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TWO LECTURES

ON

LITHOTRITY

AND THE

BI-LATERAL OPERATION,

DELIVERED IN

LONDON, BIRMINGHAM, BATH, AND BRISTOL,

BY

EDWIN LEE, Esq. M.R.C.S. &c.

(From the London Medical Gazette.)

LONDON:

J. CHURCHILL, PRINCES STREET, SOHO.

1837.

CHARRIÈRE'S LITHOTRITE,

(For Explanation, see p. 16.)

FIG. 1.

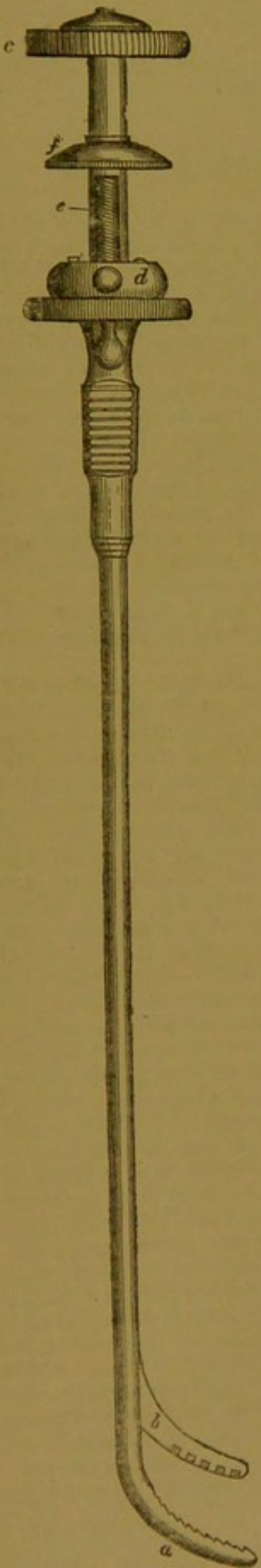
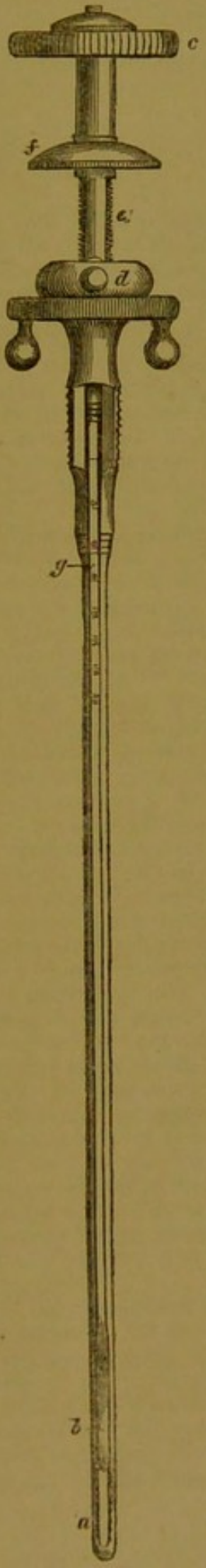


FIG. 2.



TWO LECTURES,

ON

LECTURE I.

TWO LECTURES,

&c.

LECTURE I.

It is my object, in giving these two demonstrations, to make more known and appreciated in England a means lately introduced into practice, by which persons afflicted with stone in the bladder, may, in many cases, be relieved, without the necessity of resorting to one of the most formidable operations in surgery; and as, unfortunately, the performance of lithotomy must still be frequently required, to describe a mode of operating which, though adopted by many continental surgeons, and almost exclusively preferred by the late Baron Dupuytren during the latter years of his life, has not, I believe, been practised as yet in this country, notwithstanding the advantages it appears to offer over other methods in particular cases.

Attempts to file or break down stones in the bladder have been repeatedly made from a very early period, but they were not attended with success till within the last few years, when, by the ingenuity of some French surgeons, especially MM. Leroy d'Etiolles and Civiale, who improved upon the imperfect instruments previously known, an instrument was invented, by means of which calculi in the bladder could be reduced to powder, or to fragments sufficiently small to pass away with the urine by the urethra. The successful application of this instrument caused the attention of the profession in France to be strongly directed to the subject; and the instrumental improvements that have been subsequently made have so far simplified the operation of lithotrity as to render it comparatively easy of performance by the generality of surgeons in the ordinary course of their practice. In England, however, lithotrity has scarcely as yet taken its place among the established operations; but, like lithotomy at an earlier period, its performance has been almost entirely restricted to special operators, on which account it is available only to a small number of individuals. This circumstance may be ascribed to the ideas which are generally entertained of the difficulties of the operation, of the long practice necessary to acquire a facility in performing it,—of mechanical beds, and other extraordinary apparatus being required. I shall endeavour to show that these opinions are in great measure erroneous, by demonstrating the facility with which a stone may be seized and crushed in the bladder, which may frequently be done by persons on their first attempt. The difficulty does not so much consist in finding and breaking the stone, as in getting rid of the smaller fragments, which requires a more practised hand and familiar acquaintance with the instruments. A common bed or operating table may be made to answer the purpose quite as well as beds of a peculiar construction, which are now dispensed with by most continental operators, being considered unnecessary, and sometimes attended with serious inconveniences, of which I shall speak presently.

It may be said, that although a stone may be readily seized in the dead bladder, it would be much more difficult in the living body; but as far as the mere manual operation is concerned, the reverse is more frequently the case, as the moderate contraction of the bladder during life often causes the stone to fall between the branches of the instrument,—whereas in trials upon the dead body the bladder must necessarily be opened to admit a stone, cannot always be kept properly distended with fluid, and in consequence of its flaccid state the mucous membrane is not unfrequently caught with the stone, or on closing the instrument. In some cases, however, considerable difficulty is experienced in the living body, either from the stone being lodged in a fold of the bladder or behind the prostate gland, or from the bladder contracting so forcibly as to expel the fluid injected; but in most instances the stone is found on the first introduction of the instrument.

In the discussions which took place on the subject before the Académie de Médecine, a good deal of warmth was exhibited by the advocates and opponents of lithotrity: the former brought forward accounts of the numerous patients relieved, and exaggerated the difficulties and dangers of lithotomy; while the latter

adduced cases in which the most disastrous consequences had ensued upon the performance of lithotrity, of the deaths that had occurred in consequence of it, and of patients who had been obliged, on its failure, to undergo lithotomy. A good deal of interest in the matter was excited in the non-medical part of the community, who, from the successful cases having been noised abroad by some of the more zealous advocates of lithotrity, while the unsuccessful ones were frequently not alluded to, was induced to form an erroneous estimate of the operation, believing it to be attended with but little pain or inconvenience, and not likely to be followed by unpleasant consequences. Under very favourable circumstances this is sometimes the case; but in the great majority of instances the performance of lithotrity is attended with some, often with considerable pain, and frequently gives rise to serious consequences, which have sometimes a fatal termination.

When I attended lectures on lithotrity, about two years ago, the lecturer set out with the principle of its being applicable to all cases of stone which could be made the subject of operation. This is the fault of most professed lithotritists. They take it for granted that the operation is of universal application; and by performing it in cases to which it is but ill suited, bring it into discredit among the less prejudiced part of the profession. The same thing is constantly seen to happen with respect to many other new remedies, which, though perhaps good in themselves, from being overpraised at first, and not being found afterwards to produce all the beneficial effects announced by their proposers, frequently fall into unmerited neglect. It is now, however, generally admitted by unprejudiced persons conversant with the subject, that though lithotrity will supersede lithotomy in many cases, yet that in others lithotomy is more especially indicated.

It is not my intention to enter into the history of lithotrity, and the description of the various instruments which have been brought forward, most of which are now discarded from practice, as this would occupy several lectures, and would be of little practical utility. I shall therefore confine myself to an account of some of the instruments now in use, state their respective advantages and disadvantages, and inquire briefly into some of the cases to which lithotrity or lithotomy is most applicable.

Lithotritic instruments may be ranked under four heads: 1st, those which act by perforating the stone, and gradually reducing it to a mere shell, which is easily broken; 2dly, those which act entirely by pressure; 3dly, those which act entirely by percussion; and 4thly, those which combine pressure with percussion.

Instruments which act by perforation must necessarily be straight. It was for a long time thought by many persons that the introduction of straight instruments into the bladder, through the male urethra, was in most cases impracticable, or nearly so. This opinion is now proved to be erroneous. Straight sounds may be passed into the bladder with nearly the same facility as curved ones, except where the curvature of the urethra is greater than usual, or where there exists enlargement of the prostate gland. This is as one would be led to expect on considering the yielding nature of a canal formed entirely of soft parts. But the use of straight instruments is attended with some inconveniences, to which I shall presently advert; and in order to obviate these, a curved perforating instrument was invented by M. Pravaz, but was, I believe, never used on the living body.

The three-branched instrument of M. Civiale was the first one used in France, and is the only one of the kind now employed. It consists of an outer canula, made of silver, which serves as a sheath to a longer canula, made of steel, and split at one end into three branches, which open by their own elasticity, and are closed by pressing the outer canula upon them. Their extremities are turned inwards, forming blunt hooks, which, when the branches are closed, overlap one another, and thus occupy very little more space than the end of a full-sized bougie. At the opposite extremity, or handle, is a graduated scale, to show the diameter of the stone or fragment within the branches, and a gilt line, which serves to indicate the direction of the branches. The third portion of the instrument is the perforator—a steel rod, fitting so as to slide easily within the inner canula, and having an expanded head, which terminates by several sharp projections, intended to act upon the stone; at the other end is a brass ring, round which the string of a bow may be fixed when it is desired to perforate the stone rapidly; but very often the operator rotates the perforator with his right hand, while holding the instrument firmly with his left.

It was formerly thought requisite, before operating, to dilate the urethra by the introduction of bougies gradually increasing in size; but at present the diameter of lithotritic instruments seldom exceeds that of a large bougie, and the preliminary dilatation of the urethra is consequently dispensed with, except in some particular cases.

The patient should be placed in a

favourable position for allowing the stone to fall towards the fundus of the bladder, which may be effected by placing firm pillows under the pelvis, so as to raise it higher than the abdomen. The legs and thighs should be moderately flexed, the head and shoulders slightly raised, and tepid water injected into the bladder through a common catheter, in the quantity that may be judged sufficient, or until the patient feels a desire to make water. The instrument, well oiled, is then to be passed along the urethra, till its end touches the pubis, when, by slightly raising the hand, and pressing gently forwards, it will slip beneath the bone and enter the bladder. The object in making the end of the instrument strike against the pubis is, that this bone may serve as a guide, and prevent its deviating from the central line. The operator, standing between the patient's thighs, or on his right side, carries the point of the instrument in various directions till it touches the stone, which in most cases is felt without difficulty. The stone being felt, the point of the instrument should be kept upon it, and the outer canula drawn back by the operator's left hand, by which the branches will be expanded immediately over the stone, or anterior to it. Care should be taken that the gilt line at the handle be directed upwards, as being on the same line with the longest branch, it indicates that the two others are parallel with the floor of the bladder. The perforator should then be drawn back, and by depressing the branches to the lowest part of the bladder, or by carrying them a little forward, the stone will probably be taken up. If, instead of drawing back the outer canula, the operator should open the branches by pressing forward the inner one, they would be expanded beyond the stone, and would very likely strike the posterior part of the bladder. Attention must therefore be paid to holding the inner canula firmly with the right hand, while the outer one is drawn back with the left. When the stone is within the branches, the outer canula being pushed forward upon them causes them to embrace it firmly; but unless the perforator be also gradually advanced at the same time, its head would prevent the canula from being pressed forward. Care must be taken to do this by degrees; for if the perforator be too much advanced at once, before the stone is fixed, it might push it out of the grasp of the branches. These details, which, from the description, appear difficult to be followed, become extremely easy after a little practice. When the stone is secured, the outer canula must be fixed to the inner one by a screw near the handle, and the perforator being in contact with the stone, should be rotated till a perforation is made in it, and resistance is no longer felt. The position of the stone must then be altered, by somewhat relaxing the hold upon it and tapping the handle of the instrument; or, if this do not succeed, by allowing it to escape and taking it up afresh, in order to make a second perforation. The number of perforations made at one sitting must depend upon the condition of the patient, the length of time occupied, and other circumstances.

Should the attempt to seize the stone fail, which may depend upon its being pushed aside on the expansion of the branches, or upon its lying too close to the neck of the bladder, the instrument should be closed, and the stone felt for as at first: by raising the pelvis more, the difficulty is sometimes removed. It not unfrequently happens that the stone is taken up improperly—as by the extremities of the branches, or between two of them only. When this is the case, it will soon be pushed out on the perforator beginning to act, or an imperfect lateral perforation will be made instead of a central one.

In order to withdraw the instrument, the screw fixing the two canulæ together must first be loosened; the branches must be expanded, to allow the stone to fall out, and then closed by pushing forward the outer canula upon them; care being taken that this be not impeded by the head of the perforator.

After the first two or three sittings the urine is not unfrequently tinged with blood, which is of no great consequence; the powder caused by the perforations passes away readily, and the operation may be repeated after one, two, three, or more days, according to circumstances; the patient being kept quiet in the interval, upon a restricted diet, and enjoined to drink plentifully of mucilaginous drinks.

When, after successive perforations, a mere shell remains, it may be broken by forcibly closing the branches upon it: some stones, and fragments too small for perforation, may often be broken in like manner.

This instrument is not so frequently used at the present day. Even its inventor, who, during several years, used no other, now often uses instruments for breaking down, or crushing. In some cases—as of stone in women, in whom the urethra is short and straight, the perforating method may be more specially applicable; but for men, the straight form of the instrument is a great objection, as, where the urethra is much curved, or the prostate enlarged, its introduction would be attended with a good deal of difficulty;

and when introduced, by forcibly straightening the urethra, it must cause a considerable strain upon the neck of the bladder and membranous portion of the urethra. This last inconvenience is not, however, limited to this instrument, as the instruments for percussion, and percussion combined with pressure, have only a short curve at their extremity, which is entirely within the bladder, while all that part within the neck and the urethra is straight; hence the strain upon these parts is perhaps as great by the one method as by the others, and not unfrequently induces fever, alarming nervous symptoms, and high local irritation; in consequence of which the bladder sometimes becomes so contracted during the operation, as to expel the fluid and prevent the instrument from being opened.

Civiale's instrument has the disadvantage of not being applicable to large stones nor to hard ones: neither can a stone be so easily seized with it as with others, being frequently pushed on one side, or below, by the expansion of the branches. The operation is generally longer by perforation than by the other methods, and a greater number of sittings are required before the stone is reduced to fragments sufficiently small to pass out. The branches are slighter, and are consequently more liable to break or become bent, so as to prevent their closing; and their hooked extremities are more liable to catch the bladder than those of other instruments. The closing of the branches is sometimes prevented by fragments getting between them near the canula, or between the head of the perforator and the canula. Such, then, are the chief disadvantages of this method.

Among the advantages claimed for it, are, that it gives less pain, and the bladder is less likely to be bruised than when percussion is employed; that the stone is left, after the first sittings, of its rounded or oval shape, instead of being at once broken into several angular fragments, which are frequently a source of great irritation; and that a great part of its substance is got rid of by the perforations before it is broken.

Some of the inconveniences, however, which were apprehended from the breaking or crushing of stones, are not of such frequent occurrence in practice as might be supposed. No great degree of force is required to break down many calculi, and the number of fragments is not very often found to add to the irritation of the bladder: in fact, the mucous discharge indicative of a state of chronic irritation of this viscus is not unfrequently diminished in quantity after two or three sittings of lithotrity; and the degree of pain during the operation very often depends more upon the susceptibility of the individual than upon the method employed. It would appear also, notwithstanding the numerous instances of success which were brought forward by its supporters, that the proportion of unsuccessful cases, after the indiscriminate employment of the perforating method, is greater than after lithotrity. Thus the report of M. Double, laid before the Académie de Médecine, states, that out of forty-three patients operated upon by a surgeon who employed this method exclusively, ten died, six were not relieved, and only twenty-six were cured: the unsuccessful cases being upwards of one-third of the whole, and the deaths in the proportion of 1 to 4¼.

A variety of instruments have been proposed for breaking down stones in the bladder. Some years ago, Mr. Hodgson, of Birmingham, invented an instrument for this purpose. Mr. Weiss also constructed a somewhat similar instrument, which was employed by Sir B. Brodie, and from which Baron Heurteloup is said to have taken the idea of his percussor. Another, which has been more used of late years, was invented by M. Jacobson, a Danish physician. This is extremely simple in its construction, has the advantage of being of a curved form, somewhat like a common sound, and is composed of two branches fitting within a sheath, and united at the extremity. The branch corresponding to the concavity of a sound is fixed, while the other, or convex branch, is made to slide within the sheath. Its curved part consists of three or four portions joined together by hinges, which, when the instrument is closed, present no remarkable irregularity which would be likely to injure the parts. By pushing forward this branch, its jointed portions are opened out so as to form a kind of loop, large enough to hold a stone of moderate size. When the stone is within the loop, it is crushed by the operator applying pressure by means of a screw, which has its *point d'appui* against the sheath and fixed branch, to the convexity of which the joints of the moveable branch are gradually approximated, in proportion as the screw is tightened.

This instrument may be introduced into the bladder as easily as a common sound of the same size, and would not occasion so much strain upon the prostate and perineum as others. When opened within the bladder, the inferior part of the loop touches its lower part, the stone is easily seized, and may be broken, even when of considerable hardness. Where, however, great force is employed, one of the joints might give way; but such an accident would not be attended with the same danger as the breaking of any other kind

of instrument in the bladder, as the broken portion would still be attached by its remaining hinge, and, becoming reversed, might be withdrawn with the rest of the instrument. As there are neither hooks nor projecting branches, the bladder is less likely to be caught than with other instruments; but one or two inconveniences may occur during its employment to counterbalance these advantages. As the joints occupy the whole of the convex portion, the posterior one extends to the neck of the bladder, and, when opened, may occasion pressure or stretching of this part; though, by a recent improvement, this inconvenience has been in great measure remedied: the portions being shorter, and the joints being carried nearer to the extremity, leave the part at the neck of the bladder of the same diameter as the rest of the instrument within the urethra. The principal inconvenience occasionally attending the use of this instrument, which has caused it to be laid aside by some operators, is, that after the stone is crushed, some of its fragments, forming a powder, or a sort of mortar, cannot be dislodged from between the branches, which consequently can only be imperfectly closed, and are withdrawn with difficulty, forcibly stretching or lacerating the parts. The liability to this accident must depend, in some measure, upon the nature of the stone. It has been proposed to pass a wire through a groove between the branches, in order to clear them of the fragments; but I am not aware that this has been done during an operation. If the occurrence of this accident could be prevented, the chief objections to Jacobson's instrument would be removed, and there is little doubt but that it would be more generally used, though it is not well calculated for taking up small fragments.

I now come to speak of the method of percussion. The originator of this method is Baron Heurteloup, whose instrument for breaking the stone resembles in outline those which most operators at present employ. The original percussor is of large size, and required the previous dilatation of the urethra. It has rather a clumsy appearance, and when closed is not unlike a very large metallic sound; but its curve is more short and abrupt. It consists of two branches, the one sliding within the other somewhat in the manner of a shoemaker's measure for taking the length of the foot; but the separation of the extremities of the branches is limited to an extent of about two and a half or three inches. The teeth, to facilitate the holding and breaking of the stone, are very large, and are on the same line on each branch, from which it results that the intervening part between them is much weaker than the rest, and would not be unlikely to break when the stone is very hard.

In the improved instruments, which combine pressure with percussion, the teeth are small, and so arranged that the extremities of the branches are of the same degree of strength throughout, and the force is consequently transmitted more to the commencement of the curve and straight part of the instrument, instead of being almost entirely concentrated upon the extremities. The Baron, however, now frequently uses a percussor without teeth, by which fragments can be taken up with less likelihood of catching the mucous membrane of the bladder.

A part of the apparatus considered indispensible by Heurteloup is the rectangular bed, forming an inclined plane, by which the pelvis may be raised, and the fundus of the bladder depressed, in order that the stone may fall towards this part. Another purpose of the bed is to hold the percussor firmly, after the stone is seized, to prevent the bladder being injured by the shock of the blows. This is effected by an iron appendage fixed to the end of the bed, the branches of which being approximated by a screw, hold the handle of the percussor as in a vice. The rectangular bed is, however, not frequently used by most operators, as its disadvantages have been found to more than counterbalance its supposed advantages. It renders the operation more complicated; and, except in cities, or in large public institutions, could not readily be procured. On this account alone, were it generally considered to be requisite, it must have the effect of restricting the method of percussion to particular localities. It is also of formidable appearance, which would in many cases create alarm in the patient's mind, and depress his spirits; and as, when the percussor is fixed to the bed, it constitutes part of the immoveable apparatus, the patient is, as it were, hooked on by his bladder, which might be seriously injured by the slightest movement,—an accident which has happened in some instances. Again, it not unfrequently happens that the fluid is expelled during the operation by the contraction of the bladder, by which its parietes are brought into contact with the instrument, which, being fixed to the bed, would not of course yield, and might seriously injure the bladder, especially should the percussion be persisted in under similar circumstances.

Most operators, therefore, prefer a common bed, sofa, or table, raising the pelvis by firm pillows placed beneath it; and

having seized the stone, either hold the instrument firmly with their left hand, or, if hard blows be required, cause it to be held by an assistant, with a handle constructed for the purpose, which would suffice to prevent the shocks being communicated to the bladder, without offering too great resistance, on the contraction of this viscus, or on the movements of the patient. A few sharp blows are then to be struck on the extremity of the instrument, with the hammer held in the right hand, until the stone is felt to give way, and the instrument to close. When the stone is broken, the handle is to be removed; or if the mechanical bed be used, the instrument is to be unfixed from its iron hold, and the fragments taken up, to be again broken in a similar manner.

Such is an outline of the method by percussion. The combination, however, of pressure with percussion, in the same instrument, has great advantages. These instruments are not unlike Heurteloup's percussor; but though sufficiently strong to prevent the danger of their breaking, they are yet not larger than ordinary-sized bougies, and may be passed into the bladder without preparatory dilatation of the urethra. They are likewise composed of two branches, the concave branch sliding freely within the convex or inferior one, from which it may be completely withdrawn. The instrument thus serves for percussion, while, by the addition of a screw at the handle (acting by means of a fly in Weiss's, and by turning a button in Charrière's instruments), it is converted into an instrument for crushing of considerable power, which, however, is regulated in Charrière's lithotrite by the handle being of a rounded form, so as to slip within the grasp of the hand where great force is required, and thus render the breaking of a properly constructed instrument, even by a powerful person, next to impossible; whereas, by a handle which would give a firmer hold, or by the addition of a fly, an undue degree of force might be employed by the operator, who, acting with so long a lever, cannot well estimate its power. Weiss's instrument, though not larger, is differently constructed, and stronger than that of Charrière or Segalas; and by it the hardest stones met with in the bladder may be broken without danger of its breaking, or of the concave branch being forced out of the convex one. The teeth are small in these instruments, and are not separated from each other: the extremities of the branches are, therefore, as strong at one point as at another. An important improvement has been recently made by Mr. Weiss, consisting in an opening being left in the extremity of the convex branch, which, without weakening the instrument, admits of the fragments being pressed through, instead of clogging the branches, preventing their closure, and causing laceration of the urethra, or impeding the withdrawing of the instrument, as not unfrequently occurs on the employment of instruments in which this aperture does not exist.

Percussion and pressure may therefore be employed by means of these instruments, either separately or alternated in succession. When the stone can be crushed without difficulty, this method is preferable, as it is attended with less risk of injuring the bladder; it is not so formidable an operation, and it breaks some stones by crumbling them down to a coarse powder, or to small fragments, instead of at once dividing them into two or three large fragments, as frequently happens by percussion, which should be especially avoided if possible, in cases where the bladder is much contracted, or where the fluid injected is forced out. When the stone is brittle, or harder at some points than others, the union of percussion with pressure very much facilitates its division, and when once broken, its fragments may generally be reduced to smaller portions by pressure; for which purpose it is sometimes not even necessary to turn the screw, pushing the ends of the branches against each other with the hand being sufficient.

An accident that may happen with the percussor is obviated by the addition of the screw. The moveable branch, on being struck against some stones, sinks into their substance, and occasionally becomes so firmly fixed as not to be disengaged without considerable force; but by means of the screw the branches may always be separated, and the stone allowed to fall out.

There is in general no difficulty in seizing the stone, which should first be felt with the convex surface, as in common sounding. By depressing the curve towards the floor of the bladder, the stone is pushed a little on one side, and on the inner branch being drawn back it tends to revert to the median line, and will probably fall within the grasp of the instrument; but should this not be the case, it may generally be felt on one side, and may be taken up by rotating the beak of the instrument in that direction. In those cases where the stone is lodged on one side, or behind the prostate, and cannot be felt, it may sometimes be displaced by suddenly tilting up the pelvis. When in the latter situation, the operator will frequently find it by turning the instrument round so as to present its concavity towards the middle of the prostate, and its convexity towards the pubis; by then open-

ing it, the prostate is drawn forwards, and the stone may be taken up by the extremity of the branches. Fragments lodged in this part may often be taken up in this way. When between the branches, the stone must be held firmly by the thumb of the operator's left hand, pressing on the expanded portion of the handle, if percussion is to be employed, or by turning the button (in Charrière's instrument), when pressure is used. The screw should then be tightened, and if much resistance be experienced, the button should be turned with the knobs transversely, and a few sharp blows struck on the end of the moveable branch with the hammer, the operator holding the instrument firmly in his left hand, or causing it to be held by an assistant, with the wooden handle. When the stone is felt to yield, the knobs on the button should be again turned to the perpendicular direction, and the pressure renewed by tightening the screw till the stone is completely broken, or till the resistance is so great as to require a second time the employment of percussion. In most cases, however, percussion may be dispensed with, and in many a very slight degree of pressure is required.

The instruments combining percussion with pressure offer the greatest number of advantages with the least disadvantages; and are now most generally used. They are simple in construction; need not be larger than a common sound; while at the same time, if properly made, they are not liable to break by the hardest urinary calculi. They may be easily introduced into the bladder, and are applicable to stones of large size, provided the bladder be sufficiently capacious.

The screw forceps and scoop catheter invented by Mr. Weiss will enable the operator to remove the fragments, especially when lodged behind the prostate, with less risk of pinching the mucous membrane than when the lithotrite is employed for this purpose.

LECTURE II.

Without entering into any detailed inquiry respecting the comparative merits and demerits of lithotrity and lithotomy, I shall briefly notice some of the inconveniences which sometimes attend these operations, and which may occasion their failure; and shall mention some of the cases to which the one or the other is considered to be more specially applicable. Those persons who think that lithotrity ought to supersede lithotomy on all occasions lay great stress upon the danger to life attendant upon the latter operation. It is true that lithotomy, abstractedly considered, is a more dangerous operation than lithotrity; but when performed under favourable circumstances it is successful in the great majority of cases, the patient being radically relieved of his disease in the space of a few minutes; whereas lithotrity, though by no means exempt from danger, is often a very painful operation, which usually requires to be repeated several times before the stone is removed, and renders the patient liable to consequences which do not ensue after lithotomy: thus the breaking or displacing of the instruments within the bladder, though less likely to happen now than formerly, with care on the part of the operator, is still an accident that has occurred several times, and the risk of its recurrence will always constitute one of the objections to lithotrity. It cannot always be known for certain that after lithotrity all the fragments have come away. Several cases have occurred where fragments have been retained, though they could not be detected on sounding, and have formed nuclei, round which a fresh deposit of calcareous matter rapidly took place. This, then, is another objection to lithotrity. A puriform discharge from the urethra, and swelling of the testicles, especially if they are not properly supported, are not uncommon. These, however, are but minor inconveniences, and generally disappear after a few days' rest. Some degree of fever mostly ensues upon lithotrity, as upon other operations; this is generally slight, but sometimes runs high, assumes an intermitting character, and is accompanied with symptoms of general nervous irritation of an alarming nature. Other accidents more peculiar to lithotrity, and induced by the strain upon the parts, are, neuralgia of the neck of the bladder, inflammation and abscess about the prostate or of the cellular texture of the perineum, which may give rise to retention of urine, and occasion the patient's death. Retention of urine may also be induced by the stoppage of fragments in the prostatic or membranous portions of the urethra, which is an accident of very frequent occurrence, and often gives rise to

a high degree of irritation. The fragments are often only arrested for a short time, being expelled on the patient's making water in a full stream; but should this not be the case, they should, if possible, be pushed back into the bladder with a full-sized sound. This, however, cannot always be done, and two or three instruments have been invented for the purpose of breaking them down; though from the difficulty of their application the attempts would be very likely to fail in inexperienced hands, in which case it would be necessary to cut down upon, and extract the foreign body through, the perineum. This operation has, I believe, only been required on two or three occasions, as the fragment can in most cases be pushed back, the portion of the urethra between it and the bladder being generally dilated by the accumulation of urine. This accident, then, is one of the principal obstacles to the success of lithotrity in some cases; but the consequence most to be apprehended is the occurrence of cystitis, which is said to be more frequent after percussion, from the bladder being injured either by the blows on the extremity of the instrument, or by the fragments being violently projected against its parietes at the moment the stone is broken. This last accident may also happen when pressure is employed, if the stone be very hard. The liability to cystitis must also depend in great measure upon the size and nature of the stone, the constitution of the patient, the capacity of the bladder, or upon the pre-existence of a state of chronic irritation; though this complaint is sometimes much relieved after two or three sittings of lithotrity.

From whatever cause cystitis arise, it is a most unfortunate complication, frequently terminating in the death of the patient, either in consequence of the direct effects of the inflammation, or by inducing disease in the kidneys or other parts. It is not, however, of very frequent occurrence after lithotrity; and where, from peculiar circumstances, a predisposition to it exists, the stone should be broken by pressure if possible, in preference to percussion. The sittings should be short, and repeated only when all irritation has subsided, the patient being kept in the intervals at rest, upon a bland diet, and recommended to drink freely of mucilaginous drinks.

Another inconvenience to which lithotrity may give rise is the pinching or laceration of the mucous membrane of the bladder by the instruments, during the operation. This is, of course, an unpleasant accident, though it seldom happens in the living body, where the bladder can be kept properly distended with fluid; nor would it probably be attended with the evil consequences which some persons apprehend. It is more likely to happen with instruments for perforation than with those for percussion and crushing, as the hooks by which the branches terminate would be more apt to catch the membrane than the teeth of the branches of other instruments; but on the dead bladder, in consequence of its flaccid state, this accident not unfrequently occurs; and even in the living body, where there is difficulty in taking up small fragments, and where the mucous membrane is thickened, or its surface irregular, it would be very liable to be caught. This, however, would be indicated by the increased pain, which would prevent the operator from persevering in the attempt.

Having thus glanced at some of the principal inconveniences attendant upon lithotrity, I must not omit to allude, on the other hand, to some of those which lithotomy entails. The operation is one of the most painful and dangerous in surgery; and the difficulty of performing it is sometimes very great. It is often counterindicated by diseased states of the urinary organs, or of other viscera; and when performed under these circumstances, it offers very small chances of success; while, on the other hand, lithotrity might be practised with great prospect of advantage. In the lateral operation the cutting instrument, especially the gorget, may not at first enter the bladder, or the incision at the neck of this viscus may not be sufficiently large to admit of the extraction of the stone without the employment of much force, and consequent bruising or laceration of the parts. On the other hand, if the incision be too large, it may give rise to urinary infiltration of the cellular texture—the rectum may be cut—hæmorrhage may take place to a dangerous extent, either from the division of arterial branches, or of the enlarged veins surrounding the neck of the bladder in old persons. Nervous symptoms of an alarming character, which so frequently supervene on serious operations, may endanger the patient's life, as may also fever, inflammation of the bladder, of the peritoneum, or of other viscera, should these unfortunate complications arise. These are the principal inconveniences and dangers to which lithotomy may give rise; though it is but right to add, they are not so likely to occur in young persons. From most of these consequences lithotrity, while presenting its peculiar disadvantages, is exempt.

The remarks that have been made respecting both operations refer more especially to the male sex, in whom operations for the stone are, for obvious reasons, so

much more common than in females. Lithotomy in women, though not attended with the same difficulties and dangers as in men, is so frequently productive of consequences which tend to embitter the remainder of life, that the invention of lithotrity, by which, from the more simple anatomical structure of the female parts, lithotomy will probably be altogether superseded in women, must on their account alone, and exclusive of the advantage it is calculated to confer on male patients, be considered as a circumstance of the highest importance.

Several of the objections that have been made to lithotrity, and especially to the method by perforation, will not, of course, apply to cases of stone in females, in whom the introduction and action of straight instruments are attended with no difficulty.

The size and composition of the stone, and, if there be more than one, the number of them, are important circumstances to be considered, in guiding the judgment of the surgeon as to the applicability of lithotrity or lithotomy to particular cases. The calculi most frequently met with in the bladder are composed of uric acid, or urate of ammonia, of phosphate of lime, of the ammoniaco-magnesian phosphate, and of oxalate of lime; but they are very often of a mixed composition, such as a nucleus of urate of ammonia, or of oxalate of lime, and a covering of the phosphates; or are composed of layers of phosphate and of urate of ammonia. The composition of stones may often be guessed by sounding and the examination of the urine, and is of great importance as regards lithotrity, in determining their size, density, or friability. If it were ascertained that a calculus was of the phosphatic variety, it would be known that no difficulty would be experienced in breaking it down; and lithotrity would be considered the most suitable method of removing it, should its employment not be counterindicated by other circumstances. On the other hand, should the calculus consist of oxalate of lime, which cannot sometimes be broken, or is broken with great difficulty, the fragments of which would be likely to injure the bladder, and would require the employment of much force to reduce them to portions sufficiently small to pass through the urethra, lithotomy would be preferred, if circumstances were favourable to its performance. The calculi, however, which are most frequently met with, are of various degrees of density between these two extremes. Many are of moderate hardness, and may be broken without difficulty by pressure. Some are harder at particular points than at others, and require the combination of percussion with pressure to break them. Others, though hard, are brittle, and cannot easily be broken by pressure without great force, but yield readily on percussion. Some stones, again, are much harder than others which have a similar composition, which may depend upon the proportion of the animal matter which binds the earthy parts together, upon the length of time the disease has existed, and upon other circumstances.

When, therefore, there is only one stone —when it is small, or of moderate size, and friable—when there exists no stricture or unusual curvature of the urethra—no enlargement of the prostate, or diseased state of the urinary organs—when the bladder is moderately capacious, and when the patient is not of a nervous and irritable disposition, the circumstances may be considered highly favourable for lithotrity; whereas, if the stone be of large size, or excessively hard—if there be several stones in the bladder—if the urethra be unusually narrow, strictured, or excessively curved—if there be enlargement of the prostate, a contracted or diseased state of the bladder, or if the patient be of a highly irritable disposition, the performance of lithotrity, if not altogether counterindicated, would be attended with more doubtful success. In those cases where, from loss of tone of the muscular coat, or complete paralysis of the bladder, the patient labours under chronic retention of urine, lithotrity would be performed under very unfavourable circumstances, as the fragments could neither be expelled, nor could they pass away through the catheter on the urine being drawn off. In such a case Weiss's scoop and catheter forceps would be of the greatest service, in enabling the operator to get rid of the fragments.

Chronic inflammation of the bladder, or catarrhus vesicæ, as it is termed, though an unfavourable complication, and often aggravated, is sometimes diminished after two or three sittings of lithotrity, and even after the extraction of the foreign body by lithotomy. In this case lithotrity by pressure would be the most preferable operation, if not counter-indicated by other circumstances.

In children, and young persons of the male sex below puberty, lithotomy is generally preferable to lithotrity, which in these cases presents great inconveniences in consequence of the narrowness of the urethra. On this account the instruments are required to be of much slighter construction, and must necessarily be much weaker, while there would not be a proportionate friability of the calculus, which in young subjects is mostly of the uric acid or oxalate of lime varieties: hence the greater liability of fracture or displace-

ment of the branches. On this account, also, more sittings would probably be required than in adults, as the fragments would require to be broken smaller to enable them to pass through the urethra. Another objection to lithotrity in young subjects is the greater susceptibility of their nervous system, on which account the repeated introduction and manœuvring of instruments within the bladder would in many cases be likely to produce serious consequences. The diminished capacity of the bladder would also be another impediment to the success of lithotrity in these cases. These drawbacks would induce most surgeons to prefer lithotomy, which is not attended with the same difficulties and dangers in young persons as in advanced life, but is frequently performed in two or three minutes, is successful in the great majority of cases, and does not expose the patients to a relapse, which may occur after lithotrity, from the retention of a portion of the stone.

With respect to the absence from pain during lithotrity, and the quickness with which a stone may be removed,—though it is true that where the stone is small and the other circumstances favourable, the patient may occasionally be relieved of his disease in one or two sittings with but little pain and without much interruption to his ordinary avocations,—yet these cases are very rare in comparison with those which are attended with a greater degree of pain, which require several sittings, obliging the patient to confine himself to his room on a regulated diet and mucilaginous drinks in the interval, and in which the operation is succeeded by one or more of the unpleasant consequences of which I have made mention.

One great advantage attending the invention of lithotrity is, that patients who, from a natural horror of lithotomy, were frequently induced to resort to palliatives till the stone had acquired a considerable size, or till the irritation resulting from its presence had brought on a diseased state of the urinary organs, will, as lithotrity becomes more general, apply for relief at an earlier period of the disease, when the operation can be performed under the most favourable circumstances.

In the preceding remarks I have not pretended to enter into a full investigation of the superior applicability of lithotrity or lithotomy in the various cases met with in practice, but have briefly alluded to some of the more prominent indications for both operations; and having endeavoured to demonstrate that the performance of lithotrity is not attended with the great difficulties which many suppose, I conclude with the hope, that as this operation is eminently calculated to supersede lithotomy in many cases, the generality of English surgeons will not be behind their neighbours in adopting a means of relief which must be regarded as one of the most important discoveries in modern surgery.

OF THE BI-LATERAL OPERATION

The recto-vesical and hypogastric operations have each been advocated by surgeons of eminence as the best method of extracting large stones from the bladder. The recto-vesical operation was more especially recommended by Vacca, in Italy, and by M. Sanson, in France; but the great liability of an incurable fistulous communication being established between the bladder and rectum, prevented its general adoption, and even obliged Vacca to abandon it in the latter years of his life; nor has it, I believe, been performed within the last few years by M. Sanson. The high operation has had more supporters both in this country and abroad, but the frequent occurrence of urinary infiltration in the pelvis, and of peritoneal inflammation, added to the impediments in the way of healing the wound in the bladder, gave rise to a fatal result in a large proportion of the patients on whom the operation was performed, and caused it to be restricted to cases in which the lateral operation was considered impracticable, or, from the size of the stone or other circumstances, likely to be attended with great difficulty.

The dangerous consequences resulting from an extensive incision or laceration of the cellular texture about the neck of the bladder, in cases where the perineum is deep, have been strongly insisted upon by several surgeons of extensive practical experience, as being among the principal causes of failure of the lateral operation in advanced life. Chaussier first conceived the idea of avoiding these consequences by incising both sides of the neck of the bladder, so as to admit the extraction of calculi without the incision extending beyond the circumference of the prostate, or at all events without extensive lesion of the surrounding cellular texture. Beclard also acted upon this idea, and performed the bi-lateral operation several times. Dupuytren, during the latter years of his life, preferred it almost exclusively; and in consequence of the successful results which he was stated to have obtained, it

was adopted by many French surgeons. Of seventy patients operated by this method at various periods at life, six only were said to have died; though in a table annexed to Dupuytren's work on the subject by the editors, it appears that of ninety-nine patients who were subjected to the bi-lateral operation, nineteen died, or nearly one in five, being a greater average mortality than that resulting from the lateral operation performed on persons of various ages, which, according to some extensive statistical data, amounted to one in six and a half. Of these ninety-nine patients fifty were under twenty years of age, consequently the perineum was not deep, and in many of them the stone was in all probability of small size; so that the lateral operation would appear to be more specially indicated in these cases, as the chief inconveniences which the bilateral operation is intended to prevent, viz. laceration or bruising of the parts in the extraction of large calculi, infiltration of urine in the cellular texture, most frequently occur in advanced life, where there is considerable depth of perineum. These results do not, therefore, detract from the value of the operation: they merely show that instead of employing it exclusively, discrimination is required in selecting the cases to which it is most applicable. This method is, in fact, an improvement on the operation of Celsus, or by the apparatus minor, as it was termed; and was regarded in this light by Dupuytren himself. In Celsus's operation one or two fingers were introduced into the rectum, to fix the stone at the neck of the bladder, which, with the perineum, was cut in a transverse direction upon the stone, without any instrument being introduced into the urethra to serve as a guide. The dangers likely to result from this rude operation are too obvious to require that I should stop to enumerate them; I shall therefore proceed to describe the mode of performing the operation according to M. Dupuytren.

The staff should be of large size, so as to fill the urethra; more curved than usual, and the groove very wide and deep. The instrument for incising the neck of the bladder is a two-bladed lithotome, not unlike the bistouri caché of Frère Come; but on pressing the spring at the handle, instead of a blade starting out from the convex surface, as in Come's instrument, two blades start out from the sides, so as to describe the segment of a circle, increasing in proportion as the blades are pressed out. By means of a graduated scale and a small screw near the handle, the extent of the incision may be regulated according to the judgment of the operator, from ten to twenty-one lines.

The patient being placed in the same position as for the lateral operation, the staff should be held in a perpendicular direction, with its groove opposite to the centre of the perineum, by an assistant, who presses slightly upon the handle, so as to cause the curved portion to project, and enable the operator to feel it readily. An incision of a semicircular form is then made through the skin, commencing on the right side, midway between the tuberosity of the ischium and the anus, passing at the distance of six or eight lines anterior to this aperture, and terminating on the left side, at the point corresponding to that at which it began. The superficial perineal fascia, the cellular texture, and the anterior fibres of the sphincter externus ani, are divided in the same direction, the operator depressing the lower part of the wound with his left fore-finger, so as to prevent the rectum from being cut. The groove of the staff is then felt, and a longitudinal division, of a few lines extent, made into it, through the membranous portion of the urethra. The point of the lithotome is then introduced into the groove, the concavity of the instrument being directed upwards, and the operator taking the handle of the staff in his left hand, depresses it, while, with the right, he slides the lithotome along its groove into the bladder. The staff is then withdrawn, and the lithotome is turned round, so that its concavity, which was previously directed towards the pubis, is now directed downwards, or towards the rectum. The spring being pressed, the blades are protruded to the extent that has been previously regulated, and the instrument is withdrawn, not in the horizontal direction, but by gradually depressing the handle, so that the incision of the neck of the bladder and prostate may correspond with that of the skin. The operator's left fore-finger is then passed into the bladder, to serve as a guide to the forceps, or the blunt gorget may be used for this purpose, and the stone is extracted as after the lateral operation. I will now perform the operation on the dead body, in the manner I have described.

The chief advantages of this operation may be stated in a few words. It is better adapted for the extraction of large calculi, especially in cases of deep perineum, than is the lateral operation; a way being made for the passage of the stone at the widest part of the inferior aperture of the pelvis. As the incision at the neck of the bladder would not, in most cases, extend beyond the circumference of the prostate, the risk of infiltration of urine in the cellular texture is much lessened. It exposes less than the lateral operation to the danger of

wounding important arteries, though in the bi-lateral, as in the lateral operation, considerable bleeding may ensue from the division of the veins about the neck of the bladder. On the other hand, there is perhaps more likelihood than in the other operation of wounding the rectum, which is sometimes enlarged, in old people, so as almost to enclose the sides of the prostate gland. This accident, however, but seldom happens, and the probability of its occurrence may be diminished by the exhibition of an enema previous to the operation, and by the operator depressing the rectum with the fore-finger of his left hand in the wound while making the incisions: but even should it be cut, the wound would probably heal, in most instances, without trouble.

In those cases where the stone is so large as not to be extracted without the employment of an undue degree of force, it would be preferable, instead of enlarging the incision to a dangerous extent, to break it by means of the screw, or by percussion, the lithotrite being introduced into the bladder through the wound; thus combining lithotrity with lithotomy. I do not know whether this has as yet been done, though I see no reason why the two methods should not be combined in similar cases.

Before concluding, I am desirous to allude to the recent investigations of M. Chevallier, an eminent chemist in Paris, from which we may reasonably entertain the hope that the frequency of operations for the stone will hereafter be much diminished, and that the action of lithontriptic remedies is not so chimerical as has been imagined. M. Chevallier's experiments tend to demonstrate that calculi of all kinds are more or less soluble, according to their composition, in certain fluids; especially some alkaline mineral waters, as those of Vichy; and he adduces numerous cases to prove that persons with stone have been cured by these waters, and by compositions of an analogous nature. As his memoir is published, I think it sufficient merely to allude to the subject; and it appears to me, from the results already obtained, that by more minutely investigating the chemical composition of urinary calculi, and the solvents which act upon them, than has been hitherto done, the most important and beneficial results may be anticipated.

CHARRIÈRE'S LITHOTRITE — *Explanation of the Woodcuts,*

Page 3.

FIG. 1.—Side view.

a, convex fixed branch; *b*, concave moveable branch; *c*, round handle of screw; *d*, button with knobs turned transversely, so as to allow the concave branch to slide within the convex one. *e*, screw; *f*, expanded portion of the handle.

FIG. 2.—Front view:

Showing the opening in the extremity of the convex branch, and the knobs of the button turned perpendicularly, for the employment of the screw.

THE END.

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