

lithotrite of Chismore I have employed but once, and cannot say that I found it advantageous.

**Washing-tubes.**—Bigelow's tubes (Fig. 110) are equal to any others. The large terminal eye, when placed just within the vesical orifice, acts quite as thoroughly as can any straight tube. Although I formerly used a straight tube I have abandoned it. Its introduction causes a great deal of bruising and it has no special advantages. Guyon's tube, which has two eyes, is excellent to search for the last fragment, for the water rushing through its two eyes causes more commotion of the contents of the bladder than occurs with any single-eyed instrument. But in my hands it seems more liable to catch the bladder wall, and therefore I rarely use it. To catch the last fragment I prefer a tube of my own (Fig. 111), which is, for all purposes of introduction, a short curved sound. Its eye is on the concave side of the junction, between shaft and beak, and is protected by an obturator. It has also a stop-cock in its shaft to prevent the escape of fluid from the bladder when the obturator is withdrawn. I find it most useful when introduced and turned beak downward. Its tip then depresses the floor of the bladder into a dependent pouch whose contents are readily aspirated into the eye which overhangs it.

**Anesthesia.**—Small stones may be aspirated whole or crushed and aspirated from a tolerant bladder without anesthesia. For the majority of cases I have found local anesthesia unsatisfactory. The patient usually suffers a good deal, and his straining may interfere very seriously with the manipulations. When local anesthesia is employed  $\frac{1}{4}$  grain of morphin should be administered hypodermically and 2 ounces of whisky by mouth a quarter of an hour before operation. Five minutes later a few drops of a 10% solution of cocain or eucain-B are instilled into the posterior urethra. Five minutes after that 100 grammes of a 2% solution are injected into the bladder. Five minutes later the operation may commence.

This method has not given me any satisfaction, and the use of cocain is not without its dangers. I prefer general anesthesia. For short operations nitrous oxid suffices; longer ones require ether or chloroform.

**The Operation.**—This is litholapaxy—to catch the stone with an instrument passed through the urethra, to fragment it sufficiently for the detritus to pass out through a tube, and to suck out the *débris* by some suitable apparatus.

The patient is placed upon the operating table on his back with his feet widely separated and a sand-bag beneath his hips. He is then catheterized and 100 to 175 c. c. of warm boric-acid solution injected into the bladder. A lithotrite, selected in accordance with the

size of the stone, is then introduced (Fig. 112). It may have to be assisted over the prostate by pressure on the perineum. Once in the bladder, the instrument is passed gently onward until its jaws touch the back wall. Then, gentle tappings along the side wall quickly indicate the position of the stone. When this is found, the jaws of the lithotrite are turned away from it, opened, returned while open over the spot where the stone was found, and, being gently closed, the stone will be grasped. The screw power is now thrown on by the aid of the button in the handle, and a half turn given



FIG. 112.—SHOWING THE MANNER OF HOLDING THE LITHOTRITE WHEN OPENING AND SHUTTING IN THE SEARCH FOR FRAGMENTS.

to the screw. This fixes the stone. As the half turn is being given, the jaws of the lithotrite are to be gently moved away from the bladder-wall towards the centre of the bladder. If a portion of mucous membrane has been entrapped with the stone, the operator instantly appreciates it as an obstacle to the easy rotation of the shaft of the instrument. In such case the jaws are unlocked, the stone allowed to drop out, and another effort made to catch it more cleanly. If the instrument rotates freely to the centre of the

bladder, the screw power is firmly applied and the stone fragmented. The large fragments fall on either side, and are easily picked up and again and again fragmented.

With a fenestrated instrument there is no occasion to stop to clear the jaws or to test them for clogging. The work goes evenly on until the operator infers that he has manufactured enough *débris* to make a creditable wash, and then a tube, as large as the urethra will admit, is introduced, the washing-bottle coupled, the stop-cock

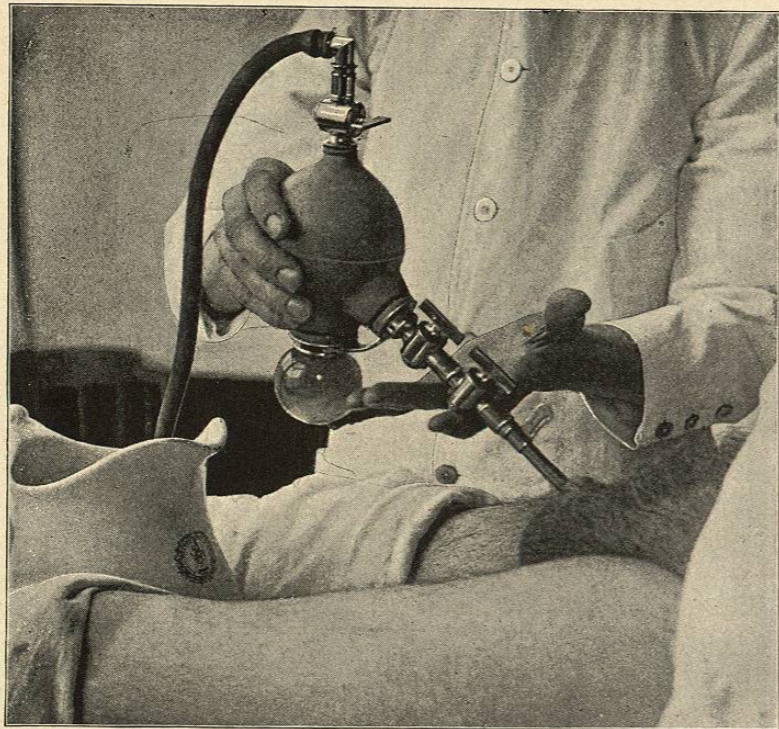


FIG. 113.—SHOWING THE MANNER OF HOLDING THE BULB. THE LEFT HAND HOLDS THE WEIGHT WHILE THE RIGHT MANIPULATES IT.

turned, and by alternate compressions and relaxations of the bulb the fragments are sucked up into the bottle and fall into the receiver beneath (Fig. 113). Care must be taken to allow no air to enter the bladder. In the case of small tubes this is best averted by pausing in the introduction, when the eye is yet within the prostatic sinus, and filling the tube from a piston syringe. If the tube is large the bottle is simply coupled before the eye reaches the bladder; then, having turned on the stop-cock, the operator waits a moment until he hears the air which was contained in the tube bubble up within

the bottle, there to remain out of harm's way in the air-space at the top. Now the bulb is compressed, the prostatic sinus is flooded, and the end of the tube, as it were, floated in through the open gate at the bladder's mouth.

If the tube becomes clogged by a fragment (which the competent operator at once recognises by the increased resistance to his pressure upon the bulb), a forcible compression of the latter will often dislodge the impacted body. Should this manœuvre fail, the bottle must be uncoupled and a catheter or other instrument run down the tube to drive out the impacted piece. Under no circumstances should a tube be withdrawn with a sharp fragment impacted in its eye, for the fragment will scratch if it does not tear the deep urethra and the result will be urethral fever if not abscess or infiltration.

The lithotrite is again introduced, some more *débris* made and removed, and so on until no further click of fragments can be heard as the water swashes in and out of the bladder either by the operator or by an assistant's ear placed against the hypogastrium. For this final search I use my tube (Fig. 111), sometimes supplementing it with Guyon's tube. The latter is especially liable to catch the wall of the bladder, and the unaccustomed ear may be deceived by the muffled, fluttering click thus produced. No description is adequate to distinguish the bladder click from the stone click, but a single experience should fix the distinction clearly in the surgeon's mind.

After the surgeon has thus satisfied himself that no fragment remains in the bladder, a catheter is again introduced and the boric-acid solution drained away. (There is no better criterion of the surgeon's skill than the colour of this solution. The more bloody it is the rougher has been the operation.) A few rapid washes suffice to clear the bladder of clots. The nitrate-of-silver solution (1:4,000) is injected. As the last grammes are entering the catheter, the instrument is slowly withdrawn, so that the solution bathes the posterior and the anterior urethra. As soon as a few drops trickle from the meatus the catheter is reintroduced and the bladder emptied. The patient is then returned to his bed.

I know no operation of which the success depends so entirely upon the surgeon's skill and technic. What is most difficult to the novice is to crush the stone methodically and deliberately. The first catch and crush is usually easy, and perhaps in a given case it would be possible for an unskilled operator to make quick work of the larger fragments without any particular method; but long before the last fragment has been crushed such an operator will find himself pottering about in the bladder, never finding any considerable fragment, although the clicks upon the aspirators assure him that

there is plenty of work left to do. This deadlock may continue quite indefinitely, and the only way to avoid it is to know in exactly what part of the bladder the stone tends to lie and in exactly what part of the bladder the beak of the lithotrite is. The practised surgeon learns these things from the very first touch, and appreciates also the general contour of the bladder, its trabeculæ, saccules, etc. But the neophyte's only hope is to go slowly. He learns by the first grasp whether the stone lies to the right or to the left, whether near the neck of the bladder or far from it, and, accordingly, he can check his tendency to wander fruitlessly about by directing the blades of his instrument to this spot where the larger fragments are almost sure to be found, or by closing the lithotrite and using it as a searcher. It is scarcely necessary to say that the lithotrite has no wider range of motion than any other urethral instrument. It may be pushed forward and backward; it may be rotated; the shaft may be elevated or depressed a few degrees, but any turn of the shaft towards the right or the left is quite unnecessary, and likely to be dangerous. It is also to be noted that when the lithotrite is touching the base of the bladder it is opened by pulling the male blade forward, while to open it near the neck of the bladder the female blade is pushed backward. It is in general easier and safer to crush the stone near the neck of the bladder, and the instinctive tendency of the beginner to let his instrument gravitate towards the fundus must be overcome.

When a fragment is peculiarly elusive it usually lies in some kind of a pocket, from which it may be extracted by rolling the patient to one side or the other, putting him in the Trendelenburg position, or simply by depressing the floor of the bladder with the open lithotrite and imparting a succession of short, sharp jars to the patient's pelvis until the stone rolls into the grasp of the instrument.

**After-treatment.**—The course of diuretic water and urotropin is resumed as soon as possible after operation. If the bladder is very irritable a catheter may be tied in (p. 210), but as a rule I prefer to let the patient urinate spontaneously, and only use a catheter in case of retention, and for a routine boric-acid wash twice a day. The irritability of the bladder the first few days may be controlled by morphin or by opium suppositories. Nitrate-of-silver injections or instillations afford great relief towards the end of the first week, but they are irritating during the first days.

I consider it unwise to let a patient—especially an old man—get up before a week has passed. He may seem well before that time, but his soreness may return and mild cystitis occur if he gets up too soon. I have in many exceptional instances turned my pa-

tient out on the second day, but I do not think well of this. I have indeed operated in my office several times under cocain—and with no anesthetic in the case of small stone—but this again only in exceptional cases.

The after-treatment cannot be considered complete until the patient has been searched for stone one month after the operation, nor can any assurance be given that no fragment has been left behind until this search has been performed. On this occasion the aspirator with a small tube is the best instrument to use. It is, however, more irritating than the searcher.

**Complications.**—**Complications during Operation.**—The difficulties most commonly encountered in finding and crushing the stone have already been noticed. It may happen that the stone cannot be crushed, either on account of its great size or hardness, or on account of its position in a small-mouthed pocket. In any such case litholapaxy must be given up and suprapubic lithotomy performed immediately if possible. Clogging is quite impossible with a fenestrated lithotrite.

The complication most to be feared is inability to crush and remove the last fragment. If there is much sacculation or trabeculation of the bladder the last fragment is most elusive, and, rather than protract the operation unduly, it may be preferable to postpone its completion to another time. This concession can only be made with reluctance, since it forfeits the most brilliant advantage of litholapaxy—viz., the entire removal of the stone. Spasm of the bladder is a most annoying feature of operations under local anesthesia, but is rarely troublesome when a general anesthetic is employed.

**Post-operative Complications.**—After litholapaxy all the complications may occur that are met with after the various operations upon the urinary tract, from catheterism upward: retention, hemorrhage, mild or pernicious urethral fever, cystitis, peri-urethral abscess, epididymitis, or even the graver complications, suppression, surgical kidney (pyelo-nephritis), possibly even pyemia and septicemia; but, as a rule, a careful operation has no sequence but a little temporary discomfort for a week or less, followed by cure.

Impacted fragments in the urethra, one of the horrors of old-fashioned lithotrity, should never occur with this operation. If the bladder is left empty of fragments such a complication is obviously impossible. Should it ever occur, the foreign body may be pushed back into the bladder or removed from the urethra with a Thompson's dilator, or by one of the methods already alluded to (p. 40). Hemorrhage is usually checked by the nitrate-of-silver wash. Should

it be profuse and the bladder fill with clots, the easiest way to remove these is by the aspirator, using a small tube. Cystotomy is the last resort.

The commonest post-operative complications are those relating to the prostate and to the kidneys. If the prostate is enlarged and succulent it resents the rough handling to which it is unavoidably subjected and causes the patient much distress for the first few days. Epididymitis and abscess of the prostate are common complications of a litholapaxy roughly performed. But the most skilled hand cannot always prevent a prolonged post-operative prostatic inflammation which may make both patient and surgeon wish that perineal section had been performed. Less frequent, but far more dangerous, are the kidney complications. It is the old man with long-standing cystitis—perhaps one who has been often operated upon for stone—whose kidneys, worn out by retention and infection, are most likely to succumb. Lithotomy is much better suited to such cases, since the atonied, pouched bladder makes litholapaxy a very trying operation, while perineal section is quicker, provides better drainage, and permits removal of the prostatic obstruction causing the recurring stone. But it is vain to argue with these men; they are satisfied with the relief they are accustomed to obtain from litholapaxy and cannot be made to see its lurking dangers.

Relapse after litholapaxy may occur from one of three causes: (1) A fragment may be left by the operator; (2) a new stone may come down from the kidney; or (3) phosphatic reaccumulation may occur in an old catarrhal bladder. The first contingency is guarded against by the thorough search at the end of operation, and again a month later. The second is prevented by the hygienic rules already laid down, or is foreseen by establishing the presence of kidney stone. The third can be prevented only by lithotomy, and not always by that operation. Freyer states that he has had no relapses after litholapaxy, although he has performed it 610 times. I cannot pretend to have equalled this record, nor, I believe, can any other surgeon, but I am sure that litholapaxy, if properly performed, exposes the patient to no more danger of recurrence than does lithotomy, except inasmuch as lithotomy enables the surgeon to deal with obstructive conditions which cannot be reached by litholapaxy.

**Statistics and Mortality.**—Since no two surgeons recognise exactly the same indications for litholapaxy, no estimate of the mortality after this operation can be made without reference to the proportion of cases submitted to it. Thus I have had 18 deaths (9%) from 198 operations for stone in the bladder. Yet of my 157 litholapaxies I have only lost 7 (4%), and only 1 in my last 63 cases. That

one was a prostatic who persuaded me against my judgment, after many days of argument, to crush his stone. He died uremic on the fourteenth day after operation. Had lithotomy been performed upon him I believe he would have lived. Indeed, every one of my deaths after litholapaxy has been caused either by suppression of urine or by chronic uremia. Every one of my patients who has died after being operated upon for stone was over sixty, except one who was fifty-eight years old. Hence I repeat that litholapaxy should have no mortality. The only cause of death after litholapaxy is the uremia to which old men with chronic retention are so liable; and these old men, in whom the danger of uremia may be foreseen, should be submitted, not to litholapaxy, but to lithotomy, in order to give them every chance that rapid operation and good drainage will afford.

#### PERINEAL LITHOTOMY AND LITHOLAPAXY

Although perineal lithotomy is of a most respectable antiquity, it has, in conjunction with the suprapubic operation, been cast into the shade by the remarkable results of litholapaxy. Indeed, it is doubtful whether the cutting operation can ever regain its prestige as regards the young. But recent perfections of the technic, notably our increasing knowledge of the advantage of galvano-cauterization of the prostate, our better appreciation of the danger of uremia and the means of avoiding it, and the various refinements of anesthesia and antiseptics, combine to make lithotomy preferable to litholapaxy in an ever-increasing proportion of cases. Lithotomy is to be employed, not only when it is impossible to crush a stone, but also when it is impracticable—i. e., when lithotomy would mean a quick, thorough operation as against a tedious incomplete litholapaxy.

The scope of perineal lithotomy has been greatly widened by the application of litholapaxy to it. By this means stones of any size may be removed through the perineum; but it is my personal preference to extract unduly large or hard stones, encysted and adherent stones, and stones complicated by tumour by the suprapubic route, reserving the perineal operation—lithotomy or litholapaxy, as the case may be—for those cases of prostatic hypertrophy complicated by stone in which the stone cannot be dealt with by the urethra, and the prostate can be dealt with through the perineum; especially if the condition of the kidneys is such as to make a speedy operation and good drainage of the utmost importance.

Lateral lithotomy I shall not describe; it has been replaced by perineal litholapaxy.

**Preparation for Operation.**—The patient is prepared as for any perineal section (p. 201), and the instruments are the same as those employed in external urethrotomy, with the addition of stone forceps (Fig. 114) and scoop (Fig. 115) and a set of litholapaxy instruments.

**The Operation.**—With the patient in the lithotomy position, a grooved staff is introduced into the urethra and pressed forward towards the perineum.

The operator, seated on a low stool, punctures the perineum in the median line with a sharp scalpel, carrying it into the groove of the staff, making the external incision not more than an inch long. The surgeon's object is to open the membranous urethra, avoiding the bulb, for incision of the latter gives rise to annoying hemorrhage. It is therefore customary to guide the point of the scalpel by a finger (protected by a finger-cot) introduced into the rectum. With this finger the apex of the prostate is felt, and the scalpel is so introduced as to open the urethra just in front of this point, due care being taken not to open the rectum at the same time. Before removing the scalpel a blunt-pointed bistoury or Blizard knife is introduced alongside of it into the groove of the staff. The scalpel is

FIG. 114.  
LITHOTOMY FORCEPS.

withdrawn and staff and bistoury together pushed forward into the bladder. A female silver catheter is then introduced through the perineal wound and guided into the bladder along the staff. Immediately a spurt of urine assures the surgeon that he is not in a false passage. The catheter is then replaced by a grooved director and the staff removed. The surgeon then endeavours to introduce his finger, guided by the director, into the bladder. Any constricting bands are cut through. When a free passage has thus been made the director is removed. In the class of cases to which this operation is most appropriate the surgeon will now be confronted by a hypertrophied prostate or a contracted neck of the bladder. This must be dealt with according to his experience (p. 313).

When the finger reaches the bladder it usually comes immediately



FIG. 115.  
LITHOTOMY  
SCOOP.

upon the stone. This, if quite small, is extracted by the stone forceps; if large it is crushed and the fragments removed by forceps (Fig. 114) and scoop (Fig. 115), great care being exercised in the removal of angular pieces; or the entire stone may be reduced to fragments small enough to pass through the tube of the aspirator. A short, straight aspirating tube of large calibre (31 French) is useful for this purpose, and my tube for last fragments. Incision of the prostate, which forms part of the old operation for stone, is quite unnecessary, unless that organ is hypertrophied and requires incision for its own sake. Such incision allows much larger stones to be taken away whole; but it is preferable to crush large pieces and to remove them by the scoop or the aspirator. The crushing is effected by a strong lithotrite. Stones too large for such a lithotrite should be removed by suprapubic lithotomy. The operation is terminated by a nitrate-of-silver (1:4,000) wash, and a perineal tube is introduced (p. 204). The after-treatment is the same as for perineal prostatectomy (p. 306). There are no special dangers or complications connected with the removal of the stone. It is not always easy to crush or extract a stone lodged in some pocket tightly surrounded by a spasmodic bladder, and it is especially difficult to remove the last fragment behind a hypertrophied prostate. But if the prostate is dealt with at the same time, adequate drainage is assured, and any dust left behind may be expected to come away during the ensuing days with the irrigations.

#### SUPRAPUBIC LITHOTOMY

If in any case it is advantageous to see the whole bladder (cases of tumour, ulcer, or sacculæ), or if the stone is too hard to be crushed and too large to be handled by the perineal or the urethral route, the suprapubic operation should be performed.

The patient is prepared as usual by shaving, soap poultice, catharsis, and urotropin. The surgeon, his assistant, and the instruments are prepared as for any major operation.

**Instruments.**—The only special instrument employed in this operation is the colpeurynter (Fig. 116). This inflatable rubber bag is greased, introduced into the patient's rectum (after he is on the table), and inflated with some 300 c. c. of air or water. By this means the bladder is distinctly elevated out of the pelvis, and the space on its anterior wall uncovered by peritoneum is thus increased. But the assistance thus rendered is not often material. The practised surgeon can reach the bladder without the aid of the colpeurynter, and hence this ingenious device is little used. Several recorded