becoming impacted in the follicles, it sets up irritation. The auxetics and kinetics become dissolved in the acid sweat, and cell proliferation is the consequence. The skin becomes dark and swarthy; then come warts followed by ulceration which assumes a malignant character. Of 245 fuel workers examined by Dr. T. M. Legge, 51 were found to be affected by warts. These warts at first are non-malignant. They only become epitheliomatous afterwards. There is a belief among the workmen that dermatitis, warts, ulceration of skin, and epithelioma have become more prevalent during recent years, a circumstance attributed to the retention in the pitch of anthracene and anthracene oil; but anthracene was found by Ross and Cropper to be inactive so far as cell-proliferation is concerned. All we can say at present is that pitch is more dangerous than tar, and tar than coal, that the harmful elements are contained in the heavy oils of the coal tar, and that they cannot be distilled out completely without ruining the pitch commercially. The remedy is to wash the tar, but to this there are trade objections.

Malignant Vesical Growths in Aniline Workers.

The frequency with which malignant growths of the bladder are found in aniline workers is a subject of not less importance than the occurrence of epithelioma in chimney sweeps and in the men who make briquettes. In 1895 Rehm drew attention to the occurrence of vesical tumours in men working in fuchsine. In the fuchsine room of one factory he found two men suffering from vesical papilloma and one man the victim of sarcoma of the bladder. The men were all under 45 years of age. Leichtenstern had observed sarcoma of the bladder in a naphthalene worker, and in a toluidine worker he found a growth similarly situated but of an indefinite character. By 1904 Rehm had collected data of other 20 cases of bladder tumours in aniline dye workers: 8 were carcinoma, 5 papilloma, and in 7 the type of tumour was uncertain. In 1906 he found that in 18 German dye factories in which aniline and aromatic bases were used, there had been between 1888 and 1906 33 cases of malignant disease of the bladder; 18 of the men had been operated upon, the other 13 had died; 11 of the workmen were still alive, some had had recurrences; each of the patients had been in the dye works for 20 years or more. Leuenberger, of Zürich, in his monograph recently published, gives the history of 18 cases. Grandhomme, Offenbach, and Fechenheim have expressed doubt as to the supposed connexion between bladder growths and working in aniline. As the town of Basle is one of the centres of the aniline industry, it may be well to compare the number of deaths from vesical growths in aniline workers and in the male population general of Basle. The aniline industry has of late made rapid strides. The total number of men employed in the manufacture of aniline dyes and aromatic substances during 1901-10 was 840; the remaining male population of Basle during the same period was 56,500. During that decade six aniline dye workers living in Basle died from bladder tumour, and in the same period 12 men of the general population. Vesical tumour with fatal result was, therefore, 33 times more frequently observed in aniline dye workers than in the general male population. When we study the figures supplied by the surgical clinique of the University of Basle the information is not less interesting. Taking the 10 years ending 1900, of the 5500 male patients who attended the clinique, four suffered from bladder tumour. During the 10 years ending 1910 9650 attended; of those, 16 were cases of bladder tumour, and of these 10 were aniline workers and two were cloth dyers; that is, more than one-half of the cases of bladder tumour occurred in aniline workers and cloth dyers. We cannot look upon all of this as a coincidence. It is an illustration of occupation being a cause of malignant disease, and of the necessity for bringing to bear upon these trades the resources of industrial hygiene and the influence of beneficent legislation.

Roentgen Rays and Radium.

Just as each new invention brings its own malady, so may disease follow in the footsteps of discovery. While the discovery of Roentgen rays and of radium has been of the greatest service to the human race, men have died victims of their influence. Burning is one of the effects of radium. Death has claimed through painful suffering and prolonged illness men who have worked with Roentgen rays of high

intensity. The development of epithelioma upon the hand and forearm of Mr. Edison's private assistant, and which necessitated the removal by surgical operation of the forearm and later on amputation of the opposite hand, followed a few months afterwards by death of the patient, are facts well known to most of us. With other cases of cancer in radiologists we are also familiar, as well as with the thickened, cracked, and painful condition of the skin of the hands observed in persons employed in this kind of work. Inventions in keeping pace with modern requirements give rise to dangers and risks to life in those who work them, dangers which were unforeseen and therefore not expected; but these need neither create in us alarm nor fill us with dismay, for the resources of man are equal to supplying the remedy.

A SMALL MUSCLE-SPLITTING INCISION FOR THE EXPOSURE OF THE PELVIC PORTION OF THE URETER.

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THE application of the Roentgen rays to clinical medicine has taught the surgeon that calculi impacted in the pelvic portion of the ureter are of common occurrence. If the existence of a small stone in this position is proved by radiography it is wise to give the patient six months' grace in the hope that the stone may be passed by the natural channels, this passage being encouraged by injecting sterile lubricants into the ureter below the stone. Three-grain doses of urotropine should be taken three times a day throughout this period to prevent hæmatogenous infection of the blocked kidney, and a large amount of Contrexéville water should be taken every day before breakfast so as to flood down the stone from behind. If at the end of this period the stone has not passed it ought to be removed by means of operation in order to save the corresponding kidney from atrophy and infection, and the ureter itself from stricture formation at the site of the stone.

In cases of tuberculosis of the kidney and ureter it is advised by some authorities that the pelvic ureter should be removed in addition to the kidney by means of a fresh incision through the inguinal muscles. Even if a surgeon does not conform to this rule, he will meet with cases where after nephrectomy for tuberculous kidney he will be driven to remove the infected ureter for sinus formation and urinary fistula (*vide infra*, Case 12).

In a certain number of cases of tuberculosis of the urinary tract the bladder is so irritable that it becomes impossible to catheterise the ureters and determine if one or both kidneys are infected. Rovsing has published an account of many cases where he has failed to make a diagnosis by the cystoscope, and has then explored both kidneys, and if one appears healthy has removed the other with success. I am of opinion that in such cases it may turn out to be simpler and as satisfactory to expose both ureters by the small incision advocated in this paper, and if one is found to be thickened and the other not, to remove the kidney with the thickened ureter (*vide infra*, Cases 11 and 13).

These conditions are so common that operations on the pelvic ureter will undoubtedly become more and more frequent in the near future. Yet, judging by recent literature, I do not think it is at all widely recognised through what a small incision the pelvic ureter can be exposed and dealt with. After all, from the patient's point of view, a small incision that will not lead to a hernia is one of the most important facts of the operation.

Many different methods of approach to the pelvic ureter have been tried, such as the vaginal, vesical, rectal, perineal, parasacral, intra- and extra-peritoneal inguinal and ilio-lumbar routes. The problem has so far been simplified in that most authorities are now agreed that: (1) the exposure should be extraperitoneal; and (2) an incision somewhat on the lines of Sir Astley Cooper's incision for the exposure of the external iliac is the type of incision to aim at. The incisions usually advocated are needlessly large, and as the wound has to be drained it is clear that there is considerable risk of ventral hernia. Many of the subjects of

ureteric stone are young men in the prime of life, and it is not good surgery to condemn such men to a ventral hernia if it is possible to avoid it.

I have devised an incision which appears to me to pass all the tests of a perfect abdominal incision. It is small—that is to say, it is only three inches long. It is a muscle-splitting incision, and it crosses no nerve trunks or large blood-vessels. It cannot, therefore, give rise to a hernia, yet through it the whole of the pelvic ureter can be isolated and explored, and the operations be performed of ureterolithotomy, ureterectomy, and cysto-ureterostomy.¹

I propose first to describe the incision and the operation for removal of stone in the lower ureter; secondly, to explain the rationale of the incision and the facts on which it is based; and finally, to add a list of the various operations which I have performed in the last two years through it.

Description of Operation.

The patient is anæsthetised, preferably by stovaine spinal anæsthesia, and placed in the Trendelenburg position in order that the intestines may fall out of the pelvis and that light may penetrate the depths of the wound. An incision is made through the skin and superficial fascia two fingers' breadth (one and a half inches) above and parallel to Poupart's ligament. It is three inches long, and should extend from the edge of the rectus muscle two inches outwards and one inch inwards. The centre of the incision lies vertically above the internal abdominal ring.

The external oblique aponeurosis having been recognised and cleared of fat, the incision is carried through it in the direction of its fibres one inch inwards in front of the rectus muscle and two inches outwards from that muscle. The external oblique aponeurosis does not usually fuse with the internal oblique aponeurosis to form the anterior sheath of the rectus muscle until at least one inch inside the edge of that muscle. The cut edges of the external oblique aponeurosis are retracted so as to expose the internal oblique muscle and its sheath, the fibres of which at this point are horizontal or run slightly inwards and upwards and in the same direction as the fibres of the transversalis muscle. The incision is now carried through these two muscles in the direction of their fibres for two inches outwards from the outer edge of the rectus muscle and one inch inwards through the anterior sheath of that muscle. By this step the edge of the rectus muscle is clearly exposed, and the muscle belly must now be gently separated from its posterior sheath and retracted firmly inwards. By this manœuvre much extra space is gained, and it is now possible to see the deep epigastric vessels as they pierce the transversalis fascia and insinuate themselves in front of the semilunar fold of Douglas to enter the rectus sheath.

A finger placed just external to and above the point where the deep epigastric vessels enter the rectus sheath is made to tear its way through the transversalis fascia into the layer of retroperitoneal fat. The transversalis fascia is so thin at this point that it is not advisable to try to divide it as a distinct layer with the knife for fear of opening into the peritoneum. The transversalis fascia can then be divided with a blunt-pointed bistoury outwards for the full length of the wound. The finger must now be used to separate the peritoneal coat in the layer of the subperitoneal fat from the back wall of the iliac fossa and the side wall of the pelvis. In the male the first structures encountered on the back wall of the fossa are the vas deferens, which should be cleared and retracted downwards and inwards, and the spermatic vessels, which should be cleared and retracted upwards and outwards. In the female the ovarian vessels and round ligament correspond to these structures and should be treated in the same manner.

The external iliac artery, easily recognised by its pulsation, is now cleared and followed up till the common and internal iliac arteries are likewise cleared. The ureter crosses the brim of the pelvis *over the external iliac artery* and runs down the side wall of the pelvis parallel to and just in front of the internal iliac artery. It lies attached to the peritoneal coat by means of a thin fascial envelope, and it tends to be stripped inwards and upwards with this coat. For this reason there may be some difficulty in recognising it; but by rolling the parts between the finger and thumb one can

usually detect it and strip it out of its bed by means of two pairs of dissecting forceps nine inches long specially designed for this work. While this is being done it may be necessary to have the parts strongly retracted with long narrow-bladed retractors and to make use of a head lamp.

The ureter is to be exposed at the point where it crosses the external iliac artery and cleared out of its bed for two or three inches above and below. A blunt hook is passed beneath it so as to steady it and bring it nearer to the surface. Two stitches of the finest chromic catgut on the finest curved needles held in a modified Halsted's needle-holder are inserted through the walls a short distance apart and parallel to one another in the long axis of the ureter. These serve as retractors to steady the ureter for incision. In these cases the urine is usually aseptic, so that it suffices to place strips of gauze beneath the ureter to soak up the escaping urine; but if the urine is very septic it is advisable to clamp the ureter with a fine pair of intestinal clamps above the level of the proposed incision. By means of a sharp tenotome a tiny longitudinal incision is made into the ureter. A ureteric bougie is inserted down the cut and the position of the stone noted. Special ureteric stone forceps are then gently insinuated down the tube, and a few trials are generally successful in grasping the stone and lifting it out of the wound. A bougie is passed into the bladder to make sure the way is clear. The cut in the ureter is united by a single layer of finest chromic catgut stitches passing through all its coats. This layer is covered in by another layer taking up the peri-ureteric tissues and covering in the first layer.

When the ureter is much dilated this procedure is easy, but in a small ureter it needs care and patience. When properly performed I find that no leakage or urine occurs at all, and the wound heals by first intention and without any suppuration. This is such a great gain for the patient that I cannot agree with those who recommend that the wound be left unstitched or only partially stitched. It is true such a wound will heal up in time, but at the cost of a lengthened convalescence and a weakened scar, and with the added risk of infection of the urine itself.

The advantages are great of removing the stone in this manner. The stone is brought up to a healthier portion of the ureter than that in which it lies so that the wound can heal by first intention, and there is less risk of subsequent stricture formation. If at first the stone cannot be dislodged with forceps and brought up to the pelvic brim, one can often accomplish this by inserting a gloved finger into the vagina or rectum and manipulating the stone upwards from below. Should this manœuvre fail, as it did in Cases 2 and 6, the ureter must be cleared out of its bed right up to the wall of the bladder. In the female the uterine artery and vein have to be cut between two ligatures before one can get at the lowest portion of the ureter, and in the male the obliterated hypogastric or superior vesical artery may have to be cut across, and the vas strongly retracted upwards and outwards. In this way I was able to remove two stones which were almost intramural by cutting down directly on to them in the lowest part of the ureter. Even at this depth stitching of the ureter can be carried out if patience be exercised.

When the wound in the ureter has been dealt with the peritoneum is allowed to fall back into place, a long strip cut from a rubber glove being carried from the site of the wound in the ureter up and out of the wound at the edge of the rectus. Such a drain has been found by experience to draw off fluid as well as a tube, and after it has been removed leaves practically no loophole in the wound for escape of a hernia. The split fibres of the internal oblique and transversalis muscles are united with chromicised catgut outside the drain. The cut anterior sheath of the rectus formed by the aponeurosis of the muscles is then united in similar fashion inside the drain. The split external oblique aponeurosis is united with a second layer of stitches, and finally the skin is united with silkworm gut.

The patient is nursed for the next two days turned over on to the side on which the wound lies and with the head down so as to encourage drainage. As a matter of fact, no leakage occurred in any of my cases except Case 2, and the wound being firmly healed the patient has been allowed up on the tenth to the twelfth day and has usually left the hospital by the fourteenth to sixteenth day. Urotropine is given regularly both before and after the operation so that

¹ In cases of acute appendicitis, when the effusion is inguinal and pelvic, this incision gives much better access to the parts than the usual gridiron or Battle's incision.

the urine does not become infected, and the patient goes out with the urine perfectly clear.

Certain difficulties that may be encountered should be mentioned. If there is much peri-ureteritis it may be difficult to peel the ureter out of its bed. Again, in Case 4 the ureter was so dilated that for some little time it was mistaken for the sigmoid flexure. Its true nature was only recognised when its wall was incised and urine gushed out. Finally, if a stone has been impacted for two years or more in the lower ureter, a stricture is likely to form at the site of the stone after this has been removed, as happened in Case 4. It is a question for future experience to decide as to what had best be done in such cases. Should the wound be closed and nothing further be done unless symptoms of stricture show themselves? This will probably mean that a secondary cysto-ureterostomy is impossible, and that nephrectomy is the only way out of the difficulty. Or should an immediate cysto-ureterostomy be performed in all cases where the stone has been impacted for two years or more? Very probably the kidney is of little value in such a case, so that it is a moot point as to whether the added risks of a cysto-ureterostomy are worth taking, and in all probability the patient will come out of his difficulties most surely if his ureter be left to take its chance, and if a secondary nephrectomy be proceeded to forthwith as soon as any sign arises of stricture of the ureter.

The Rationale of the Incision.

When incising the abdominal wall the surgeon should split muscles and their sheaths in the direction of their fibres, should turn muscle bellies aside, should cut no nerves, should leave intact the main vascular trunks, and should make an opening as small as is consistent with a proper display of the parts beneath.

In planning an incision to explore the pelvic ureter the following facts had to be considered: (1) the position and direction of the last dorsal and ilio-hypogastric nerves; (2) the position and course of the deep epigastric vessels and their relation to the transversalis fascia; (3) the arrangement and direction of the fibres of the rectus, oblique, and transversalis muscles. To determine these points I made special dissections of the abdominal wall in a number of subjects, and I must also acknowledge my indebtedness to a paper by V. P. Blair, of St. Louis, who dissected ten subjects and published his observations in 1905.²

Based on a number of dissections the following statements will be found to hold good in the average case. The twelfth dorsal nerve crosses the semilunar line and enters the sheath of the rectus halfway between the umbilicus and the pubis. The ilio-hypogastric nerve will be found in the substance of the internal oblique and then between that muscle and the external oblique about one finger's breadth above Poupart's ligament.

The deep epigastric vessels cut the edge of the rectus abdominis muscle one and a quarter inches—that is to say, rather less than two fingers' breadth—above Poupart's ligament. The vessels appear to bear a variable relation to the transversalis fascia, and may not pierce the fascia till just as they enter the rectus sheath itself.

As regards the arrangement and direction of fibres of these muscles. If an incision is made parallel to and two fingers' breadth above Poupart's ligament, the fibres of the external oblique aponeurosis are in the same direction as the incision or they run a little downwards and inwards with regard to it. They extend in the same direction over the edge of the rectus for nearly one inch before fusing with the deeper layer of the rectus sheath.

The fibres of the internal oblique and transversalis muscles and their aponeuroses are horizontal except in the external part of the wound, when those of the internal oblique tend to run upwards and inwards. These muscles can, therefore, be split together in a direction either horizontal or slightly upwards and inwards, and the split is then extended onwards on to the anterior layer of the rectus sheath for the distance of one inch.

The edge of the rectus muscle is drawn inwards to make more room. This method of incising the sheath of the rectus horizontally is a great advance on incisions such as Battle's incision, wherein the rectus sheath is cut vertically across the fibres of the sheath and the posterior part of the rectus sheath is also cut vertically across its fibres, the cut severing

the twelfth dorsal nerve and its accompanying vessels. The posterior sheath of the rectus below the level of the incision is absent or is merely represented by the transversalis fascia.

As regards the size of the incision, experience of the cases detailed below has taught me that three inches is quite long enough for the average case (2½ inches in Case 8). In my early cases the incision was longer, and it may be necessary in exceptionally difficult cases to prolong the incision to four or even five inches by splitting the muscles in an outward direction. I lay special stress on the question of size, as, judging by the literature, I do not think it is yet recognised at all widely that so small an incision will suffice. The old-fashioned ilio-lumbar incision of great size should never be needed.

The relation of the right ureter to the vas and the visceral branches of the anterior divisions of the internal iliac vessels is very like that of a pen held in the right hand ready for writing. The pen represents the ureter, the thumb the vas deferens, the first finger the leash of vessels (superior vesical, uterine and inferior vesical) running forwards from the parent trunk along the side of the pelvis between the ureter and the wall of the pelvis and then round and over the ureter to enter the bladder and uterus.

Notes of Cases.

Subjoined is a list of 13 cases in which I have employed the incision in the last two years for operations on the pelvic ureter.

CASE 1.—Female, aged 31 years. January, 1911, eclampsia during parturition. Ever since pain in right loin, renal colic, hamaturia, and pyuria. Examination showed B. coli and pus in large amount in the urine, albumin one-third. In skiagram an ovoid shadow was seen in the region of the right pelvic ureter. August 4th, 1911, operation, muscle-splitting incision as above. Stone found 1 in. outside bladder wall, pushed up into healthier part of the ureter, and removed. Rubber drain; no leakage; first intention wound. Patient left hospital on sixteenth day. Stone, phosphate of calcium and magnesium.

October, 1912: Urine clear, no pus; no block in right ureter as tested by a ureteric catheter; no stone shadow in the X ray. The patient came up for headache and oedema of the legs due to a fresh attack of non-microbic nephritis.

CASE 2.—Male, aged 22 years. August 13th, 1911; two attacks of renal colic during the last six months. A skiagram on each occasion showed a stone shadow in the right lower ureter in the same position. Urine, trace of albumin, red blood corpuscles, calcium oxalate crystals, no pus. August 13th, 1911, operation, incision as above, but nearly 5 in. long. The ureter was exposed and cleared right down to the bladder wall. Stone almost intramural. Ureter incised over stone, stone removed, and ureter stitched; drain. A little urine leaked for a few days. Patient left hospital on sixteenth day soundly healed. Stone, calcium oxalate. Urine at exit, no albumin, no pus.

CASE 3.—Male, aged 41 years. Eight months' history. Urine, trace of albumin, many red corpuscles, calcium oxalate crystals. Skiagram, stone shadow in left lower ureter. Oct. 16th, 1911, operation, incision as above, 3 in. long. Ureter opened 3 in. above the stone, and the stone removed easily with forceps. Wound in ureter reunited; small tube. No leakage; tube out second day; wound healed by first intention, and patient left hospital on sixteenth day. Urine, no pus, but still a trace of albumin. Stone, calcium oxalate and magnesium phosphate mixed.

CASE 4.—Male, aged 24 years. Nov. 1st, 1911; two years' history. Treated by a man who calls himself the "Human X Rays." Urine acid, pus in fair amount, albumin. Skiagram, very large ovoid shadow in the region of the left lower ureter, measuring ½ in. by ⅓ in. An "iron oxide" bougie was passed ¾ cm. up the left ureter and a stereoscopic X ray picture was taken. This showed the top of the bougie touching the stone shadow. "Edema bullosum" of left ureter. Nov. 9th, 1911, operation, incision as above, 3 in. long. Ureter so dilated that at first it was mistaken for the sigmoid flexure; very adherent to the surrounding structures in the region of the stone; opened at the pelvic brim level, a large stone pushed up with a scoop, being very adherent to the sides of the ureter, and removed. The wound in the ureter was reunited; fine tube; no leakage. Healed by first intention.

Nov. 24th, 1911: Left renal colic, large tumour in left loin, fever. Cystoscopy, left ureter completely blocked. Left nephrotomy, drainage of a large collection of urine in the distended kidney under tension. Functional tests showed that the right kidney was good enough and left kidney almost functionless. Dec. 7th, 1911: Original wound opened up again. Ureter so buried in adhesions that it could not be isolated. Left lumbar nephrectomy performed. First intention wound. Kidney substance was thinner than notepaper. Patient left hospital quite well on Dec. 30th.

CASE 5.—Male, aged 38 years. March 23rd, 1912; since August eight attacks of right renal colic. Urine natural. Skiagram showed a stone shadow in the right lower ureter. March 25th, 1912, operation, 3-in. incision as above. Ureter exposed and opened at pelvic brim, stone extracted with forceps; rubber drain; no leakage. Wound healed by first intention and patient left hospital on nineteenth day.

CASE 6.—Female, aged 28 years. Sept. 3rd, 1912; ten months' history. The skiagram showed a stone shadow in the left lower ureter. Urine normal. Sept. 6th, 1912, operation, incision as above. Ureter exposed at pelvic brim and incised. Stone lying just above bladder; could not be pulled up with forceps, nor could it be pushed up by means of a finger in the vagina. Ureter cleared right down to bladder and again incised over stone; stone extracted. Both incisions in ureter united with a double layer of chromic gut. Wound reunited, with a small drain. First intention. No leakage of urine. Patient left hospital on eighteenth day, urine clear. Stone—calcium oxalate.

² Interstate Medical Journal, vol. xii., No. 8, 1905.

CASE 7.—Male, aged 59 years. Oct. 10th, 1912; ten months' history. Skiagram showed a stone shadow in the lower end of right ureter. Cystoscopy showed a large "middle lobe" prostate. Urine clear, no pus, no albumin. Oct. 24th, 1912, operation, incision as above. Ureter opened at pelvic brim. Stone lying 2½ in. below the opening, easily extracted; ureter closed; rubber drain. No leakage of urine. Wound healed by first intention. Patient left hospital on the fourteenth day; urine clear at exit. Stone—calcium oxalate, trace of calcium phosphate.

CASE 8.—Male, aged 46 years; six months' history. Urine contained a fair amount of pus. Skiagram—stone shadow in the left kidney and another in the left lower ureter. March 4th, 1913, left pelvic ureter exposed as above. As the urine was purulent the ureter was clamped at the upper end and opened at the lower pelvic brim. Stone extracted with some difficulty by means of a scoop; was lying 3 in. below the opening. Wound reunited; indiarubber drain. Wound was 2½ in. long as measured at the end of the operation. First intention. Eight days later nephrolithotomy. Patient left hospital soundly healed four weeks from date of entry.

CASE 9.—Male, aged 43 years. Jan. 20th, 1913; 11 years' history. Urine clear, trace of albumin, calcium oxalate crystals. Skiagram—stone shadow in left pelvic ureter and another in the left renal cortex. Jan. 23rd, 1913, operation, incision as above; ureter opened at pelvic brim level. Stone lying 3 in. below opening, easily extracted. Ureter closed; rubber drain: no leakage of urine. First intention wound. Patient got up on thirteenth day, urine being clear. Stone—calcium oxalate. Feb. 13th, 1913, second operation. Left kidney exposed by muscle-splitting incision and stone extracted from the lower middle posterior calyx. No drainage; first intention wound. Patient allowed up on fourteenth day. Urine clear. Stone—calcium oxalate.

CASE 10.—Female, aged 23 years. Two years' history of pain, for which appendix had been removed by another surgeon. Skiagram—stone shadow in left lower ureter. April, 1913, operation. Left ureter exposed through 2½ in. incision. Much dilated; opened at pelvic brim, stone easily removed; wound in ureter reunited. No drainage; first intention. Patient up on ninth day. Stone—calcium oxalate.

CASE 11.—Male, aged 44 years. Oct. 7th, 1912; four years' history. Urine contained large amount of pus and tubercle bacilli. No radiographic evidence of tuberculosis in the kidneys. The right ureter could be felt per rectum to be thickened, evidence of infection of the right kidney, but not so the left ureter. Several attempts at cystoscopy and catheterisation of the ureters failed as the bladder was too irritable. Oct. 31st, 1912, operation, incision as above. Left ureter exposed in the pelvis and found to be adherent to the subperitoneal fat and definitely thickened. This proved that the left kidney was infected as well as the right, and that the case was inoperable. No drainage; first intention. Patient left hospital on twelfth day.

CASE 12.—Male, aged 21 years. August 9th, 1912. Diagnosis—right renal tuberculosis, left kidney healthy and of excellent functioning powers. August 16th, 1912, operation, Mayo's incision, right nephrectomy. Kidney and ureter stuffed with tubercle. A urinary fistula formed in the wound. Sept. 9th, 1912, second operation, incision as above, right ureterectomy to bladder wall. Ureter cut across with a cautery after it had been ligatured with stout catgut. Wound not drained; healed by first intention. Patient left hospital on Sept. 25th soundly healed.

CASE 13.—Male, aged 37 years. Four months' history; chronic phthisis. Cystoscopic diagnosis—tuberculosis of right kidney. No specimen could be obtained by catheterisation of left ureter. March 25th, 1913, operation. Left ureter exposed through 2½ in. incision; found to be not thickened. Right nephrectomy. Result two months later—no symptoms and urine free from pus.

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OBSERVATIONS ON "DIAGNOSTIC" TUBERCULIN.

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WITH the introduction of the tuberculin test it was hoped that much of the difficulty attending the recognition of pulmonary tuberculosis in the early stages would be removed, and that in a case presenting signs and symptoms suggestive of tuberculosis, but lacking the definite proof afforded by the presence of tubercle bacilli, the application of the tuberculin test would determine the existence or non-existence of the disease. This hope has not been fulfilled. Some clinicians, however, are still of the opinion that by the use of tuberculin in such cases a definite diagnosis can be arrived at. Those who hold this view believe that a general reaction—namely, a rise of temperature, malaise, &c.—to diagnostic doses of tuberculin is sufficient proof of the existence of what may be termed "clinical tuberculosis." If, in addition, there are signs or symptoms suggestive of pulmonary tuberculosis, a positive diagnosis, in their opinion, is justified.

This view unfortunately cannot be maintained. Franz in particular has shown that a very large proportion of apparently healthy men who present no signs or symptoms whatsoever of tuberculosis give a general reaction to diagnostic doses of tuberculin, especially so if the individuals thus examined came from a district in which tuberculosis is prevalent. Such cases Lawrason Brown, of the Adirondack Sanatorium, terms "non-clinical" tuberculosis. It is

probable that in such cases there has been at some time an infection with tubercle; the infection, however, has never reached the stage at which it can be diagnosed clinically, is in many cases probably obsolete, and requires nothing in the way of active treatment.

It may be said with confidence that in healthy persons the tuberculin reaction is of no clinical significance, and that in a case of ill-health a reaction to tuberculin is, in itself, no evidence that tuberculosis is the cause of the symptoms. In brief, it is generally recognised that so far as pulmonary tuberculosis is concerned tuberculin for diagnostic purposes has great limitations, since a reaction occurs as readily in cases of mere infection with tuberculosis (non-clinical tuberculosis) as in clinical tuberculosis, and in respect to clinical tuberculosis we are unable to differentiate with any certainty by the use of tuberculin between cases of active, quiescent, and arrested disease. There are, however, good grounds for holding that in the case of a patient presenting indefinite signs and symptoms the failure to react to a subcutaneous dose of 10 milligrammes is strong evidence against the existence of clinical tuberculosis, and that conversely the occurrence of a focal reaction in a suspected area in the lungs is suggestive of the existence of potentially active tubercular disease.

The above represents very briefly the state of our knowledge of the value of tuberculin as a means of diagnosis at the date of the commencement of our work on tuberculin. Since that date (October, 1911) every patient at the sanatorium in whom we have failed to find tubercle bacilli has been subjected to the subcutaneous tuberculin test. In this report I propose to record the results of these observations, and to indicate to what extent we have been influenced by them in the diagnosis and treatment of these particular cases. The number of patients thus observed up to March 31st amounted to 50.

Method of observation.—The patient (afebrile patients only are tested) is kept at physiological rest for some 48 hours before the inoculations are begun, the temperature being recorded three-hourly throughout this period and during the whole period of subsequent observations.

Dosage.—The sequence of doses used is as follows: First dose, 2/10 milligramme (0.0002 c.c.) albumose-free tuberculin; second dose, 1 milligramme (0.001 c.c.); third doses 5 milligrammes (0.005 c.c.); fourth dose, 10 milligramme, (0.01 c.c.).

Site and time of inoculations.—The inoculations are made at 10 A.M., usually in the forearm.

Clinical record.—Note is made daily as to the presence of (a) local reaction at the seat of inoculation; (b) general reaction—namely, rise of temperature, malaise, &c.; also of any increase of symptoms, such as cough, sputum, &c.; and (c) focal reaction—namely, the appearance of, or increase in, physical signs or increase of sputum. Sputum, when available, is carefully tested for tubercle bacilli by the sedimentation method of Ellerman and Erlandson. The 50 cases now under consideration may be for convenience divided in two groups: (1) those in which there were physical signs suggesting the possibility of tuberculosis either in the lung, larynx, or pleura (37 in number); and (2) those in which no physical signs were present (13 in number). It may be assumed that all the 50 cases had something suspicious in their clinical history, symptoms, &c., inasmuch as they had been sent into the sanatorium as cases of pulmonary tuberculosis. The results of the diagnostic tests are summarised in the following table:—

	Cases with suspicious physical signs.	Cases with no suspicious physical signs.	Total.	Per cent. of all cases.
Gave no reaction ...	8	3	11	22
Gave a focal reaction ...	12	1	13	26
Gave a general reaction } only ...	17	9	26	52

Indications given by the above Results.

Focal reactions.—The 13 patients who gave a focal reaction were regarded as suffering from tuberculosis in an active or