the bones.

In this operation, the tourniquet is sometimes placed with the pad in the cavity behind the knee, but the pad is never so effectual here, as when placed higher, and on the artery near the groin.

This figure truly represents the spines of the bone, projecting in such a manner as to protect the muscles from the sweep of the knife. This is the reason why the knife to be used should be straight and pointed; so that, without changing his instrument (after the sweeping motion in the second incision) the Surgeon may complete the division of the muscles, by cutting betwixt the bones.

The retraction of the muscles in this operation is very necessary; but it is more difficult than in other cases; this is owing to the interosseous ligament, and to the attachment of the muscles to the spines of both bones. † Care must be taken to detach the ligamentous septum from the tibia and fibula, or the retracting cloth, however pulled upon, cannot retract the muscles.

The relation of the bones, as seen in this section, shows why the Surgeon should stand on the inside of the limb.

We see here the sharp corner which is left by the division of the anterior spine of the tibia. (*A*.) This makes it necessary to apply the saw again obliquely, so as to take off the projecting angle.

The three arteries will be easily recognised in their positions, one anterior and two posterior to the ligamentous septum; they should be secured before the tourniquet is thrown loose; after that, the *surales*, muscular branches, will bleed, and should be tied.

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* This may be done without dissecting them from the fascia.

† The cloth used as a retractor must be split into three slips, and the middle portion put betwixt the bones.

AMPUTATION LOWER IN THE LEG, AND WITH A FLAP.*

In fig. 1. of Plate XI., the incision is made in a different manner. There being no muscles anterior to the bones, when we amputate near the ankle, this form of incision is contrived, that a flap may be made of the integuments and muscles on the back part, and that they may be brought up to cover the face of the bones.

The large amputating knife is set on, a hand's-breadth above the outer ankle, and drawn with a semicircular sweep, the edge being directed upwards so as to make the flap *A*. The Surgeon having made this incision, keeps the knife in its place, the edge resting on both the bones, until he measures with his eye the extent of the flap, and the remaining diameter of the limb. If he be not satisfied that there is enough of flap to cover the face of the bones, he moves the edge of the knife higher, using the tibia and fibula as a director to the knife. When the flap is made, without raising the knife from the incision, he changes its direction, and makes the semicircular cut *B C*, dividing the integuments on the fore-part of the leg. He will now find it convenient to take the scalpel, to cut the remaining part of the muscles, and the interosseous ligament. After which, the operation is to be completed, as described above.†

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* This operation should not be performed unless the patient be young. For the object of it is to permit the adjustment of such a false leg as may give the patient the use of the knee joint. Old people prefer resting on the knee, and then the length of the stump is a great encumbrance.

† Notwithstanding the provision of the flap, the integuments on the fore-part are to be carefully retracted.

The flap *A*, is to be brought up so as to cover the face of the stump, and care must be taken to make the edges of the flap correspond with the line of the integuments in front.

I may observe, that in this, and all amputations performed near the joints, it may be necessary to cut off such tendinous parts as project from the face of the stump; and even, sometimes, to dissect off a part of the fascia, if it be exposed.

AMPUTATION OF THE ANTERIOR PART OF THE FOOT, AND OF THE TOES.

EXPLANATION OF PLATE X.

FIG. 1. exhibits the foot, with the fore-part amputated.

Fig. 2. is the portion cut off. The operation is performed in this manner. An incision is made across the dorsum of the foot, one inch anterior to the articulation of the *astragalus* with the *naviculare;* a second incision, of a semicircular form, is made across the bottom of the foot, one inch and a half anterior to the first. This incision is made down to the bone. Two lateral cuts are made to join the extremities of the first incision to the extremities of the second. The next part of the operation is, to dissect back the sole of the foot, so as to make a flap, *A*. fig. 1. Lastly, you have to dislocate the *naviculare* from the *astragalus B*, which you do, by cutting across the strong ligament, which is in the sole, and stretches from the os calcis to the os naviculare. You then separate the os cuboides from the anterior articulating extremity of the os calcis.

PLATE X.

London, Published Dec.1st 1810, by Mess.rs Longman, Hurst, Rees, Orme, & Brown.

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A small trephine is then to be set on near the head of the metatarsal bone, so as to cut through the bone, and enable you to lift it out. Finally, separate the remaining connections, and take the toe and the attached metatarsal bone away. Fig. 5.

The depth and ragged appearance of the wound, declares the unfavourable nature of the operation. Yet I have thought it greatly preferable to do the operation on the foot or hand thus, than to make an incision on the sole as well as the dorsum, and then to use the metacarpal saw; for that manner of operating makes a horrid fissure, and a very unfavourable wound, as well as a protracted and painful operation.

What is given in illustration of the operations on the toes and metatarsal bones will enable the Surgeon to operate on the hand and fingers. The operation on the fore-arm, and still more the operation on the arm, are very simple, and cannot be done amiss, if the general principle laid down in the first part of this number be attended to. In regard to the

AMPUTATION AT THE WRIST,

I have only to say, it is very easily performed, and, sometimes, very properly performed. For instance, if a pistol has burst and shattered a boy's hand, or if the hand has been caught in machinery, and crushed,

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a very frequent accident, the Surgeon can perform the operation with the instruments in his pocket-case. On such an occurrence as this, when the bones and tendons are bruised, an early amputation is desirable.

1. Mark well the styloid processes of the ulna and the radius. Begin the incision so far beyond these that they may be covered with the flap of the integuments; the incision should be semicircular; the extremities of the incision terminating half an inch before the processes of the bones. 2. Dissect up the incision, so as to uncover the bones of the carpus. 3. Divide the extensor tendons as high as possible. 4. Then, bending the hand downwards, cut the capsular ligament and round ligament of the ulna, that joins the carpus to the fore-arm. This almost severs the hand. 5. Cut through the flexor tendons and integuments on the inside of the wrist at one cut; inclining the knife in such a manner as to leave the skin full over the ends of the radius and ulna. This operation, tedious in the description, is performed within the minute. Take up the two arteries, and bring the edges of the skin nicely together.

AMPUTATION AT THE SHOULDER-JOINT.

EXPLANATION OF THE GROUP, PLATE XI.

THIS group exhibits the position of the patient, and the Surgeon and his assistants, prepared to perform the operation of amputation at the shoulder-joint.

To do this operation well, to reduce it to that precision, and that degree of safety with which the other operations of amputation are performed, is by no means easy. I say this, because many make light of the operation, as being one which they have often, and easily performed. But I admire that dexterity, which they are too modest to claim for themselves. It must be considered an operation difficult to perform, as well as a severe one, for the sufferer. It requires decision and rapidity; and the knife is to be handled more like a sabre, than a Surgeon's scalpel.

1. The assistant, or friend, who supports the patient in his arms.

2. A stout assistant, who holds a sheet, which is round the patient's body, and who supports him against the pressure of the next figure.

3. The assistant Surgeon, who stands behind the patient; and who, with his thumb, presses the subclavian artery, above the clavicle.

4. A junior assistant should be seated here, as much as possible out of the way of the Operator. His business is to hold the shattered arm; to raise it, and move the humerus as the Surgeon may direct, during the operation.

5. The operating Surgeon, who now sees that every one is in his place and knows his duty, and understands to do what belongs to him, without bustle, and without improper interference.

EXPLANATION OF PLATE XII.

Fig. 1. shows the first stage of the operation at the shoulder-joint. It represents the patient determined and upright, in this early part of the operation.

London, Published Dec.1st 1830, by Mess.rs Longman, Hurst, Rees, Orme, & Brown.

A, The flap made, by lifting the integuments, and the deltoid muscle.

B, is the head of the humerus, disclosed by the incision.

The Surgeon grasps the fleshy prominence of the shoulder, the integuments, and deltoid muscle, with the left hand; then using the large amputating knife, and setting it on a little to the inside of the insertion of the deltoides, with a sweep of the hand he cuts to the bone; and being directed by the bone, he cuts upwards, so as to raise the large flap *A*. *

Fig. 2. This figure represents a further stage of the operation.

A, The flap.

B, The head of the humerus dislocated. The thumb of the Surgeon is slipt into the capsule of the joint, and with the fingers of the same hand, on the outside of the integuments of the axilla, he grasps and compresses the axillary artery. By this he prepares to divide the remaining part of the muscles and integuments. †

As soon as the Surgeon has raised the flap, he cuts into the capsule of the joint. Then the assistant, who holds the arm, should pull it down, and turn it a little outward; at the same time pushing it across the patient's body. This allows the Surgeon to slip his finger betwixt the head of the humerus and the

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* He must have so planned and calculated his incision, putting on the knife, and terminating its sweep in such a manner as to raise a fleshy flap, that shall correspond with and cover the lower half of the wound, which must be left by the final incision, and the extraction of the head of the bone.

† This part of the operation requires some commentary. It is often of the greatest moment to save blood. A man is severely wounded; the arm lacerated; the bone shattered; and he is very faint and low from loss of blood and the severity of suffering. Perhaps he is wounded elsewhere; a grape shot may have bruised his side and broken a rib at the same time, that it has shattered the head of the humerus, and bruised the flesh of the shoulder; in this condition an ounce of blood saved is of consequence. I know not how to express myself in regard to those critics who say that the securing the artery is a matter of indifference; for it makes all the difference betwixt this and other cases of amputation.

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OTHER MODES OF OPERATING.

I have described the operation as I have performed it; but it is obvious that the mode must be varied with circumstances. You must make the flap where you can; nay, it may be necessary to make two small portions of flap on opposite sides, and plan the incision so that these portions may combine and unite across the face of the wound. This variation in the manner of amputating arises from the variety in the nature of the wound. The deltoid may be destroyed by round shot, or so injured and perforated by grape or musket ball, as to be unfit for forming the flap.

The operation has been performed thus: — 1. A semicircular incision through the skin and muscles is begun at the extreme point of the acromion scapulæ, and made to terminate at the lower edge of the broad tendon of the pectoralis muscle. 2. The tendon of the pectoralis muscle is cut across by running the probe-pointed bistoury under it. 3. The artery is dissected out and tied. 4. A semicircular incision is then made, commencing like the first, and sweeping round the outside so as also to terminate with the first, on the lower part. 5. The head of the bone is dissected out from the socket. 6. And the knife being carried close under the neck of the bone, for some little way down, the direction of the edge is changed, and the nerves and artery are cut across; the previous ligature of the artery making this quite safe. The two lateral semicircular flaps are brought together, and close the wound.

ANOTHER METHOD.

Commencing the operation by cutting down upon the artery, and putting a ligature round it; a large flap may then be made of the outer and lower part of the integuments and muscles, and this may be so

calculated as to cover the whole face of the wound, when the integuments have been destroyed by shot, or in consequence of sloughing, on the upper and inner part of the shoulder.

DRESSINGS.

The thing the most necessary to attend to in dressing the wound is, the condition of the nerves; they should be very short, and well buried in the wound, or else they will give great pain and trouble afterwards. The flap being brought down, and the edges of the skin held in accurate contact, the assistant puts on the adhesive straps; over these the dressings are placed, and then a soft compress; and over the compress broad and long straps of adhesive plaster, reaching across the back and breast. Finally, with great care, the spica bandage is applied, to support the whole.

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THE OPERATION

FOR

ANEURISM.

It is necessary to look back to the occurrences of former years, to stimulate my attention to this subject. The operation, when planned and executed as it ought to be, is a bloodless and simple operation; when well performed, the students of a full theatre disperse with a feeling of disappointment; they say, is this all? But, on the other hand, if the operation be undertaken, without studying all the particulars of the case, as well as of the anatomy—if the Surgeon has got a notion that he is acting on the principles of Mr. Hunter, and blunders on without a distinct idea at all; then it is something after this fashion. First, there is a tedious dissection to expose the artery, and branches are cut, and blood unnecessarily lost: and then the tourniquet is called for. The artery is at length included in a ligature; when the Surgeons are seen to exchange looks of enquiry and alarm, finding the tumor still pulsating! Then follow more deep dissections, and more arterial branches are to be tied, and the muscles are exposed and separated, and the

wound is improperly large. After such an operation, that which it is natural to expect, follows: the limb swells, and vesications appear upon the extremity. Such were the consequences of the early operations for Aneurism; consequences which were ignorantly attributed to the tying the main artery of a limb; whereas they result from a large wound and clumsy dissection; by which the collateral branches are interrupted in their action.

OPERATION OF TYING A GREAT ARTERY.*

The Incision. In the operation for Aneurism, the incision should be as small as is consistent with the depth of the vessel to be tied. In exposing the artery, the parts should be as little disturbed as possible. Precision and neatness of manner, which are often affectedly assumed in other surgical operations, are here essential to a good operation, and to the safety of the patient.

The *Fascia* is to be cut open to the full extent of the incision through the skin; for without this, the incision through the integuments being free, avails nothing.

The Muscles. The fibres of the muscles are to be left untouched; the muscles are to be carefully separated at that precise part which leads directly to the artery, and only to the extent which shall be sufficient to expose the artery. The artery is never in the substance of the muscles, but betwixt them.

* I have elsewhere, and on many occasions, discussed the subject of the ligature of arteries. I hope my motive will not be misunderstood, and that I shall not be considered too negligent of the opinions of others, if I proceed here directly to the rule of practice.

The Sheath. The sheath invests artery, vein, and nerve; but there is a subdivision of the sheath, which immediately surrounds the artery. This is to be opened by scratching with the point of the knife directly over the artery. He must be insufferably clumsy who cannot open the sheath of an artery, without piercing the proper coats of that artery. It is essential to the operation, that the artery be fairly disclosed. *See Additional Notes,* No. I.

Position of the Limb. I have seen formidable mistakes and exceeding great awkwardness during this operation, from the neglect of a very simple matter; from omitting to bend the limb, when the Operator was desirous of lifting the artery from its bed. In most cases, if you are careful to relax the parts, by bending the limb or inclining the head, the artery can be lifted from the bottom of the wound, and held exposed. However, this is to be done with the greatest precaution, and only when necessary.

The Artery. Particular care is to be taken of the cellular connections of the artery; the proper coat of the artery is to be exposed to the contact of the ligature; but while you ensure this object, do not destroy the connection of vessels — the vasa vasorum — which supply the coats of the vessel. *

The Ligature. Let it be of three strong silk threads †, laid parallel and waxed; and oiled just before operating. Nothing should intervene betwixt the ligature and the coat of the artery; neither nerve nor vein, nor even cellular membrane. In drawing the ligature, take care that the loop or circle of the

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* The coats of the artery have to undergo a process of inflammation, to which the supply of blood through the vasa vasorum is necessary.

† One of my colleagues is partial to the use of catgut ligatures, but I have not been sensible of their advantage. I think Mr. Norman's Cases of the Bath Hospital are decidedly against their use in Aneurisms. Some army surgeons, and Mr. Lawrence, have tied arteries with a single silk thread, cutting off the ends of the ligature and leaving the knot in the bottom of the wound. In Mr. Lawrence's Case of Popliteal Aneurism, the wound continued to discharge upwards of two months, until the ligature came away. I have operated with a ligature of three threads, and afterwards cut off all but one thread. — See below, the Operation for Popliteal Aneurism.

ligature and the knot, be sunk into the coats sufficiently, to prevent the pulsation of the artery shifting the place of the ligature; yet it should not be drawn so tight as to cut the inner coats of the artery. * The ligature should be applied as high as the incision will admit of. It is usual to cut off one end of the ligature, and to bring out that which remains at the middle of the incision.

How many Ligatures. It is sufficient to tie the main trunk of an artery with a single ligature, when you operate for what was called a true Aneurism; that is, a circumscribed and sacculated Aneurism. The operation is to be performed, and the ligature applied above the tumor, and as near to it as possible, without the incision, or the inflammation, which is the consequence of it, interfering with the Aneurism. † But in the case of a wounded artery, it is necessary to tie a ligature below the bleeding orifice, as well as above it. In a diffused Aneurism, what is called the method of Mr. Hunter, that is, exposing the artery some way above the tumor, and tying it once, will not suffice. Inosculations fill the main artery, and the blood, being carried into the trunk, betwixt the ligature and the wound, the Aneurism continues to be fed. ‡

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* For some time, an idea prevailed that, to ensure the operation of a ligature, it was necessary to cut the inner coats of the artery, by drawing it sharp and tight. This was brought forward in ignorance, and could be received by those only who were negligent of principles.

† If the coagulum of an Aneurism is penetrated by the knife, so as to expose it to the atmosphere, it becomes putrescent, and is soon followed by still more mischief. Even if the tumor of the Aneurism should be left entire, yet, if the inflammation resulting from the cut be communicated to the aneurismal tumor, a high inflammation of the limb is to be apprehended, and a consequent compression of the collateral arteries.

‡ With such a field of enquiry in anatomy and physiology as the indolence of the Profession has left open to us, the claim of priority in observations on this subject ought not to be considered important. It is the easy manner in which my observations have been transferred, that tempts me to say, thus abruptly, there are two circumstances in the history of Aneurism, which have been first taught by me. 1. That an open artery requires a ligature below it as well as above it. 2. That the inosculations communicate with the trunk of the artery immediately below ligature, and that the blood flows into the Aneurism through the main artery after that artery is tied above the tumor. The due consideration the of these two points, will, more than any thing, tend to direct us to a safe practice in these operations.

I have known an Aneurism burst, after the application of a ligature upon the trunk above the tumor. *

Time. The time of operating is as soon as the nature of the case is fully explained. I cannot here detail the mistakes that have been made, in supposing a tumor aneurismal because it pulsates. The more frequent error is, to delay an operation, because the tumor does not beat, or to delay the operation until the sac is burst up by some accidental effort, and a second and larger tumor formed. The danger from the operation is increased in proportion as the tumor enlarges; first, because it is approaching more to the nature of a diffused Aneurism; secondly, because it encroaches more, and presses upon the collateral branches, on which the circulation of the limb must depend, after the tying of the main vessel.

Inosculations. As to the question of inosculations, and the supply of the limb with blood; any artery to which we can have access may be tied. This was determined long since in this country, as far as it was possible by observation and reasoning, by the careful revisal of cases, by just criticism and induction. † The boldness and success of the operations performed afterwards, must be admired; and nothing would have been wanting to the merit of the Operators, had they made acknowledgement to him, who first saw through the obscurity of this subject.

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* When the ligature is applied upon an artery which has a regular sacculated Aneurism, it so far subdues the force of the arterial stream that the blood coagulates in the Aneurism; but if the blood has free egress from the wound of the artery and goes abroad into the limb, making what is properly a diffused Aneurism, the probability is, that complete coagulation shall not take place, and that the blood will continue to be supplied to the trunk, and to flow out of it by the wound, and the tumor will, therefore, still encrease, though more slowly.

† By Mr. John Bell, in his works.

THE OPERATION FOR POPLITEAL ANEURISM,

INCLUDING THE

EXPLANATION OF PLATE XIII

THE *instruments* necessary, are a scalpel; two blunt hooks; forceps; a directory; an eyed probe; an aneurismal needle with the ligature. Two pieces of adhesive strap are all the dressings. *

This is an operation that requires a very precise knowledge of the anatomy. But do not let the young Surgeon rest too implicitly on his dissecting-room knowledge, because it is a mere piece of dissection. I have seen the operation gone about very carelessly, and, consequently, performed in a very bungling manner; and this both in the anatomical theatre, and in the operating room of an hospital. †

In fig. 1. we have the external incision represented.

A, The integuments, divided in the first incision.

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* For an operation of difficulty, a blunt needle may be required, so curved that it may form a portion of a circle, and it should be fitted to a handle of the nature of a *porte-aiguille.*

† I confine myself to the operation. To enter on the description of the disease would lead to a very wide discussion.

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B, The fascia, divided in the second incision.

C is the inner edge of the sartorius muscle, exposed by opening the fascia. *

INCISION.

The Anatomist sees, at once, that it is impossible to make the incision directly down upon the artery. The Surgeon may feel the pulsation of the artery, and reasonably expect to cut down upon it; but in this he is deceived. For, unless he operates too high, the edge of the sartorius is over the artery. *See Additional Notes,* No. II.

First Fascia. When the incision through the skin and fat is made, the fascia is exposed. It must be cut to the full length of the incision of the skin.

Sartorius Muscle. On raising the fascia, *B*, the edge of the sartorius *C* is seen. Let the Surgeon be very attentive to the direction of the fibres, so as to ascertain that it is this muscle which he has cut upon. †

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* There is a difficulty in exactly representing the place of the incision, owing to the roundness of the surface. The apparent place of the incision changes with the rolling of the limb. Besides the drawing, therefore, the Surgeon may require other aids to direct him in the first incision. Let him mark a point on the groin, equi-distant from the symphisis of the ossa pubis and the superior spinous process of the os ilii. There the crural artery will be felt pulsating. Let him fix a cord there, and stretch it to the inside of the patella. The cord will be very nearly in the line of the artery. If he press the end of a cord against the superior spine of the os ilii, and stretch it to the back part of the inner condyle of the femur, in the line of the inner edge of the sartorius, the centre of the incision ought to be one inch above the point where those lines cross.

† Here is the first ground of error; the Operator does not expect a muscle to lie over the artery. He recollects confusedly that there is a rule against cutting muscles when dissecting for an artery. He turns up the outer instead of the inner edge of the muscle; he finds, after searching for the artery on that side, that he ought to have sought it on this; by and bye, we see the muscle flapping loose in the wound! Perhaps a worse error befals: he thinks he has cut upon the sartorius muscle, when he has not; it is the fibres of the triceps which he has

Giving the blunt hook into the hands of an assistant, to hold open the integuments on the inside, he proceeds to lift the inner edge of the sartorius muscle.

EXPLANATION OF FIG. 2.

A, The sartorius muscle. The edge is raised with the blunt hook.

B, The blunt hook of the assistant, with which the integuments on the inside are held apart.

C, The artery, obscurely seen through the fascia. *

The Surgeon scratches, with the point of his knife, directly over the beating artery; and having made a little perforation in the fascia, he introduces the end of the probe, or the small directory, and slits up the membrane the length of three quarters of an inch.

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exposed; and, in attempting to get under the muscle, he digs deep towards the bone, and never finds the artery. Is it the edge of the vastus externus that he has hit upon? If so, he is in worse trouble, and dissecting betwixt the muscles, he goes still further from the artery!

* This is a puzzling part of the operation to Surgeons of the old school, who performed their operation by remembering to make certain turns and motions of the instruments. I have heard a Surgeon say, at this stage of the operation, with a voice in which there was more meaning than force, "Here is a second fascia!" yes sir, and no *lusus* either. I can remember the time when our students were taught that the fascia was a membrane which covered the muscles and gave them strength; they were not taught the connections of the fascia, the *sepimenta* and sheaths which descend among the muscles and connect them, as here, with the sheath of the great vessels. The consequence of this neglect was, that they remained ignorant of what is emphatically called Surgical Anatomy.

EXPLANATION OF FIG. 3.

In this figure, the parts are more exposed than they ought to be in the operation. This was necessary to make the drawing useful. When the operation is properly performed in the living body, there is very little to be seen; and, properly, there ought to be no more seen here. In this figure, the sheath is opened, and the artery and vein exposed.

A, A blunt hook, raising the edge of the sartorius muscle.

B, Another hook, holding aside the integuments.

C, The ligature put round the artery, but not yet tied. The artery is a little pulled out from its place.

D, The femoral artery.

E, The femoral vein. The vein is seen to lie deeper than the artery, and towards the bone.

F, The nervus saphenus, or longus.

Observe, that when the sheath of the artery is opened, it is not at all difficult to put the blunt hook or probe, or blunt aneurismal needle round the artery; for the cellular tissue in immediate contact with the artery is loose. But if the Surgeon does not fairly lay the artery bare; if, through timidity, he has the sheath still covering the artery, when he attempts to pass the needle, the parts resist, and he bores the instrument through with some difficulty. *

* I have seen the Surgeon transfix the vein in thus forcing through the blunt probe. Then came a stream of blood. I thought he had struck the artery. It became necessary to put on the tourniquet, and to tie both vein and artery.

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THE OPERATION FOR INGUINAL ANEURISM,

AND

EXPLANATION OF PLATE XIV.

THE principal figure of this plate is a sketch from the dead body, showing the appearance of the inguinal Aneurism in the left thigh, and the place of the incision, where the artery had been easily found and tied. *

The second and third figures represent the exact anatomy of the parts concerned in this operation, *as seen on the right side.*

Fig. 2. *A*, The inferior pillar of the ring.

B, The upper edge of the tendon of the external oblique muscle. The tendon was split by running the knife in the direction of the fibres of the tendon.

C, The spermatic cord.

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* This incision is in the direction recommended by Mr. Abernethy, but differs from that described below. It should begin nearer the pubes, and be continued a little more obliquely outwards. Mr. Abernethy's words are, "An incision of three inches in length was made through the "integuments of the abdomen, beginning a little above Poupart's ligament, and being continued upwards." It is remarkable that this author does not once mention the spermatic cord, nor the other circumstances of the anatomy which ought to be a direction to the operator. *See Additional Notes*, No. V.

D, The lower edge of the internal oblique and transversalis muscles. They are represented pushed up.

E, A lymphatic gland, very large, and very constant in its place. This gland receives the pulsation of the artery.

F, The epigastric artery.

It is of most consequence to observe the space occupied with fat, betwixt the gland, the spermatic cord, and the epigastric artery. It is here that the Surgeon has to make his way with the handle of the knife and the finger; and if the artery be deep, it is owing to the accumulatiou of fat in this space.

Fig. 3. This figure represents a deeper view of the parts.

A, The tendon of the external oblique muscle cut and laid down.

B, The internal oblique, and transversalis muscles, divided and turned up.

C, The spermatic cord.

D, The external iliac artery.

E, The external iliac vein.

F, One of the cutaneous nerves of the thigh. The trunk of the anterior crural nerve is seen here, but much further away from the artery. *

G, The epigastric artery and vein.

H, The large lymphatic gland, the same which is seen in Fig. 2. †

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* There is a nerve not seen here, which takes a course with the spermatic vessels to arrive at the groin; in raising the cord to expose the external iliac artery, this nerve will be found to resist considerably.

† The lymphatics are seen running up from this gland betwixt the small nerve and the artery.

THE OPERATION.

The object of this operation is, to tie the external iliac artery, so high, that the wound made in the operation, may not interfere with the tumor of the Aneurism, nor open the coagulated blood to the influence of the air; nor excite inflammation in the sac by its contiguity. The wound must not be a penetrating wound, that is, there must be no breach of the investing membrane of the abdomen; or the patient's danger will be increased a hundred fold. *

Incision. Having ascertained the middle point, betwixt the superior spinous process of the os ilii and the symphisis pubis, you feel there, the pulsation of the artery. Next feel the spermatic cord, and trace it backwards into the abdominal ring, and mark where it disappears. You have now got two points to direct your incision; make another, by drawing a line from the superior spinous process of the os ilii to the umbilicus: mark a point, two fingers' breadth from the process, upon this line. Begin the incision

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* Among the many wild things which imperfect education, and a want of correct principles, give currency to, the most provoking, because the most unhappy in its consequences, is the notion that there is no danger in penetrating the abdomen, in cutting the peritoneum.

In this very operation I have witnessed death from the ulceration of the peritoneum. The artery had been correctly tied, the pulsation ceased in the tumor, the size of the tumor diminished from day to day; when, all at once, the patient was seized with pain in the abdomen, next day he was delirious, thought his attendant was the devil, seemed in great agony of mind, and sunk and died on the third day from the attack. On opening the body, the peritoneum was extensively inflamed, and where that membrane lay against the ligature, I saw two small round holes not larger than a pin's head, and about a quarter of an inch from each other; the peritoneum was much inflamed opposite to the wound, and pus lay upon its inner surface. The inflammation had spread widely over the cavity.

opposite the outer margin of the abdominal ring; carry it over the point where you felt the artery beating, in a direction outward and upward, and let it terminate at the point you have marked at, two fingers' breadth from the spinous process of the os ilii, measured in a direction towards the umbilicus.

Second Incision. Having exposed the aponeurosis, or tendon of the external oblique muscle, and observed the direction of its fibres, pass the directory into the ring, and into the spermatic passage; taking care that the instrument is directly close under the tendon, and, consequently, external to the cord; slit up the tendon in the direction of its fibres. *See Additional Notes*, No. V.

The Cord. The spermatic cord is now exposed. With the blunt hook and the handle of the knife, the cord is to be raised and pressed upward and inward. In doing this, you will necessarily raise the lower edge of the obliquus internus muscle. If the patient be fat, or the Aneurism prominent and high, the wound, in this state, will be too confined; and it will be necessary first to pass the directory, and then the point of the finger under the edge of the muscles, and to divide them in a direction upwards. The condensed cellular membrane, or fascia, which is on the lower surface of the transversalis, will generally yield to the finger.

There will be found a soft mass, just within the Poupart ligament; it may be mistaken for a vessel; the more especially, as the pulsation may be felt on pressing it. It is a lymphatic gland. This gland is to be left in its place. Above this, there is a soft, fatty substance, which is to be put aside with the finger and the handle of the knife; and now, upon putting in the finger, you feel the artery distinctly.

The space, where you feel the artery, is thus defined: 1. Below, towards the thigh, you have the Poupart ligament, and the internal inguinal gland. 2. On the inside, towards the pubes, you have the epigastric artery. 3. Above and towards the ilium, you have the edge of the oblique and transversalis muscle. 4. And above and towards the rectus, you have the spermatic cord.

Pushing up the spermatic cord and cellular membrane *, you place an assistant's finger there, to guard the peritoneum; you have the epigastric artery on the inside, still involved in its cellular membrane; and now you expose the artery.

Feeling the artery full, and pulsating under your finger, you think it bare; when a little consideration should remind you, that it is not.† It is still covered with its sheath, and filaments of the fascia strengthen that sheath; and here I must again observe to you, that the safest way is to scratch the sheath, directly over the center of the artery; to cut at the side of the artery is dangerous. The vein lies close by the inside of the artery, and, in some measure, below it. The vein is on the inside, the anterior crural nerve on the outside.‡ Therefore, I advise you to scratch, until you can pass your probe or blunt hook through the sheath and ligamentous fibres which directly cover the artery.

When you have exposed the proper coat of the artery, make the assistant raise the thigh as much as the circumstances of the tumor will admit; then you will be able to grasp the artery betwixt

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* To me, it appears that there are good reasons for pushing up the spermatic cord. First, you get much easier at the artery. Secondly, you have the spermatic cord betwixt you and the peritoneum. Thirdly, If you incline, you may, in this direction, push the peritoneum very high, and expose the external iliac artery at its highest point; whereas, if you go above the spermatic cord, and keep it in its place, you must be entangled in the reflexion of the vas deferens, and you will make the peritoneum thin as a cobweb, by separating from it the cellular tissue of the cord.

† Mr. Abernethy says, "The pulsation of the artery made it clearly distinguishable from the contiguous parts, but I could not get my finger round it with the facility which I expected." "After ineffectual trials to pass my finger beneath the artery, I was obliged to make a slight incision on either side of it, in the same manner as is necessary when it is taken up in the thigh, where the fascia which binds it down in its situation is strong." This double incision is not necessary in either of these cases; and I apprehend very dangerous in the present instance. *See Additional Notes*, No. VI.

‡ The external iliac vein is close to the inside of the artery. The anterior crural nerve is quite removed from the artery. It has, however, occurred that the patient has called out lustily of pain in his great toe, at the time the Surgeon was drawing the ligature;—we dare say, with the zealous endeavour of cutting the inner coat of the artery, according to the new doctrines! It was well that the patient had not resolved to suppress his feelings, or the nerve would have been tied instead of the artery.

the thumb and the fore-finger; you will find it so loose, that you will experience no difficulty in passing the needle under it. It is struggling to thrust the blunt needle through the sheath and fibres of the fascia, and neglecting to raise the limb, that makes this part of the operation tedious.

One firm ligature of four threads, waxed and oiled, will be sufficient; it is not necessary to tie the artery twice, nor, consequently, to cut it across.* *See Additional Notes,* No. VII.

OPERATION FOR CAROTID ANEURISM.

EXPLANATION OF PLATE XV.

THERE are some peculiarities in this Aneurism. There can arise no suspicion of the circulation being for a moment suspended or diminished, since four arteries ascend to the head. The common carotid artery gives off no branches, and is therefore favourable for the operation. One thing, however, deserves

* Mr. John Bell and Mr. Abernethy, and Mr. Maunoir of Geneva, have been advocates for tying the artery twice and cutting it betwixt the ligatures. It is a practice which may have advantages, but the idea that they thereby made the artery as secure as when tied in amputation, was undoubtedly a great mistake. Has the profession still to learn the difference of the condition of an artery where the limb is cut off, and

PLATE XV.

Fig 1.

Fig 3.

Fig 2.

London: Published June 1832 by Hall, Longman, Rees, Orme & Brown.

particular attention; the frequent act of swallowing, the spasmodic affection of the muscles of the throat, and the dread of suffocation, which arise from the pressure of the aneurismal tumor against the throat. If the operation be long delayed, and the tumor has much enlarged, these symptoms become alarming, and are even increased, in the first days after the operation. *See Additional Notes*, No. IX.

EXPLANATION OF FIG. 1.

It represents the Aneurism which takes place at the division of the common carotid, and the incision for tying the carotid artery. The incision appears small, the figure not being the size of life.* I think two inches a full incision.

A B, The incision to expose the carotid artery.

C, The fibres of the platysma myoides.

This incision should be made along the anterior edge of the sterno-cleido-mastoideus; as if the purpose were to expose the round edge of that muscle. The first cut is made through the integuments, and

with it is removed the stimulus to the activity of the vessels, and of an artery tied in the centre of a limb, where the member still influences the condition and activity of the trunk and its branches?

* In an operation to take up the carotid, performed by Mr. John Bell, the length of the incision was three inches. *See Additional Notes*, No. X.

exposes the fibres of the platysma myoides; the second incision divides the fibres of this cutaneous muscle. *

The edge of the mastoid muscle being dissected bare with the edge of the knife, the Surgeon should proceed, using the blunt hook and the ivory handle, instead of the knife. With these he raises the anterior edge of the mastoid muscle; in doing which, he will find his operation facilitated, by inclining the patient's head a little, so as to relax the muscle.

EXPLANATION OF FIG. 2.

A, The blunt hook with which the edge of the mastoid muscle is held aside.
B, Another blunt hook, with which the Surgeon holds open the sheath of the artery.
C, The omo-hyoideus muscle, passing over the sheath of the artery. †
D, The edge of the sterno-thyroideus muscle.
E, The artery exposed.

When the Surgeon holds aside the mastoid muscle, he will see the omo-hyoideus passing obliquely across the sheath of the artery. The sheath must be opened, by scratching with the point of the knife, a little anterior to the artery, that is, upon the anterior part of the sheath; for the vein lies behind the

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* For the same reason that you divide the fascia largely, you divide this muscle up to the extremities of the incision.

† I think the best place to take up the artery is immediately under the lower edge of the omo-hyoideus muscle. If we go above this muscle, we come upon the base of the aneurismal tumor. Mr. John Bell tied the carotid above this muscle, but then it was in a case of Aneurism that took place from the stab of a pen-knife opposite to the angle of the jaw.

artery, and more under the mastoid muscle. The Operator is to open the sheath, by scratching the sheath with the point of the knife, not cutting with the edge; but rather carrying the back of the knife forward; and from time to time he tries to lift up the membrane with the blunt hook. When he has succeeded in opening the sheath, he is to stretch it, by using the hook and the ivory handle of the knife; then the artery appears as at *E*, of this figure.

EXPLANATION OF FIG. 3.

A, The skin, and platisma-myoides.
B, The mastoid muscle.
C, The sheath of the artery.
D, The carotid artery.
E, The ligature. One end of the ligature having been cut off, the other has been passed through a needle, and carried through the skin.

When the artery is so exposed, there is no difficulty in passing the needle.* Let the point of the needle be introduced on the jugular side of the artery; a rude hand pushing it in an opposite direction under the artery might pierce the jugular vein.

The ligature is to be formed into a single knot, and drawn, until it be indented into the coats of the artery; a second knot is to be tied; then one end of the ligature is to be cut off, and the other kept.

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* A small flat blunt needle of tempered silver is sufficient for all occasions, and is very well adapted for this operation. I have seen the common eyed probe preferred, where there were all varieties at hand.

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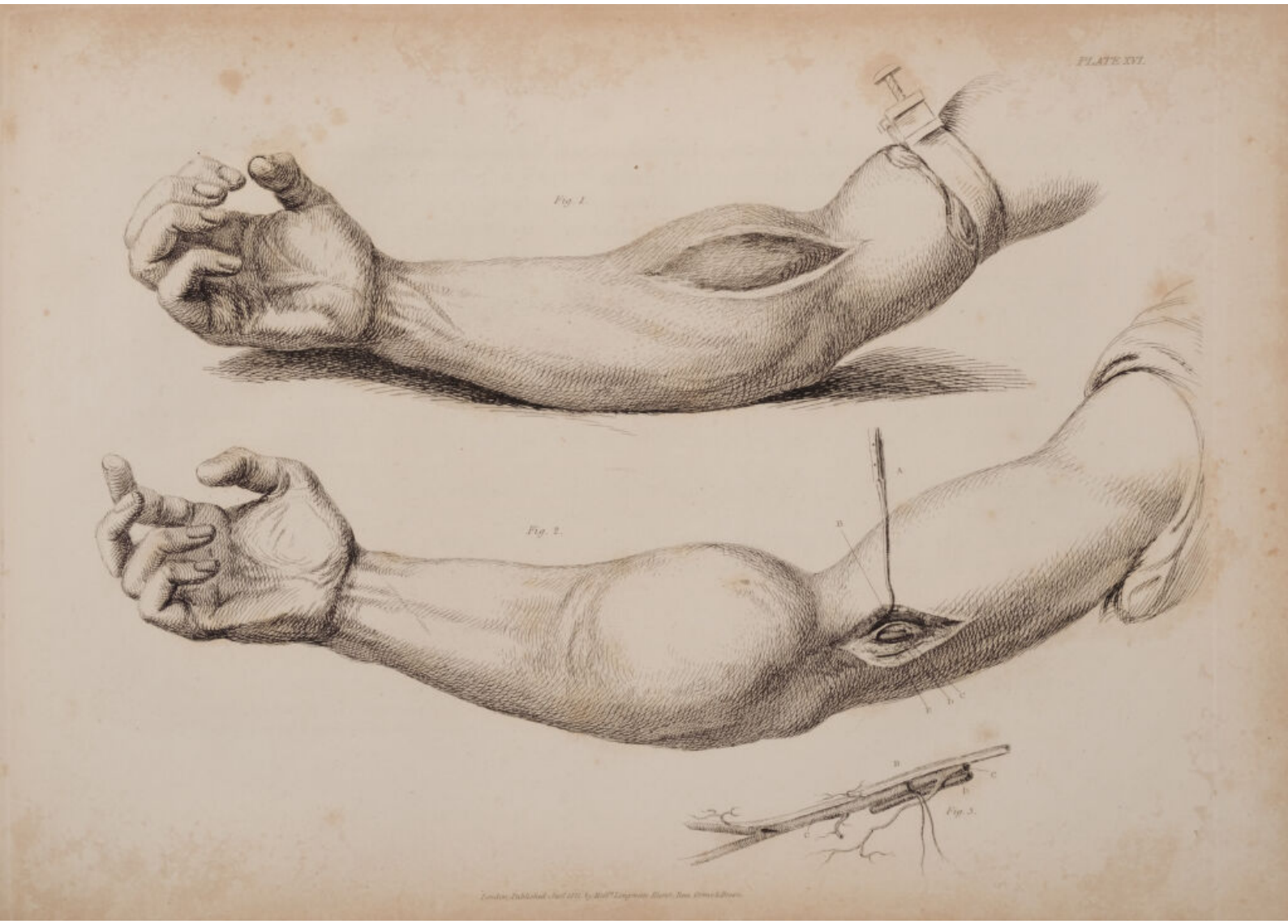
PLATE XVI.



London, Published April 1811, by Mess.rs Longman, Hurst, Rees, Orme & Brown.

There are two methods of operating for this kind of Aneurism; one where the tumor is opened, and the wounded artery tied; the other where the humeral artery is exposed and tied, an incision being made a little above the tumor. In this first figure is represented the incision of the integuments of the tumor, where the Surgeon has undertaken to open the Aneurism. The tourniquet is placed on the limb; because, upon opening the sac, there is nothing to prevent the full jet of blood from the artery.

A singular appearance is presented in this stage of the operation. The fascia seems to have gained strength, and its silvery fibres are particularly distinct, and contrasted with the dark coagulum of blood which is stuffed beneath it.

When the fascia is thus exposed, the Surgeon proceeds to puncture it; and, introducing his directory, he cuts it up, and exposes the mass of coagulum. * Immediately the coagula roll out. The wound being sponged out, the Surgeon expects to find the parts with which he is familiar; but he is disappointed; he sees nothing but an irregular cavity, into the walls of which the blood has been driven, making them of one dark colour.

He calls to have the tourniquet slackened; it is let down for a moment, a jet of blood shows the place of the artery; he introduces the end of the probe into the wound of the artery, and raises it up; to facilitate which, he bends the arm; this permits him to separate the nerve and artery. † He must not dissect the artery much from its bed, especially in carrying the knife downwards, for he might cut the ulnar or radial arteries as they go off.

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* Does it require to be noticed here, that there may be a high bifurcation of the humeral artery, and that the radial branch may be taking its course within the fibres of the fascia itself?

† I have seen the nerve and artery taken up together by the neglect of this precaution.

The double ligature being passed under the artery, it is to be cut and made into two, one of which is to be pushed above the wound of the artery and there tied. The other ligature is to be pushed below the wound and tied. *

The defect of this operation is, that we have got a large irregular wound with the surfaces somewhat injured by the driving of the blood into the cellular texture, and therefore likely to run into a tedious suppuration.

EXPLANATION OF FIG. 2.

THIS figure represents the mode of operating by tying the humeral artery above the tumor, by which the Aneurism is not opened. †

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* Before the tying of the lower ligature, the tourniquet being laid loose, I have seen the blood returning from below.

† This manner of operating was first practised by Mr. John Bell. I have explained why a wounded artery should not be thus treated; this is a wounded artery; but there is time afforded for the formation of a circumscribed Aneurism, and in this consists the distinction. It is an Aneurism by puncture, but not a diffused Aneurism. I had my suspicion that the operation of tying the artery above the tumor would not be effectual. I thought that, like an instance I saw of Aneurism in the ham formed by puncture of the artery, the tumor would continue to enlarge after the artery was tied above. I was wrong in my conjecture, for in two instances the operation succeeded; but circumstances have come to my knowlege, which countenance my first opinion, and that we cannot always depend upon the ligature of the humeral artery above the elbow proving sufficient for the cure of this Aneurism; nevertheless, I must recommend this simpler mode of tying the artery.

Begin by making an incision from near the base of the tumor upwards on the arm, in the line of the inner edge of the biceps muscle. Divide the superficial fascia. Raise the edge of the biceps muscle and expose the sheath of the cord of vessels; open that sheath. You see what appears to be the artery, it has the colour, the form, the pulsation; — notwithstanding, it is not the artery, but the median nerve clinging to it, and immediately above the artery. *

A, The integuments held up with the blunt hook; the edge of the biceps is seen.

B, The median nerve, lying close upon the humeral artery.

C, The humeral artery.

D, The vein lying under the artery.

E, The internal cutaneous nerve on which you may inadvertently touch in making the incision.

N. B. Just over the nerve may be seen the remains of the sheath which has been dissected up to expose the artery.

Fig. 3. In this figure there is a little plan of the relative situation of the nerve, artery and vein marked by the same letter as in the last figure, to serve as an additional illustration of the operation.

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* I was very much surprised on dissecting the arm of a patient, on whom a Surgeon had performed the operation of tying this brachial artery, to find that the ligature was put neatly around the nerve, without including the artery.

OPERATION FOR THE AXILLARY AND SUBCLAVIAN ANEURISM.

THIS is a subject which I shall not, at present, enter upon. It might be useful to give the anatomy concerned in the operations upon the subclavian artery; but such was not the object of this work. It was intended to present the anatomy, but the anatomy, under the impressions we take of it from incisions made in the living body, not from the detail seen in dissection.

If opportunities occur, I may, hereafter, add this operation in an appendix. I shall only say, on this subject, that it appears to me, in looking upon the parts in the dead body, that in certain cases it might be practicable to tie the subclavian artery by dividing the clavicle and letting the shoulder fall back. I conceive that in a matter of this importance, when the immediate death of the patient is to be apprehended from delay, the inconveniences which might remotely accrue from the division of the bone are of little comparative weight.

ADDITIONAL NOTES TO PART IV.

During the printing of this Part, which treats of the operations on the arteries, I was induced to read some recent papers and cases: and being led on from one to another, I have been much surprised to find, in these records of the Profession, a great want of precision in the manner of operating, as well as considerable inaccuracy in the description of the anatomy. I have, therefore, added some critical notes; which, until I perused these cases, I did not believe necessary.

Note I. page 81.

The Sheath. In the descriptions of authors, I see much inaccuracy on this head. They speak confusedly of the fascia and the sheath. It ought to be carefully noticed, that the proper sheath of the vessels has often threads, and little ligamentous bands of the general fascia incorporated with it; that the artery, vein and nerve are embraced in one general sheath; but that the artery lies in a distinct subdivision of the sheath. I find Surgeons of the first eminence speaking of the artery, vein and nerve, and how carefully they separated them, and how distinctly they exhibited them to their assistants, so as to show that they believed such display, actually a merit.

Let me, on the contrary, entreat my reader to believe, that, in the operation for Aneurism, he ought only to open that division of the sheath which involves the artery; and that the perfection of an operation of this kind is not to display the adjacent parts, but to disclose the smallest portion of the artery possible, and only the artery.

Note II. Popliteal Aneurism, page 85.

A gentleman, who has written a very meritorious work on the arteries, and who has been most assiduous in waiting on some of our first Operators, and very much devoted to them, describes the incision thus. " He makes an incision through the " integuments, upon the inner edge, and in the course of the sartorius, commencing it two inches and a half below Poupart's " ligament." As the Poupart ligament reaches across the top of the thigh, I am a little at a loss to know exactly where the incision begins; but, at any rate, in a full sized man to begin the incision within two inches and a half from the ligament, it is out of all reason too high. There is no temptation for this, but the greater facility of finding the artery here by its pulsation; but I must observe, that the higher up the artery is tied, the more freely do the inosculations communicate with those branches of the femoral artery, which come off betwixt the ligature and the Aneurism: consequently, the greater is the supply of blood poured into the sac of the Aneurism. This it is the object of the operation to prevent. I may add, the failure from ulceration is an accident the more formidable, the higher the artery has been tied.

Nor do I conceive it right to cut in the line of the sartorius muscle, but rather in the direction of the artery; and the incision should be carried down, just so far, that the edge of the sartorius may cross, obliquely, the lower angle of the wound. The edge of the muscle being first disclosed, and then raised, a smooth surface of fascia is seen below, which being opened, the artery is easily discovered. The incision in the principal figure of this plate, is such as I have made, and found the artery with the least possible discomposure of the parts. At the same time, if my reader cannot depend on exactly hitting the edge of the sartorius, he will perform the operation with more ease to himself, by cutting an inch higher than is here represented.

Note III. Popliteal Aneurism, page 88.

In operating as I have here described, I neither saw the femoral vein nor the saphenus nerve; nor ought they to be seen. I have here insisted on precision in the manner of operating, and that the parts should be little fingered or pulled about. The conviction of this necessity has risen very slowly upon the Profession, if it has now obtained in the degree it ought. It is a rule that I received from my brother; and yet, in the following quotation, we shall see it could not be acted on, while he continued of opinion that it was necessary to divide the artery.

" By the expression uncovering two inches of the artery, I do not mean that it lay exposed to view, as in a dissected thigh; " but, by dipping the points of my finger and thumb, I felt it so. I raised, very gently, and with every precaution, not to stretch " too much, the artery included in its peculiar sheath, and accompanied with its vein and nerve. The whole resembled, in thickness, " tension, firmness, cartilaginous feeling and pulsation, the umbilical cord. Being now raised from its bed, and held firm, I " proceeded, with the same scalpel, to open the vagina or sheath: to dissect the vein and nerve from the trunk of the artery; " and having done so, I let it gently go; and, like a bow-string, it returned to its straight line. I passed two crooked and blunt " needles under it, about the distance of an inch from each other, (and in continuation.) I took the scalpel again; dipped my " finger and thumb into the wound; pinched up the artery; and slipping the knife within the lips of the wound, turned its " edge upon the artery, and cut it across; and still holding the upper portion, I turned its mouth directly up; when it was plain, " that neither vein nor nerve, nor the slightest thread of cellular substance was included." By the description of this operation, we see how much we lose by using the double ligature. The artery must be dissected bare, pulled out, and *fingered*. It is this consideration which has made me prefer the single ligature, against the highest authorities in the Profession.

Note IV. Popliteal Aneurism, page 88.

In describing the operation for Popliteal Aneurism, I have not mentioned the saphena vein, *because it is so long since I have seen it in this operation*. The saphena vein is considerably to the inside of the proper incision. When this vein was cut, the incision had been made too low, and too far towards the inside of the thigh; or instead of making the incision in the course of the artery, it must have been made in the course of the sartorious muscle.

Note V. Inguinal Aneurism, page 92.

More than one Surgeon has done his first operation by an incision upwards, and has changed his manner. Mr. Norman of Bath changed his method in his second case. It has been objected to the operation, that an oblique incision will not answer when the tumor is large. But this is very far from being a good objection; on the contrary, when the tumor is high, it must prevent you making the incision in the course of the artery, it must prevent you prolonging the incision downwards; of necessity

you must carry it more upwards; the inner muscles must be cut proportionally upwards, and more of the peritoneum thereby exposed. This is truly dangerous; nor do I conceive we should altogether put out of consideration the possibility of producing hernia, since hernia has followed the operation for Inguinal Aneurism.

Note VI. Inguinal Aneurism, page 93. *Foot Note.*

Mr. Freer says on the same subject; "But in this patient, the artery was so firmly bound down by its fascia, that I could not "get my finger under it, without using the knife to divide the fascia." Need we say, it must be always so.

N. B. The engraver, in copying fig. 1. Plate XIV., has given a character to the ligature more picturesque than necessary; it appears here a *rope;* it was a ligature of four silk threads.

Note VII. Inguinal Aneurism, page 94.

It was proposed to tie the artery below the origin of the epigastric artery. This was a step in retreat; this was to be blind to the improvements of the age. In the Med. Chir. Transact. vol. vii., we have a description of an operation on the *External Iliac*, in which there is something new in the manner of operating; but the dissection exhibited the artery tied below the circumflex artery. "The ligature was on the artery, close to Poupart's ligament, about an inch below the giving off the circumflex, and "some quarter of an inch from giving off the epigastric." If this means that the artery was tied betwixt the roots of these branches, it was a most dangerous position of the ligature. The Operator must guard against this possibility, by attention to the position and course of the epigastric, in the third figure of this plate. Hæmorrhage occurred from this cause, on the fourteenth day after an operation by one of our London Surgeons; the ligature was found to have been put just below the origin of the epigastric artery.

I conceive it is a mistake to suppose that there is any very considerable variation in the origin of the epigastric, or A^{a} circumflexa ilii. If mistakes have been committed, I think they must have been owing to too much indifference about the exact place of the Poupart ligament, and confounding it with the crescentic appendage to the ligament.

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In a strong man, when the mastoid muscle is raised, there is seen neither artery, vein, nor nerve, nor general sheath; but only a broad flat muscle, which seems incorporated with a broad smooth membrane. It is the upper belly of the omo-hyoideus which you see. Let the Operator mark the lower edge of this muscle, and pierce the membrane, close to the edge of the muscle; and proceed as described in the conclusion of Note XI.

N. B. The patient should be seated during this operation, the head resting on a pillow. In this position, the jugular vein will be less distended.

N. B. A nerve, a branch of the ninth nerve, may be seen on the fore-part of the sheath of the carotid artery; if possible, avoid exposing it, since being engaged in the inflammation of the wound, it may increase the irritation of the muscles of the throat.

Note XI. Carotid Aneurism, page 98.

In thus describing the operation, I must seem to be omitting particulars. By one author, it is thus described. "I made an "incision, two inches long, on the inner edge of the sterno-mastoid muscle, from the lower part of the tumor to the clavicle, "which laid bare the omo and sterno hyoideus muscles, which being drawn aside, towards the trachea, exposed the jugular "vein." (If he drew the omo-hyoideus forwards, he must have tied the artery above that muscle; and we suspect by this, the incision was carried too near the aneurismal tumor.) The same author, in a second operation, describes the process more distinctly. "I began my incision opposite to the middle of the thyroid cartilage, from the base of the tumor, and extended "it to within an inch of the clavicle, on the inner side of the mastoid muscle. On raising the margin of this muscle, "the omo-hyoideus could be distinctly seen crossing the sheath of the vessels, and the nervus descendens noni was also "exposed." (So far, all is correct; but, in what follows, we must accuse the author of indifference to his own great reputation.) "I next separated the mastoid from the omo-hyoideus muscle, and the jugular vein became apparent, which "being distended, spread itself over the artery. Drawing aside the vein, the par vagum was evident, lying between it and "the carotid artery, but a little to its outer side. This nerve was easily avoided," &c. In the former operation, he had told us, that he had been careful to exclude the par vagum on the one hand, and the recurrens on the other, from the ligature of the artery; and that the motion of the jugular vein was the only difficulty in the operation. I cannot reconcile these things with my

notions of a correct operation. We should be careful to open the sheath on the side towards the trachea, close to the edge of the sterno-thyroideus, *D*, fig. 2.: to open only that division of the general sheath which contains the carotid artery, and then we shall see neither the recurrens nor the par vagum; and we shall not be troubled with the great vein forcing itself out upon us. In Mr. John Bell's operation, it was not seen, nor in Mr. Vincent's case. By others it is not mentioned. But in Mr. Dalrymple's case, who operated in imitation of the above description, both nerve and vein were displayed. If the vein should, by its distention, interfere with the operation of the needle, a dextrous assistant would press with the points of his fore-fingers above and below the wound.

Note XII. Carotid Aneurism, page 98. *Foot Note.*

Par vagum. It would appear, that in Mr. Vincent's case, the presence of the ligature near the nerve had produced a sensation of fullness and uneasiness in the abdomen, "as the whole sensation ceased the moment the ligature was removed." Med. Chir Trans., vol. x. Or is this the influence of theory?

Note XIII.

I should not be satisfied with myself, in concluding these illustrations of the operations for Aneurism, if I omitted mentioning the operation performed by Mr. Stevens on the internal iliac artery. The narrative of this case will be found in the fifth volume of the Med. Chir. Transactions. It was, in the proper sense of the word, a bold operation. It seems to have been performed with great precision, and that implies knowledge of the anatomy. To the narrative of the case, he has joined some just observations; and we cannot but be pleased to find in that paper, a perfect fairness, in remarkable contrast with those of some other gentlemen, who, in writing about arteries and aneurisms, have been under a continual restraint.

In the last Part, treating of Amputation, I have omitted to state, that in high amputation of the thigh and arm, we shall find advantage in tying the arteries and removing the tourniquet before sawing the bone. This enables us to retract the muscles more fully, and consequently to sink the bone deeper in the face of the stump.

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THE OPERATION

OF

CUTTING FOR THE STONE IN THE BLADDER.

OF SOUNDING.

THE operation of Sounding for the Stone in the Bladder requires very considerable dexterity. It will be acknowledged to be an important operation, when it is considered that we have to decide, whether that pain which makes life intolerable, proceeds from disease seated in the bladder, or is a consequence of some remote sympathy — whether it depends upon disease in the coats of the bladder itself, or upon a stone seated within it? Do we not hear of persons being cut for the Stone and no stone found; and does not this emphatically declare the importance of the previous operation of Sounding? Therefore I have

given these plans in explanation of the circumstances which have chiefly disconcerted me in practice, conceiving that they must prove of use to others, and may prevent even fatal mistakes. *

EXPLANATION OF PLATE XVII.

EXPLANATION OF FIG. 1. The parts are exhibited, as if a lateral section were made of the bladder, &c.

A, The staff introduced into the bladder.

B, The os pubis.

C, The cavity of the bladder.

D, The prostate gland.

E, A stone which has formed in the perinæum, and the point of which projects into the urethra.

Now, in this case, it happens that the Surgeon feels the gritty rub of the stone, as he passes in the Sound; he is certain of the presence of a stone, and he conceives that the impression is made on the extremity of the instrument; and therefore that the stone is in the bladder — when it is in the urethra, or the prostate gland. †

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* The Surgeon ought to have a variety of iron Sounds of different curves, some intended to go round under the arch of the pubes, and to reach the higher parts of the bladder; some nearly straight, to go behind the prostate. He must sometimes sound with a catheter, so as to let off the urine, and permit the gradual contraction of the bladder during the operation.

† It is worse than awkward when the Lithotomist, in operating with the gorget, drives the instrument against the stone. If nothing should prevent him making the incision, a worse error follows; the forceps are directed quite over the stone, and there is much unnecessary groping and plunging of that instrument.

PLATE XVII.

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EXPLANATION OF FIG. 5. This figure represents stones in two different situations within the bladder, and in both of these it is difficult to detect them. Sometimes, it happens that in the first operation of sounding, the stone has been easily found, lying free in the cavity of the bladder; but either before or during the operation of lithotomy, it slips into one of those recesses, which causes delay and difficulty in the operation, and, ultimately, death.

First, as to the position of the larger calculus, *E*, it ought to be recollected, that a bladder containing a stone, is sometimes excited to great muscular exertion, and the coats become thickened. The consequence of this is, that the muscles of the ureters become strong and prominent; and then they make a sort of septum, dividing the bladder at the lower part. Behind this septum, *G*, the stone lodges in a sort of sac, defended from the touch of the sound. *

F is a small stone, lodged betwixt the prominence of the prostate gland, *D*, and the septum formed by the muscles of the ureters, *G*. When, in sounding, the stone is felt here, being so near the centre of motion of the sound, the Surgeon is apt to conceive that there is a large stone in the bladder; when it is a very small calculus sunk deep into this cell. †

EXPLANATION OF FIG. 6. This figure represents a thickened bladder, and sacculated stone.

A, The sound. *D*, The prostate gland.

E, The stone sacculated, and touched by the point of the sound, so as to feel as if it were within the cavity of the bladder.

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* In extracting the stone in the operation of Lithotomy, I have felt those muscles draw the centre of the bladder nearly into a circle, so as to enclose the stone. This, I am inclined to believe, has sometimes been called a case of sacculated calculus, whereas it is a natural consequence of the excitement of the bladder during a protracted operation.

† See further of the extraction of the stone.

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THE OPERATION

OF

LITHOTOMY.

In treating of this operation, I mean to confine myself strictly to what requires the aid of demonstration or drawings to explain. Yet I am constrained to observe that it is an operation of that magnitude, entailing that degree of responsibility on the operator, for which there can be no reward or equivalent; and nothing but an overpowering sense of duty ever has or ever will induce me to perform it. If a patient says, "In your hands I believe myself safe," I think the obligation binding; but if he should hint that another might do it, I consider it a happy release from the most oppressive duty the Surgeon has to perform. As I have had some experience in this operation, and can, at least, affirm, that I have given the most intense thought to each case, turning every circumstance in my mind, both before and after the operation, I hope that I shall be able to offer some useful hints.


PLATE XVIII
Fig 2

OF THE STAFF.

EXPLANATION OF PLATE XVIII.

Fig. 1. The staff which I have used in adults. This appears a clumsy instrument, but in that, or at least in its size, its superiority consists. It is of a thickness fully to dilate the urethra, and the groove is very large. The consequence is, that the staff is easily distinguished, deep in the wound, and the groove is easily struck; and when the cut is made, the wound remains open and stretched. The groove is a little to the right side of the instrument; to the left side of the patient. At the curve, the edge which forms the groove is cut a little down. This not only permits the Surgeon to hit the groove more easily, but also to give that direction to his knife, by which he cuts the neck of the bladder and the prostate on the left side. It will be further observed, that the groove does not extend to the extremity of the instrument. This is to prevent the end starting out of the incision, a most perplexing accident, when it does happen through the awkwardness of the assistant who holds the staff. A bar is placed across, near the handle of the instrument; this is useful, not merely to give firmness to the grasp, but to be an index to the Operator and his assistant, of the exact position of the extremity which is in the bladder.

I need not say any thing in this place of the manner of introducing this instrument, only we may observe, that as its form is calculated to direct the incision, and to lie in contact with the stone, it is not so well adapted to the curve of the urethra, and therefore requires more time and attention to introduce it than the catheter.

But I must give a caution to the assistant, when holding the staff. The Surgeon gives it into his hand, when he has found that it rests in contact with the stone. He has calculated the place of the stone, in reference to the instrument. He knows, therefore, where to put his finger on the stone, after the incision, and avoids the plunging and searching for the stone, which, in this operation, not only looks ill, but is an additional aggravation of the patient's suffering. *

When the assistant receives the staff, let him be careful, neither to press it down towards the rectum, nor to draw it up too close to the arch of the pubes. When the staff is drawn up and hooked, as it were, close under the pubes, the Surgeon has difficulty in making his deep incision, especially in a boy. When the assistant leans with too heavy a hand upon the staff, the Surgeon always feels it at the lower part of his incision; so that, after having made his cut into the bladder, and when he is about to pass his finger, the wound is stretched by the pressure of the staff, and the incision appears above, instead of to one side of the instrument.

EXPLANATION OF FIG. 2.

This is a sketch of the nates and perinæum. The place of the incision is marked by a simple line. The first incision should be large, and lower than I think it is usually performed. Let it be remembered,

* The only time in which I disregarded this, my own rule, I had bitter occasion to regret it. I had the very best assistance, and the opinion of the first Surgeon in London. He waived the ceremony of feeling the stone a second time; he had been satisfied the preceding visit. So had I, and I began my operation, without assuring myself of the stone and the staff being in contact. When the incisions were made, I could feel no stone, nor discover it with any variety of instrument! At last, after greatly fatiguing the patient, I found a small stone, socketted behind the prostate gland, which I extracted with the bullet forceps.

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INCISION, WITH THE KNIFE DIRECTED DOWNWARD.

A common scalpel is struck a full inch deep, at the point *C*, that is, under the arch of the ossa pubis, and close by the side of the bulb of the urethra. It is then drawn downwards, in a direction very slightly semicircular, terminating at *D*. As the knife is carried downwards, it is withdrawn from its deep position; there would be danger in cutting as deep at the lower part of the incision as at the upper. The consequence of this shallowness of the incision at the lower part, is, that the finger of the left hand must be introduced, the parts felt, and the rectum pressed down, and towards the right side; and the knife repeatedly used in the manner of a dissection. *

INCISION, DIRECTED UPWARDS.

The fore-finger of the left hand is passed into the anus, the length of the first joint; the point of the scalpel is then entered a little below, and towards the left side of the anus, at *D*. It is passed in a

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I was obliged to stop and follow him in all his motions; and entreat him, by every motive I could suggest, to be steady. I thought it cruel to withdraw the knife and leave the operation unfinished. I completed the operation in these circumstances; but, on the second day, I found I had cut the rectum within half an inch of the verge of the anus. It might have been much worse, I might have divided the common pudic artery. It was this circumstance that induced me to change the direction of the incision, and to do it so that it becomes of very little consequence whether the patient be steady or not.

* So as to divide the *transversalis* muscle and a part of the *levator ani*, and the fascia of the perinæum.

direction slanting upwards, by the side of that part of the rectum which is covered by the internal sphincter. The point is directed, still upward and inward, towards the membranous part of the urethra. In doing this, little of the integument is divided in the first instance; the transversalis Perinei and the portion of the levator ani are cut, while yet the patient is steady (for there is little pain); and the knife is steadily directed by the finger in the rectum, so that the gut cannot be cut; and yet you are enabled to pass the knife so near the gut, that there is no danger of cutting the common pudic artery.

The point of the knife being at its greatest depth, behind the bulb of the urethra, the Operator keeps it there, but raises the handle of the knife to a level with the point, by which he cuts the integuments, nearly to the same level, the incision terminating at *C*, that is, where it is begun in the other manner of operating. *

INCISION INTO THE BLADDER.

Deep in the external wound, and at the upper part, the Surgeon feels the staff with the fore-finger of the left hand. He turns the edge of the knife upwards, and again clears his way, by slight incisions, till the staff is more distinct to the touch, and the fore-part of the prostate gland also distinctly to be felt. He now holds his scalpel as he would the writing-pen, and runs the point into the groove of the staff.

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* In either mode of operating, it should be the business of an assistant to stretch the integuments of the perinæum, that they may not fold before the edge of the knife, which makes a ragged cut. The reader will observe, that the incision *C D*, inclines a little round the anus, and at its highest part comes more into the center of the perinæum.

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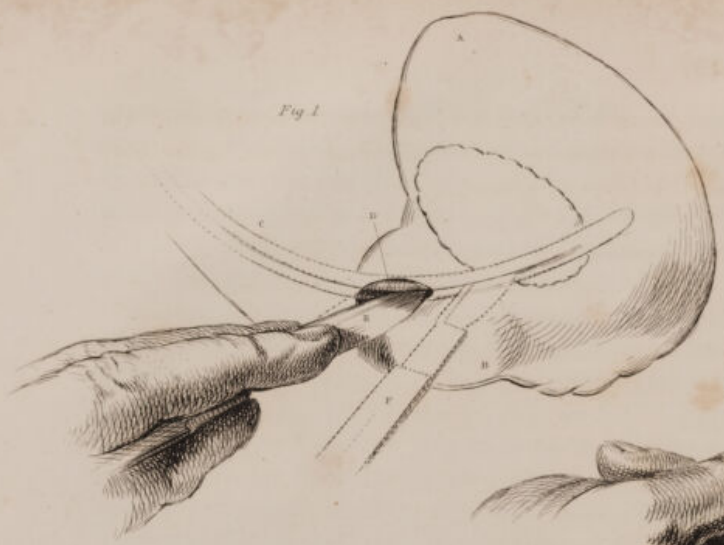

Fig 1.

Fig 3.

Fig 2.

London, Published Feb.1.1825 by Rich.d Longman, Hurst, Rees, Orme, & Brown.

kept steady in the groove of the staff, whilst the Surgeon carries the handle of the knife away from the staff. By this means, the wound of the prostate is enlarged, and the fore-finger of the left hand follows the knife into the bladder; and now the knife lies upon the finger, and the edge is guarded by it. If the Operator pleases, he can enlarge the wound, the finger being the directory. But the fore-finger of the left hand being admitted into the bladder, it is better to withdraw the knife, and to push the finger along the groove of the staff, until the stone be felt.

If it be then found necessary to enlarge the wound, it had better be done, as represented in the next plate. *

Let it be particularly observed, that the Surgeon, by boring in his finger through too narrow an incision, is in danger of one of two errors; either pushing off the bladder from its connection with the os pubis †, or of pushing the inner membrane before the point of the finger, and never getting properly into the bladder. ‡ Therefore, if he finds that he has made a small incision, and that it does not enable him to enter his finger fully into the bladder, he is to slip the bistoury, represented in the next plate, along the groove of the staff; making sure that it has fairly entered the bladder, he passes the fore-finger of the left hand betwixt the staff and the bistoury, and turning the edge of the bistoury loose from the staff, he

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* The instrument used here, is a long probe-pointed bistoury, with a full handle to grasp. It is curved towards the extremity corresponding to the groove of the staff, and it is blunt for a full inch from the extremity; the cutting edge is an inch in extent. However, a common probe-pointed bistoury, with a bit of plaster wound round it, is just as good.

† This is an accident very little adverted to, and yet very apt to happen, if the operator's attention be not called to the circumstance. The consequences, too, are very serious, for by this the urine finds access to the cellular membrane under the peritonæum, and behind the fascia of the prostate.

‡ This has often happened in operating with the gorget, and it may happen in any method of operating, if we attempt to introduce the forceps through an insufficient opening into the prostate, and without previously passing the finger. It is in this manner that the bladder is caught, in the endeavour to seize the stone, and irrecoverably injured.

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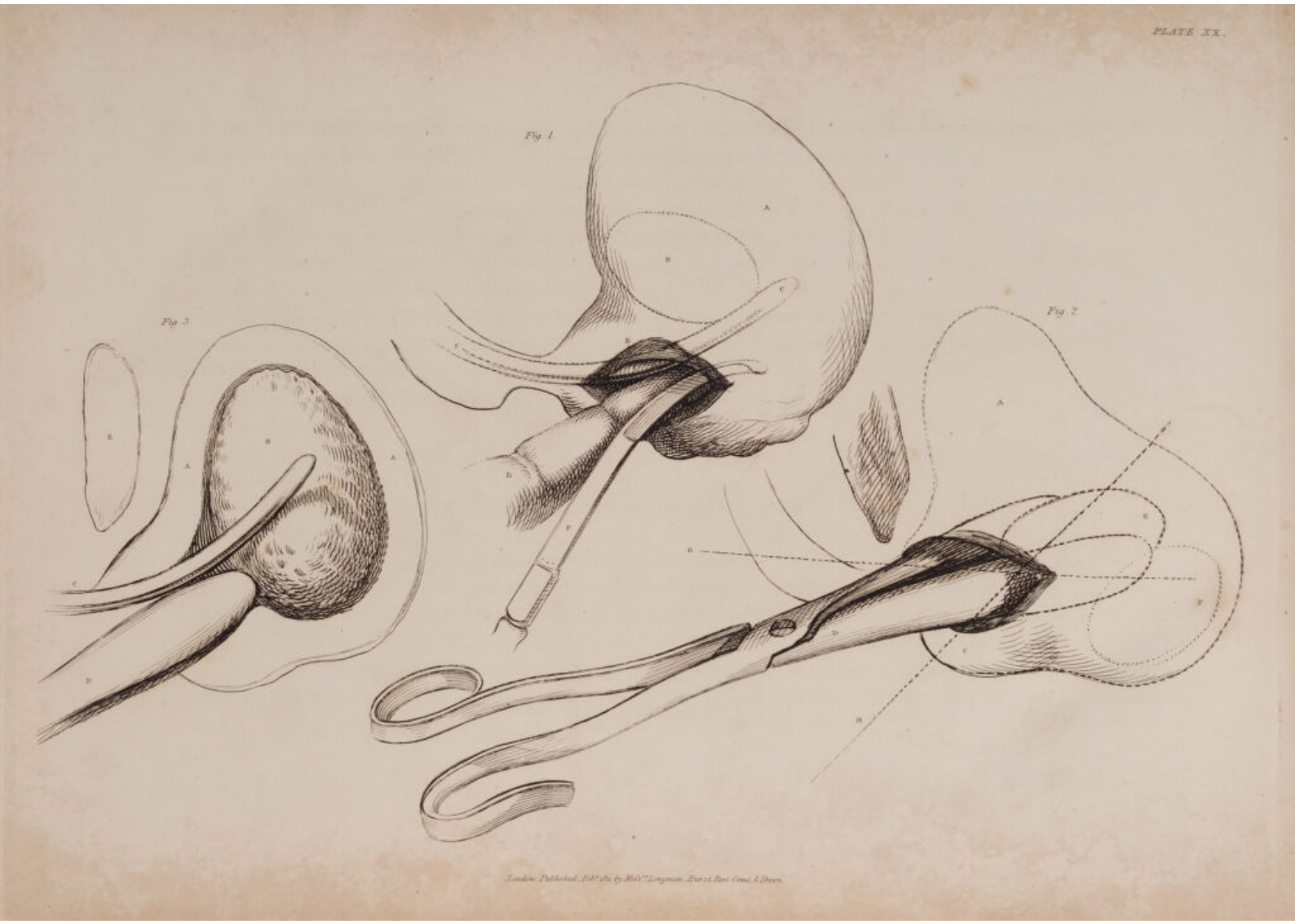

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more accurately than was practicable before. It is this stage of the operation that is represented in this figure.

The form of the outward incision, in this lateral view, is the shaded part of the drawing.

EXPLANATION OF PLATE XX.

This plate contains plans illustrative of the latter stage of the operation.

Fig. 1. An outline, showing the manner of enlarging the incision by the use of the probe-pointed bistoury.

A, The bladder.
B, The stone, in outline.
C, The staff, in outline.
D, The finger, introduced into the incision, which has been made into the neck of the bladder.
E, The staff, exposed by the incision.
F, The bistoury, lying on the finger, and directed by the finger in enlarging the incision horizontally, and towards the patient's left side.

Fig. 2. represents the forceps introduced, the bladder and stone in outline.

A, The bladder.
B, The os pubis.
C, The prostate gland.
D, The forceps, having hold of a stone.
E, The stone, in outline.

F, A second stone, lying under the first.

G, The line in which it is improper to withdraw the stone.

K, The line in which the stone ought to be withdrawn.

From this plan it is evident, that, in order to extract a calculus, we must take care to keep it off the back of the os pubis, *B*. We must therefore pull the forceps downward, by the side of the anus, in the line *K;* and if the stone be very large, and if we require to enlarge the outward incision, it must be done downwards, by the side of the anus. If the incision of the bladder requires to be enlarged, it must still be done horizontally. But it is the imperfection of the external incision, which, for the most part, prevents the stone being easily withdrawn. Some part of the perineal fascia, or some part of the levator ani, is opposing itself to the extraction of the stone. * It may well be asked, what are our very large and powerful forceps intended for? Are they a measure of the force we are to employ? We must admit that they are, for often they are bent in the operation. Here, I apprehend, is a source of error; the parts are not capable of standing the violence of these instruments. The injury proves too much for the patient's strength; he is lost by violence. If powerful forceps are to be used, it should be for the purpose of crushing the stone. This it is right to do, wherever the stone is large. It is considered an awkwardness to break the stone in the attempt to extract it. It ought rather to be deemed a fortunate circumstance. It proves that the stone can be crushed; and if it is large, it is better to crush it, than to lacerate the parts; which is a sure consequence of bringing through a large stone. †

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* If the incision be not enlarged, the violent extraction of a rough and large stone may tear off the prostate gland from the bladder, or injure the urethra and prostate gland.

† A stone is *large* in proportion to the incision. The finger of the operator having been introduced, he is enabled to judge of the extent and dilatability of that incision. When he grasps the stone, he is enabled to judge of the diameter of the stone and blades of the forceps. It must, therefore, depend on his judgment, whether he is to persevere with the forceps, or to prefer the lever, or to attempt breaking the stone.

Fig. 3. represents the stone firmly embraced by the thickened bladder *; a circumstance which presents very considerable difficulty to the Operator. He has made his incision; he feels the stone; the extremities of the forceps strike against it; but he cannot get the blades of the forceps to grasp the stone, nor can he insinuate them betwixt the contracted bladder and the surface of the stone. It is in such a case, that he will find it of advantage to have a pair of forceps, with the blades separate, and having a joint, like midwifery forceps. He can insinuate one of the blades betwixt the bladder and the stone; and giving this to an assistant to hold steady, he can introduce the other blade, and afterwards join them, and proceed to extract the stone. †

The separate Sketch attached to this Number represents the manner of using the lever, by passing it behind the calculus, and fixing it by the fore-finger.

The *Lever* ‡ is a very useful instrument, and may often supersede the employment of the forceps. When it is almost impossible, without improper violence, to seize the stone with the forceps, this instrument may be used, to displace the stone from its seat, deep in the bladder; and to bring it forward to the opening; and when it is there, instead of attempting to introduce the forceps, by which, in all probability, the stone

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* This is a circumstance which should not come unexpectedly on the Surgeon. The small quantity of urine that can at any time be retained, the continual dribbling of urine, and the sensations communicated by the sound, should have informed him of this condition of the bladder, before he undertook the operation. This, by the bye, is a state of things very unfit for the operation with the gorget.

† And the extraction ought to be made in the same gradual manner, and with the same motions, alternately from side to side, that are recommended in the delivery of the child's head with forceps.

‡ The *scoop* is a useless instrument, unless used as a bad sort of lever; bad, because it occupies too much room. Can it have entered into the head of a Surgeon that the sand and fragments of a broken stone are to be scraped together and scooped out from the bottom of the bladder? This part of the operation is to be done by injecting tepid water; and for this purpose, the injecting pipe should have the extremity

will be permitted to fall back into its recess; pass the finger, and fix the stone upon the lever, and so extract it. If the stone be large and rough, the surface will be entangled with the edge of the incision into the bladder, and an instrument must be passed to guard the urethra; a spatula will be sufficient; the blade of the forceps; or even the handle of a common spoon will do this.

When the stone is very large, it is to be brought down with the lever, and extracted, with the assistance of the fingers in the rectum.

The lever is also a Sound, by which we may make observations as to the seat of the stone, when it escapes us during the operation. By it also, we search to discover if there be a second stone. And here I may observe, that although at first it may not be possible to reach the whole surface of the bladder with the point of the finger, yet, by a little delay, the bladder contracts itself, and comes down in such a manner, that any part of the interior surface may be felt by the fore-finger.

In the contraction of the bladder, after the incision for the stone is made, there is a circumstance particularly deserving notice, and which could not be hitherto understood, from inattention to the structure and action of the muscles of the ureters. Some have described the case to which I allude, as a sacculated stone; others have called it, the hour-glass contraction of the bladder. The fact is this; by the presence of a stone, and the consequent frequent desire to make water, the muscular fibres of the bladder acquire a very considerable strength and prominence. But of these fleshy columns, the muscles of the ureters become the most remarkably enlarged. Accordingly it happens, that when the incision is made, and the urine escapes, these muscles contract upon the stone, and then the Surgeon feels a sort of orifice within the

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reverted, so that, when introduced to the fundus of the bladder, the force of the stream may be directed outward, instead of upwards to the fundus, where it gives pain, and where its force is spent without advantage.

bladder, beyond the edges of the incision into the bladder; and through this second orifice, he can touch the stone with the extremity of the fore-finger. He finds great difficulty in seizing the stone, when it is in this confined position, and it is very natural for him to suppose, that the stone is sacculated. *

There is, however, nothing preternatural in this occurrence; and as it is almost a necessary consequence of the presence of the stone, we should be prepared for it, and learn to pick out the calculus from its lurking place, with the extremity of the lever. †

When we introduce the finger or Sound, to assure ourselves that no portion of calculous matter remains in the bladder, we should examine, particularly, the depression which is sometimes formed betwixt the prostate gland and the muscles of the ureters, for there a stone may lurk. I have repeatedly seen the forceps passed over the stone, from the circumstance of this cell giving a lodgment to it; and if this should be the case, then is there much unnecessary fatigue endured by the patient, in searching for the stone.

DRESSING AND POSITION OF THE PATIENT.

Although this be no matter of demonstration, yet it is so essentially necessary to the safety of the patient, that I must make one remark. It is generally believed that no dressing, and no attention to the wound

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* See what is said above on Sounding.

† I could give examples of the distress and delay such a circumstance gives rise to. On one occasion, I had made my incision, and had got hold of the stone with the forceps, having previously felt it with my finger; the stone slipped from my grasp, after which I could not find it, until I discovered the muscles of the ureters making a crescentic-shaped bar in the middle of the bladder, behind which, the stone was screened and nearly enclosed.

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OF HÆMORRHAGE.

I HAVE not seen a patient suffer from Hæmorrhage, in consequence of this operation, since the time I was a pupil attending hospitals. But I have heard much of this, as a source of danger; and I must attribute failures from this cause to an improper mode of operating.

By placing the finger in the rectum, as a directory in the first part of the operation, and by carrying the incision behind the bulb of the urethra, without cutting that body, we avoid all the considerable branches, and are quite secure of not striking the trunk of the pudic artery. On the contrary, by the practice which is but too frequent, of cutting upon the staff, instead of being directed by the anatomy, and of cutting into the bulb of the urethra, and thence along the whole course of the canal, into the bladder, considerable vessels must be divided, viz. the artery of the bulb and the artery of the body of the penis; both of them, active arteries.

The bleeding from these arteries may be troublesome; I should hope not fatal. But when the main trunk of these branches is cut, there is then real danger. This artery is cut by mistaking the exact place of the inside of the tuberosity of the os ischii, *E*, Fig. 2. Plate XVIII.; by forgetting how much further towards the perinæum the inner edge of the bone really is, than is indicated by the utmost convexity of the tuberosity felt through the integuments. When this mistake is made, the Lithotomist carries his knife close upon the bone, and touches the pudic artery.

But it is by that barbarous instrument, the gorget, driven in along the staff, and therefore, of necessity, passing through the upper part of the arch of the pubes, that the main pudic artery is cut. I have seen a jet of arterial blood thrown along the groove of the gorget before the stream of urine came. There is another instrument, which deserves the worst epithets of all, the bistoure caché. This instrument cuts as

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4. Make your outward incision low and free, so that you are enabled *to look upwards* upon the prostate gland. This is the essential part; to make sure of it, place the ends of your four fingers in the wound.

5. Enter the knife into the groove of the staff, into the urethra, just anterior to the prostate gland; divide the base of the prostate gland fairly, and very little of the bladder.

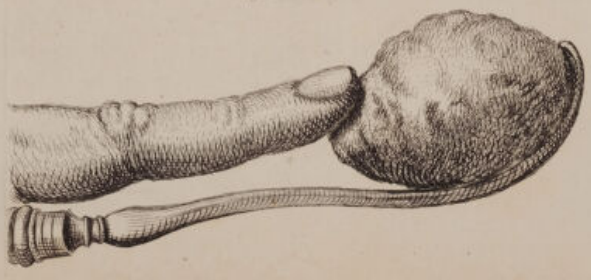
6. Introduce your fore finger, and with it dilate and enlarge the wound. You will feel a grasping of the parts around your finger; this must be so, but introduce the finger again and again along the staff, so as to touch the stone.

7. Introduce the forceps along the groove of the staff, make sure that they are in contact with the stone, and then withdraw the staff.

8. Grasp the stone, by fully opening the blades of the forceps, and slowly closing them. The operation hitherto requires some dexterity and knowledge of the parts. The extraction of the stone most requires patience, and a disregard to what spectators are thinking of you; especially fools with watches in their hands.

9. But of all the precepts, which have been neglected in this negligent age, the most unaccountable is this, that our Surgeons have given us no rules for securing the free evacuation of urine after the operation.

This must be the last hint I have to offer to my reader — and may these illustrations prove of advantage to him — may they assist him in preparing for the operations of Surgery, and enable him to anticipate the dangers, that they may be met with a ripened judgment, and so be converted into occasions of his triumph!



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