generally due to the abscess having burst into the bowel, and this may result in a permanent cure, or the abscess may partially fill again, as a result of which the temperature rises, and an operation similar to what is above described may then be necessary.

Exploring appendiceal swellings with ordinary exploring needles is unwise, more especially in small abscesses, as the needle frequently never reaches the abscess, and it is therefore better to do the operation, as, even supposing that no pus is found, the exploratory incision will hasten the disappearance of the inflammatory swelling around the cæcum. All these points have been fully illustrated in the cases which you have seen operated upon. In cases where there is a swelling without any suppuration the temperature is not so high, and gradually the lump disappears, and these patients may or may not have a recurrent attack; in many cases a cure takes place where prolonged rest and careful dieting is insisted upon.

ACUTE PERFORATIVE APPENDICITIS.

Acute perforative appendicitis is due to rupture of the appendix from acute ulceration occurring to such an extent that general peritonitis takes place, the symptoms being intense pain, sickness, rapid pulse, temperature frequently subnormal or only slightly elevated, pain on pressure over the iliac region, with frequently a board-like condition of the muscles. In such circumstances the patient's only chance of recovery is an operation without delay. Opium may be given to soothe the pain when severe, but on no account delay operating. Cases of this kind ought to be put in the same category as ruptured gastric ulcer or ruptured typhoid ulcer, and the sooner this fact is recognised the better it will be for the patients suffering from such a dangerous disease.

The operation itself is carried out in exactly the same way as above described, with the exception that pus is found in the free abdominal cavity, and the burst appendix can generally be removed. Saline solution is used to cleanse the peritoneum, and two large tubes are left in the abdominal cavity along with gauze drains to ensure free drainage, and the usual dressings applied. Cases operated on before the beginning of the third day may recover, but after the third day the chances of recovery are very small. The two cases which you have seen recently illustrate the truth of this remark; the little girl sent by Dr. Langmuir, who was operated on thirty-six hours after the commencement of her illness, recovered completely, as also the patient sent by Dr. Somerville, who was operated on four hours after she was seized with pain. Another case recommended by Dr. Garnett Wilson, within twenty-four hours of the seizure also recovered, but you have also seen cases in which patients refused operation, and declined to come to the infirmary until it was too late.

I cannot too strongly impress upon you the great importance of early operation in all cases in which the symptoms show acute perforation. Cases are from time to time recorded as having made wonderful recoveries, but try to operate upon your patients within six hours of the attack commencing, and you will be able to publish frequent satisfactory results.

THE first annual meeting of the American National Association for the Study of Epilepsy and the Care and Treatment of Epileptics was held at Washington on May 14th and 15th. The objects of the Association are to promote the general welfare of sufferers from epilepsy, to stimulate the study of the causes and treatment of the disease, and to advocate the care of epileptics in institutions where they may receive education, learn trades, and obtain suitable treatment.

THE MARRIAGE OF FIRST COUSINS IN PENNSYLVANIA.—The various States of the American Union seem to be vying with each other in legislating for the hygienic perfection of matrimony. We presume, at any rate, that this is the intention of a recent enactment whereby the marriage of first cousins is made illegal in the State of Pennsylvania on and after January 1st, 1902, and all such marriages contracted in the State after that date will be declared void. If heredity counts for anything, Pennsylvanians must have a considerable strain of Quakerly meekness in their composition; but even the most peaceful of Quakers might resent such grandmotherly legislation as this.

AN ADDRESS

ON

THE SYMPTOMS AND MODERN METHODS OF DIAGNOSIS OF STONE IN THE BLADDER, KIDNEY, AND URETER.

Delivered before the East Sussex Medico-Chirurgical Society.

By P. J. FREYER, M.A., M.D., M.Ch.,
Surgeon to St. Peter's Hospital.

THE characteristic symptoms of stone in the bladder are four in number:

1. Increased frequency of micturition.
2. Pain in connection with the act of urination.
3. Hæmaturia.
4. Sudden stoppage of the flow of urine.

If a patient suffers from these four symptoms, you will at once suspect that he or she is suffering from stone in the bladder. If in addition you ascertain that previous to the setting in of these symptoms the patient had passed one or more small calculi, your suspicion will grow into almost a certainty that there is a stone in the bladder; in which case it is probable that the urine will be found to contain pus and mucus; but it must be remembered that the passage of clear acid urine is consistent with the presence of a lithic or oxalate of lime stone in the bladder. A phosphatic calculus is, however, invariably attended by pus and mucus in the urine. A stone may be found with any three of these symptoms, any two, or even any one of them. A large calculus may even exist and give rise to none of these symptoms. This urate stone which I show you, the *débris* of which weighs 3 ozs., I removed successfully by litholapaxy from a young man of 20, and he repeatedly assured me that till six months before coming under my care he had been troubled by no urinary symptom. Still, this calculus did not grow in six months; it was the product of years. So that the patient must have carried it about in his bladder for a lengthened period without any inconvenience. On the other hand, very similar symptoms to those I have indicated may exist and no calculus be found or be present, simply from the fact that these symptoms may be produced by some other disease than stone.

Let us now examine these four symptoms individually, and see what are the peculiar characteristics of each when due to stone:

1. Increased frequency of micturition is the earliest, as it is the most constant, symptom of stone. The bladder becomes irritable—frets, as it were—at the presence of its unnatural and unwelcome tenant. This, like most of the symptoms of stone, is aggravated by exercise and diminished by rest. Consequently it is less frequent at night, when the patient is lying down, than in the day, when he is going about, exactly the reverse of what occurs with enlarged prostate—a point of diagnostic importance, as we shall presently see.

2. The pain which is almost invariably present with stone is, strange to say, rarely referred to the bladder itself. It is reflex in character, and situated near the end of the penis, at the posterior aspect of the glans, most frequently in the position of the frænum. It occurs, as a rule, in connection with the act of micturition, setting in, and gradually increasing in intensity, towards the end of the act, as the bare walls of the bladder come in contact with the stone; and it gradually disappears as the bladder refills, the urine acting as a buffer between the stone and the bladder walls. But any form of exercise, such as riding, running, or jolting in a carriage over a rough road, will bring on the pain. It is described variously by different individuals as of a scalding, burning, aching, or lancing character. A patient of mine once described it as a sensation as if the penis were being broken off. The pain diminishes in intensity as life advances, being much more excruciating in children than in aged persons. There is nothing more heart-rending to behold than the suffering of a little child afflicted with stone as he dances about the floor during and after micturition, shrieking with agony and pulling at his foreskin (which becomes elongated and probably ulcerated), trying to relieve the pain.

3. The hæmaturia attendant on stone, though neither the earliest nor the most distressing symptom, is that which usually most alarms the patient and induces him to seek medical advice. It presents three characteristics: (1) It comes on gradually, sudden or profuse hæmorrhage not being characteristic of stone; (2) it generally occurs towards the end of micturition, the earlier portion of the stream being clear, the later portions tinged with blood, and winding up with a few drops of bright pure blood; (3) exercise increases and rest diminishes the liability to its occurrence. After active exercise the urine will, as a rule, be uniformly tinged with blood.

4. Stoppage of the flow of urine is the least common of these symptoms, and is due to the stone falling against, or plugging the inner orifice of, the urethra. It is much more common in the earlier than in the later stages of stone, whilst the latter is still small.

Such, then, are the characteristic features of each of these four symptoms of stone. There are, however, as I have already said, many other diseases of the urinary tract which present somewhat similar symptoms. Let us examine these latter and see what peculiarities they possess which will help us towards a diagnosis.

1. I may say that increased frequency of micturition by itself, apart from one or more of the other symptoms described, is of little diagnostic importance. It may occur with any disease of the urinary tract, and, indeed, in perfect health, under the influence of drugs, certain articles of food and drink, or with the sudden setting in of cold weather, owing to the increased work thrown on the kidneys from the action of the skin being checked. It is when taken in connection with one or more of the other symptoms that it is of consequence as a diagnostic feature of stone in the bladder.

You are aware that stone in the bladder in females is extremely rare as compared with males. Amongst over 1,000 operations for stone in the bladder in my own practice, there were only 23 females, or a little more than 2 per cent. But two of the symptoms of stone—increased frequency of micturition and pain—are very common in women. These two symptoms are, in the great majority of cases, due to some flexion, enlargement, or inflammatory state of the womb causing pressure on the bladder. Vascular caruncle of the urethra is also not an uncommon cause of these symptoms.

2. The reflex pain referred to the glans penis, already described, used to be regarded as pathognomonic of vesical calculus; but recent observations, and particularly the extended use of the cystoscope, have shown that it occasionally occurs in connection with other conditions—namely, stricture of the urethra, enlarged prostatic middle lobe, tubercle of the prostate, local cystitis, ulcer of the bladder, pendulous tumour falling against the neck of the bladder, clots of blood and thick tenacious mucus lying at the inner orifice of the urethra and blocking the passage; also, though rarer, stone in the ureter or pelvis of the kidney.

The pain of stricture, when it does occur, accompanies the act of micturition, and is felt at the seat of the stricture; the pain in connection with enlarged prostate precedes the act, and is, as a rule, referred to the hypogastric region; whilst the pain of vesical calculus follows the act of urination, and is felt behind the glans. For the further diagnosis of stone from enlarged prostate, you will in the latter disease have the frequency of micturition greater at night than in the daytime, the advanced age of the patient, the dribbling of urine, and rectal examination to guide you. But it must be remembered that the two diseases frequently coexist, stone being very common in prostatic patients. When great irritability of the bladder with hæmaturia occurs in such a patient, the presence of stone should always be suspected. I am fully convinced that prostatic patients frequently carry calculi to their graves, undetected and even unsuspected.

3. Hæmorrhage between the acts of micturition must come either from the urethra or prostate, usually the latter.

In tumours of the bladder the bleeding will be more profuse than in cases of stone, painless as a rule, the urine uniformly mixed with blood, and containing large irregular clots, and perhaps portions of tumour *débris*, visible to the naked eye or by the microscope.

The hæmaturia of tuberculous ulcer of the bladder much resembles that of stone; but the family history and the co-

existence of tubercle in other parts, particularly in the epididymis, vesiculæ seminales, and prostate, will, as a rule, help us to a diagnosis. There is no other disease the symptoms of which so nearly resemble those of stone as tubercle of the bladder, and it will frequently be impossible to diagnose between them without the aid of the sound or cystoscope.

"Endemic hæmaturia," due to the presence of the bilharzia hæmatobia, is, as a rule, painless, though occasionally cystitis accompanies it. The cause of the hæmaturia will be suspected when the patient lives in or has come from a country where the bilharzia abounds—namely, Egypt, Abyssinia, Natal, and the Cape. The diagnosis is confirmed when the ova are found in the urine by the microscope.

In hæmorrhage from the kidney the urine is, as a rule, uniformly mixed with blood, frequently smoky or porter-like in colour, and often contains dark worm-like clots—casts of the ureters.

4. Sudden stoppage of the flow of urine may also be caused by a pendulous tumour of the bladder or prostate dropping against the inner orifice of the urethra, by a foreign body, clot of blood, lump of thick inspissated mucus, or *débris* of tumour. This symptom may also be due to a prolapsed lower end of the ureter containing a stone. I have met with three or four instances of this kind in my practice, and one in particular, where, to overcome the difficulty caused by the prolapsed ureter plugging the urethral orifice, the patient had to lie down on his side or pass a catheter.

Having thus analysed the characters of the various symptoms, and having come to the conclusion that the weight of evidence points to the presence of stone, you will proceed to sound the patient to confirm your diagnosis. But no matter how strongly the symptoms point in this direction, you should on no account give a definite diagnosis till the stone has been felt or seen—seen in a manner that I will subsequently indicate.

Before sounding, a rectal examination by the finger should be made. In this way you will ascertain the condition of the prostate, whether it be inflamed, hypertrophied, or the seat of tubercle or cancer. Organic deposit in the base of the bladder may be felt, if such exist, or even a large calculus, or one encysted in this vicinity. Note, also, whether there be any inflammatory thickening or tuberculous deposit in the vesiculæ seminales. In elderly males a soft catheter should be passed into the bladder to ascertain the quantity, if any, of residual urine.

From what one reads in surgical textbooks it might be imagined that sounding the bladder is a very dangerous proceeding, not at all unlikely to be followed by death. Consequently patients frequently shrink from examination, and even conceal their symptoms lest they might be persuaded to submit to it. Now, I venture to assert that there is no more harmless proceeding in surgery than sounding for stone, if conducted with care and skill. Of course, if force be used in passing the sound—as, indeed, in passing a catheter—irreparable injury may be done. No one likes to be thwarted in his attempts to pass an instrument into the bladder, and I fear that force is frequently used where the surgeon would be wise, in his own interests and those of his patient, to transfer the case to other hands. In passing instruments through the urethra your maxim should be: never use force, never give pain, and never draw blood if possible.

A patient is best sounded on a rather high couch. He lies on his back with his head resting on a pillow, his lower limbs flexed and slightly abducted. The bladder should contain about 1 or 2 ounces of urine; if it be empty, this quantity of warm boric lotion should be slowly injected through a soft catheter. As a rule, in the adult, an anæsthetic will be unnecessary, but it should always be employed in children, and will sometimes be necessary in the adult, particularly in prostatic patients.

After a large experience of sounds of all kinds, I have come to the conclusion that there is nothing superior to the simple, solid steel sound, known as Mercier's (Fig. 1), with its short, well-curved beak and bulbous end. That which I generally use in adults is No. 6 of the English scale in the shaft, increasing to No. 10 in the bulb; for children, No. 2 in the shaft and No. 5 at the bulb.

Standing on the right side of the patient you hold the

sound—previously sterilised, warmed, and oiled—horizontally by the right hand and insert the beak through the meatus, pulling the penis slowly on to it by the fingers of the left hand. The sound is gradually elevated, as it slides down the canal, to the vertical position. By gently depressing its handle between the thighs the beak will be found to slip along the membranous and prostatic portions of the canal and into the bladder. In the large majority of cases, if a stone is present it will at once be recognised by the grating sensation elicited as the sound enters the bladder. If not, the beak is pushed on to the distal part of the fundus, and then, as it is slowly withdrawn to the neck of the bladder, the shaft is rapidly but lightly rotated in a half circle, so that the beak taps the bladder walls on either side. This process may be repeated two or three times. We should be careful at this stage, particularly in children, not to mistake the bony ischial spine for stone. The handle is now depressed between the thighs and the beak rotated backwards, and gradually withdrawn with a rotatory motion from side to side towards the neck, thus searching the floor of the bladder immediately behind the prostate. Every part of the bladder is methodically searched in this manner. Finally, the sound is held almost perpendicularly with its beak resting on the trigone; it is then lifted slightly off the base of the bladder, and the beak rapidly but lightly shaken from side to side. By this manoeuvre I have frequently detected the faint grating or tinkling of a tiny stone. In women it will sometimes be found that the bladder is divided into two lateral cavities by a central ridge produced by pressure of an enlarged womb from behind—saddle-bag shaped, in fact. The beak of the sound must be inserted first into one and then into the other of these cavities, which should be methodically searched.

Fig. 1.

Fig. 2.

It will be found, however, that in the most experienced hands a small stone lying in some peculiar position—such as in a depression behind an enlarged prostate, in a cyst, between the rugose folds of a corrugated bladder, or covered by thick, sticky muco-pus—will sometimes evade detection. The discovery of these small calculi before they grow into large ones is of vital importance, as their removal by litholapaxy is almost unattended by any danger.

In the *Indian Medical Gazette* of March, 1884, I called the attention of the profession to a new method of diagnosis for small stones by means of the aspirator and cannulæ employed in Bigelow's operation. The largest of these cannulæ (Fig. 2) that will pass through the urethra with ease is introduced into the bladder, and the aspirator (Fig. 3) applied.

Fig. 3.

Water is then pumped into the bladder and exhausted, the process being repeated again and again, whilst the eye of the cannula is moved about in various directions and positions so as to explore every nook and cranny of the viscus. If a small stone be present it will almost with certainty be drawn with

Fig. 4.

force to the eye of the cannula, and its presence revealed by the click or tinkling sound produced by its impact against the metal tube. Further, if the stone be a very small one, it will pass through the cannula into the glass receiver without

the necessity of crushing it. This method of diagnosis was first suggested to me by the sounds produced by the fragments clicking against the eye of the cannula during the operation of litholapaxy. I myself have diagnosed many calculi by this simple method when all others have failed. Its practical advantages were at once recognised by many distinguished surgeons, particularly by my colleague, Mr. Reginald Harrison, in his published writings, and it is now generally employed. You will observe that this simplified form of Bigelow's aspirator (Fig. 3), which I devised some five years ago, and have since employed, is extremely light and handy. I consider it the most efficient aspirator now before the profession.

When, however, the stone is fixed in position—whether in a narrow-mouthed sac, wedged in between the prostate and the bladder wall, or sticking in the ureteral orifice, as a stone sometimes does in its passage from the kidney—even this method of diagnosis may fail. In obscure cases of this kind it will be necessary to have recourse to illumination of the bladder by the apparatus (Fig. 4)—Leiter's electric cystoscope—which has proved such a valuable aid to the diagnosis of tumours and other obscure diseases of that viscus.

Finally, when all these methods of diagnosis fail to reveal the presence of a stone, and the symptoms persist, it may be advisable, or necessary, to open the bladder either perineally or suprapubically to ascertain their cause. The latter method will, as a rule, be the preferable one, enabling us both to feel and see the conditions of the inside of the bladder, and to at once remove the cause of these symptoms.

We now pass on to the consideration of

THE SYMPTOMS OF RENAL CALCULUS.

Pain in the loin corresponding to the affected kidney is, as a rule, the earliest, as it is the most constant, symptom. In the primary stages of the malady the pain assumes the form of periodic attacks of what is commonly known as "renal colic." In a typical attack of this kind the pain commences and is fixed in the loin, but shoots down the groin, along the course of the ureter, into the bladder, and frequently into the corresponding testicle in the male, or labium majus in the female. The testicle is generally retracted, and may be swollen and tender. The pain may also radiate down the thigh, and across the abdomen towards the other kidney. Generally speaking, the pains radiate along the branches of the lumbar plexus of nerves.

The pain varies in intensity in different individuals, and

at different periods in the same person. It is sometimes slight or of moderate degree; more frequently it is excruciating, causing the patient, bathed in profuse perspiration, to roll about in agony, making ineffectual attempts to ease his distress by change of position. It may be so severe as to necessitate frequent hypodermic injections of morphine, or even the employment of a general anæsthetic for its relief.

The renal colic attacks are almost invariably accompanied by gastrointestinal disturbance, namely, nausea, vomiting, and perhaps purging. They are also, as a rule, attended by reflex disturbances of the urinary tract, namely, pain or scalding in the urethra; increased frequency of micturition; scantiness or even partial suppression of urine, due either to obstruction to the flow or inhibition of the functions of the affected kidney, or even the sound kidney on the other side. As the attack passes off the kidneys resume their functions, and immediately on its subsidence the

volume of urine is greatly increased.

The attack of renal colic may pass off in an hour or two, or continue for two or three days. Sometimes it comes to an abrupt termination by the stone passing down the ureter and out through the urethra, or the stone may be arrested in the bladder, a new train of symptoms, namely, those of vesical calculus, setting in.

As the disease progresses the intervals of freedom from suffering diminish in length, and the accessions of lumbar pain, as a rule, increase in intensity. But eventually, after the malady has lasted for a lengthened period, perhaps two or three years, the typical renal colic attacks gradually subside, to be replaced, however, by pain of a dull, heavy, aching, or gnawing character, fixed in the loin.

Now, how is this change in the character of the pain accounted for? It is attributable to the following circumstances: When the stone is small and lies loosely in one of the calices, by some sudden jar or movement of the body, it is shaken into the pelvis and attempts to pass down the ureter by the accumulation of urine above. Obstruction to the flow of urine and pressure on the nerves are thus caused giving rise

to the distressful condition already described, till, by some movement or position of the body the stone get displaced upwards again, when the symptoms suddenly ceases.

As the stone grows in size it has a tendency to get fixed in one of the calices, thus ceasing to block the ureter and obstruct the flow of urine; or lying in the pelvis it may gradu-

Fig. 5.

Fig. 6.

ally throw up coral-like branches into the calices, forming large calculi like these specimens (Figs. 5, 6) from my own practice which I show you, varying in weight from $\frac{1}{2}$ to 2 ounces, one of which recalls to you Henle's cast of the pelvis and calices of the kidney. When renal calculi grow to this size they, as a rule, cause little pain whilst the patient is at rest, owing to the fact that they are immovably fixed in the kidney, and probably surrounded by thick inspissated muco-pus. A very large stone like one of these specimens can occasionally be felt on palpation through the loin. A typical, almost pathognomonic, characteristic of the pain due to renal calculus is that it is brought on or increased by exercise, particularly riding on horseback, and diminished by rest.

When the attacks of renal colic have continued for some time, another symptom of not less significance, namely, hæmaturia, sets in. Sometimes, though rarely, periodic hæmaturia may be the first symptom noticed by the patient, the lumbar pain supervening later on.

The hæmaturia occurs in connection with the attacks of renal colic, setting in shortly after the pain commences and continuing for some hours, perhaps a day or two, after it ceases, the urine then gradually becoming clear and remaining so till the next accession of pain.

As a rule, the quantity of blood passed is not large. Profuse hæmorrhage is not characteristic of renal calculus. The urine will vary in colour, according to the proportion of blood it contains, from a faint pink to a deep red. Frequently in patients suffering from stone in the kidney when the urine is quite clear to the naked eye traces of blood will be discovered by the aid of the microscope.

Like the pain of renal calculus, it is typical of the hæmorrhage that it is increased by exercise and diminished by rest. It is in the early years of the disease that this symptom is most marked. In the later stages, when the stone has grown to such a size that it is fixed in one of the calices or embedded in the kidney substance, and enveloped by muco-pus, there is rarely any hæmaturia, unless the patient be subjected to severe jolting or direct pressure on the kidney.

With the presence of these two characteristic symptoms—pain in the loin and hæmaturia—your suspicions will at once be directed to the existence of stone in the kidney; and on palpation of the loin it will probably be found, if the disease has existed for some time, that there is a tumour in this region of the abdomen, reniform or ovoid in shape, smooth on the surface, more or less movable, but bound down or anchored behind. On deep inspiration it will move downwards to the extent of an inch or more, returning upwards partially under the ribs on expiration. This tumour is, of course, an enlarged kidney, due to congestion or inflammation of that organ from irritation of the contained calculus. In thin subjects, and particularly in women, this enlarged kidney will be easily and distinctly felt. If the fingers of one hand be pressed deeply in the loin, and those of the other hand be placed on the abdomen in front, you will probably be able to roll the tumour slightly about its fixed point. In fat subjects, and when the kidney is placed high up under the ribs, as it sometimes is, it will often be impossible to feel the enlarged kidney. In the early stages of the disease, before congestion or inflammation of the organ has set in, there will be no tumour felt, the kidney not being sufficiently enlarged to render its presence manifest on palpation.

During these manipulations another important symptom will be elicited, namely, tenderness in the loin; this will in some cases amount to acute pain. Nausea will also probably be induced by palpation of the kidney.

Even in the early stages of the malady, when there is no apparent enlargement of the organ, palpation of the loin will probably elicit tenderness at some particular spot. A very characteristic symptom of renal calculus is a sharp stabbing pain felt when the fingers are pressed deeply in the ilio-costal space, just outside the margin of the erector spinæ muscle. A somewhat similar pain is caused by pressing the fingers into the abdomen at a point midway between the navel and the anterior superior spine of the ilium, this indicating, probably, that the stone lies in the pelvis of the kidney or its vicinity.

Turning our attention now to the urine, apart from the existence in it of blood already dealt with, in the early period of

the disease you will frequently discover the presence of albumen. In the later stages this is invariably found.

Pus in the urine is an important symptom. Though generally absent in the early history of renal calculus it is almost invariably present in the later stages of the disease, due to the pyelitis or suppurative nephritis set up by the irritation of the stone. As a rule, the urine is acid in the presence of this pus, but occasionally it is alkaline.

Mucus is frequently present in large quantity when the urine contains pus. In the early stages of renal calculus in young persons mucus may be present without the existence of pus.

Microscopically, crystals of uric acid, oxalates, or phosphates will probably be found, and, apart from the significance of this symptom as confirmatory of the presence of renal calculus, will give a clue as to its composition.

These, then, are the symptoms of stone in the kidney. It is rare that you will find them all present in any particular case. But a combination of a certain number of them will afford you ample grounds for coming to a correct diagnosis. Indeed, calculi imbedded in the cortical portion of the kidney may exist for years and give rise to no symptoms beyond, perhaps, some aching in the loin.

There are, however, some cognate considerations that will frequently assist you towards a correct diagnosis. For instance, the previous passage of one or more small calculi would be a strong confirmatory indication. Then, again, you should always inquire as to whether there is any history of injury of the kidney, for traumatism, particularly when accompanied by the effusion of blood into the pelvis or substance of the kidney, is frequently followed by the development of stone. If the patient has resided in a locality favouring the formation of stone this should be taken into consideration. It is well known that residence in certain localities, such as Norwich, strongly favours the development of urinary calculi.

Lastly, heredity should be inquired into, for stone and those diatheses that favour its formation are hereditary in families. The year before last I successfully removed renal calculi from a young officer, now in South Africa, and his mother; and the father of this lady had died from stone. Some years ago, in India, I removed by litholapaxy calculi from three generations—son, father, and grandfather.

The Roentgen rays have, as you are aware, been employed in recent years for the purpose of diagnosing, or confirming the diagnosis of, stone in the kidney, and with considerable success. When the stone is large, and particularly when it is composed either of oxalates or urates, which give a dark and dense shadow picture, the results are, as a rule, satisfactory. They are less so when the stone is phosphatic, owing to the shadow in such cases being lighter and less defined.

The circumstances which militate against the success of this method of diagnosis are—the stone being small, the patient being stout, the movements of the kidney during respiration blurring the image, the shadow cast by the stone being concealed by that of the bones, and the calculus being phosphatic, any one or more of which may render this method nugatory. When a distinct isolated shadow resembling a stone is shown you may be pretty certain that there is one present. But negative evidence as to the presence of stone by the Roentgen rays should not deter you from exploring the kidney by operation when the symptoms of stone are well marked.

Lastly, let me direct your attention briefly to

THE SYMPTOMS OF STONE IN THE URETER.

The symptoms of renal and vesical calculus are, as we have seen, generally well defined and characteristic. Those of stone in the ureter are, as a rule, extremely obscure. Indeed, it is only when the stone is impacted in the lower end of the ureter that any definite diagnosis can be ventured on.

A stone travelling down from the kidney to the bladder may be arrested in any part of the ureter where it meets with a contraction, valvular process of mucous membrane, or curve; but the situations in which it is most likely to get impacted are: (1) At a point two inches from the commencement of the

ureter, (2) at the brim of the pelvis, and (3) at the vesical end of the ureter.

When we speak of renal calculus, we include not only one embedded in the substance of the kidney, but also one lying in the pelvis or calices of that organ. And, this being so, I know of no symptoms by which we can, with anything approaching certainty, distinguish between a kidney stone lying in the pelvis and one impacted in the ureter at any position above an inch or two from its vesical orifice. The symptoms of a stone lodged along the greater part of the course of the ureter are to all intents and purposes the same as those of a stone lying in the renal pelvis and obstructing the ureteral orifice.

It is true that a ureteral calculus blocking the passage will give rise to hydronephrosis on the affected side; but so may a pelvic stone; and if both ureters be blocked in this way calculus anuria will result. It is also possible that a stone impacted in the ureter may give rise to pain or tenderness on pressure at the seat of impaction when deep pressure is made along its course, and this, combined with other symptoms, may lead you to strongly suspect the nature of the disease. But the probabilities are so strongly against a definite diagnosis that the recognised rule of surgery in all such cases now is to explore the kidney for stone in the first instance by the lumbar method, and, if it be not found there, to examine the ureter by a bougie or probe passed down through the pelvis, and, if a stone be then found, to extend the lumbar incision parallel with Poupart's ligament sufficiently far to enable you to reach the stone and extract it. By this procedure I discovered and successfully removed the calculus which I show you, which was firmly impacted 4 inches from the pelvis of the kidney. The details of the case are published in the *Transactions of the Medical Society of London* for 1899, and in the *Lancet* of July 22nd, 1899. When, however, the stone is impacted in the lower end of the ureter, at or near its vesical orifice, it generally admits of recognition.

I need scarcely tell you that when, after repeated attacks of renal colic, all the kidney symptoms are replaced by those of stone in the bladder you will at once come to the conclusion that the stone has made its way down the ureter, and is lying in the bladder. I could detail to you numerous cases with a history of this kind from my own practice, in which I detected the stone in the bladder and removed it by litholapaxy.

But when the renal symptoms cease, and are followed by vesical symptoms, and no stone can be detected by the sound, you should suspect its impaction in the vesical end of the ureter; for a stone in this position may give rise to all the symptoms of vesical calculus.

How are we to diagnose a stone in this position? Introduce, in the first instance, the forefinger into the rectum, the patient lying on his back, and make deep pressure above the pubes with the other hand, when you may feel the stone as a hard nodule lying in the ureter beyond the trigone. In the female it may be similarly detected by introducing the finger into the vagina. Then, again, if the stone project from the ureteral orifice into the bladder, it may be felt by the sound; or in the female the urethra may be dilated, a finger introduced into the bladder, and the calculus detected in this manner.

But the most important means of diagnosing a calculus lying in the lower end of the ureter or projecting from its orifice is Leiter's electric cystoscope. By this instrument I have in recent years detected several calculi lying in this position which were not recognisable in any other manner.

These two large calculi which I show you were contained in a cystic tumour of the ureter projecting into the bladder, which I diagnosed by the cystoscope, and successfully removed suprapubically. The case is recorded in full in the *Medico-Chirurgical Transactions*, 1898, vol. i.

In the *Lancet*, July 22nd, 1899, details are given of a case in which the cystoscope revealed a long narrow stone projecting into the bladder from the left ureteral orifice, and which I successfully removed by introducing a lithotrite, catching the end of the stone, pulling it out of the ureter, and then crushing it.

In May last a patient came under my care in whom the symptoms of kidney stone on ceasing were followed by those

of vesical calculus. He had been sounded by several surgeons with a negative result, and I myself could find no stone by the sound. By the cystoscope I detected the lower end of the right ureter prolapsed into the bladder, in shape and size like the nipple of a woman's breast. At the bottom of the dimple, in the centre, I saw a dark grey speck, and came to the conclusion that this was a stone lying in the ureter. I performed suprapubic cystotomy, found matters exactly as seen by the cystoscope, and show you this stone which I successfully removed.

A fortnight after this I saw a case—an officer just home from the Boer war—in consultation with Dr. Robert Maguire, with a history similar to that just recorded, but no stone could be found on sounding. Cystoscopic examination revealed practically the same appearances as in the last case, on the left side. We arrived at a similar diagnosis. As the patient's symptoms were of recent standing we thought it advisable to send him to Contrexéville for a course of the waters, in the hope that the stone might be washed out. Three months later the patient was sent back from Contrexéville with an intimation from Dr. Debut d'Estrée that the stone had passed into the bladder, and on September 19th I removed it by litholapaxy, Dr. Maguire being present.

As this method of diagnosis of ureteral calculi is comparatively new, I have thought it right to give you brief details of some specific instances of its success from my own practice.

NOTES ON 206 OPERATIONS FOR STONE.

By W. F. ADAMS, M.R.C.S.ENG., L.R.C.P.,

Mission Hospital, Dera Ghazi Khan, Punjab.

DURING the two years and four months I have been stationed at Dera Ghazi Khan, Punjab, on the banks of the Indus, I have operated on 206 cases of urinary calculus. My experiences largely coincide with those of other Indian surgeons, but a few notes on so many cases may prove interesting.

LITHOTRITY.

My rule has always been to remove the stone by lithotritry. The following I consider contra-indications:

I.—In Boys.

1. When there is marked cystitis lithotomy drains the bladder and cures both diseases.
2. When there is much difficulty in passing instruments.
3. When the stone is too large or hard for the necessarily small lithotrite.
4. When there are indications of advanced kidney disease or great debility, the shock of the cutting operation seems less severe, probably because it is briefer.

II.—In Men.

1. When the instruments cannot be passed.
 2. When the stone is too large or cannot be grasped.
- I have never found one too hard, though frequently great force is required, and have even blistered my hands with the lithotrite. A former operation often renders the introduction of instruments difficult. Strictures can usually be dilated to admit of the passage of instruments, but in bad cases perineal section will cure both stricture and stone. I had one case of impermeable stricture and stone thus successfully treated.

As will be seen from the summary of cases, lithotritry was successful in the smallest boys; 48 cases were in boys under 10 years of age. Only one death occurred in a boy $3\frac{1}{2}$ years old, whose bladder was full of calculi, weighing in all 7 drachms; 15 of these cases were in children under 3, and all did well. In these cases the children were quite happy in a day or two, though sometimes irritation of the mucous membrane of the urethra caused pain on micturition for some days. In two cases urinary abscesses formed, but eventually all healed up. One case required two sittings. I often washed the bladder out again to make sure no fragments remained. This hardly ever happened, although small pieces were sometimes passed by the urethra after the operation.

In lithotritry the previous injection of a drachm or two of sweet oil into the urethra is an advantage, and with small boys there is less risk of scratching the urethra if the cervixes of the blades of the lithotrite are filled up externally with soap. Great patience and delicacy are obviously necessary with children. If the instruments cannot be moderately easily passed, lithotomy had better be resorted to. But I