

of feces. When there is considerable prostatic hypertrophy or the stone is encysted, there is less tendency to dysuria, so that even with intense cystitis the paroxysms may be neither frequent nor severe.

Hematuria.—Hematuria, like the characteristic dysuria, is traumatic in origin, and is, during the first stages of the disease, only aroused by some jolt. It is usually associated with dysuria, and the hemorrhage, though profuse, is usually short-lived. Later in the disease the perpetual straining due to cystitis may make the hematuria quite continuous.

Stoppage.—Sudden stoppage of the urinary stream is a symptom of stone which is peculiarly characteristic though not very common. It is caused by the stone rolling into the vesical orifice and plugging it like a ball-valve. Striking cases, like that of Sir Henry Thompson, whose patient could urinate only while lying on his back, are most uncommon. Prostatics with stone do not show this symptom, and it may be caused by prostatic or vesical tumour.

In children certain special symptoms are associated with stone, notably priapism and a tendency to pull at the prepuce, with a resultant lengthening of that tissue.

Certain reflex pains in the back, testicle, eye, and sole of the foot (pododynia) are among the infrequent symptoms of stone in the bladder.

Course of the Disease.—Although a stone may lie quiescent in the bladder for many months, it usually begins to set up irritation before long. There may be a history of renal colic or of the introduction of some foreign substance into the bladder; there may be a long history of chronic cystitis, or there may be no suggestion of how the stone began. Then, after a longer or shorter time, appear the characteristic dysuria and hematuria, more or less clearly marked. Later, if there is no cystitis already, infection occurs, and leads gradually, by repeated attacks of greater frequency and intensity, to the perpetual spasm described above.

DIAGNOSIS

Every case of painful or hemorrhagic cystitis should be searched for stone. Although the subjective symptoms just described may be absolutely characteristic, in most cases they are confused and ill-described by the patient, so that the only means of making the diagnosis clear is to search.

Sounding or Searching for Stone.—Many different ways have been suggested to prove the existence of stone in the bladder. Among these the cystoscope and the X-ray have grown in favour of late. The cystoscope is fallacious even in the hands of the most expert.

Stones, as seen through it, have been mistaken for tumours and prostatic outgrowths, and its use is often difficult as well as painful, on account of the bleeding and the excessive sensitiveness of the neck of the bladder. The X-rays are even less accurate. In contrast with these methods by which the surgeon endeavours to see the stone, are the old proved methods of touch. Nothing is so characteristic, so entirely unmistakable as the click of a stone against a searcher. It is alleged that the stone may be so covered with mucus as not to click, and that a stone in a saccule of the bladder or behind a hypertrophied prostate cannot be touched by the searcher. I can only say that, in a lifelong experience, I know of several cases whose stones I have overlooked; but in every one of these I either did not make the attempt or was unable to introduce a searcher. Once only have I found a small, untouched stone behind a large prostate a few weeks after a supposedly successful litholapaxy. Yet I have often touched stone after others had failed to do so, and must believe that the searcher is a no more accurate means of diagnosis than any other instrument, unless guided by a practised hand. I have been able to identify a stone by its impact against a soft-rubber catheter, and I have often employed in the final search, after litholapaxy, a Bigelow aspirator



FIG. 105.—THOMPSON'S SEARCHER.

(p. 449) in the hope of obtaining a click from a very small fragment. But for routine use there is no instrument so well borne by the patient, so easily and quickly manipulated by the surgeon, and so accurate in its results as the Thompson searcher (Fig. 105). The addition of a sounding-board, a stethoscope, a microphone, or a wax covering only detracts from the simplicity of the operation.

To *sound for stone*, the patient is placed upon a table or a firm couch, lying upon his back, with the shoulders low and the pelvis raised upon a hair cushion or some other solid support, so that it may be several inches higher than the shoulders.¹ The thighs and legs are extended and lie flat. The bladder should, when possible, contain about 100 c. c. of fluid, either the patient's urine or a warm boric-acid solution. The difficulty is not to recognise the stone when it is touched, but to touch it at all if the bladder is capacious; for it

¹ If the stone is movable and the bladder contains fluid, when the pelvis is raised higher than the shoulders the stone will roll away from the tender neck of the bladder and rest at the fundus behind the trigone, where it is most easily found.

may elude all search when the bladder is full, and may be covered by the loose folds of the viscus and out of reach when the bladder is empty. Hence not less than 100 nor more than 175 c. c. of fluid should be injected. It is best not to make the examination during a fit of the stone; but if the bladder is excessively irritable or the patient is nervous—and particularly for a second search after one negative exploration—it is wiser to use general anesthesia than to risk failure without it.

The surgeon, standing at the patient's right side, introduces the searcher gently, making its heel slide along the membranous urethra and the floor of the prostatic sinus, and aiding its passage through these segments of the urethra by depressing with his left hand the skin over the pubes, so as to relax the suspensory ligament of the penis. In some cases the whole search is made less painful by keeping the ligament thus relaxed throughout the entire proceeding. When the heel of the searcher enters the bladder it should be carried gently down the inclined plane formed by the base of the bladder until arrested. Most often the stone will be struck at this point. If not, then the toe of the searcher should be gently rotated as far as it will go, first towards one and then towards the other side of the bladder. Next, the searcher is drawn forward, well inclined to one side, and by rotating the cylindrical handle gentle taps are given to the wall of the bladder along the entire side as far forward as the instrument can be drawn. It is then slid back to the fundus along the course it has just traversed. This double passage is repeated on the other side of the bladder. Next, the beak of the sound is reversed, and the whole floor of the bladder is swept by to-and-fro lateral motions of the tip, as it is brought forward to the vesical neck and carried back again to the fundus. If encysted or adherent stone is suspected, the fundus may be more fully examined by flexing the thighs to relax the abdominal muscles, and sweeping the bladder with the sound while counterpressure is made above the pubes.

Should a stone be touched, the bulbous tip of the searcher passed over its surface will indicate whether it is rough or smooth. The character of the click produced by tapping the stone gives a clew to its composition, a dull, low-pitched sound indicating a soft stone, probably phosphatic, while a clear, high-pitched click indicates an acid stone.

To ascertain the size of the stone, the tip of the searcher is tapped along its surface from one end to the other, and the distance traversed is estimated roughly by the length of shaft introduced or withdrawn. During operation the size of the stone may be esti-

mated more accurately by grasping it in the lithotrite and carrying it up to the abdominal wall, where it may sometimes be outlined by the fingers.

The number of stones present cannot be very accurately made out. If the searcher clicks to one side and then to the other, two stones may be assumed to be present; and if at the beginning of litholapaxy a stone grasped by the lithotrite can be made to click on one or both sides, there are two or three stones present. No accurate calculation can be made beyond this except by lithotomy.

The operation of sounding should always be terminated by an instillation or irrigation of nitrate of silver, and if the patient is much irritated he should be kept in bed for a day or two thereafter. The surgeon should not hesitate to desist without having reached an absolutely satisfactory conclusion, for the most skilful surgeons have failed to find stone. If the searcher alone fails the examination may be completed under general anesthesia with searcher and aspirator or cystoscope, in which case the patient should be prepared to undergo immediate operation if the stone is found. If he will not accept this alternative, he may be given palliative treatment, the possible presence of stone being always kept in mind, until either his improvement shows that stone is not present, or the persistence of his symptoms forces him to accept operation.

PROGNOSIS

Unless the stone is small enough to be viable through the urethra, there is only one prognosis—it will certainly remain, and the symptoms will inevitably grow more severe until it is removed by operation. I have never known any of the so-called solvent treatments of stone to be of the slightest use. They do not check the growth of the stone, they do not ameliorate the cystitis, they do not cause spontaneous fracture.

The prognosis as to recurrence is referred to in connection with the preventive treatment.

TREATMENT OF STONE OTHER THAN RADICAL

Preventive Treatment.—Efforts may be made looking towards the prevention of stone formation in two directions: (a) In correcting an inherited or a diathetic tendency to acid primary stone formation, when this is known to exist; (b) in overcoming local physical conditions whose continuance threatens stone as a secondary symptom—alkaline, secondary stone.

(a) *When lithiasis exists, when a patient constantly passes acid concentrated urine more or less charged with crystals, when he has*

already passed one kidney stone and fears the formation of another, what may be done to aid him?

I need not here discuss the colloidal theory, because that theory has not yet reached the practical stage. The scientific writings of Ord and Carter are full of suggestion, but another master must teach us how to apply them.

Practically the best that can be done at present may be accomplished by—

1. Dietetics.
2. Exercise.
3. Encouraging elimination by other avenues.
4. Diluting the urine constantly.
5. Use of solvents, and attempts to dilute the colloids.

But over and above all this the diagnosis of stone in the kidney must be made, for if a stone remains there it is quite fatuous to attempt to prevent the formation of others in the bladder.

1. **Diet.**—Thompson, who has given this matter much attention, believes that uric-acid formation lies essentially in the liver, and that it is by correcting disease of that organ that we may hope to overcome the diathesis. He adopts, in the main, the Carlsbad notions, and cuts off sugar, fat, and alcohol, rather than the meats. In truth, such a dietary usually proves more effective than the old-fashioned one, which interdicted nitrogenized food because uric acid is a nitrogenized product, overlooking the fact that there is necessarily enough nitrogen eliminated every day in the urine to supply unlimited uric acid, given the colloidal and other conditions upon which the formation of calculus depends.

Practically, then, it is found that a proper diet consists of meat, poultry, fish, eggs, bread, and all the cereals, all the fruits and roots, green vegetables and salads, with butter and milk in moderation—though the last sometimes keeps up uric-acid tendencies. If any of the above-mentioned articles prove hard to digest, that fact alone is sufficient to condemn it in the individual case.

Sugar is harmful; most wines and liquors are pernicious; sometimes a little light wine is allowable, or gin or old whisky in selected cases. Heller showed that an exclusive diet of rye bread caused all uric acid to disappear from the urine, this substance being replaced by hippuric acid, a solution of which is a natural solvent of uric acid.

2. **Exercise.**—Exercise, probably by improving digestion and giving plenty of oxygen to the blood and tissues, is a factor of such generally recognised value in preventing uric-acid formation that its mention alone is required: discussion is unnecessary.

3. **Encouraging Elimination.**—The liver has a large share in uric-acid formation, and, by preventing its becoming what is called torpid, a long stride is made in the preventive treatment of stone. The action of the bowels should therefore be closely attended to. Added to this, a course of Glauber's salts may be given occasionally, or small, graded, prolonged courses of the sulphate-of-soda bitter waters (Hunyadi, Friederichshall). Garrod¹ speaks strongly in favour of long courses of the benzoates of sodium and potassium for the purpose of acting as uric-acid solvents.

4. **Dilution.**—Many persons prone to discharge uric acid and urates in excess and to have concentrated urine, are not free drinkers of water, and for such persons some good may be done by encouraging them to take a glass of water between meals and another on retiring. This renders the urine by so much the more dilute, and thus militates against precipitation of the urinary salts. Filtered rain-water is better than ordinary water for this purpose. Distilled water is excellent, and some of the unaërated mineral-spring waters, such as Wildungen, Poland, Bethesda, better still; after being charged with carbonic-acid gas, their diuretic property is much lessened.

5. **Solvents.**—A quick way to dissolve acids in the urine is to administer alkaline medicines, particularly those that also have a diuretic effect, such as the acetate or the citrate of potash. Here belong also all the alkaline salts and the alkaline mineral waters. As a preventive of stone formation, the alkaline method is defective in that it is by no means essential, and in many instances, if long continued, it finally ceases to act, or may have the further harmful effect of disturbing digestion, and sometimes directly causing anemia. When alkaline medicines are given, it must be remembered that they produce their maximum effect if administered about two hours after the end of a meal. The borocitrate of magnesia in about 1-gramme doses, 3 times a day, is well borne if a long course of alkaline medicine is desired.

The so-called uric-acid solvents are more satisfactory. They have the advantage of being better borne by the stomach and of acting best when given in interrupted courses—a month of medication followed by a month of rest. Urotropin, piperazin, and uricedin are useful. They need not be taken for a lifetime, but only during those periods when the urinary specific gravity and acidity run high.

Crystals of oxalate of lime do not cease to appear under an alkaline course. They constantly occur in connection with phosphaturia. Dilute mineral acids, nerve tonics, bitters, exercise, and air are the

¹ Lancet, 1883, i, 670.

best means with which to fight this tendency. Beale believes that the free use of carbonate of ammonium will prevent cystin formations.

To dilute the colloids, which seem to preside over crystallization, all that at present can be done is to keep the urine dilute and bland, and the digestion perfect, to prevent catarrhal conditions of the stomach and intestine, and to avert feverishness from whatever cause. Whether hydrangea is valuable or not I have not yet decided. Cider habitually used seems to help.

To sum up, my directions to patients are habitually as follows:

1. Eat lightly. Take meat but once a day. Eschew sweet foods, fried foods, and, above all, such foods as interfere with digestion.
2. Drink no wines but white wines; no liquors but gin and whisky—these in moderation. Drink plenty of water (any flat mineral water will do, and the patient will drink it more faithfully because it comes in bottles).
3. Exercise freely at all times, and in the open air.
4. Keep the bowels regular.
5. Alkalies or solvents I prescribe with little hope that the patient will continue to use them.

(b) *The preventive measures useful against secondary phosphatic stone formation* are better known and more certain of success. No amount of phosphates in the urine can cause secondary alkaline phosphatic stone. This is due always to inflammation somewhere along the urinary tract. Therefore, the means of prevention of secondary stone include the surgical treatment of all obstructive urethral disease (stricture, enlarged prostate), the removal of tumours and foreign bodies, the relief of residual urine by the timely employment of the catheter, and the treatment of vesical catarrh by irrigation, medicated injections, etc. In short, if stagnation can be prevented stone can be prevented. Old prostatics, who will not submit to radical operation, but are satisfied to carry about a pool of residual urine in a trabeculated, sacculated bladder—these are the men who return year after year for the aspiration of phosphatic stones.

The Electrolytic Treatment of Stone.—Although the electric current influences crystallization, and although Bouvier-Demortiers, Dumas, Prévost, and Erckmann have shown that stone may be pierced and disintegrated by the galvanic current, yet the method is a failure for all practical purposes, and not worthy of adoption under any known circumstances.

The Solvent Treatment of Stone.—Since Pliny's ashes of snail-shells even to the present day, the wise and the foolish alike have searched unceasingly for something which, taken by the mouth, might be capable of dissolving a stone in the kidney or the bladder, and the substance has not been found. The Joanna Stephens reme-

dies worked wonders in the last century, until Parliament bought the secret for £5,000, after which they quickly fell into disuse and are now forgotten. Each of the four patients, whose cures were attested by the trustees appointed by Government to investigate the matter, died with stone in the bladder, as proved by autopsy.

The most serious efforts of modern times to dissolve small acid stone (in the kidney) by medicine taken into the stomach are those of Roberts¹ and Garrod,² of England, and they are most praiseworthy. The former uses long courses of the citrate of potash (3 grammes every three to four hours), substituting bicarbonate if the citrate proves too diuretic; the latter uses the same salts of lithium in a smaller dose.

Beale³ uses carbonate of ammonium to prevent cystin precipitation (3 grammes 3 times a day in 1 case) for three years.

All these efforts are in the right direction, but there is little hope of effecting any serious good with them if the stone is large enough to be worthy of the name.

The Palliative Treatment of Stone.—In cases unfit for operation a judicious combination of alkalies, rest, milk diet, anodynes, and tonics, addressed to the individual needs of the case, aided by catheterization, vesical irrigation, and medicated injections, may be appropriate.

¹ Urinary and Renal Diseases, 2d American edition, 1872, pp. 298-321.

² Lancet, 1883, i, 669.

³ *Ibid.*, 1884, ii, 363.

CHAPTER XXIX

VESICAL CALCULUS—RADICAL TREATMENT—FOREIGN BODIES IN THE BLADDER

It has always been customary among writers upon the subject of the treatment of stone to weigh minutely the advantages and disadvantages of the various operations, as well as the propriety of subjecting certain cases to any operation. The lapse of time has brought theory and experience no nearer together. Each operation still has its supporters, and doubtless always will have. But, thanks to Bigelow and Lister, thanks to the modern perfection of operative technique, the difference of opinion, which seems bound to persist, almost narrows itself down to a matter of taste. The general surgeon who interferes but rarely with the bladder cannot fail to prefer the generous drainage and clear field afforded by the suprapubic operation. On the other hand, the surgeon who has been educated in the deft manoeuvres of litholapaxy will subject almost every case to that operation. If the statistics of the two operations are not identical, they are equally good in this respect at least: the surgeon who is unskilled in litholapaxy will have a higher mortality and more complications from that operation than from simple suprapubic cystotomy, while the skilled lithotritist will be able to assure his patients more rapid and comfortable cure than they could expect from lithotomy, with absolutely no danger of death in properly selected cases. In short, the situation may be summed up as follows: *Suprapubic lithotomy exposes the patient to more dangers and inconveniences than does litholapaxy. Yet lithotomy is appropriate to all cases, which litholapaxy is not; while litholapaxy requires a special training, which lithotomy does not.*

The facts upon which these views are founded will be developed in the following sections. We need dwell upon only three operations—viz., litholapaxy, perineal lithotomy (or litholapaxy), and suprapubic lithotomy. Lithotripsy is dead, having disappeared from surgery as its brilliant child and successor, litholapaxy, established its

claims. Similarly, perineal litholapaxy has replaced the lateral operation and all other devices for extracting large stones through the perineum.

LITHOLAPAXY

Of all the operations that are or have been employed in the treatment of stone in the bladder, litholapaxy when properly performed is generally conceded to be the safest and most brilliant. In support of this proposition it is only necessary to adduce the authority of Cabot and Chismore in this country, of Thompson and Harrison in England, of Guyon in France, and of the entire school of Indian surgeons who alone see more cases of stone than all the rest of the world put together. No age is a bar to litholapaxy. Any stone may be crushed if it can be caught in the jaws of the lithotrite. It is alleged that the stone may be too hard for the lithotrite to break, but I have not met such a case. The size of the stone may constitute a contra-indication to litholapaxy. The crushing of a large stone is always a tedious and protracted operation, and I am not prepared to agree entirely with Freyer,¹ who once continued the operation for two hours in order to remove a large stone. Such a stone would, I believe, be more safely relieved by the knife. These and the other contra-indications to litholapaxy may be summed up briefly:

1. Cases complicated by prostatic hypertrophy, in which—
 - a. Instruments cannot be introduced,
 - b. The stone cannot be grasped, or
 - c. The condition of the bladder and prostate is such as to indicate cystotomy or prostatectomy, the stone aside.
2. Cases complicated by cystitis so severe as to resist all attempts to ameliorate it. Such cases will usually show some obstruction at the neck of the bladder, which is best dealt with by perineal section.
3. Cases complicated by stricture, impassable or resilient, or with such urgent symptoms that there is no time for dilatation.
4. Cases complicated by tumour of the bladder.
5. Cases of encysted or adherent stone.
6. Cases of stone formation around a foreign body, the extraction of which through the urethra would be difficult or impossible.
7. Large or hard stones, as remarked above.
8. Cases of general sepsis or uremia, in which rapidity of operation and thorough drainage are the only important points.

This formidable list covers practically but a small percentage of

¹ Litholapaxy, 1896, p. 62.