Stone in the bladder : lithotomy in the infant and the child ; crushing the stone in the adult and old, with the application of lithotomy to each, in certain cases, practically considered / by Richard G. Butcher.

BUTCHER

ON

STONE IN THE BLADDER.

PRACTICAL LITHOTOMY AND LITHOTRITY.

STONE IN THE BLADDER:

LITHOTOMY IN THE INFANT AND THE CHILD;

CRUSHING THE STONE IN THE ADULT AND OLD,

WITH THE

APPLICATION OF LITHOTOMY TO EACH, IN CERTAIN CASES, PRACTICALLY CONSIDERED.

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I. LITHOTOMY IN THE INFANT AND THE CHILD.

II. CRUSHING THE STONE IN THE ADULT AND OLD, WITH THE APPLICATION OF LITHOTOMY TO EACH IN CERTAIN CASES.

In my work on "Operative Surgery," published in 1865, I have considered at some length the operation of lithotomy in the infant and the child, and illustrated that subject by several cases, and a beautifully coloured plate, exhibiting numerous calculi from the size of a few grains, up to that of several drachms, safely extracted by the lateral method of operation. Adhering strictly to the rules which I then laid down, within the past five years I have frequently operated at this tender age, and with a like success. Though the object of the present paper is chiefly to convey my views with regard to crushing the stone in the adult and old, and the suitableness of sometimes adopting lithotomy in preference, I am inclined, before proceeding, again to draw the attention of my readers to the lateral operation of lithotomy in the infant and the child—having cut a child some days since in Sir P. Dun's Hospital, it will do admirably for illustration, more particularly as I consider

this descriptive demonstration the type of practical teaching. Christopher Buller, aged seven years and three months, was admitted, under my care, into Sir P. Dun's Hospital, October 16, 1869, with stone in the bladder—this I ascertained by sounding him a few days before. The sufferings of the patient for nearly a year before were sometimes excessive, particularly during the latter months, and this compelled the woman who had charge of the child at last to bring him to hospital. His history and complaints at once, in my mind, pointed to stone in the bladder. He could not for a long time before retain his water at night, and was always blamed for wetting the bed; this symptom had been looked upon as the consequence of carelessness; by day he was often seized with the most urgent desire to make water, which frequently would flow away before his trousers could be opened—the pain and distress after making it occasionally doubled the child up, so that he would crouch upon the ground, pressing the lower part of his belly; at other times, when the stream was flowing it would suddenly cease, and not continue again until change of position; latterly the child was for ever fiddling with his penis and dragging the prepuce; during the last month, occasionally on the cessation of the stream, a few drops of blood would pass away, and sometimes with the straining of the last drops of water prolapsus of the rectum would occur—thus the chain of rational symptoms was complete, and the diagnosis next practically confirmed by the introduction of the sound.

The operation was performed after the following manner, October 20, 1869, at 10 o'clock a.m. Early in the morning, a little warm water was thrown into the rectum, so as to empty the bowel, and the urine was retained in the bladder for two hours previous to the above time. The child was placed upon the operating table, and brought under the influence of chloroform. I then passed the staff and struck the stone. Compression was made upon the penis to prevent the water flowing off. Each hand and ankle were then bound together, and the patient brought down to the end of the operating table, upon which the buttocks steadily rested, immediately sustained by a blanket, covered with a sheet neatly turned in, on a line with the edge of the table, and secured by a couple of laps of bandage to prevent slipping. In the act of tying up the child, the rectum discharged its contents, and slightly prolapsed; the part was cleaned, and the gut restored. I may here

add, it is a custom of mine immediately before applying the knife, both in the old and young, to introduce my finger into the rectum, and thus solicit the evacuation of any fluids or solids which may be there, and so secure the safety of the bowel. The staff was taken by an assistant standing on the left side of the patient, and held well up to the pubis; an assistant on either side separated the limbs, and held them wide apart, the sole of each foot resting firmly on the table, so as to insure the proper axis of the pelvis. Bringing myself to a convenient height by going down upon the right knee, feeling diligently with the index finger of the left hand, the staff could be discovered traversing the membraneous portion of the urethra, I then laid the knife on, about three-quarters of an inch in front of the rectum, probably a line or two less, and immediately to the left of the raphe, carrying it with a determined weight backwards and outwards for fully an inch and a half, midway between the anus and ischium, but nearer to the former, thus dividing skin, superficial facia, and much fat. Again the knife was carried to the front of the wound, and struck at once into the groove of the staff, at the anterior part of the membraneous portion of the urethra, the instrument was moved gently from side to side, to make certain it was fairly lodged, then slightly lateralized, and passed backwards and upwards, dividing the membraneous portion of the urethra. The point of the knife was then, as it were, brought away from the groove of the staff, its blade holding the same amount of lateralization, and made to cut its way from this deep position backwards and outwards, accurately in the line and axis of the first incision to its posterior extremity. The sharp-pointed knife was then laid aside, and the narrow blunt-pointed instrument substituted, to complete the careful and accurate section of the prostatic portion of the urethra. The staff being rigidly maintained in the same position, there was no difficulty in inserting the blunt-pointed knife in its groove; a double movement and concentration of action was now brought into requisition. The blunt-pointed knife was held up well to the groove in the staff, while the index finger of my left hand lay in the acute angle between its back and the groove in the staff, and thus the knife was pushed backwards and upwards, dividing the rudimentary prostate and neck of the bladder, the finger and knife went into the bladder together—some of the water gushed out, but some was retained by my finger blocking the opening—the staff was withdrawn, and

the knife laid aside. I next introduced the gorget, its concave surface resting partly on the side and back of my finger nearly to the tip, then with half a turn it glided into the bladder, when my finger was withdrawn, and the forceps, with its closed blades, and in its narrowed axis, passed along it, the hand of the operator being in the prone position; the gorget was then laid aside, and I raised myself from the kneeling position; the instrument was rotated by half a turn, the hand being made supine. The stone, though felt, could not be readily seized, owing to the size of the instrument; a smaller one was passed in after a similar manner to the first, and on opening its blades and striking it gently the stone fell into the chops of the forceps, and was readily extracted by an up and down movement of the instrument as it rested upon the index finger of my left hand acting as a fulcrum beneath. By these combined and gentle movements the stone was extracted with the least possible force, and with comparatively little violence to the wounded parts. The stone was composed of lithic acid, and about the size of a small walnut. Finally, the finger was passed into the bladder and swept all round it, to make certain that no second stone was there. The patient was next unbound, and the *canule a chemise*, well oiled, introduced into the bladder, and retained by suitable tapes. He was then laid on his back in bed, a folded blanket under him, his knees tied together, with a small soft pad between, and the thighs slightly flexed, by a pillow placed beneath the hams; thus the wound was protected from pressure, and a ready escape afforded for the water from the bladder. Quickly the child awakened from the chloroform, and was quite unconscious of what had been done.

3 p.m.—No pain; urine passing freely through the *canule.*

21st.—The child slept the entire night free from pain, water passing abundantly through the *canule.* 3 p.m.—Urine flowing freely by the instrument—cut the retaining tapes, so as to leave it at liberty.

22nd, 9 a.m.—Urine flowing copiously through the wound, the canule having slipped out of its own accord.

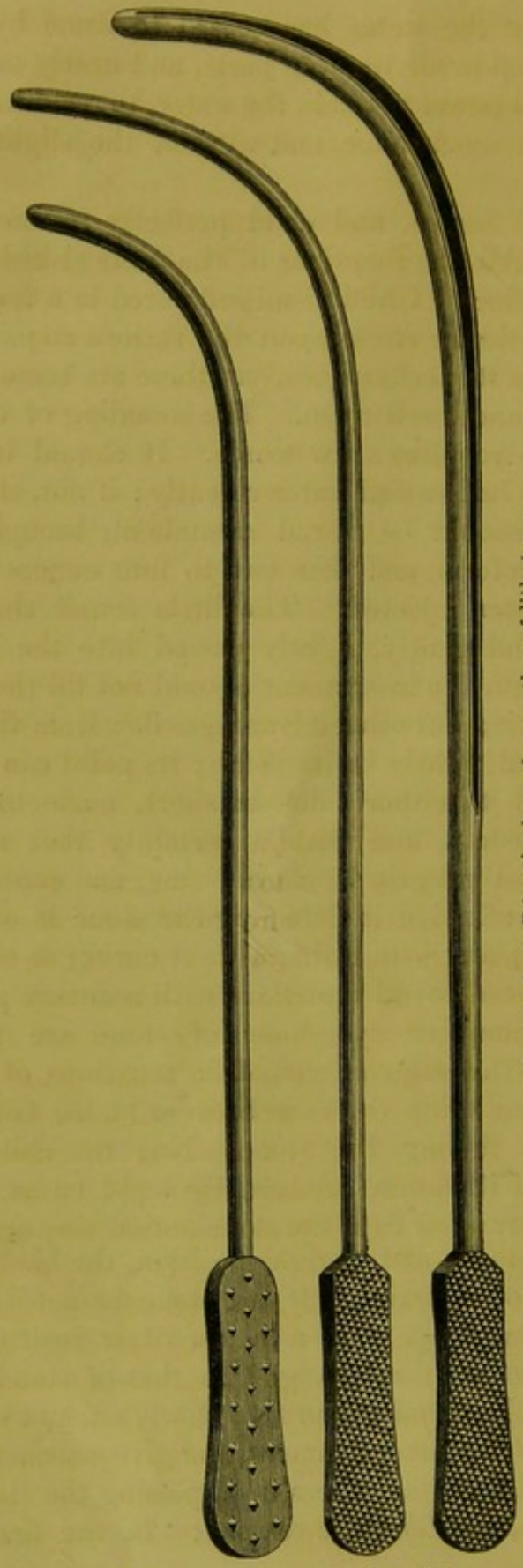
29th.—Not an unpleasant symptom since the operation, and now for the first time some urine by the penis (ninth day after the operation). Wound rapidly healing.

Nov. 5th.—Nearly the entire of the urine passing by the penis, only a few drops by the wound.

9th.—This day the water has ceased to come by the wound, which is healed up in all its deep parts, and nearly on the surface. The child has full power to retain the water, to restrain it in its flow, or to pass it with much force, and without the slightest degree of pain of any kind.

18th.—Wound healed, and child perfectly restored to health; no more pain. All the functions of the parts risked in the operation perfectly distinct. Child dismissed cured in a few days after.

I have laid particular stress upon the various steps of the operation, as I advocate its performance, yet there are some points which I wish to repeat and dwell upon. The sounding of the patient in the first instance requires a few words. It should be ascertained whether the child had passed water recently; if not, all is well; but if so, the child should be placed recumbent, brought under the influence of chloroform, and then two to four ounces (according to age) of tepid water injected. The little sound should be then warmed, oiled, and gently, lightly passed into the bladder. To facilitate this result, the instrument should not fill the urethra, but glide easily along it; but other advantages flow from the instrument not being retained tightly in its route; its point can be elevated, depressed, moved to either side—in short, made to explore the bladder with freedom, and with a certainty that never can be obtained if the urethral grip be close, biting, and constricted. The instrument most effective in detecting the stone is one somewhat short in the sweep, and with rather a short curve; so constructed, it can readily be moved in all directions with accuracy and precision. When the presumptive symptoms of stone are present, and strongly marked, the surgeon should be tenacious of his opinion, and not lightly put aside the case because he has failed on one or two occasions in finding the stone. No; the child should be placed in bed, all irritation subdued by tepid baths and suitable medicine; and after a few days the examination may again be made, both in the recumbent and upright position, the bladder being, of course, in a state of repletion. If the stone be not detected while the patient is lying down, then a hollow silver instrument should be passed, and the position changed to that of standing up; the urine should then be permitted to flow slowly off, and very probably the calculus will strike the instrument, and give satisfactory evidence of its presence. I have laid stress upon passing the staff before the patient is tied up, and for these reasons:—In the first place, it is



Butcher's staff for the lateral operation of lithotomy.

Size—Five-sixth scale for child.

easier to do so, and safer, when the limbs are relaxed; and secondly, any unexpected difficulty may unsteady the hand of the unpractised operator. The educated touch of the trained surgeon may reject this advice, but I would caution the young surgeon not to do so, for too much force may be communicated to the staff, and if so, it may very readily be passed through the upper wall of the urethra in front of the bladder, or, again, very readily behind that viscus, between it and the rectum. The tissues comprising the urethra at this tender age are so feeble in their cohesion that they will readily yield to violence; and, again, the angle to the bladder, at this period of life, is so acute that greater facility is afforded to the instrument in going astray. It is well that a couple of ounces of water should be retained in the bladder previous to the staff being introduced; it facilitates the detection of the stone; and the stone should invariably be struck previous to cutting the patient—not only because the stone, if a very small one, might have escaped from the bladder, but because this evidence not only proclaims the presence of the stone, but also *that the guide to it is direct and certain, the instrument has not gone astray.* Now as to the form of the staff: It is essential that, beyond its curve, it should be of considerable length, otherwise, when fairly held up to the pubis, there will not be a sufficiency of it in the bladder, owing to the long neck and pelvic position of the organ. As to the arrangement of the groove in the staff, it should begin well in front of the commencement of the curve, on its convex surface, so as to be at its full depth, where the surgeon strikes for it at the beginning of the membraneous portion of the urethra. I prefer the groove on the convex surface of the instrument to that on the side, subjected to this modification; *that one side be a little lower than the other, so that when the instrument is introduced, the side next to the right hand of the operator be a little less than a line lower than the opposite edge of the groove, which condition should maintain to within three-quarters of an inch of the end of the instrument, when it should gradually come up to a level with the opposite side* (see woodcut); such an elevation guards against any slipping of the knife when within the bladder. This arrangement facilitates the lateralization of the knife to the required extent, without changing the staff from its proper position, held up to the arch of the pubis, and it is in direct opposition to that reprehensible practice of trying to rest the staff upon the stone, and partially turning the groove to the incised side, so as to lead the operator to

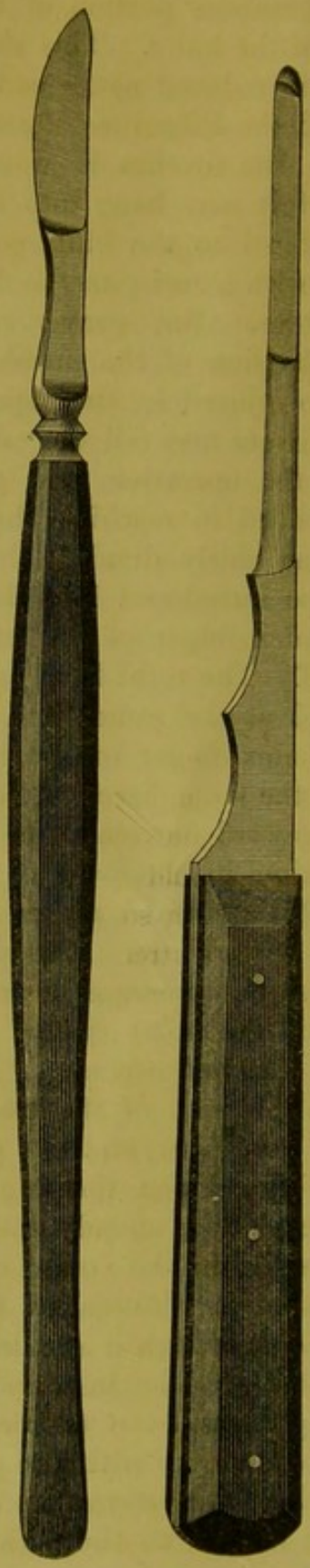
it; this latter manœuvre greatly endangers the rectum; it also facilitates the slipping of the knife, and its wandering away from the director; and it may readily entail more extensive division of the neck of the bladder posteriorly than requisite, or at all safe. One word more with regard to the way in which the staff should be held —it is a word of caution to the assistant, that in his anxiety to see the wound, and the steps of the operation, he should not bend over the patient, and so depress his hand, thus changing altogether the position of the staff, and bringing the extremity of its curve out of the bladder. If so, unfortunately, the knife falls short of it, and the operator may fail in reaching the viscus, and even not be able to rectify the error into which he has been led, so I would warn the surgeon, before he completes his last incision, to look well to the position of the staff.

Now, as to the first incision, there is no use in beginning it too far forwards, for no additional space can be obtained by doing so for the extraction of the stone. The close proximity of the osseous walls on either side prohibit such a sequence; but the incision should go well back, and nearer to the rectum than the ischium, and considerably beyond the former. By so doing commensurate space is secured for the travel of the stone, and a direct outlet is provided for the dribbling of urine from the bladder.

Next comes the important step of opening the urethra. The knife should enter and strike the staff at the commencement of the membraneous portion of the urethra; the index finger of the left hand will discover the instrument and the part, and the scalpel should penetrate a couple of lines behind the first incision. The knife being lodged in the staff it should be moved quietly from side to side so as to make certain of its presence there; the instrument should then be slightly lateralized, as admitted by the construction of the staff, and so pressed steadily backwards, dividing the membraneous portion of the urethra, even to the rudimentary prostate and neck of the bladder; the hand should then be depressed, of course, bringing down the knife with it, and so the instrument withdrawn, thus dividing the intervening parts from the termination of the membraneous portion of the urethra to the posterior extremity of the first incision, creating a great triangular gap; the apex at the prostate, the base at the perineum, direct throughout.

I cannot lay too much stress on the necessity of freely opening

the entire of the membraneous portion of the urethra by the one and continuous stroke of the knife. This should be the surgeon's aim, for if the knife be introduced again and again with the intention of clearing the staff, the difficulties of completing the operation are greatly increased; the urethra is wounded and notched in several parts; shreds of it may hang into the groove of the staff, and impediments so offered to the blunt-pointed knife, so that it cannot travel freely or with security to the division of the prostate and neck of the bladder. But graver consequences may still follow this imperfect division of the membraneous portion of the urethra. It may be so injured by the repeated wounds that the remaining connecting tissues may fail to resist the efforts essential to the completion of the operation, and give way, and so the surgeon may thus be foiled in reaching the bladder. The membraneous portion being fairly divided throughout, the blunt-pointed bistuory is to be introduced into the grooves of the staff, and immediately the index finger of the left hand into the angle between it and the staff. The right hand presses the blunt point firmly to the staff, and at the same time onwards towards the bladder. While the index finger of the left hand is in contact with and pressing it in the same direction, both arrive at the rudimentary prostate, the onward movement being still continued, the back of the knife resting in the pulp of the finger, the sharp projecting edge slightly lateralized makes sufficient division, and both enter the neck of the bladder. The wrist of the right hand now is slightly lowered, and pressure downwards and to the left side gently made, with the point of the finger resting on the bistuory to the extent deemed necessary. The blunt knife and the finger being within the neck of the bladder, the blunt instrument may be laid aside; and now, and not until now, can the staff be taken out with safety. Upon the finger is then introduced the blunt gorget in the manner already described, and upon it the forceps. It is much safer, in the young or old, to conduct the forceps by the gorget to its destination than upon the finger; first, because it will travel through a smaller space; secondly, and most important, the liability of the instrument's slipping aside and unnecessarily separating parts, even to the passing between the bladder and rectum, is done away with and guarded against. The forceps passed along the finger seems more showy to lookers-on; but greater security is insured to the patient by conducting the

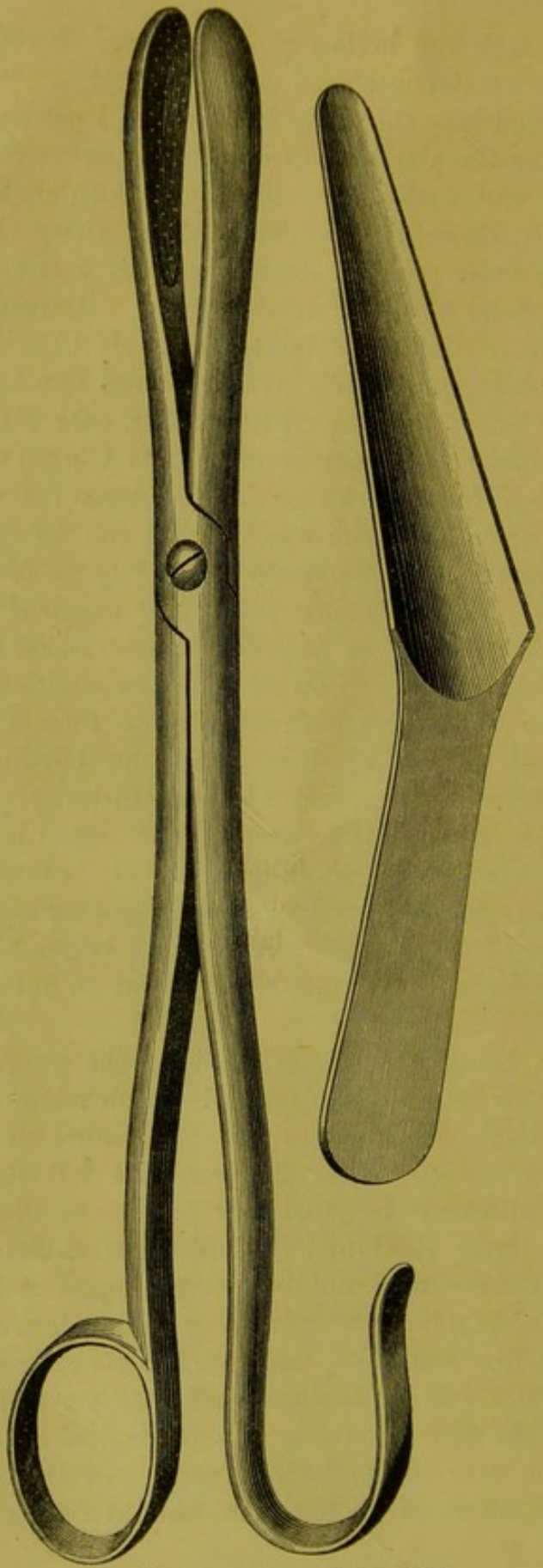


Size—Seven-eighth scale for child.

instrument through the hollow of the gorget; therefore the latter must be received and considered most practical.

I have depicted here the sharp knife which I use for the external incision, and likewise the blunt-pointed instrument for the division of the prostate and neck of the bladder. Both are represented in their form and shape for children. The sharp knife is very slightly, in the least possible degree, cut off at its point so as to make it glide along the staff more evenly. A word with regard to the formation of the blunt instrument. It should be long and narrow in its blade, quite straight, not curved like Cooper's hernia knife. I have had it constructed for myself, *with the point blunted for the eighth of an inch*, not more, not as Cooper's hernia knife, for half an inch at least. I lay great stress upon this point, because I have found, when the knife was blunted too far from the point, in gliding along the staff, *the hinder portion of the blunt part being out of the groove, hitched against parts that required to be divided, and so created difficulty in keeping the instrument in its proper track, and sometimes even tilted it from its position;* therefore I always use the instrument with little more than a button point, about the eighth of an inch long; and the cutting edge need not be so extensive as figured in Cooper's bistuory. The form of the knife I prefer and use is accurately represented in the woodcut. The gorget, made of steel, should be slightly hollowed, not wider than the index finger, or even so wide, somewhat longer, and slightly tapering towards its extremity, its edges nicely rounded off, and its handle of the same metal, set at an obtuse angle with the shaft.

The forceps being within the bladder, the gorget or forceps' director may now be taken away, and search made for the stone. Every effort should be made to seize or secure it in the most favourable axis, and the index finger of the left hand should be brought into requisition to assist this project, as illustrated in the case which I have described. When the calculus is caught, too much pressure should not be exerted upon it lest it may be broken up into fragments, a result not to be desired in ordinary cases. To prohibit such a consequence a little slide may rest upon one of the handles, and when the stone is caught it may be passed down, and so prevent any closer approximation of the blades; I have forceps so constructed by Savigney. In the delivery of the stone the index finger of the left hand should be always used as a



Size—Three-quarter scale for child.

fulcrum upon which to lever the forceps, and so materially facilitate its extraction, and that, too, with the least possible amount of contusion and injury. Such can be accomplished, even though the stone be large. The advantages of this mode of practice is adverted to in several of the cases which I have recorded in my work on "Operative Surgery," and clearly in the case which I have just recited recently operated upon.

As to the form of the forceps, it should be long and narrow in its blades, each blade very gently curved and rounded off at its margins, roughened on the inside to secure their grip, and they should be firmly riveted together, so as to prevent, by pressure through the leverage of the long handles, the approximation of the long blades, a casualty which would endanger the coats of the bladder (see Woodcut). Curved forceps may also be at hand, but they will seldom be required at this period of life. The *canule a chemise* I have had represented of its full size, for the young subject, and so it should be prepared for use. The slight circumferential groove in the outer plate of the canula, commencing half an inch above the aperture in its extremity, permits the fine linen to be fastened there in its position, with very little increase of bulk or volume. The tapes connected to the opposite end effectually retain the instrument in the bladder, when attached to a band, which should be made firm around the patient's loins; the tapes ought likewise to be carried beneath and around each thigh, and then tied. Care must be taken that the instrument is not thrust in too far; *its extremity should only rest within the neck of the bladder*, and then no uneasiness can be occasioned by its presence, and all its salutary influence may be obtained. The foregoing case marks plainly its time for removal.

In early life the parts situated in the complicated region of the perineum are so different in density, size, and position from that which they are found to present in the adult, and again in the old subject, that they truly require quite separate consideration. Again, the axis and osseous limits of the contents and space must ever be remembered in these distinct epochs of life.

In infancy and childhood the several parts concerned in the operative procedure of lithotomy holds very different relationship to each other, as well as to the important viscera in the vicinity from what they do in adult life, and again in the old subject. At this tender age the pelvis and osseous supports for the lower

Full size for child.

extremities is but imperfectly developed; therefore the parts which are destined to be within its protection at maturity are but as yet floating viscera, mostly contained within the abdominal cavity. The straits of the pelvis at this early period are quite different also, peculiarities inherent in the infantile pelvis. In the child the superior aspect looks more directly forwards, and the infant more directly backwards than they do after adolescence. Changes in the curves of the spinal column cannot be permitted to offer a solution; the pelvic axis are independent altogether of its influence. When regulated by normal nutrition, growth, and development, as many of the peculiarities of childhood return again to the old man, so do we find true apparent analogies to exist; the superior aperture at one time directed forwards, as in the infant, whilst the lower has an inclination backwards. We cannot now trace to any intrusive alteration in the bony walls, but must attribute it to the senile changes in the curvatures of the spine, and allied to the flexion of the hip and knee-joint, so habitually resorted to for repose in the aged creature. There is one difficulty which presents itself in the conformation of the bones—the measurement of the inferior outlet of the pelvis—that has been found to pertain to the adult skeleton, and does not apply to infancy and childhood. The variableness of this measurement has often given anxiety, difficulty, and failure too, to the lithotomist. On the authority of two of the most distinguished surgeons of the French school, the question is immutable. Dupuytren has examined twenty-three subjects, and found the distance intermediate between the tuberosities of the ischia to vary from two inches to three and a half inches; while Velpeau affirms he measured forty subjects, and observed in one case these processes to be but an inch and three quarters asunder, while in another they were four inches apart.

TABLES *showing some of the varieties in those parts concerned in the Operation of Lithotomy in the Child, the Adult, and the Old Man.*

Axes of the Pelvis, contrasted in the Child, the Adult, and Old Age		
Child	Adult	Old Age
The superior aperture looks much more directly forward than in the adult. Axis of inferior aperture much more backwards than after puberty.	Axis of superior aperture marked by a line from the vicinity of the umbilicus downwards to the os cocyx. Axis of inferior aperture passes upwards and slightly backwards through the mid-space between the tuberosities of the ischia to the promontary of the sacrum.	The superior aperture looks again more directly forwards, like the child. Axis of inferior aperture inclines backwards, as explained, more considerably than in the adult.
Conditions of the Rectum contrasted in the Child, the Adult, and Old Age		
Child	Adult	Old Age
Peritoneum very low—on rectum—at birth within an inch of the anus, even up to five, a very trifling interval after this, distance increases *pari passu*, with the development of the inferior fundus of the bladder.	Peritoneum covering of rectum, or *cul de sac* of peritoneum, about three inches and a half from the anus, when bladder in state of repletion. Varieties are described when the serous membrane extended to within two inches of the anus, though the bladder distended.	The prostate being generally enlarged, sustains the peritoneum, and as it were lifts it up from the anterior wall of the bowel below.
The rectum presents in its course a very faintly marked curve forwards—indeed almost straight.	The course of the rectum in its upper thirds correspond to the curves of the sacrum, while inferiorly it turns backwards as it were around the front of the cocyx; therefore concave above, convex inferiorly.	Rectum increased in length; sometimes inflected from side to side, and cavity generally dilated.
No dilatation of the rectum above the sphincters in the child.	Shape of rectum somewhat cylindrical; slightly dilated below, and well marked constriction where grasped by the sphincters.	In old age rectum often greatly enlarged, and cylindrical form gone; distended so as to embrace in its anterior wall the prostate and vesiculæ, and assuming more of a pyramidal form, the base below.

A wide range of information is conveyed to the surgeon on examination through the rectum by the finger, in the adult and old subject, as contrasted with that in the infant and the child. By

well-educated touch, on the finger being passed into the bowel in the adult and old, the position of the bulb of the urethra, its membraneous portion, the prostate gland, the vesiculæ seminales, may all be determined both in health and disease, the bulb being about an inch above the anus, and half an inch in front of the rectum; the membraneous portion of the urethra about an inch and a half from the anus, and three-quarters of an inch in front of the rectum; the prostate gland from two inches to two and a half inches above the anus, lying on the anterior wall of the bowel, and separated from it only by a line's breadth of dense cellular tissue. The close proximity of those parts affords at once an explanation of how the surgeon may derive valuable assistance by passing his finger up the rectum, and directing a catheter in its passage onwards to the bladder; how he can readily detect the amount of disease in the prostate or vesiculæ seminales; how he may be enabled, when sounding a patient, to tilt a calculus upwards and forwards when the "*bas fond*" of the bladder is inordinately developed, and thus make its presence ring by percussion against the steel instrument. The proximity of these parts likewise exhibits how readily the bladder may be tapped either above or through the prostate, and how, by introduction of the finger, all these important parts in front may be strained and so steadied as to allow, with the greatest safety, a direct passage to be made to the bladder, somewhat analogous to the median operation; while, at the same time, it will account for several sympathetic affections which may emanate from or be transmitted to this important region.

In connexion with the operation of lithotomy, the condition of the membraneous and prostatic portions of the urethra in the child, and the position which they hold to surrounding parts, must ever be remembered as contrasted with their arrangement in more advanced life. The non-developed condition of the prostate, the vertical axis of the prostatic portion of the urethra, owing to the bladder being chiefly an abdominal viscus, take, in a remarkable way, from it that support aud steadiness which is enjoined by the alterations effected in adult life, the bladder then becoming a pelvic organ, the prostate encasing the commencement of the canal, each held and bound together by more firm layers and reflexions of fascia. Again, the walls of the urethra throughout its entire course are more muscular, thickened, and resisting in the aged. The cohesion between the several parts of the canal in the child is very feeble, and readily yields to violence.

Conditions of the Bladder contrasted in the Child, the Adult, and the Old Man.

Child	Adult	Old Man
Bladder narrow at neck, tapering into the urethra, the only part in the pelvis. In the fetus, when distended, it presents somewhat the appearance of a cylinder contracted at either end; soon after birth the upper fundus becomes rounder, and then it acquires the pyriform shape or flask-like. Its vertical axis greatly exceeds its transverse and antero-posterior; even when empty the greater portion of it is in the abdomen. From this form it slowly changes until up to six, when the bladder is of an oval form, both extremities being nearly equal, and very little of it rising above the pubis.	Bladder buried down in pelvis; when empty, triangular in form; base below, but not closely applied to the rectum when expanded, so as to contain half a pint or more of fluid; its figure is somewhat oval, its vertical axis considerably the greater; the transverse and antero-posterior being nearly equal. The lower end of this ovoid rests upon the rectum far more closely than in its undistended state.	Bladder more contracted; lower in the pelvis. At this period "*bas fond*" greatly developed; and when prostate enlarged, may not be easily emptied of urine, originating the first alterations and deleterious consequences of ammonial urine.
Axis of bladder very variable, owing to its being principally contained in the abdomen, and subjected to move in obedience to the abdominal muscles. During childhood the axis of the bladder appears, in the *dead subject*, to run from before backwards, nearly horizontally, because the distended bladder, no longer supported by the abdominal muscles, turns forwards over the pubis; but in the *living child*, when the recti are forcibly contracted, the line in question becomes nearly vertical.	When the bladder in the adult is over-distended, it is considerably increased in every diameter; it is reversed also in its shape; the largest extremity of the oval is now superior, occupying the hypogastric region, which it renders prominent and tense.	Bladder sometimes dilated into a pouch behind and below the level of its neck, forming even a permanent reservoir—one in which calculi are not unfrequently contained.

CRUSHING THE STONE—LITHOTRITY.

I shall now detail several cases in which I successfully crushed the stone, performed lithotrity, some of them surrounded with many difficulties, and yet, by this conservative method, with vigilant care, brought to a satisfactory and happy result. No surgeon will hesitate about the applicability of the operation of lithotrity in suitable cases, but yet there are cases in which the surgeon's best judgment will be tested in giving the preference to it over lithotomy. The surgeon will often find it difficult to be firm in supporting his views as to the propriety of adopting the latter measure,

so thoroughly does the weight of public opinion and the urgent entreaty of friends contend for the operation without cutting. When the patient comes within the range of youth and manhood, when as yet no changes, the result of morbid action or of age, are impressed upon the bladder, prostate, or urethra, the stone may be crushed with every prospect of success, with that certainty, I would say, of cure, which must, in my opinion, render any other operative measure not only unwarrantable but highly censurable. In the old subject, too, as a general rule, the stone may be crushed with safety, and with a good result; but, as I will presently describe, there are cases in advanced age where the knife offers the best chances of success and recovery. If the case is suitable in other respects, the constituents of the stone offer no obstacle to its being broken up, be it hard or soft, large or small, that is while ranging within a certain scale, say from that of a bean to a middle-sized walnut; it sharply breaks, or it crumbles down, no matter how close its cohesion, under the quick application of force, or the gradual pressure of the screw, as applied by the beautiful lithotrites of the present day. Without in the least wishing to disparage the French instruments, as constructed by Charrière, Leur, and others, in my mind nothing can exceed the perfection to which Weiss, Coxeter, and Mathews have brought these instruments, the former in his adjustment of the screw and stop, the latter in the application of the rack and pinion construction. Of course, I leave out of consideration here those cases to which lithotrity is not applicable, and where the calculus is so large as nearly to fill the contracted bladder—for in those instances the knife alone is to be depended on, and affords the only chance of relief—while the mode of operation must be adapted to each special case—here the surgeon's judgment must determine whether the lateral operation of Cheselden, or the bi-lateral of Dupuytren, Allerton's form of the median, as advocated by the Italian surgeons, or Civiale's medio-bilateral, or the recto-vesical of Hoffman and Sanson, or the supra-pubic operation, be the one selected. Whether knife or lithotrite be employed, it is essential, for the safety of the patient, that the surgeon should have an accurate knowledge of the perineum and all the parts in relation to this region. By a reference to the tables which I have laid down, it will at once be seen how this practical lesson bears weight, and the necessity for its adoption. I am induced to select many of the following cases, because operated on a long time ago, and since then frequently under observation,

proving the result of the operation to be all that could be desired, a perfect immunity from any return of the disease.

CASE I.—*Lithic Acid Stone—One inch in one axis; three-quarters of an inch across—Crushed—Perfect Recovery.*—Mr. W., aged fifty-three, applied to me on April 10th, 1864, complaining of acute pain after making water. Sometimes, though desire urgent, incapable of passing any, at others the flow would be continuous to the evacuation of the vesical contents, while at others suddenly the stream would be checked and stop; but after change of position would go on again. The pain which most arrested his attention, and urged him to come up to town, was that occasioned by riding on horseback, and still more by travelling on his outside car; being a country gentleman and accustomed to a very active life, this symptom not only distressed but alarmed him. On getting the foregoing history of his case, I suspected stone, and having sounded him, at once detected its presence. On the following morning I measured the stone, and found it to be a small one, only an inch in the longest axis, and three-quarters transversely. I inferred that the stone was very hard from the sharp click of the instrument when struck against it, and also from the acid nature of the urine. The patient was a large stout man, and the urethra was unnaturally small, as well as the entire genitals, so that, contrary to my usual practice, I had to dilate the canal by the gradual introduction of instruments for a few days, so as to enable me having passed the lithotrite, to ensure its working freely without being gripped, and also to make provision for the free passage of the fragments when the stone was broken up. Constitutional treatment, sedatives to allay pain, and the warm bath and stupes over the pubic and perineal regions, were had recourse, to allay all local irritation. A fortnight passed over in making those necessary preparations. On the 28th, assisted by Dr. Bevan, I decided on crushing the stone. The patient was placed on a narrow bed, with solid mattress support, the pelvis somewhat raised by a small hair cushion. The urine being almost healthy, the patient was directed to retain the water from two to three hours (which he was enabled to do), before the time appointed for the operation. Standing on the right side of the patient, I introduced one of Weiss's improved lithotrites, and before its blades were expanded, at once struck the stone; the instrument was then gently withdrawn, so as to leave but little more than its beak in the bladder. The female blade

was then gently passed inwards, the handle of the instrument being at the same time gently raised. The stone at once fell into position, and on pressing forwards the male blade was securely gripped. The blade was pressed forward, and the instrument screwed home. The crackling of the stone was quite audible, the fracture was sharp, and evidently the stone was very hard from the force required to disintegrate its structure. Two or three of the fragments were then taken up, and broken after a similar manner. I next introduced an instrument with short wide blades, and crushed to powder a few of the fragments and delivered in its chops a quantity of detritus. The operation was performed when, as I said before, the bladder was about one-half to two-thirds distended with water. The breaking of the stone, the manipulation of the lithotrite evoked no pain, and only a few drops of blood tinged the water that followed the withdrawal of the instrument. On the patient being visited at 4 p.m., five hours after the operation, I found him lying quite free from pain, having passed a full quantity of water and a large quantity of broken up stone. Lithic acid fragments very hard and sharp in the fracture. Ordered diluents in abundance; hip bath, and an opiate at bed-time.

29th.—Had a quiet night; passed water four times; several small fragments and detritus passed with it; one fragment impacted almost four inches from orifice, attended with great pain, just before my visit at 9 a.m. With a long-handled very narrow forceps I was enabled to seize the piece, and with great gentleness and care to extract it without the least laceration, as proved by the absence of any trace of blood. During the following four days several small pieces of stone came away, unattended with pain.

On the sixth day after the operation, May 5th, all irritation having subsided, and as no detritus came away for the two days previous, I sounded him again. Having passed in the lithotrite, I felt a portion of stone and broke it up, together with two or three fragments. This proceeding was unattended with pain, and not a trace of blood followed. Ordered warm bath and a sedative draught at bed-time; diluents freely.

May 6th.—Had a quiet night; passed water very abundantly, and small pieces of well broke up stone. At three o'clock I was sent for, and found a large fragment impacted in the fossa behind the glands. I passed in a small scoop by a little management behind the piece and prized it out; treatment as on yesterday.

On the 10th of May, the man passed water quite freely, without

the least uneasiness whatever, either before or after, or during the flow. This state of things continued, though I permitted the patient to get up and walk about his room.

On the 12th, I carefully sounded the patient, and again on the 14th; in neither instance could I detect the slightest fragments, and the absence of all pain confirmed the local examination as to the stone being entirely removed. During the past five years I have frequently seen the gentleman; he has had uninterrupted good health, and no return of the stone.

CASE II.—*Lithic Acid Stone—Size one inch and an eighth in one Axis; and an inch and a quarter across — Lithotrity—Patient aged sixty-five—Perfect recovery after the fourth Operation.*—Mr. N., aged sixty-five, consulted me in conjunction with Sir D. Corrigan, on June 28th, 1865. He was a large full man, florid complexion, and apparently in good health. He describes his case as follows: He had been suffering for two years and a half previously, with frequency in making water; pain sometimes after, and with the last drops frequently a tinge of blood. These annoyances gradually increased, so that latterly he could not take carriage or horse exercise, owing to the increase of suffering, so much so, that often he had been obliged to dismount, or get out of the carriage and walk home; sufferings produced in this way by jolting exercise, were invariably accompanied by increased quantity of blood in the urine, and during and after this state the frequency and urgency of making water were also considerably aggravated. The patient was a hard and cold man, kept a good deal within himself, so his early sufferings and annoyances were sternly borne with, and it was not until after the lapse of a long time, and when at length his pains became so acute, that he sought for relief on the above date. At this time he was unable to retain his water for more than a couple of hours at farthest, while sometimes in walking through the street, he would have to turn down the first lane or archway he met to evacuate the contents of the bladder; at times so urgent would be the impulsive power to pass it, that before his trousers could be unbuttoned his dress would be all wet. At this time, when he consulted Sir Dominic Corrigan, and myself, he had all the rational symptoms of stone, marked in an aggravated way, and it only remained now for the sound to confirm its presence in the bladder. The gentleman was placed lying upon his back on a sofa, with the pelvis well raised by a couple of pillows; the sound was readily

introduced, as the urethra was healthy and roomy throughout its entire extent. The instrument ranged to either side, and below for two or three turns without touching the stone, but upon being pressed in further, almost up to the very handle, and then gently moved to either side, the foreign body was detected at the very summit of the fundus, to which point it arrived as being made most dependent by position. The man being very large, over six feet, and the bladder of its full size, will account for the length to which the instrument had to be pressed, to obtain the required information, and more particularly, when it will be remembered, as yet the irritation had not existed long enough to contract the bladder, or morbidly spoil its coats, or even so as to effect putrefactive changes on the fluid thrown into it; so then the stone was struck audibly, sharply. In this case everything seemed so favourable to the crushing of the stone, both in Sir D. Corrigan's judgment and my own, that we determined on operating the following morning. The grounds upon which I selected lithotrity were these:—The man was in good health; he had full expulsive power over the bladder; the urethra was healthy and capacious throughout its entire extent, and the measurements of the stone were moderate, one inch and an eighth in one axis, and an inch and a quarter across; and, though believed from the analysis of the water, and from the sharp click when struck by the steel instrument, to be very dense in its cohesion, hard in its character, yet this condition was not considered sufficiently weighty to prevent the attempt being made of reducing it to fragments. On the 29th of June, at 11 a.m., in presence of and assisted by Sir D. Corrigan, I crushed the stone after the following manner:—The patient was placed upon a firm narrow bed; the pelvis well raised; water was retained in the bladder for two and a half hours previous to our coming. Standing on the right side of the patient, his limbs well apart, I introduced Weiss's improved fenestrated instrument, and detecting the locality of the stone far back in the fundus of the bladder, the blades being gently opened, by a little lateral and wavy motion from side to side, the stone fell into the chops of the instrument, the male blade was gently pressed down, and with a force sufficient to ensure its grip, until the stop was pressed down, then the instrument was slightly withdrawn away from the walls, and as it were into the cavity of the bladder, before the screw was made to work. The force required to turn the screw was very considerable at first, so hard was the stone, and it was only by forcible exertion that the teeth

of the instrument were driven into its structure, but this being once accomplished, the rending of it was quick and decided, as evidenced by the sharp crack elicited, and confirming the amount of its cohesion; four pieces were taken up consecutively and reduced to fragments, and the lithotrite was withdrawn; no blood followed the operation; the patient was seized with urgent desire to make water; a large and copious stream came off; the patient being restricted to recumbent position no portions of the stone were expelled in this convulsive effort to empty the bladder; a hot stupe was laid over the bladder and perineum, and a sedative draught given.

Visited at 4 p.m.—Patient has not suffered any inconvenience or pain; passed water three times, and with each evacuation some fine detritus, making about half a tea-spoonful; hip bath, stupes, and an opiate at bed-time; diluents freely.

June 30th.—Had a good night; passed water four times, and several fragments of stone, some attended with sharp pain; a large piece became stuck about three inches from the orifice, producing considerable suffering. I extracted it with a long fine forceps. Constitutional and local treatment to be continued.

July 3rd.—Complains of sharp pain at head of penis; in fact his early symptoms aggravated after making water. I passed in a sound, and discovered some large pieces; on the following morning in presence of Sir D. Corrigan; again used the lithotrite after the same manner as at first; I succeeded in breaking up to powder three large pieces, pieces as expressed by the scale from a quarter to half an inch. I next passed in a non-fenestrated instrument, and brought away a good deal of detritus.

July 9th.—Since last report has gone on most favourably, passing a good deal of detritus and a few small fragments; pain diminished considerably after making water. The urgent desire to make it nearly gone, and also the frequent appeals to pass it diminished by more than one-half. The irritation after last operation having subsided, I introduced a sound to explore the bladder, and after some search discovered a small piece which was keeping up the irritation. I introduced the lithotrite, and after gentle search secured the piece, which was quickly broken up; a good deal of it was brought away by a smooth-bladed lithotrite, and without pain. Constitutional and local treatment to be persevered with, as after each of the former operations.

On the 10th (the following morning) the remainder of the detritus was brought away in the urine; after this quickly all

irritation subsided. The frequent calls to make water ceased, so that on the second day after he could sleep the entire night through without being disturbed, and by day his calls to make water were not unnatural. All pain had subsided in the effort to make water, and after passing it. To be certain that all was right I carefully examined, with a short-beaked sound, the bladder, but not a portion of stone could be discovered.

Now the patient was permitted to get up and walk about. After a few days he was allowed to go out and take carriage exercise, from which he returned without having expressed the least distress. I sounded him again, only to confirm my former examination; the entire stone was removed.

CASE III.—*Large Lithic Acid Stone, measured three-quarters of an inch by an inch and a-quarter—Crushed and Extracted, with perfect Recovery, after two Operations.*—Rev. Mr. J., aged forty-eight years, a peculiarly nervous creature, consulted me the first week in January, 1866. He stated that about nine months before he was attacked with severe pain in the loins, so severe as to confine him to bed. The pain was very acute a part of the time, and led to the supposition that a small stone was the cause of his sufferings and distress; as suddenly the pain ceased, and in a few days after he passed a small stone, somewhat larger than a grain of wheat, and in two days after a second, about the same size. These he presented to me, they were perfect examples of pure lithic acid stone. After the escape of these two stones he was then tormented by great uneasiness after making water and sometimes a sudden check in its flow, with great straining; on changing position it would flow on again uninterruptedly for some time, and would again be stopped, when by adopting a similar procedure it might again flow uninterruptedly to the emptying of the bladder. Generally the stream would be checked three or four times during the expulsion of the entire contents of the organ. He also passed a little blood on one or two occasions. The whole history of the case led to the inference of the presence of stone in the bladder, and after sounding the patient carefully I was satisfied of the presence of the foreign body, and certain that a stone was there. However, I sounded him at a disadvantage, there being at the time scarcely any water in the bladder. Not content with this examination, on the following morning I again sounded the patient, the bladder being distended, and audibly struck the stone, a very sharp click

being elicited. On measurement it was somewhat more than three-quarters of an inch in one direction, and fully an inch and a-quarter in another. The gentleman had to return to the country to make arrangements as to his professional business, and he did not again come under my care until the 26th of the following month, February. On this day, the bladder being half full of water, I gently passed in a sound, and distinctly struck the stone. While in the country all the gentleman's sufferings were augmented, and he ardently pressed to get relief from his pain. Ordered a hip bath, a gentle aperient, and a sedative draught at night. On the next morning visit on the 28th, assisted by Dr. Bevan, I proceeded to crush the stone. The gentleman being placed lying towards the edge of the bed on a hard mattress, with the pelvis well raised by the introduction of a pillow beneath, I introduced Weiss's improved fenestrated lithotrite with a gentle steady movement into the bladder, the penis being steadily drawn forwards as it were upon the instrument with the left hand, while the right sustained the lithotrite in its direct course to the opening in the triangular ligament, when the hand sustaining the instrument was suddenly depressed, so tilting its point through this narrowed part, and so directing its onward course with the greatest gentleness and least possible obstruction into the bladder, and so in accordance with the strict anatomical arrangements of the region. The instrument being within the bladder, it was gently passed forwards, and next in succession to either side, but without touching the stone. Then the lithotrite was slightly rotated, its point depressed towards the left side and downwards, when an audible click against the stone was felt and heard. I gently withdrew the instrument, opened its jaws, and after a slight waving movement of it from side to side, the stone dropped into its grip. On closing the male side and fastening the slot, I screwed home the instrument, which required much force to break the stone. However, it soon gave way, and with a very clear and distinct sound of its disintegration. I next opened the instrument and searched for the larger fragments, reducing three considerable ones to minute portions. I then cautiously closed the instrument, and withdrew it. The patient, though extremely nervous, yet admitted I did not hurt him. After the removal of the lithotrite there was an uncontrollable impulsive movement to empty the bladder; the urine gushed out at first slightly tinged with blood, and so in the recumbent position the patient was allowed to pass the water; when nearly done I

restricted him in the act, and so he was enabled to retain some. I then gently introduced a catheter, and threw in from three to four ounces of warm water, to allay irritability and float, as it were, the broken fragments from the coats of the sensitive viscus. The pillow was removed from beneath the hips, and the patient directed to lie quietly on his back, a large pillow being placed beneath the hams, so as to flex the thighs. In half an hour after a full opiate was given. Visited at 4 p.m.; had some sleep; no pain; pulse a little accelerated; skin hot. Ordered a diaphoretic mixture, and diluents freely. He made water, and passed several fragments of lithic acid stone, varying in size from a grain of wheat to three times that bulk, besides a quantity of detritus. Ordered to be constantly stuped over pubis, genital organs, and perineum; opiate at night.

March 1st, 9 a.m.—Had a quiet night's refreshing sleep; pulse soft and 78; skin moist; passed water three times in the night and once this morning; several large pieces of stone came away, lithic acid, with some coating of phosphatic deposits, together with detritus; to continue diaphoretic mixture, stupes, opiate. 6 p.m.—Passed two very large pieces of stone; a third was stuck in the urethra, about four inches from the orifice; the pain was so great that I was sent for. With a long narrow forceps, after a little gentle handling, I got out safely the piece, without laceration; opiate at night, and constant stupes.

March 2nd.—A large quantity of detritus passed, and three small very irregular sharp pieces.

On the 4th the bladder was so quiet, so free from irritation, that I again introduced the fenestrated lithotrite, and broke up two considerable pieces without pain or suffering, or any appearance of blood. Three hours later he passed a copious supply of water, being far better able to retain it, and with the full stream a considerable quantity of detritus. During the next two days he passed occasionally some detritus. On the 7th I was agreeably made aware that he only passed water once from the night previous, that it flowed in a copious stream, without the slightest straining, uneasiness, or check of any kind, and with not a particle of detritus in it. The gentleman was up now and walking about, and so he continued for two days, when I submitted him to a searching examination, lest a fragment might have been left behind. Directions were given that the urine should be retained from two to three hours. When I passed a scoop lithotrite with a slender

stem, and searched the bladder most carefully in all its parts, the construction of the shaft of the instrument enabled me to move it in all directions without any grip in the urethra, but I could detect no particle of stone. This examination was conducted without the patient expressing the least pain, so completely had the bladder recovered its healthy condition, all source of irritation being removed. A few days later the patient returned to the country, and at once resumed his duties, and I have good reason to know that now he enjoys perfect health.

CASE IV.—*Lithotrity on a Patient aged sixty-seven years—Large Phosphatic Stone, two inches in one Axis, and one inch across—Entirely removed by Three Operations.*—Rev. Mr. ——, aged sixty-seven, consulted me in September, 1866, for stone in his bladder. His health was greatly broken down from months of agony which he endured. He had long been suffering from an affection of his kidneys as well as that of the bladder. When I saw him he could scarcely retain a wine glass of water, and the pain he endured on passing it could not be described; a few drops of blood immediately following the expulsion of the last drops—ten, fifteen, eighteen times in the night, and nearly as often by day—he was urged to make the effort to pass it. I placed the patient in bed, and put him under the most soothing kind of treatment—baths, sedatives, diluents, &c.—rest in the horizontal position, with hips well raised by pillows. Gradually the increased irritation and distress which he laboured under after a long journey from the country subsided under this lenient, mild treatment, and after a few days I was enabled to throw a little warm water into the bladder, and gently introduce a sound; this I accomplished so as to satisfy myself that a large stone was there. The urine was putrid, alkaline, loaded with mucous, accompanied with a highly offensive ammonial smell. Strict constitutional and local means were enforced to allay this terrible irritation—opiates, acids, buchu, belladonna (most valuable), with constant stuping over the vesical and perenial regions, and occasional hip baths were had recourse to, and soon with salutary effect. The bladder lost a good deal of its irritability, the urine became clearer, the mucous diminished; the terrible watchfulness consequent upon the repeated demands to make water gradually lessened; he had better nights, more sleep, and he was able to consume considerably more nutriment. The advantage of raising the pelvis, and thus allowing the stone to lie in the upper fundus of the bladder, a point

which I have laid great stress on before, was very marked in this case; whenever the pillows were taken away his sufferings were produced in a very aggravated form. Now came the question, as we gained a period of repose, what was to be done? no doubt the kidneys were engaged, but yet the presence of the stone entailed such misery, that the patient implored that it should be taken away, his life was so wretched, his sufferings so terrible; surgery prompted to the same issue, but the practicability of crushing the stone was surrounded with difficulties, owing to the morbidly sensitive condition of all the parts concerned; still the prostate was not enlarged. In consultation with Professor Bevan, taking every particular of the case into consideration, we came to the conclusion that lithotrity was alone applicable, and I decided on crushing the stone October 1st, 1866. 11 o'clock a.m.—The patient was placed on the right side of the bed, supported steadily on a hard cushion, the pelvis was considerably elevated, more than I usually direct, and the head resting horizontally with the body. Chloroform was gradually administered, and its soothing and quiescent influence rapidly produced; the limbs being held well apart, standing on the right side of the patient I introduced a catheter and injected four ounces of water at the temperature of 100° into the bladder. The catheter immediately revealed the site of the stone; it was withdrawn, pressure with the index finger and thumb of the left hand being made on the penis to prevent the escape of the fluid; I next passed in Weiss's fenestrated lithotrite, when it readily came upon the stone far back, where it was expected to be found, owing to the well raised position of the pelvis maintained for some days. On separating the blades of the instrument, after two or three gentle sweeps, the stone fell within its grip, and was immediately steadied, and the slot drawn down; the force necessary to screw home the male blade was but small, the stone readily crumbling to pieces, proving its phosphatic nature; by very gentle efforts, consecutively, four pieces were caught, and at once broken up into debris. So soft was the stone that when the instrument was withdrawn it was impacted throughout the intervals of the teeth. The patient awakened from the chloroform, and was much surprised to hear that the stone had been broken up, as he had not felt any part of the proceeding. After the removal of the instrument a good deal of water rushed out, slightly tinged with blood. Ordered warm stupes over part, a full opiate, and some warm wine and water, hot jars to feet and loins. Visited at 4 p.m.,

found the patient quiet, free from any marked pain; he had passed more water at a time than he had done for weeks, and with less distress; some powder and small fragments of tripple phosphate were discharged; took beef-tea freely; pelvis kept elevated, and with great benefit; for the three following days, he greatly improved, the character of the water was altered very much for the better, the distress and urgency in making it very much diminished; so that on the 6th, assisted by Dr. Bevan, I again proceeded to crush the stone, having gone through the same arrangements in placing the patient as on the first occasion, bringing him under the influence of chloroform, injecting the bladder with warm water, &c. I as cautiously as before introduced the lithotrite, and readily seized a considerable piece of the stone, which by gentle force pulverized, so on a second and a third piece; this breaking was effected with the fenestrated instrument; I then withdrew it and passed in a fine scoop lithotrite, and pulverized several pieces. No efforts were made by the patient to shrink from the manipulation which I carried on, so admirably did the chloroform act, and by such quiescence I was enabled to apply the greatest gentleness, at the same time to act with the utmost precision on the fragments. After the instrument was removed the water that passed was very lightly tinged with blood; position, opiates, stupes, warm stimulants, diluents, as before. When visited at 5 o'clock p.m., he was comparatively easy, and had passed a fair quantity of water, and nearly two tea-spoonfuls of the broken up stone in powder and small bits. At 7 o'clock I was called suddenly to him, as he could not pass any water, and having a great straining and desire to do so. I gently passed down a full-sized silver catheter, and was obstructed just at the membraneous portion of the urethra by a solid body. I felt this at once to be a portion of stone impacted, and too large to get on. I endeavoured by gentle pressure to push it back, but could not do so by the amount of force which I considered it safe to employ, so I passed down a full-sized catheter with an open end and rested it against the foreign body; I then applied a syringe to the end of the instrument, and sent down a gush of water with considerable force, this, after one or two efforts, was effectual in liberating it and carrying it in its current back into the bladder. The force of the column of water was effective, because acting in two ways—by its presence it lifted away as it were the sides of the urethra from the irregular sharp edges of the stone, while the weight and force of the centre of the column drove the

stone before it back into the bladder. The removal of the stone was speedily followed by the bladder emptying itself, and so giving relief; a large quantity of the stone came away. After two days, irritation having greatly subsided, and as particles of the stone ceased to be discharged, I again, on the 8th, applied the lithotrite, adopting all the precautions before mentioned, and with like success; the ready finding of the stone, its easy disintegration; the patient quickly recovered from the influence of the chloroform, and passed water without any discolouration by blood; a large quantity of sand was discharged with it. Ordered a full warm opiate, stupes, diluents freely, and nourishing broths. Visited at 5 p.m., when he expressed himself as feeling more comfortable than he had been for months, particularly remarking after making water he had no pain. Visited on following morning, 9th, when I found he had a good night, passing water only three times, and not attended with pain. I introduced a sound and could not discover any stone. This examination was unattended by much inconvenience, and I was as much rejoiced as the patient to find the entire had been taken away, after the third operation the amount of stone filling nearly an ounce bottle. Visited at 5 p.m., when I found the patient hot and restless; pulse rapid; countenance flushed; urine in very small quantity. Ordered a diaphoretic mixture and diluents; hot stupes over pubis and femoral regions. Seen again at 10 p.m.—condition worse; more excited; no urine passed, so introduced a silver catheter with great gentleness, but no urine in the bladder; complete suppression; dry cupped over the loins, diuretics; prescribed stupes, &c.; gin punch freely. Found the patient worse on the following morning; not a drop of urine secreted; introduced a catheter, but not a tea-spoonful of fluid in the bladder. He lingered on, gradually getting stupid until early the following morning, when he died of uremic poisoning. I was much distressed having failed by every means to obtain a *post mortem* examination in this most interesting case.

CASE V.—*Tripple Phosphate of Ammonia and Magnesia Stone, one inch and a quarter in one axis, and over three-quarters of an inch in another—Lithotrity—Patient fifty-eight years—Recovery after fourth Operation.*—M. N., aged fifty-eight years, came to consult me in November, 1867. He stated that, though an Irishman, he had been resident in Jamaica for the last twenty years; that he returned from abroad three years since invalided. He suffered when

away from terrible ague, and for the last twelve months from great pain in the bladder, and in the effort to expel and retain the urine. During the latter six months his sufferings have been greatly augmented, and he was in the habit of frequently passing a gum elastic catheter, as he thought, and was directed, to relieve the bladder. Before coming to me he was treated for ague and cystitis, and without the least relief. On the 16th of the above date he came to my study, trembling all over, and with urgent desire to pass water; he got a vessel to do so, and I observed his efforts, the jerking squirt, straining, change of position—again some flow, and so on to the finish—about four ounces being discharged, highly coloured, from being slightly tinged with blood. After the expulsion of the water his sufferings were excessive; he writhed on the sofa, and trembled in the most violent way. A warm opiate with brandy was immediately given, which soon quieted the paroxysm. On closer inquiry I found that latterly he always felt this torture after passing water, with acute pain shooting to the end of the penis. On consideration of the entire case, as he described his sufferings, and as they were revealed to me in his efforts to empty the bladder, I came to the conclusion that he had a stone in the bladder. I ordered him to take a hip bath at night, and put him on large doses of belladonna, Brandishe's solution, and sedatives—these acted most soothingly, and with excellent effect, so that on the 19th, four days after the scene of misery which I have described, he came to my study again. I then gently sounded him, and detected a stone, which registered on the scale of the instrument one inch and a quarter in one direction, and over three-quarters of an inch in another direction. I decided on crushing the stone. The man was so broken up in health that I was certain he had not power to repair any wound. The bladder was able to expel its contents, and the urethra was roomy and capacious—circumstances of much moment in coming to a conclusion as to the safest operative procedure to be adopted. The gentleman was kept on the sedative treatment, and restricted to quiet for a few days, and on the 22nd, assisted by Mr. William Colles, I proceeded to crush the stone at 11 a.m. The patient was placed for the operation after the manner which I described in the former cases. He would not take chloroform, therefore I had some trouble both in injecting the bladder and forcing the required quantity into it (about four ounces), as he could not retain latterly more than two to three ounces.

However, the water was delivered, and the lithotrite gently and

steadily introduced, not, however, without much wincing on the part of the patient. He was then allowed a few moments to rest, and search made for the stone. Now, though the pelvis was well elevated, and the bladder fairly distended, yet the stone did not fall as well back as I have been in the habit of finding it on these precautions being taken. However, one or two gentle sweeps with the instrument discovered it, and on cautiously opening its blades, and lightly shaking it, the stone fell within its grip, was secured, and rapidly broken up. The stone was caught across, according to the measurement before revealed, and it readily crumbled down, proving the stone to be of phosphatic origin—five large pieces were taken up in succession, and crushed to powder. I then withdrew the instrument, a good deal of the crushed stone came away in its blades, the contained water squirted out after it, tinged with blood, and some detritus with it. Ordered a full warm opiate draught—hot jars to feet—stupes over the pubis and perineal regions. 5 p.m.—Has suffered some pain—was inclined to rigor, but cut short by warm sedative draught, and hot jars to loins. A good deal of water passed, with some detritus, but no fragments—to continue diluents—stupes—opiates. I was now for the first time informed that when abroad he indulged largely in the use of opium, so I had to increase my measure, and also ordered him three grains of quinine every fourth hour in pill. 8 p.m.—Was suffering much pain from an impacted piece of stone, two inches from orifice of urethra; this I easily extracted with a fine forceps after a little time. I injected about three ounces of warm water, with a little watery extract of opium, and withdrew the catheter—the fluid was retained, and he experienced much comfort from its presence. Opium and quinine to be continued, also diluents freely, stupes, &c.

Nov. 21st.—Called suddenly at 8 a.m., the patient suffering from retention, and such great agony. I discovered a piece of the stone entangled behind the membraneous portion of the urethra, very firmly. I passed down the catheter with a cut off end, as on other occasions, forced down through it by a syringe a heavy column of water, which on being repeated gradually freed the stone, and ultimately forced it back into the bladder. I then let off the water which had been contained in the bladder, and injected three ounces at 100° in temperature, with a weak solution of watery extract of opium—attended after a short time with the happiest result, the greatest relief from pain and all irritability. Stupes to be continued. and opium and quinine every fourth hour.

3 p.m.—Free from pain since last visit; has passed water frequently, with much gravel and sediment—bathed in sweat after an ague attack—increased the quinine to five grains every third hour—sedatives, diluents—urine as before.

9 p.m.—Very quiet since last visit, and has passed several large fragments of the stone—to continue sedatives, quinine, belladonna, &c.

Nov. 22nd.—Had a quiet night—several hours of undisturbed sleep—pain very much diminished after making water—passed a very large amount of sediment and small fragments, within the three days more than a large table spoonful—very little mucous in the urine—clear and better in every way—irritability so much subdued, decided on the following morning, 23rd, on breaking up the rest of the stone. At 9 a.m., assisted by Mr. William Colles, we prepared the patient, and placed him in the same attitude as in the first instance. The lithotrite was cautiously introduced, five ounces of warm water being previously injected, and a portion of stone seized and crushed. Again, a piece considerably larger, marking on the scale three-quarters of an inch, was reduced to powder, very little force being required, the stone was so soft. Four more pieces were then severally reduced to powder, and the instrument withdrawn. A gush of water followed, and a large quantity of the recently broken up stone. For four following days little to report, save the safe passage of fragments and detritus; the same constitutional treatment pursued, and during the entire time no rigor. On the 28th, so little irritation that I introduced the scoop lithotrite, and broke up several small pieces, and delivered in its blades a large quantity. Continued all treatment constitutional and local. On Dec. 1st, again introduced the scoop lithotrite, when I detected only one little piece, the powder after the last crushing being safely expelled up to this date. I broke this remaining fragment, and brought it away in the lithotrite.

On the following morning, 2nd, found he slept the entire night, being only once awakened to make water—all pain after making it gone. The bladder retains now six ounces of fluid before it is called upon to contract; the urine is free from urea or pus. On the 3rd, I sounded the patient carefully, but could not detect the least fragment left behind. In a week after this time all symptoms of irritation gone. The patient cured.

CASE VI.—*Large Phosphatic Stone, with Lithic Acid Centre—*

Crushed and Removed successfully after three Operations—Size one inch and a half by an inch.—Mr. K., aged seventy years, consulted me in July, 1868, for stone in his bladder. He had been suffering for several months most acutely from all the paroxysms and distresses consequent upon that affection. The nature of the case was recognized and made out months before the above date by the able surgeon under whose care he placed himself in the country, Dr. Joseph Fergusson, and all that could be done to allay the local irritation and suffering was fully carried out, but yet the foreign body was in the bladder, and fresh and repeated outbursts of mischief quickly came on, and ultimately urged him to seek for its removal.

The day after the above date he was seen by Dr. Fergusson and myself, when we entered into every particular of his case, and we decided on sounding him the following morning, having ordered a hip bath and a gentle sedative at bed-time.

I was sorry to learn in the history of the case that Mr. K. had been a delicate man for years, independent of the local affection, having had a very weak stomach and feeble heart. These were dispiriting complications with the great suffering and distress consequent upon stone in its advanced stage. On the next morning, July 27, sounded the patient, and at once struck the stone audibly. The stone was measured one inch, and a little more than a quarter in one direction, and an inch in another.

On examination by the rectum, the prostate was not found much enlarged, the left lobe slightly, but yet nothing worth considering; there was no tenderness on pressure. Both Dr. Fergusson and myself considered the case favourable for breaking up the stone, and indeed to this proceeding alone the patient would give his consent.

A few days were allowed to elapse, and means taken as much as possible to lessen local irritation, and prop up the weakened system.

On the 29th, assisted by Dr. Fergusson, I proceeded to break up the stone. The patient was arranged on a firm bed, in the manner described in some of the foregoing cases, with the pelvis well raised, a few ounces of warm water (five, at temp. 100°) were thrown into the bladder, which with difficulty was got to retain this quantity, so great was the irritability of the organ. The fenestrated lithotrite was next introduced, and the stone quickly discovered and seized; it was a soft stone, and crumbled down rapidly beneath the screw, four of the larger pieces were taken up in succession and reduced to

powder. The instrument was then withdrawn, a gush of water quickly followed, tinged slightly with blood, and containing some detritus in it. The pain was not great during this proceeding; ordered stupes constantly over the pubis and perineum, diluents and sedatives; removed the wet sheet and pillows beneath him, but elevated the pelvis again on a fresh one, even more than during the operation, so as to relieve the irritated neck of the bladder from the pressure of the sharp edges of the crushed stone. Visited at 4 p.m.—Quiet; passed water and some fragments.

30th.—Had a fair amount of sleep—passed a large quantity of water, all tinge of blood gone—some detritus and small pieces of phosphatic stone—sedatives, stupes—nutriment and wine to be continued.

Three days having passed over, and but little local irritation, I again introduced the lithotrite, and broke three large pieces, a good deal of which I delivered in the scoop instrument.

6th August.—A large quantity of stone now passed, fully a dessert spoonful, with great relief from pain and suffering; can retain water in much larger quantity, and expel it with far greater force and precision. Was sent for suddenly, owing to a piece becoming impacted about two inches from the orifice, and which I extracted with long fine forceps. Owing to the irritability of the stomach and the weak heart I had much to contend against in this embarrassing case; yet, by watchfulness and care, he was relieved, after a third application of the lithotrite, from the entire stone, the bladder expelling part of the crushed material. On the 13th I sounded the patient most carefully, and again on the 15th, and could not detect any portion left behind. On confirming this conclusion, as arrived at from actual examination, the local symptoms bore testimony, as the pain of making water had entirely ceased. The pain at the end of the penis was entirely gone. The power of retaining the water was greatly restored, and the impulsive desire to make it was now absent. The patient was permitted to get up and walk about, and though relieved in every way from local annoyance, yet the patient's spirits remained greatly depressed; he continued, however, well, from any vesical annoyance.

After about a fortnight's time this gentleman went to the country, when his heart symptoms gradually became more embarrassing, and he lived for a few months. I was glad to hear from his brother-in-law, a medical man, that from the hour the patient

left Dublin until the day of his death he never complained of the least pain in making water, or of any of those symptoms which characterized his sufferings before I crushed the stone, and successfully removed it from the bladder.

CASE VII.—*Tripple Phosphate Stone—Size two inches and an eighth in one direction, and somewhat more than one inch and three quarters in another—Successfully Crushed and Removed from a Gentleman, aged seventy-eight years, after eleven Operations—Perfectly Cured.*—Mr. W., aged seventy-eight, consulted me on July 17, 1869, owing to supposed calculus in the bladder. He was suffering severely from urinary annoyances for over four years. He was sounded on three occasions, and by different surgeons; one pronouncing the presence of a stone, others not. However, on the above date, I was requested to see the gentleman. On the following morning I sounded him with great care and considerable trouble. The bladder was so irritable as not to contain, of its own accord, an ounce of water. However, I threw in about three ounces, and with difficulty retained it while I introduced a sound. In a few seconds I discovered the stone, and from the solid resistance to the instrument I was apprized it was a large one. I quietly withdrew the instrument, satisfied by the accuracy of the exploration. The history of the case was well given as one of stone in the bladder. The patient dated his sufferings, of a decided character, as far back as four years and a half, when, after a walk, or being driven on an outside car, he felt considerable pain in making water, and straining, when generally some blood followed the effort. Gradually from that time he had pain after passing water. Sometimes the stream was arrested in its flow, when, by change of position, it would again pass on. Latterly the repeated calls to make water were more urgent, and attended with increased pain, so that he felt a perfect inability to ride or drive. The urine became gradually thick and loaded, and most offensive after resting for a couple of hours; and now he suffered the most agonizing pain at the neck of the bladder after making water, and continued to the extremity of the penis. The patient's general health, when I saw him, was completely broken up from continued suffering, loss of rest and appetite. I confined the patient to bed, and ordered such means as would allay the increased local irritability—sedatives, narcotic stupes, hip baths, &c. In consultation with Mr. Adams, on the 20th July, I measured the

stone; it marked beyond the index nearly a quarter of an inch. Being gripped tightly, it measured a little more than two inches in one direction, and somewhat more than one inch and three quarters in another. The instrument was then gently withdrawn; some blood followed, and a good deal of suffering.

The patient never had any affection of his urethra during life; therefore the instrument glided through the channel without interruption. The prostate was not enlarged, neither was it tender on pressure; but the urine was most offensive, and loaded with mucous. I must say my feelings at first tended towards performing the lateral operation in this case, and at once, ridding the man of the enormous foreign body, I inclined to this view, from the healthy state of the prostate, and the fortitude with which the patient submitted to my judgment; but I inclined more particularly to this cutting operation from the success which followed my efforts in almost a similar case sometime before. However, the patient and friends were very anxious that the stone should be broken if possible; and as the urethra was healthy, and as there was no valid objection to the operation of lithotrity being performed, though large the stone, Mr. Adams agreed with me in adopting this mode of procedure. The patient was confined to bed, and continued on the same soothing line of treatment for three days, as was adopted from the first. On 23rd July, at 11 a.m., I decided on the operation, when I was assisted by Mr. Adams and Dr. Bennett. The patient was placed in bed on a firm hair mattress, with a folded hair pillow beneath the hips, so as to raise the buttocks, and so allow the stone to gravitate backwards, when water was thrown into the bladder, and the viscus partly distended. His head lay on a horizontal line with his trunk, the knees being drawn well apart. Chloroform was then administered, and the patient brought fully under its influence. The bladder, as I have before mentioned, could not be brought to retain two ounces of urine; therefore I had to distend it to what I considered a safe extent for the operation by gently injecting about six ounces of water at the temperature of 100°, the catheter being cautiously removed, and the penis compressed. Standing on the right side of the patient, I quickly introduced Weiss's improved fenestrated lithotrite down to the triangular ligament, and when steadied there depressed the handle between the legs, tilting the point upwards, and with a gentle onward motion into the bladder. The stone was readily

detected, the instrument opened with its blades wide apart, and the stone gripped. Four turns of the screw were forcibly made, when the stone broke with an audible noise. Again a large fragment was secured and broken up; another and another were acted on, and then the instrument was gently withdrawn; some blood and water followed. The chloroform was discontinued, and the patient awoke quite unconscious of what had been done, and asking when the operation was to begin. The pillow was removed from beneath the hips, a dry one not so thick introduced, and covered with a folded sheet. Half an hour later a warm anodyne was given; hot jars applied to the feet, after which the patient fell into a calm sleep.

3 p.m.—Patient free from pain; passed some water.

24th (9 a.m.)—Had a good night; passed water frequently, mixed with some blood; no fragments. Treatment, sedatives, stupes, baths.

28th.—Since last report passed several well-crushed pieces of stone, phosphatic deposit, with some layers of lithic acid. Parts so calm that I was determined to use the lithotrite again.

Assisted by Mr. Adams and Dr. Bennett, the patient was placed and chloroformed, and the bladder was injected with five ounces of warm water, and the fenestrated lithotrite introduced, several large pieces were broken up. Five times the instrument was used with good effect, and then taken away. The injected water instantly rushed out, slightly tinged with blood. Opiates, stupes, &c.

29th.—Had a good night; passed water sometimes, and a great quantity of detritus, and several small pieces of stone. Not the same urgent desire to make water, and the bladder somewhat more retentive.

August 3rd.—Since last report passed a large quantity of fragments, but for last twenty-four hours none; bladder quiet; rest fair; appetite good. Again applied the lithotrite, assisted by Mr. Adams and Dr. Bevan, the patient having been chloroformed, and the bladder injected with five ounces of water previously. Four applications of the instrument were made at this time, and with great advantage, considerable-sized pieces being seized and broken up. The patient awoke after the instrument was withdrawn, and the operation completed without being aware anything had been done to him. So he went on gradually improving, numerous pieces, and of considerable size, being passed, as well as a large quantity of detritus.

On the 10th of August, again assisted by Mr. Adams and Dr. Bevan, I used the lithotrite, previously throwing six ounces of water at 100° into the bladder, and dulling sensibility by chloroform. Several small pieces were seized and crushed, and one large fragment measuring three quarters of an inch. Owing to the quiescent condition of the patient, and the improved retentive power of the bladder, great service was rendered by this operation. With the greatest gentleness six times the instrument was applied, and crushed away portions of stone; and after its withdrawal, though water gushed out, yet no blood tinged its colour. We looked most favourably on all that had been effected by this procedure.

August 11th.—Had an excellent night's rest; drank freely of barley water, and seltzer water and sherry, and broth. There was a large and healthy secretion of urine passed, with increased power by the bladder, and attended by the expulsion of nearly a tea-spoonful of small fragments. Again the immunity from pain now was very marked; the patient entirely lost the straining after passing the last drops of water. All these conditions were improved up to the 17th, when a new complication showed itself—inflammation of the right and left testicle. The amount of stone in fragments and detritus passed up to this time and collected, irrespective of what could not be saved when the patient's bowels were moved, weighed more than three drachms (exactly three drachms and five grains). None passed for two days previous to the above date, and there was no suffering before making water, and but little after, no impulsive desire to pass it; and all this time the character of the water was quite changed; all pus and mucous had ceased to be present. I should mention that the patient has been for the last fortnight taking a mixture of hops, buchu, and dilute nitro-muriatic acid, and opiates steadily administered. For several days after the above date the inflamed testicles were very troublesome, attended with the most severe darting pains through them and down the thighs. The treatment I submitted him to, constitutionally and locally, was the following:—Lint soaked in a very strong solution of watery extract of opium and belladonna, and laid over the testicles, well supported on a pad placed between the legs, and a towel passing beneath across from one thigh to the other, together with relays of warm stupes outside the narcotic dressing, all covered with oiled silk to retain both heat and moisture; while a pill was given containing a grain of calomel,

half a grain of James's powder, a grain of quinine, and a grain of opium every fourth hour; also, a full opiate at night, with morphia suppositories (quarter grain in each) two or three times in the twenty-four hours to relieve uneasiness about the rectum. Under this treatment the inflammation quietly subsided, the acute sufferings and symptoms ceased. Now the pills were stopped, and the soothing local means continued. Thus the patient rapidly improved up to the 23rd, when he had but little to complain of. I then sounded him, but could not detect any stone, as there was not sufficient water in the bladder. I again examined him on the 25th with a like result. The patient felt so well that he put on his clothes and walked into the drawing-room wonderfully strong, and without assistance.

25th.—Passed a good night, only disturbed once to make water; character of the water much improved, and in a full quantity; testicles nearly restored to normal size. The right one, however, is still a little fuller than it ought to be; parts well supported with a suspensory bandage.

27th.—Much as on yesterday; went out to drive in an open carriage, and the night after did not feel altogether so well; he had more frequent necessity for making water, and pain both when passing it and after; stupes, sedatives, &c.

29th.—Did not feel so comfortable about the bladder; great frequency in making water, and on this morning and yesterday both mucous and a little pus passed in the fluid, with the alkaline smell that so strongly characterized it in the first instance. I suspected from his return of suffering, and the changed character of the water, that some portion of stone must be still in the bladder, and on sounding him carefully confirmed my suspicion by audibly striking a considerable sized piece. Having sounded the patient so carefully on two occasions before he was allowed to go out and drive, and not being able to discover the presence of any foreign body, I was led to the conclusion that this portion of stone now discovered had got into some pouch in the bladder, remained there quiescent for several days, until by the jolting of the carriage it was thrown again into the vesical cavity, producing its unmistakable train of symptoms as evidenced at first. I at once decided on the application of the lithotrite. Confining the patient to bed the day before, on August 30th, at 11 a.m., assisted by Dr. Adams and Dr. Bevan, the patient was placed under the influence of chloroform, and the bladder injected as on former occasions. Then I introduced

the fenestrated lithotrite and seized and crushed a very large stone, measuring more than three-quarters of an inch, and next applied the instrument to several fragments, five applications of the instrument in all. A large quantity of detritus was expelled with the water on the lithotrite being removed. The man quickly recovered from the chloroform, having suffered no pain, being quite unconscious that anything had been done to him; an opiate in an hour's time, stupes, &c. 4 o'clock p.m.—Free from pain; no return of uneasiness in the testicles, though a renewal of this troublesome complication I greatly apprehended. Repeat opiate at bed time.

September 1st.—Passed three very large fragments. September 2nd.—Passed several large fragments; quantity and character of water greatly improved; he has continued his buchu and nitro-muriatic acid mixture steadily, as well as opiates both in draughts and suppositories; pain before and after making water considerably diminished; appetite excellent, and sleeps well.

September 6th.—Again used lithotrite, crushing four good sized pieces. 3 p.m.—Several small pieces came away and some detritus.

September 7th.—No additional pieces passed; good night; free from pain, except after passing water.

September 12th.—Again introduced lithotrite, assisted by Dr. Bevan; patient under chloroform; broke up four pieces, and removed with scoop lithotrite a large quantity of small bits and detritus. Again on the 16th used the fenestrated lithotrite, assisted by Dr. Bevan; broke up many pieces and removed several small ones with the scooped instrument; I was struck by the size of one piece crushed at this operation. On the 23rd September sounded again, owing to symptoms indicative of pieces still left behind. After throwing into the bladder six ounces of warm water I discovered a large piece, and at once passed in the litho-trite and broke it up into several pieces, each again being caught in the broad shaped instrument and reduced to smaller pieces. All this procedure was carried out under the influence of chloroform, and the patient was not sensible of having been meddled with; no trace of blood after any of the past operations. 3 o'clock p.m.—Some pain along whole track of urethra; the patient passed off several large fragments, some as large as a pea, and very sharp and irregular, some of them of so great a size that it really was difficult to conceive how they could get away simply by the force of the current of the water. It must be remembered, however,

that now the tone of the bladder was greatly restored—very good, and by which he was enabled alone to expel these pieces, and also to retain a large volume of water to impel and float them away. Opiate-stupe constantly applied over the pubis.

24th.—Had sleep; passed several pieces of stone, and fully a table-spoonful of small detritus; stupes.

25th.—Had an excellent night, and looks very bright and happy; passed away several pieces more, of well broken up stone, and a good deal of detritus; altogether from this last crushing more than a dessert spoonful of fragments and detritus has been passed.

26th.—Three large pieces passed. 29th.—Out driving on yesterday, and no pain, neither after passing water. 30th.—Out driving, and no pain.

October 2nd.—Passed a lithotrite (a small one) to examine the bladder. Having previously placed the patient under chloroform, and injected six ounces of water at the temperature of 100°, assisted by Dr. Bevan, I discovered, after much search, one small piece, which I caught and crushed into powder. A good deal of detritus was removed with the scoop lithotrite; no blood from the operation.

October 3rd.—Slept well; passed a good deal of water and about a tea-spoonful of small pieces.

October 7th.—No more stone passed; no pain after making water, or at any other time; has been out walking and driving in an ordinary cab over the paved streets, yet without any uneasiness or desire to make water. I passed a small sound, and most carefully examined the bladder, without being able to detect the least fragment of stone. On the following morning, 8th of Oct., the patient was placed under chloroform by Dr. Bevan. I injected the bladder with six ounces of warm water, then introduced the scoop lithotrite and swept every part of the bladder with it, turning the instrument down behind the prostate, and at the same time passing the index finger of my left hand up the rectum so as to tilt forward any pouch of the bladder that might conceal a fragment. Yet, by the most searching examination, I could not detect the least portion of stone. Thus, after the eleventh operation, the patient was entirely freed from this enormous stone, and most successfully cured.

October 14th.—Visited the patient this day; during the past week has been out walking and driving every day, and feels relieved from every anxiety and pain; no forcing in making

water, and has gained strength and physical power in a most remarkable manner.

In the management of the foregoing cases, I have laid great stress upon the gentleness with which the lithotrite was introduced into the bladder in every instance. The practitioner must never lose sight of the fact, that it is a widely different thing to pass a straight instrument into the bladder, and making the urethra straight for the instrument, a proceeding which never can be accomplished, owing to the manner in which the membraneous portion is tied up to the pubis by ligaments before and behind, and strong reflections of fascia which render it and the prostatic portion of the canal permanently concave to the bladder. The lithotrite, warmed and oiled, should be passed down to the opening in the triangular ligament, and then the handle of the instrument depressed well between the thighs with a gentle onward movement, when it glides without opposition into the bladder, thus representing in its introduction a lever of the first order. The instrument once in the bladder must be handled with the greatest lightness, and carried to the superior fundus and back part of the bladder, when most likely it will touch the stone; then in withdrawing the male blade the calculus very often falls into the lithotrite. If it should not do so I would say, on the surgeon touching the stone he can easily determine on which side of the instrument the calculus rests; then he should turn the instrument gently to the opposite side, open the blades, and so opened throw it over the stone to the other side, and thus on closing the instrument he will find, most likely, the calculus has been caught; if not, or if any doubt as to the relationship of the stone and instrument exists, the operator should again open the blades of the instrument and cast it to the opposite side over the stone, and then probably he will be more fortunate in securing the foreign body. However, generally speaking, the slightest lateral movement of its blades will determine on which side the stone lies. In this quiet way *the instrument may be applied to the stone in the happiest manner.* Again, as reported in many of the foregoing cases, the lithotrite on entering the bladder, was for a moment held quietly, and the instrument steadily, while the male blade of the instrument was insidiously introduced so as to transverse the lower part of the bladder, the centre of the bladder, and the space beneath. After the stone fell into the jaws of the instrument it was secured and rapidly crushed. There is a movement

which I have practised in one or more of the foregoing cases with the lithotrite, and which I have also alluded to in using the forceps in lithotomy as a means of securing a grip of the stone, adverted to, by Sir B. Brodie. I shall quote his own words. If on the introduction of the lithotrite within to the lower and back part of the bladder, and on the separation of its blades, the stone does not fall into the lithotrite, "the forceps, without being moved from its situation, may be gently struck with the hand on one side, or on its anterior part, and the slight concussion thus communicated to the bladder, will probably be sufficient to dislodge the calculus and bring it within the grasp of the instrument. If it should be otherwise, the forceps being closed may be very gently and cautiously turned to one side or the other, so that the curved extremity of it may make an angle of 25° or even 30° with the vertical line of the body, then opened and passed in the direction of the rectum, in the manner already described."—(*Trans. Med. Chir. Soc.*, Vol. XXXVIII., p. 174.) The chief advantages of this proceeding is to place the instrument in a position presumed to be advantageous, *and to bring the stone to the instrument.*

On the perusal of the foregoing cases it will be perceived that I do not approve, after crushing the stone, of working away in extracting the fragments; if the urethra is free, and in that condition which would warrant lithotrity, the fragments must be left for expulsion by the contractile force of the bladder itself; it may be said, the bladder in its deranged state, so contracted, so irritated, cannot expel the detritus; if the bladder is in this state I would say cut the patient; if the bladder is in this condition that it has no power in expelling its contents, and so the broken up fragments, surely the most sceptical must admit, it is in no state to admit with impunity, without seriously resenting the irritability and violence created by the oft-repeated introduction of lithotrite, or catheter for the suction bottle, to mechanically extract those portions of stone recently broken up. When the bladder is inflamed even secreting pus, absolutely on the verge of ulceration in some patches, how can it be credited that this practice can prove salutary? No doubt, in some instances, cases seen early before all the serious consequences of stone in its advanced stage are set up; the calculus may be broken up into fine fragments, and extracted piecemeal, with good instruments and a steady hand, without much pain and with little or no harm to the patient; and yet his urethral membrane may be torn, as I have seen by this quick method and

extravasation of urine occur, and I doubt not that this method may lay the foundation for permanent stricture of the urethra. I must emphatically say I do not sanction this method in even any of the cases that will bear it; but, the large mass of cases of stone in the bladder in the adult and old, will not permit such obtrusive meddling. The irritability is so great, the changed tissues of the parts by disease are rendered so sensitive, that the surgeon will be fortunate if even, after preparatory sedative and soothing means, he can get an exploring instrument, sound, or lithotrite into the bladder; and when fortunate in doing so and making himself accurately acquainted with the nature of the case, he is glad to pause, and consider the most suitable way of removing the foreign body, if the urethra is sound, though all this terrible anxiety about the bladder, he may and possibly will decide on crushing the stone, gently using the instrument for a few applications to it; first, in its primitive size, and two or three times after to its larger fragments, and then leaving them to be cast out by the efforts of the bladder in expelling the urine; and it is very remarkable, at least so I have constantly observed, when, after the stone has been well and carefully broken up, how soon the terrible excitability subsides, the sharp edges of the broken pieces are soon smoothed down, and on the second or third day large quantities of detritus are expelled, though for the two former days scarcely a fragment had come away. The irritability being subdued and the muscular tone of the bladder developed, a larger quantity of water is retained, and a greater expulsive power is restored, and so the fragments now begin to pass with the larger and more certain continued stream.

However fortunate the surgeon may be in crushing the stone in properly selected cases, yet there are others, as I have before adverted to, where the knife offers a far better chance of success. When, for instance, the case is of a long standing, with the vesical symptoms greatly aggravated, the bladder contracted with its mucous membrane highly inflamed and even secreting pus, when the prostate is enlarged and the "*bas fond*" of the bladder, deep, always holding in it a quantity of fetid ammoniacal urine and pus, when the urethra is hard and rugged, and spoiled in its natural structure from repeated attacks of inflammation and venereal excesses. In these cases a direct passage into tbe bladder by the lateral method of lithotomy is the correct mode of proceeding. In a few seconds the stone is taken out, the source of irritation removed, the fetid contents of the bladder has a ready outlet. I have no fear of

dividing the enlarged prostate; if moderately done, it will in most cases then yield to force, sufficiently for the purpose of extracting the stone without passing beyond the fascial covering of the gland. I admit, in some instances, the prostate is very firm and rigid, and will not tear, then the surgeon should pass the index finger of his left hand into the opening, and on it convey down the blunt pointed knife and divide the rigid parts. Sooner than cut extensively I prefer breaking the stone than extracting it in pieces through the wound, and then washing out the bladder. If the opening through the prostate be carefully executed by limited section and forcible dilatation or rather tearing, there need not be much apprehension of serious bleeding from the prostatic plexus of veins or vessels. I shall detail a case where I removed by this careful section from a gentleman, aged seventy-eight years, the large number of twenty-seven calculi.

Lithotomy on a Man, aged seventy-eight—Twenty-seven Calculi, varying in size from a pea to a large marble, removed by the Lateral Method.—J. N. came under my observation, through the kindness of Dr. Ledwich, a short time since. The gentleman had been suffering for several years from irritation in his bladder, mucous urine, &c., and latterly with so much difficulty in making water that he came up from the country for advice. Dr. Ledwich and myself sounded him carefully, suspecting the presence of stone. The patient was placed in the recumbent position, and the sound carefully passed, and the instrument made to explore in every direction except the "*bas fond*," which could not be reached, owing to the enlarged prostate; I then passed the index finger up the rectum to lift forwards the pouched bladder, but this movement, so often successful, failed to give information as to the presence of the stone. I next withdrew the sound, and passed a hollow one, placing the patient in the erect posture and allowing the urine to flow off gradually, and succeeded in striking a stone even audibly; towards the end of the flow much blood and pus was passed, and attended with great irritability and suffering. On considering the age, pain and suffering from the least attempt at retention of water, the rugged unnatural state of the urethra, we came to the conclusion, in consultation, of the propriety of cutting him rather than crushing the stone. Assisted by Drs. Ledwich and Bevan I cut him by the lateral method, and after the manner to a certain extent which I have described for children. The patient was laid on a table; the rectum having been

emptied by a water enema early in the morning, and the urine retained. He was then brought under the influence of chloroform; I introduced the staff, and satisfied myself and those standing by of the presence of the stone; he was then tied hand and foot according to the usual method, and drawn well down to the end of the table; the knees were kept apart, and the staff was held by an assistant well up to the pubis, and the scrotum likewise; the first incision was commenced an inch and a-half in front of the anus, carried outwards and backwards, fully an inch behind the latter, and somewhat nearer to it than the ischium through the skin and fascia; I then struck the knife into the groove of the staff close up to the anterior part of the incision, passed it gently from side to side to make certain of its safe position, and divided freely back the membraneous portion of the urethra, and then freely cut outwards all the parts to the back of the first incision. I next introduced the index finger of my left hand along the staff to the prostate, and run along the groove of the staff the blunt pointed knife, following it with the index finger on its back, and pressing it downwards and backwards lightly, and thus dividing the prostate in the most measured way, and to a small extent. When a gush of mucous and urine flowed out I retained my finger in the bladder, withdrew the staff, and on the former introduced the gorget, and by it the forceps, extracting by repeated efforts the large number of twenty-seven calculi, one or two sometimes, two or three sometimes together, as they varied in size from a pea to a large marble; they were all soon removed, as I satisfied myself by introduction of my finger The entire time taken from the time he was chloroformed, bound up, staff introduced, cut, and twenty-seven calculi taken out, only occupied thirteen minutes, as marked by one of my students present. There was no bleeding, from the careful way in which the prostate was incised. He awoke quickly from the chloroform, and was quite unconscious that any operation had been performed. The following case is most interesting as occurring likewise in the very old subject, where calculus had existed for a long time, and all its attendant train of misery, where lithotrity had failed, and yet when in the most unpromising condition I cut him by the lateral method and extracted the stone with the most perfect success. The particulars of this case, as President of the Royal College of Surgeons, I detailed to the Surgical Society of Ireland the very evening after the operation

Lateral Operation of Lithotomy, successfully performed for the removal of a Large Calculus, after Lithotrity had failed.—The patient was a labourer, aged sixty-eight years, and was admitted into Mercer's Hospital under my care in April, 1867. He stated that he was a sufferer from stone in the bladder for four years; throughout the greater part of this time his sufferings were excessive. Four months before his admission the stone was detected by an able surgeon in the country, and lithotrity performed upon him. A few fragments were broken off and expelled from the bladder; soon symptoms of irritation set in, and no further attempt made of breaking up the stone. A few weeks after he was sent from the country and placed under my care.

The patient suffered most intensely after the journey the day after admission to hospital; he was writhing in torture, ever trying to pass a few drops of water, and always an aggravation of suffering after the effort and the issue. The usual means for subduing inflammation and irritation of the bladder were had recourse to; the warm bath, hot stupes over the vesical region and perineum; the internal administration of sedatives and antispasmodics, together with wine and stimulants, and strong broths to sustain the wearied powers of life. I would wish to lay great stress upon the necessity of attending to position in cases similar to the present—the hips and loins of the man were raised upon pillows far higher than his chest and head, which lay on a horizontal plane, the object being to allow the stone to fall back from the irritated and most sensitive neck of the bladder, and so when the organ even was empty that its weight should be directed by gravity backwards. I cannot illustrate the force of this position more strongly than by quoting a case from my work on Operative Surgery, when for several years the patient selected it for himself as most bearable, and for such a length of time as to cripple up the lower limbs beyond the power of extension; in this state he was brought over from Wales to me for operation. The case is thus described. (*Butcher's Operative Surgery*, p. 735). George Martin, aged seven years, admitted to Mercer's Hospital, May 29th, 1860. He was a native of Wales, and brought over to be placed under my care. His father was a sailor, and gave a most graphic account of the boy's pains and sufferings. He stated that for three years and a half the boy was affected, and that for two years he was almost constantly confined to his bed. His suffering and agony was so great in the act of making water that sometimes he would rush out of the bed

screaming and tearing the prepuce and penis, and even pitch himself with the greatest violence against the wall to try to kill himself when a terrible fit of the stone would seize upon him. Latterly he was quite bed-ridden and incapable of straightening his limbs, *owing to his always assuming one position in the bed, so as to* obtain comparative relief. The boy always lay upon his back, with his buttocks and hips propped up, supported far higher than his abdomen or chest, and this was with the intention that the stone should fall back towards the superior fundus of the bladder, and away from its sensitive neck. The presence of the calculus was detected in Wales, but all operative interference deferred from time to time; at length worn out, emaciated with suffering and torture, the boy was brought over on the above date and placed in hospital. His appearance was truly pitiable; he was worn almost to a skeleton, and his haggard look of suffering, apprehension, and terror was pitiable to witness. When I first saw him he lay in the remarkable position which I have described; and then his father detailed to me those particulars which I have just mentioned. His knee-joints were stiffened, and his hips were stiffened; the legs being flexed upon the thighs, and the thighs upon the pelvis; the spine had also a slight inclination forwards, from the manner in which the head had been constantly propped up. When the boy was placed upon his feet he could not elevate his trunk or straighten his limbs, but at once placed his hands upon his knees to prevent his falling forwards. I sounded the patient, and detected readily a very large stone, which by measurement exceeded far and away any that I had before met with at this early age. I cut out the stone strictly after the manner which I have described in the early part of this paper. The calculus was of great magnitude, growing for years; in weight one ounce and a half; its size is accurately delineated in Plate 51, Fig. 7, and its appearance on section Fig. 8, (*Butcher's Operative Surgery*).

The report goes on to say—"On the 20th of June, all the urine passing by the penis and wound rapidly closing up; the limbs permit of considerably more extension. On the 25th—wound in perineum all healed, and the irritability of the bladder all gone; the little fellow can retain his water all right, and he has erections without pain; the limbs have now entirely lost their rigidity, and the boy can stand up quite straight. On the 30th—he was up and *walking* about the ward for the last two days; the bladder has regained its full tone and power both in retention and expulsion.

On this day he was dismissed cured, and left the hospital with a little fellow also cured, who was cut for the stone the same morning as himself." To come back to the important case under description. After some time the patient's sufferings were comparatively lessened, and by a perseverance in the adoption of those means which I have alluded to, with but little variation, for some days, the urgency to make water, and the rapid demands to do so, were not so oppressive; from being up some ten or twelve times in the night, and nearly as often by day, as was the case on his first admission, tranquil rest at night for a couple of hours together was insured, and probably as long intervals of repose by day; nevertheless the case was still a very extreme one, surrounded with difficulties and risk. On examination by the rectum, the prostate was discovered considerably enlarged, the lateral lobes almost in equal proportions (the right half somewhat the larger), forming a large massive tumour. I sounded the man, to make certain of the presence of the stone, in reference to which none of the equivocal symptoms were absent. The greatest gentleness was adopted in the introduction of the sound, yet it was by no means an easy matter to make it lightly travel over a very rugged urethra. The size of the instrument employed was a medium one, No. 9 of the catheter scale. On the conveyance of the instrument into the bladder extreme torture was experienced, as scarcely any water could be retained either by the efforts of the patient or by artificial supply. The bladder would not distend, therefore the range of the sound was very limited; it seemed gripped. I then passed the index finger of the left hand into the rectum, and felt the bulging of the bladder backwards, and through the coats of it and those of the rectum, readily felt the stone, and lifted it up to the sound, striking upon it with a sharp and audible click not to be mistaken, and recognizable some feet from the bed. Certain now as to the presence of the calculus, its locality, and the pathological state of the viscus itself, as well as that of the prostate and parts around, I at once removed the sound as quickly as I could, and with as much gentleness. I measured the stone, and found it to be in one axis an inch and three-quarters, and an inch in another. Considerable irritation was set up after this examination, and days of the most careful management were required to subdue it, on the principles which I have already laid down in similar disturbance, and as in relation to this case on admission to hospital. I may add, however, so tardily did the excitement subside, that I determined

on not again sounding him. From the contracted condition of the bladder, the enlarged prostate, the enfeebled state of the man from repeated suffering, now that a time of repose was obtained I considered it most advisable to remove the stone by the lateral method. The patient being prepared for the operation, the rectum being cleared out by an enema, administered the evening before, and on the morning of the operation by some warm water being thrown up; as no urine could be retained a few ounces of warm water, at the temperature of a hundred, was injected, and the bladder would not relax for the reception of more; so he was brought into the operating theatre, placed under chloroform, the staff passed, the stone struck, bound hand and foot after the method described, and brought to the end of the table; the ordinary incisions were adopted, and the bladder reached, with the knife shaped as figured in one of the woodcuts in the early part of this paper, the instrument being, of course, larger for the adult subject. I did not find it necessary to use the blunt-pointed knife; the index finger of my left hand passed along the staff, lay within the neck of the bladder, and then the staff was withdrawn, and upon the finger the blunt gorget conducted to the bladder, and by the gorget the forceps. The gorget being taken away, search was made with the forceps for the stone; but the bladder was so contracted, and the prostate so large that it could not at once be discovered, I quickly passed the index finger of my left hand up the rectum, and lifted the stone into the chops of the forceps and commenced to extract; a good deal broke away from the stone, and it slipped loose, but by the same manœuvre I instantly caught it again, and extracted a large piece, fully the size of a hazel-nut, this being the nucleus, and pronounced by Dr. Haughton to be composed of oxalate of lime. I next with the forceps and scoop removed a large quantity of considerably sized fragments, and a good deal of detritus, and then washed out the bladder, and passed my finger all round its cavity to make certain no second stone existed, and that all the fragments were removed. There was scarcely any blood lost, and but a very few moments passed in executing the operation. The staff used was such as represented in the woodcut, proportionately enlarged, and I cannot speak in too high praise of the form of the staff—to these points I have before adverted. I have mentioned I did not use the second or blunt-pointed knife in this case, because I wished to make the least possible opening in the prostate in the first instance, and having got my finger into the bladder I dilated

sufficiently. As to the advantages of the blunt-pointed knife depicted in the woodcut, they are dwelt on when speaking of lithotomy in the infant and the child, and in the deep perineum of the old its value is incalculable. The *canule a chemise* was introduced and fastened in its birth. I have mentioned the more fragile layers of the stone were broken down when grasped by the forceps. Had I not been able to extract it through the small aperture which I made into the bladder, I was prepared with a lithotrite to break up the stone rather than increase the opening in the diseased prostate and irritated structures around. Under similar circumstances I most assuredly recommend this practice as the best.

On April 3rd the report taken states patient doing well; not a bad symptom. On May the 4th the wound was healed up, and on the 18th the patient was dismissed, and with perfect power over the bladder either to retain the water, to check it in its flow, or to expel it with greater force. I could enumerate other cases to substantiate my views upon these subjects, but I consider what I have stated is sufficient, as in their recital they would only be a repetition of the facts which I have laid down exactly in a practical point of view, and as I have learned them.

The subjects considered in this paper are of the highest importance. The presence of calculus in the bladder at any period of life is surrounded with difficulty, and carries with it imminent peril to the sufferer; therefore it is that I have made the subject my special consideration for a long time, and hesitated in recording my views until I had practically noted down and learned the lessons which I now offer to my professional brethren, being well assured they will stand the test of trial, and, above all, if carried out, will afford security and cure to the unhappy creature affected with stone in the bladder, be he young or old.