

lithotrite, by rotation of the handle of the instrument, is swept round a half-circle, until it looks backward toward the patient's rectum—assuming what is called the "reversed" position. To accomplish this manœuvre, it is necessary to depress the handle of the lithotrite between the thighs of the patient, changing the oblique direction of its shaft until it is in a line with the axis of the patient's body, or even below it (Fig. 98). This movement lifts the beak of the instrument toward

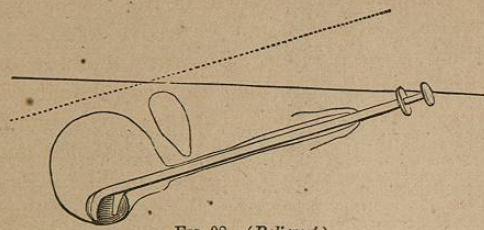


FIG. 98.—(Reliquet.)

the centre of the bladder, so that, while being revolved in its cavity, there is less danger of rough contact with its walls. Very possibly this rotation of the instrument may result in contact with the stone, and afford enough indication of the position of the latter to enable the operator to grasp it at once. If not, he should proceed to incline the open jaws of the lithotrite, first to one side to an angle of 45° , and close them, and then to the opposite side and close. For this manœuvre the lithotrite with smoother jaws is preferably used. The instrument with largest curve and longest jaws is rotated into the reversed position with some difficulty and pain to the patient; moreover, a stone so large as to require its employment could be almost certainly recognized and seized without reversing the instrument, certainly without reversing it completely. For very small stones—where there is an excavation at the base of the bladder, or to find a last fragment—still another manœuvre will be found useful, and for this the lithotrite with broad, smooth blade (Fig. 82) is to be preferred. The instrument being lodged in the bladder, is rotated into the reversed position, and gently withdrawn, until the concavity of its beak is almost in contact with the lower margin of the outlet of the bladder.

The male blade being now held firmly in position, the female blade is projected until it touches the posterior wall of the bladder, and, the handle of the instrument being raised enough to allow the broad extremity of the female blade to impinge lightly upon the floor of the bladder, the latter is gently drawn home—raking in, as it were, any fragment that might lie in its way.

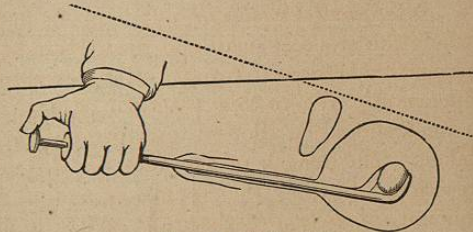


FIG. 99.—(Reliquet.)

In both of these latter manœuvres, in which the reversed position is employed for seizing the stone, the jaws of the lithotrite, with the stone or fragment in their grasp, are to be rotated back again into the upright vertical position in the centre of the bladder (Fig. 99) before the screw-power is applied.

By the aid of the three manœuvres which have been described, or of a combination of them, with possibly some modification required by exceptional cases, a surgeon of ordinary dexterity will be able to manage successfully any movable vesical calculus, if not excessive in size or hardness, without serious injury to the bladder. But careful study of the details of manipulation and practice upon the dead body should not be neglected. It is always to be borne in mind that these movements are to be conducted invariably with deliberation, and that gentleness and smoothness of motion are especially desirable. Every thing like a jerk or sudden movement should be studiously avoided. In opening, closing, and rotating the lithotrite, as little change in the direction of its axis as possible should be permitted; this change in direction is very liable to occur while the male blade is being screwed home, and at this moment vibration and lateral motion should be guarded against with the greatest care.

In withdrawing the lithotrite after crushing, care is required lest there may remain so much *débris* between its jaws as to cause abrasion of the neck of the bladder or of the urethra. The scale at the handle of the instrument, with which the eye of the operator should be familiar, will tell him if the jaws are well closed. If there be any doubt on this point, or if there is complaint of pain as they engage in the neck of the bladder, let him return the beak of the instrument to the centre of the cavity, and unload the jaws more completely by slight, successive movements of opening and closing.

Subsequent Crashings.—It happens in a certain proportion of cases, where the stone is small and the urethra healthy and capacious, that the patient finds himself completely relieved of his symptoms after a single operation. Where this is not the case, an interval of from three days to a week should be allowed to elapse before a second operation is undertaken. The length of the interval will depend upon the amount of reaction following the operation, and in some degree also upon the amount of *débris* discharged. After a first crushing this is usually not great, especially if the stone is hard—the fragments being mostly too large to pass. It is not customary to await the discharge of *débris*, unless, indeed, the amount be very considerable, in which case it is well to get rid of all that will pass within a reasonable time. The main point to be considered, in deciding how long to wait before a second crushing, is, whether the reaction caused by the first operation has subsided, or nearly so. This is to be determined by the amount of complaint elicited by pressure over the pubes, by the degree of irritability

of the bladder as shown by the length of the interval between the calls to urinate, and the condition of the urine as to the presence of pus, as compared with the state of the patient before the operation.

As soon as it is evident that no progressive trouble has been caused in the bladder, and that existing irritation is subsiding, the second operation should be undertaken. As a rule, it may be assumed that the bladder will show less sensibility after a first operation has been well borne. But exceptions are not infrequent. The presence of two or three sharp, angular fragments of a large, hard stone would tend to keep up irritation.

The object of the surgeon is now to reduce fragments to powder: he can, probably, make use with advantage of a lithotrite with shorter, smoother jaws, and allow himself a little more time for the operation. In other respects the manœuvres required are the same as those already described.

The escape of detritus after a second operation is usually greater; but this is not to be looked for too anxiously. If the object of pulverizing the fragments be thoroughly accomplished, the result may be safely left to take care of itself, unless the expulsive power of the bladder be defective. Too great anxiety to get rid of the results of a crushing is likely to result in impaction of fragments in the urethra.

The surgeon's increasing familiarity with the degree of tolerance of the patient's bladder will enable him to regulate the proper intervals of subsequent crushings as required. Usually, when conducted with proper precaution as to care and gentleness, these are borne better and better. The intervals between the calls to pass water become gradually longer, and other evidences of irritation of the bladder diminish in like degree. At length, sand and fragments cease to pass, and the surgeon has difficulty in finding a fragment in the bladder to crush, or fails entirely. As already stated, this result may follow a solitary crushing, or it may require a score of successive operations, or even more; usually, the number is from three or four to ten, before the evidence becomes apparent that the stone has been removed.

Is the patient cured? It is not always easy to answer this question, and it is very important that it should be answered with certainty, for the retention of a small fragment might become the origin of a new calculous formation.

The charge has been brought against the crushing operation that patients are more liable to relapse after it than after cure by the knife. The charge is probably unfounded in truth, but it obviously owes its aspect of probability to the results which have followed want of care in getting rid of last fragments. Thus, the detection of the last fragments, which is, in fact, the proving of the cure, becomes a point of much importance in the operation of lithotrity. Careful search should be made, therefore, with the lithotrite with short, broad jaws, by employing all the

manœuvres which have been described, if necessary, to verify the absence of any remaining fragment. Where all symptoms of vesical irritation have disappeared, and the microscope discovers no traces of blood or pus in the urine, the patient may be pronounced to be free from stone. But where the urine remains turbid, as is generally the case—for the evidences of cystitis always disappear slowly, and, in old cases, never entirely—and this symptom is increased, or blood is detected after motion, as in riding, and there is not absolute relief from tenesmus at the close of the act of urinating, then a decision should be deferred, and the search repeated. A small fragment is more readily caught when the bladder contains a diminished quantity of urine. The position of the patient should be varied by more or less elevation of the pelvis, according to the nature of the case, remembering that while a small fragment is usually found well back from the neck of the bladder, nevertheless, from its lightness, it is almost certain to be carried forward toward the outlet as the urine escapes. This latter circumstance is taken advantage of by employing a lithotrite with a perforated shaft, through which the urine may be permitted to escape, or injected, as desired, so that the amount of water in the bladder may be varied during the search. By placing the patient in a standing position, leaning slightly forward, with the jaws of this instrument held open at the neck of the bladder, and then allowing the urine to flow out, Sir Henry Thompson succeeded, in a very difficult case, in catching the fragment. Of course, in this manœuvre, the jaw of the male blade is held in contact with the outlet of the bladder, and only the female blade moved, both in opening and closing the instrument. Civiale's "trilobe" (Fig. 78) is also recommended by this skillful operator. It is to be held open at the neck of the bladder, in a similar manner, so that its three branches form a sort of pyramidal cage, with its apex downward, and in this, as the urine escapes through the hollow shaft of the instrument, the fragment is caught.¹ When there are sacculi in the walls of the bladder, or even slight depressions which have formed between interlacing hypertrophied muscular fibres, a small fragment might become so fixed in one of these as to escape detection. In such a case, full, free, and repeated injections of tepid water into the bladder would be likely to detach the fragment and bring it away, or, at least, within the reach of the lithotrite. It is favorable for the surgeon that, in searching for last fragments, he has usually to deal with a bladder in an improving condition, the tolerance of which he has already proved and established. Under these circumstances there is room for

¹ I succeeded in a case, after frequent disappointment, by the following rather rough and somewhat unjustifiable manœuvre. After opening the lithotrite in the usual position in the bladder of the patient, who was a little old man, I passed my right arm beneath his bended knees, and, holding the lithotrite and penis steady with the left hand, lifted his pelvis from the bed and brought it down again with a slight jolt. All that can be said in favor of this manœuvre is, that it was twice successful, and that it was followed by no harm.—VAN BUREN.

more freedom in manipulation, and, in the great majority of cases, there will be little difficulty in final success.

Complications.—It is well to consider what modifications of the operation may be rendered necessary by the presence of complications; for, although, when the stone has been discovered early, nothing is usually more simple and sure than its cure by lithotrity, there will be inevitably a certain proportion of old, neglected, and aggravated cases encountered in practice, which, by the aid of trained intelligence and skill, may also be brought within the scope of the operation. For these the alternative is lithotomy, with its increased risks to life. Even when the calculus has been discovered, while yet of small size, the sensibility of the urethra and neck of the bladder is, in some cases, so excessive and persistent as to constitute a positive obstacle to lithotrity. As a rule, where there is no serious alteration of texture, this extreme sensitiveness is gradually blunted by the gentle and judicious use of instruments during the preparatory treatment. But in some cases, happily rare, this result does not follow; and each exploration, however carefully conducted, is succeeded by increased frequency and urgency of the calls to urinate, with pain in the bladder, radiating, from its neck as a centre, to the hips, sacrum, perinæum, and hypogastrium. Exaggerated nervous susceptibility, of this kind, is not necessarily accompanied by pain on deep pressure above the pubes, or by increase in the quantity of blood or pus in the urine, and it subsides in a day or two, often sooner, to be renewed with undiminished force after each successive exploration. It is readily distinguishable from the consequences of mechanical injury to the urethra or bladder, from too rough use of instruments, by the absence of persistent febrile reactions, and of the positive symptoms of inflammation.

Occasionally the intense nervous irritability of the subject will manifest itself in the shape of a chill, sometimes followed by fever and sweat, sometimes not. This phenomenon occurs more frequently, possibly, in persons who at any time have been exposed to malarial poisoning, but not necessarily. A chill may thus follow each attempt at exploration of the bladder. Here the free use of quinine is sometimes beneficial.

This persistent hyperæsthesia is more often encountered in the young, but also in a fair proportion of old, broken-down subjects of urinary disease, and it is often due to perverted sensibility of the nerves which supply the sexual surfaces—mainly the prostatic urethra—and to the peculiar degradation of general nerve-power often associated with this morbid condition. It is analogous to certain forms of irritable stricture, and also to the nervous affection of the deeper portions of the urethra and neck of the bladder, already described as neuralgia of the vesical neck. It is often associated with more or less pusillanimity of character, and its victims not unfrequently become addicted to the habitual use of alcoholic stimulants or opium.

In a case of this kind which has resisted gentle approaches and failed to yield to quinine, when the surgeon has satisfied himself that the usual causes of exaggerated pain are absent, and that the urinary surfaces are in other respects in fair condition, his proper course is to have the patient placed thoroughly under the influence of sulphuric ether, and proceed at once to crush his stone.

Of course, when the urethra and bladder are thus rendered insensible to rough contact of the instrument, it will be incumbent upon the operator to employ even more deliberation, and more scrupulous care in his manipulations than usual, for he is deprived of the evidence of the patient's sensations, which ordinarily serve as a warning against neglect of gentleness, or precipitation in movement. With these precautions there need be no hesitation in the employment of anæsthetics. At present sulphuric ether is preferable, as by its skillful administration the patient can be more certainly rendered perfectly motionless without danger to life.

It has been hitherto considered wiser to abstain from the employment of anæsthetics in lithotrity save in exceptional cases, but, with the systematized manœuvres and the perfected instruments now in use, there is no reason why the trained and careful surgeon should deprive his patient, or himself, of the great advantages which it not infrequently offers in cases which are neither grave nor exceptional. It is true that in the great majority of the cases which present themselves for lithotrity, the trivial character of the pain of the operation renders anæsthesia entirely unnecessary, and it should never be employed to do away with the usual sensibility of the parts, in an ordinary case of stone; it is far better that these should be rendered tolerable by the regular systematic training to the contact of instruments during the preparatory treatment. This preparatory training is as necessary for the surgeon—to familiarize him with the condition of the patient's organs—as it is for the patient, to accustom him to the contact of instruments. For lithotrity in children, anæsthesia is a necessity; and, in women, the recognized propriety of its employment would tend to increase the usefulness of the operation. Experience has proved that the dangers anticipated from its use have not been realized, and we are justified in the conclusion that in careful and judicious hands they are no more to be feared than in other operations of surgery, where increased risk is more than overbalanced by increased advantages.

Atony of the bladder is a complication for which especial measures are required. It was formerly regarded as a serious, if not an insuperable, objection to the crushing operation; at the present time, in view of the success attending its management, atony is rather considered an advantage than otherwise, through the freedom from exaggerated and spasmodic contractions of the bladder which its presence insures to the operator. The loss of contractility may be partial—affecting only por-

tions of the bladder, and not the whole organ. It may be complicated with exaggerated contractility, even of other portions of the bladder-walls—recalling the condition of the uterus known as “hour-glass contraction.” By this latter combination of symptoms the phenomenon is explained, of calculi being retained in unusual positions in the bladder, contrary to gravity; as, for example, above and behind the pubes, giving rise to suspicion of sacculation or encysted calculus, when no such condition exists, and interfering sometimes with the success of the manoeuvres of lithotrity. Atony is also variable in degree, in the same patient, at different times. One day he may be able to empty his bladder completely; a few days later the surgeon may find a residual accumulation amounting to four or five ounces. As a rule, the contact of instruments employed in explorations, and especially manoeuvres with the lithotrite, stimulates a weak bladder to stronger contractions. But this recovery of power is not permanent; the atony returns, and often in a greater degree. It has been observed that atony has followed the successful cure of stone by lithotrity, assuming the relations of effect to cause. Such a result is neither unphysiological nor improbable. The phenomenon of contractility in muscular fibre is a peculiar manifestation of vital force, and one of its peculiarities is that undue excitement is followed by corresponding loss of power. If the excitement be excessive and prolonged, the consequent exhaustion may be permanent. The vesical atony may have been recognized only during the search for stone, in which case the latter should be left unmolested until the former has been treated, and the tolerance of the bladder established. The tendency of the bladder to fall into acute inflammation upon drawing off its contents would be greatly increased by the mechanical irritation of lithotrity, and there might be induced a grave form of general cystitis, tending to a fatal result through invasion of the kidneys.

By avoiding the dangers peculiar to atony, the treatment of calculous patients with this complication is usually followed by satisfactory results. It must be borne in mind, however, that it is a condition which exists more commonly than is generally supposed, and often escapes detection until bad results force it upon the surgeon's notice. When present it is a necessity for the patient to be taught to use a catheter for himself, whether he is to be lithotriized or not; and, where lithotrity is contemplated, this is an indispensable condition.

When this complication exists, it is always a matter of probability that the calculous formation in the bladder has been preceded—in fact, that it has been caused—by the atony, both perhaps preceded and caused by enlarged prostate. In addition to the catarrh and possible atony which are likely to accompany it, an enlarged prostate may constitute an obstacle to lithotrity in two ways: by preventing the ready introduction of instruments into the bladder, and by hindering the escape of fragments, both of which difficulties have been already considered. When

associated with an enlarged prostate, atony is not only not unfavorable to lithotrity, but in many cases a positive advantage; the manoeuvres of the operation are quietly borne, for they are painless, there is no danger of fragments being crowded into the urethra by spasmodic contractions of the bladder, after the operation, and, as to evacuation of *débris*, this can usually be accomplished by judicious management, without delay or danger. The conduct of the case simply involves the necessity for more time and care.

ENLARGED PROSTATE, WITH IRRITABILITY.—Of all the complications of stone which interest the lithotritist, perhaps the most troublesome cases are those in which an enlarged prostate is associated with exaggerated sensibility of the neck of the bladder, with a tendency to spasm; and these are not uncommon. Patience and great delicacy of manipulation are necessary in their management; the patient should be trained to lie on his back as much as possible, with the pelvis raised; uva ursi, buchu, and alkaline diluents, are to be administered in accordance with the grade of the cystitis; and anodyne suppositories in the rectum, if well borne, are often of the greatest service. The patient is an old man; his daily habits and peculiarities are to be studied; and, with due respect to hygiene and dietetics, they should be interfered with as little as possible. The question will probably arise as to the propriety of employing an anæsthetic. If the stone be small, so that its *débris* may be got rid of promptly, and there is no serious organic disease, this question may be answered in the affirmative; and, after a fair trial of alleviating means without result, the surgeon should act at once. The proper course would be to select a favorable opportunity, anæsthetize the patient, and, having pulverized the stone as thoroughly as possible, consistent with safety, proceed at once, by the aid of an evacuating catheter and the injecting apparatus (Fig. 88), to bring away the *débris*. This proceeding is, of course, attended by risk, but, with the requisite skill and judgment on the part of the surgeon, the success is often very gratifying. When the stone is larger, requiring more than one operation for its removal, and especially if there is a possibility of the presence of obscure renal disease, which cannot always be determined in advance, then the risks become greater. Acute cystitis is liable to supervene, or uræmic poisoning may explode in any of its manifold forms, and place life in imminent danger. The case of the late French emperor illustrates this point.

Where stricture of the urethra exists at several points in the canal, and the disease is of long standing, lithotrity is of doubtful utility. With a large stone and the prospect of numerous repetitions of the operation, the chances of the impaction of an escaping fragment in the defective urethra become very prominent, and, in most cases, this is a serious accident, even where the canal is healthy. When there is much cystitis and irritability of the bladder or urethra, the case is still more unprom-

ising. It must be remembered that no treatment can certainly restore the walls of a strictured urethra to their original flexibility, and that local pus-secreting surfaces in the canal of any duration are rarely if ever again covered entirely by healthy epithelium. A very slight amount of mechanical irritation from instruments or calculous *débris* after so-called "cure" of stricture would almost certainly renew local inflammatory excitement, with tendency to spasmodic contraction at the damaged points of the canal. A preliminary treatment of the strictured urethra of indefinite duration, by dilatation and incision, would be unavoidable, and the subsequent use of a full-sized instrument by the patient himself and his intelligence and docility are of necessity assumed. For a patient in whom these qualities were wanting, if under the age of fifty, lithotomy would offer at least equal chances of a safe cure. For a younger subject, with a smaller stone, the risk of possible impaction being fairly assumed, the tendency of modern practice is growing gradually more favorable to lithotripsy. In such a case, after most careful preparation, the stone should be thoroughly reduced to powder, and the escape of detritus should be rather delayed than courted.

A case is not suitable for lithotripsy in which the cystitis is intense in character, and of long standing, and accompanied necessarily by hypertrophy of the walls of the bladder, with contraction. The cystitis may possibly have existed before the formation of the stone, may be due to stricture, or other causes than stone; epithelial degeneration may have developed itself in its mucous membrane, or cancer, in some other form, in the walls of the bladder. A judicious trial of means calculated to reduce the grade of the inflammation would be proper in a case presenting this aspect, and, meanwhile, accurate diagnosis is to be sought for; but, as soon as the inefficiency of these means becomes evident, or the presence of cancer is assured, the idea of lithotripsy should be abandoned.

Repeated and continued hæmorrhage after each exploration, in a case of stone, is suggestive of the possible existence of villous growth, or at least of a very unusual amount of congestion of the mucous membrane of the bladder, and, in either case, the prompt removal of all cause of irritation from the bladder, by the knife, will afford the best chance of cure, if, indeed, the case do not prove too desperate for any operation.

The presence of a *large hydrocele* of the tunica vaginalis, which can usually be got rid of; or of an *irreducible hernia*, which is likely to prove more troublesome; or of an *ankylosis of the hip-joint*, with inversion and adduction of the thigh from hip-joint disease, may so far interfere with the introduction of the lithotrite, or indeed of all rigid instruments, as to compel a resort to lithotomy.

In *hypospadias*, when the deformity is excessive, the urethral orifice may be too small to admit a lithotrite, and too thin and ill-formed to justify enlargement by the knife; but, generally, by employing additional

care in manipulation, this complication does not prove insuperable, although it is always a source of annoyance.

It may be laid down as a rule sanctioned by experience, that in cases of stone presenting complications which render lithotripsy of doubtful propriety, where the earlier efforts at exploration are followed by an aggravation of the patient's symptoms which does not subside promptly, and the necessity of lithotomy becomes imminent, it is better to decide upon the cutting operation at once, unless the case prove to be one of those in which no operation whatever is advisable. The temper of calculous patients is often of a character to bear disappointment badly, and the depression likely to follow the occurrence of unexpected pain or difficulty, if prolonged by repeated trials, might compromise the success of the cutting operation when too long delayed and undertaken as a last resource.

CHAPTER XVII.

LITHOTRITY.

Lithotripsy continued.—After-Treatment.—Precautions and Care after Crushing Operations, with Consideration of Complications liable to arise, and the Methods of meeting them.—Lithotripsy in Children.—Lithotripsy in Women.

THE *after-treatment* in lithotripsy comprises the management of the patient after each attempt to crush a stone or fragment, and also the measures required, after the last fragment has passed, to confirm the cure and prevent relapse. All the intercurrent symptoms, conditions, and accidents, liable to follow the manipulations of lithotripsy, are also to be considered. On the first two or three occasions that the patient passes his water after the operation, he will suffer necessarily some increase of pain, but with the usual precautions this will require no further interference. If the calls to empty the bladder become more frequent, however, with persistence of the increased pain, and especially if there should be any tendency to spasm of the bladder, it is advisable to employ an opiate suppository, or enema, at once. Spasmodic contractions are especially dangerous while freshly-made fragments are in the bladder.

Next to a just estimate of the necessity for short operations and gentleness in manipulation, perhaps the most important point in the modern practice of lithotripsy is the rule which requires the patient to keep the horizontal position for at least twenty-four hours after the crushing of the stone has been effected. Its object is to prevent sharp, angular fragments from coming into contact with the sensitive neck of the