

lower bowel. When the bladder has become inflamed and altered, more or less dull pain is felt above the pubes, radiating to the hips, sacrum, thighs, and perinæum. The pain, in vesical calculus, is aggravated by motion, whether active or passive, and it is relieved by quiet and rest; especially by rest on the back with the hips raised. But the greatest pain of stone is usually felt in the act of passing water, and mainly toward the close of the act, when the bladder, empty of urine, grasps the stone with violence, and forces it against the sensitive orifice of the urethra, as if determined to eject it. Often a veritable spasm seems, in this crisis, to seize all the muscular tissues in the neighborhood of the outlet of the bladder. While suffering from this pain, the child, unrestrained by modesty, and giving full vent to his feelings, will grasp his genitals and dance around the room, howling with anguish.

In estimating the value and significance of pain, as a symptom of stone, it must be borne in mind that pain of a similar kind, although less in degree, is also present in cystitis of the neck of the bladder, from any cause, and also in simple nervous irritability of the neck of the bladder from sexual causes—"neuralgia of the vesical neck"—an affection too often ignored. In this latter condition the pain and frequency of voiding urine are sometimes greater than in actual inflammation. The sensibility to pain, or impressionability of the sufferer, is also to be taken into account, and, above all, the condition, of the genital organs, as to healthy innervation; for, unsatisfied sexual longings, and unnatural practices employed to gratify these longings, beget a peculiar hyperæsthesia of the genitals, in which the urinary organs largely share.

Misplaced sensations are sometimes caused by the chronic inflammation due to stone, or other cause, the more common expressions of pain being absent, as in Brodie's case, where a long-existing neuralgia of the foot was relieved by the discovery and cure of an old stricture of the urethra. Nor, finally, must it be forgotten that stones have been found in the bladder, after death, in persons who had given no evidence of the existence of the disease during life.

Increased frequency of desire to void urine is also a symptom of the diseases of the neck of the bladder, just enumerated, as well as of stone, and the pain in the act is also, as a rule, greatest at its close, just as the tender parts are grasped spasmodically by the extending muscles. But in stone this final, spasmodic pain is infinitely more acute, it lasts longer, and seems to be more apt to be mitigated by pressure at the head of the penis.

The presence of a little blood in the urine in conjunction with pain at the close of the act, especially after active exercise, or riding over a rough road, is very significant of stone; but this conjunction of symptoms is also occasionally present in other bladder, urethral, and kidney diseases. (See HÆMATURIA.)

Perhaps the most characteristic symptom of stone is the sudden arrest of the stream of urine while in full flow, accompanied by simultaneous spasmodic contractions of the muscles at the neck of the bladder, with coincident sharp and severe pain. This group of symptoms is produced by the falling of a movable body in the bladder, over the orifice of the urethra, so as to close it suddenly as by a ball-valve. In the rare case of a polypus, or of a prostatic tumor growing from within the neck, the tumor in either case being attached by a slender pedicle, the same phenomenon has been known to occur.¹

It will thus be seen that, of the cardinal symptoms of stone, there is no one that is absolutely pathognomonic of the disease, and that clinical study and experience are necessary to the proper estimate of their significance. Study of the patient's habits, history, constitution and hereditary tendencies, will materially aid in forming a judgment as to probabilities. The same symptoms would possess a very different value before puberty, and after the age of forty; for, in childhood, all the diseases mentioned above as likely to be confounded with stone could be at once excluded, and the irritation caused by excessive acidity alone would remain to be considered.

In estimating the pathological condition of the urinary passages as affected by the presence of calculus, the microscopical and chemical examination of the urine must not be neglected. The existence of true inflammation can always, by this means, be distinguished from simple irritation by recognizing the presence of pus-globules in any quantity; and the character of these globules would seem to furnish some evidence as to whether they are the result of mere surface irritation, or of deeper and more serious lesions of tissue.² Pus in the urine may come from the secreting structure of the kidney, as when it assumes the form of tubular casts; from the pelvis of the kidney; from the ureters, bladder, or urethra; and, except in the case of casts, its source is to be distinguished mainly by the coexisting evidences of local lesions. In pus

¹ Willis deposited in the Museum of the Royal College of Surgeons, London, a bladder taken from a man of sixty-seven, dead of cancer of the kidney, in which there was "a small polypoid body growing from its inner surface, directly over the orifice of the urethra, and covered by a shell or crust of the triple phosphate. . . . He had long suffered from occasional attacks of retention of urine and symptoms of stone. . . . Retention of urine was the urgent symptom of the case." It was always relieved by the introduction of a small flexible bougie, alongside of which the urine would escape. The bougie evidently pushed away the ball-valve, and was substituted for the catheter, as it answered the same purpose, with less irritation.—"Urinary Diseases and their Treatment," by Robert Willis, M. D., London, 1838, p. 284.

² "Quite normal pus-corpuscles of a perfectly circular outline, which, after treatment with acetic acid, exhibit the characteristic nucleus, composed mostly of two or three nucleoli, admit of the conclusion that the disease giving rise to their formation is of a mild form—a simple catarrh of the mucous membrane. But when the pus-corpuscles are irregular in form and outline, and on treatment with acetic acid show an irregular nucleus, or an indistinct granular mass in their interior, or when such corpuscles are mixed with irregular debris, not particularly defined, then purulent destruction is evident, and the integrity of the organ where this formation takes place is in great danger, or lost altogether. Such pus would be the product of ulceration and tuberculosis."—VOGEL, quoted by Thudichum, "Pathology of the Urine," London, 1858, p. 259.

from the pelves of the kidneys the globules are free and not collected in masses, and the whole deposit is heavy, sinking rapidly to the bottom of the vessel, and often presenting to the naked eye a peculiar greasy appearance. Pain on pressure over the site of the kidney, or the presence of any unusual swelling or tumor in this locality will aid in recognizing pyelitis, which is almost invariably accompanied by more or less hectic and emaciation. Pus from the urethra is apt to assume the shape of floating thread-like filaments visible to the naked eye. These are washed from the surface of the urethra by the passing urine, rolled over and over, and thus spun into threads. Moreover, pus from the bladder can always be distinguished from that furnished by the urethra by collecting the urine which passes first and contains the washings of the urethra in a separate vessel, and comparing it with that which comes afterward.

A very common error in practice is to mistake the gelatinous mucoid material which results from the reaction in the bladder of ammonia upon pus for true mucus, and thus fail to recognize the existence of cystitis, perhaps already well established and extensive. The student of urinary diseases who will take the trouble to agitate in a test-tube a drachm of pure pus derived from any source with an equal quantity of aqua ammoniæ, and observe the result, will hardly fall into this error. True mucus, which is always present in healthy urine, collecting in a floating cloud of variable density as the urine cools, is furnished by the mucous follicles, which everywhere line the urinary passages. That furnished by the urethra is notably increased by erotic excitement. Mucus from the urinary passages proper is liable to be temporarily increased by greater density or more irritating quality of the urine; thus, the morning urine will always show a larger cloud of mucus. The presence of a foreign body in the bladder notably increases the amount of mucus in the urine. Pure mucus is always translucent, and its diagnosis may be established by the number of epithelial cells embedded in its substance. The mucus-corpusele cannot be distinguished, singly, from the pus-corpusele, and perhaps neither of them from a young epithelial cell; but, in mass, the difficulty ceases. The amount of mucus present in urine is rarely sufficiently large to lead to its being mistaken for gelatinoid pus. When there is any doubt, the habitual presence, in any considerable quantity, of pus-globules will readily settle the question in favor of the latter; gelatinous pus in any quantity, moreover, is never found, except when the urine is alkaline. It is generally associated, therefore, with the earthy phosphates; and, when the prismatic crystals of the triple phosphate of ammonia and magnesia are found embedded in it, the presence of ammonia, arising most probably from decomposition of urea, may be safely assumed. Finally, in cases where mucoid pus is largely present, the daily washing out of the bladder with tepid water will often restore the normal acidity of the urine, by removing the ammonia and

other irritating causes, and, simultaneously with this change, the mucoid pus will disappear, to be replaced by a deposit of ordinary pus, usually diminished in quantity by the soothing influence of the fomentation. Attention to these facts will tend, in obscure cases, to facilitate the diagnosis of stone. The presence of the symptoms of vesical calculus which have been detailed, or of any of them, when their cause cannot be clearly made out after mature consideration, justifies a formal exploration of the interior of the bladder, by means of a sound. Such further examination, it should rather be said, becomes a duty; for the paramount importance to the patient of the early discovery of a stone in his bladder, in view simply of the comparative safety with which he can be relieved of a small stone before its presence has caused morbid change in the bladder, renders an early resort to the only certain test of its presence, an imperative obligation upon his surgeon.

Sounding.—The operation of sounding a patient for stone requires a light hand and gentle manipulation. It should not be resorted to during a "fit of the stone;" nor, if there be any suspicion of cancer of the bladder, without great circumspection, for severe hæmorrhage and aggravation of symptoms have followed in such event. Previous preparation is advisable in persons who suffer much, by rest, diluents, alkalies, if indicated, or possibly anodynes. In all serious cases a period of comparative quiescence of the symptoms should be chosen for the operation. An anæsthetic is required for adults, only exceptionally; for children it is desirable in the large majority of cases; and, as a matter of complaisance, perhaps, for women. The instrument should be of metal, with a short curve, like that of a lithotrite, and slightly



FIG. 76.

bulbous at its beak. The "searcher" of Sir Henry Thompson (Fig. 76), the best sound in use at present, is capable of serving a double purpose; for it is hollow like a catheter, with an eye near its beak, and a metal plug fitted to its open end, so that the urine in the bladder can be drawn off, if in excess, or warm water injected, if necessary, during the opera-

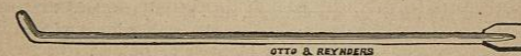


FIG. 77.

tion. Mercier's "sonde coudée" has a different curve, and although not a catheter, is an excellent searcher (Fig. 77). The patient should lie on his back, with his hips slightly raised, on a firm bed or lounge, so placed that the operator may act from his right side, for the sound is

preferably introduced from this side, in order that the operator shall be in position to use his right hand most advantageously, and without changing sides when the sound shall have entered the bladder. The manipulation employed in introducing the sound is the same, with trifling modification, as that required for the lithotrite (Chapter XVI.). When in the bladder, the sound is to be pushed gently onward, until the posterior wall of the bladder is reached, when, withdrawing it slightly, its beak is to be turned carefully, first to one side, and then to the other, until the lateral wall or floor of the bladder is touched, by rotating its shaft between the thumb and finger; then it is withdrawn an inch—more or less—and the same manœuvre repeated; this is done again and again, if necessary, until the concavity of the sound comes in contact with the neck of the bladder, when it is withdrawn entirely. For a patient under middle age, this mode of examining with the sound would be adequate to the discovery of a calculus, if present, in a large majority of cases. Nevertheless, it is a safe rule of practice, never to decide the question after a first examination in which the result has been negative, but to ask for a second or even a third opportunity for search, before giving a positive opinion; and not to lose sight of the great advantages to be derived from ether or chloroform.¹ But, in a male patient over the age of forty, there is always a possibility that the bladder may have undergone a change in shape at its base—such as has been already described as forming a pouch behind the enlarged prostate—and here another manœuvre of great practical value is to be added to the operation. Instead of withdrawing the sound entirely, when its concavity has reached the neck of the bladder, as first directed, its beak is to be again carried forward to the centre of the bladder, and, the handle of the instrument being well depressed between the thighs, its beak is to be rotated by a complete half-turn of the shaft, so as to assume a reversed position and touch the floor of the bladder; keeping the handle of the sound sufficiently depressed to render its beak readily movable, this is now to be gently swept from side to side, as when it occupied the first position, and it will pretty certainly strike a calculus, if any be present, in a pouched *bas-fond* behind an enlarged prostate. The beak of the

¹ Early in 1847 a boy of two and a half years was brought to me, with a history of great suffering, as from stone, since shortly after birth, but, although examined half a dozen times, none had been discovered. The little fellow struggled violently, and he was necessarily held by main force. As soon as the sound entered it, his bladder was seized by spasm and its contents forcibly discharged, and simultaneously the contents of the rectum also. The sound was so firmly grasped by the empty bladder that its beak could not be moved without force, and with great increase of outcry. Under these circumstances I bethought me of the new remedy which I had seen used a short time before by Morton, upon a patient of the late Valentine Mott, and brought it to bear upon my refractory patient. The result—with which we are now so familiar from daily use—was then novel, and it was wonderfully satisfactory. A small movable stone was struck by the sound almost as soon as it entered the relaxed and insensible bladder. A week later it was removed by the lateral operation, under ether, and a prompt recovery followed. The patient subsequently served creditably during the late war. I believe this to have been the first case of lithotomy with anæsthesia.—VAN BUREN.

sound is then to be carried again to the centre of the bladder, with its handle still depressed, and restored to its first position by a half-rotation of the shaft of the instrument, and then carefully withdrawn. The whole operation should never exceed three minutes. When performed with due gentleness, it should cause but little pain, unless the patient is unusually sensitive, or the bladder in a state of acute inflammation. In the latter case, if delay be not admissible, the propriety of anæsthesia should be considered; for the condition of painlessness affords the operator undeniable advantages in attaining his object, although, with an unpractised hand, it possibly increases his liability to do harm.

It is desirable that there should be from three to six ounces of urine in the bladder when the sound is used, or, in other words, that the patient shall have retained his water from an hour and a half to three hours. If too full, a small stone is more likely to escape recognition; if the bladder contains less than three ounces, the sound is less easily manageable without rough contact with its walls. It happens sometimes, on the first contact of the beak of the sound with the walls of a sensitive bladder, that the organ is thrown into a state of spasm, and the urine forced out through the urethra, alongside of the shaft of the sound. When this accident occurs, it is better to defer the operation; or administer an anæsthetic, and, reintroducing the sound, inject through it four ounces of blood-warm water, and then proceed with the exploration.

If a calculus be struck shortly after the sound has entered the bladder, the operator has then a chance of forming at once some idea also of the condition of its walls, and of the size, roughness, and degree of hardness of the stone; for the sharp click of a hard stone is not difficult to distinguish from the muffled sensation received from a soft one, and, if the beak of the sound in contact with the stone is made to glide alongside of it by slow advance or withdrawal, a pretty accurate idea of its size, and of the degree of roughness of its surface, may be acquired.

After the operation of sounding, it is safer that the patient should have warmth applied to the hypogastrium and to the feet, and that he should keep his bed, at least for the remainder of the day; in short, he should be treated as after the use of the lithotrite.

Choice of Method of Cure.—When the presence of a stone in the bladder has been demonstrated, the questions at once present themselves: Can the patient be cured by the crushing operation? must he submit to lithotomy? or, is it more judicious to employ no surgical operation in the case, but simply to palliate symptoms by such medical treatment as may relieve from pain, and prolong life?

It may be safely assumed, in general terms, that a cure by operation may be undertaken in any case of stone in which the patient is not of extreme age, where the stone is not of unusual magnitude, and where the patient is free from evidence of any organic disease by which life is