incision above to free the kidney and the upper ureter and a vaginal incision to free the lower end of the ureter. When the ureter is entirely free the fingers in the abdominal, and those in the vaginal wound meet and the organ is extracted above.

Nephroureterocystectomy.

One of the most serious local extensions of the disease has, from the first, been deemed an involvement of the vesical walls, and a number of surgeons have considered cases of this character as beyond the pale of radical relief. My own work in some desperate cases has taught me that with careful surgery almost no case is beyond radical relief so long as the disease remains confined to the urinary tract of one side and the bladder; and to this may be added a non-tuberculous pyelitis of the opposite side.

Two of my cases looked exceedingly hopeless and had been given up to die, both were emaciated by months of night vigils, and constant intense suffering with tenesmus, and one did little else than lie moaning like a distressed animal, screaming if she was touched on the vagina, and soaked in her offensive involuntary discharges. The bladder was contracted, ulcerated, bleeding, and uniformly of a deep angry red colour characteristic of an active universal cystitis.

The first step was to relieve the pain, and that was done by making a large vesico-vaginal fistula. Next the tuberculous kidney with its thickened ureter was taken out, then in one case a large part of the bladder was excised, and subsequently another piece was taken out, both times suprapubically, between one-third and a-half in all. The fistula was closed, the bladder was irrigated and distended, and in the latter case the remaining kidney was irrigated. Both recovered over a year ago and are now well women managing their respective households. I cannot insist too strongly on the value of the prolonged bath at an even temperature of 100° F. for hours or all day as devised by Dr. Hunner for these cases, especially if the vagina is patulous.

The steps in these bad cases are the following: (1) Drain a bladder thoroughly; (2) then remove kidney and ureter; (3) use the bath when possible; (4) close the fistula; (5) treat any remaining small patches of the disease with nitrate of silver applied through the open-air speculum; (6) use distension and irrigation treatments; (7) excise any rebellious areas of disease.

As a matter of fact the small patches of cystitis and the little areas of disease around the ureteral orifice are rarely tuberculous, and this is the reason they clear up so readily without further treatment after a nephrectomy.

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CONSTRICTION OF THE URETER.

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The causes of ureteral constriction may be divided into three classes: The first, congenital anatomical anomalies; the second, morbid affections of the ureteral channel itself; the third, morbid affections which involve the ureter from the outside. The anatomical peculiarities which have been described are: Kinking of the duct over an abnormally situated renal vessel and an oblique or unusually high insertion of the ureter into the renal pelvis, giving rise to physical difficulty in the emptying of the latter. True congenital stricture of the ureter has also been recorded in a few cases. The affections of the canal itself which may cause stricture are: Ureteritis, especially the tuberculous form, injury, and the lesions set up by calculi.

Of the acquired conditions other than those of the canal itself, which may lead to ureteral obstruction, the most common at the upper pole is renal mobility causing kinking of the duct at the lower pole, new growths, and inflammatory processes of the pelvic organs.

Sooner or later obstruction to the passage of urine down the ureter is followed by dilatation of the renal pelvis and of the ureter itself above the obstruction. The degree of this dilatation will depend on the degree of obstruction and the length of time it has been established. The ureter, like other muscular organs, will not undergo dilatation until the resistance to its contractions has passed a certain limit; it will

tolerate a certain degree of resistance for a certain period. That a resistance sufficient to lead to symptoms of ureteral colic may be present without any marked dilatation is shown by one of the cases which I shall relate. Under such circumstances diagnosis may be a matter of considerable difficulty, and the symptoms have been attributed to affections of the uterine appendages, of the intestinal tract, and of the appendix. The first of the three cases which I have to record is instructive chiefly from the point of view of the symptomatology and the diagnosis.

CASE I.

On August 15th, 1902, a young lady, aged 20, was sent to me with the statement that she had had several attacks of appendicitis, and with the request that I would remove her appendix during the period of quiescence which was said to be then present.

History.—In November, 1900, she had her first attack of so-called appendicitis; this came on with great suddenness, while she was in a railway station; she collapsed with very acute pain, referred to the right iliac region. She was taken home in the train and vomited several times on the journey. The same night the pain became more generalized over the abdomen, and during the next three days morphine was administered steadily. At the end of this period there was still some general abdominal pain, worst in the right iliac region; this gradually subsided, and she was soon pronounced convalescent. Since this time, that is to say for about twenty months, she had had a somewhat similar attack about every two months; these had always been attended by constipation and much nausea; the pain was of a sharp burning character. The last attack had occurred a month previous to the time of consultation; she was kept in bed for thirty-six hours, and since this she had never been free from a dull pain in the right iliac region, which was always more pronounced after exercise. The abdomen was normal to inspection and flaccid; palpation showed an area of marked tenderness over an oval area immediately inside the upper third of Poupart's ligament, but there was no increased resistance here. Except for this tenderness, abdominal examination showed nothing abnormal.

On August 21st the appendix was removed; it showed an area of eroded mucous membrane adjacent to the base, but no appearances such as were expected on reference to the history. She returned home at the end of September. During the winter she continued to have dull pains referred to the right iliac region, and either stayed in bed or lay on a couch. In March she had an acute attack; she had just got up out of bed about 5 p.m., when a sudden very acute pain came on below the operation scar and radiating to the front. For 24 hours she had retention of urine; she felt a desire to pass water, but could not. In July I saw her again, with Dr. Tellett of Ramsey. He told me that, although he considered her attack one of cystitis, he had not been able to discover any abnormality in the urine. At this time she was still suffering, and, except for an occasional walk into the garden, was unable to take any exercise. The pain remained localized as before, the only new point being that it occasionally radiated to the right loin. At this time I diagnosed either stone or stricture in the right ureter, and she came over to Liverpool for further treatment. The urine examination at this time showed: Reaction, neutral; specific gravity, 1030. Deposits: Oxalates in abundance, acid phosphate crystals, a few white corpuscles and epithelial cells of transitional type; no albumen, blood, or pus. For three days after her journey she was unable to empty her bladder voluntarily. The average amount of urine passed for ten days before operation on August 5th was 45 oz.

On August 5th I dilated the urethra and passed a ureteral catheter into the right ureter through a Kelly's speculum. I was unable to introduce this further than $\frac{3}{4}$ in. from the orifice, where it met with some resistance. I then opened the abdomen and exposed the right ureter transperitoneally, and making a small longitudinal incision passed a fine flexible bougie downwards. It was arrested about an inch from the bladder, and on exerting some pressure it was felt to be gripped in the channel, and I could pull on the ureter in the same way as one can pull on the urethra with an instrument tightly gripped by a urethral stricture. I was not able, however, to get any instrument available through the constriction. Feeling confident, however, that I could dilate the stricture from the bladder with a suitable instrument, I closed the ureteral incision, brought the peritoneum together across it, and sutured the incision in the abdominal wall in the usual manner.

For a month after this the patient was free from pain, owing no doubt to the degree of dilatation which the stricture had received. I should say by that the instrument which was introduced into and gripped the stricture was a black gum elastic filiform bougie of the smallest size. In October I successfully dilated the stricture from the bladder; this dilatation was accompanied by the sensation of something giving way at a distance of about $\frac{3}{4}$ in. from the aperture, the instrument being under the control of a finger in the vagina; finally, I was able to pass a black rubber bougie up to the kidney without difficulty. Since this time she has had no return of her former symptoms, and this fact supports the idea that the ureter was bound down by adhesion in the pelvis, being the subject of extra-ureteral and not intra-ureteral stricture. I regret to say that recently I have had to operate again for symptoms due to omental adhesions to the neighbourhood of the wound in the parietal peritoneum through which I incised the ureter; these gave rise to a train of symptoms quite different in character from those from which she previously suffered, and she is now well.

CASE II.

A girl, aged 21, fell downstairs and injured her left side on June 21st, 1904. Three days later she, for the first time, detected a lump in the left side of the abdomen which she had never noticed before.

She was admitted to the Northern Hospital and a firm, movable, tender swelling about the size of the closed fist was found present in the left hypochondrium reaching backwards to the loin. She had no fever, the urine was acid, of specific gravity 1020, containing no blood, albumen or other abnormal constituent.

The tumour was exposed by lumbar incision and found to consist of kidney and dilated renal pelvis. From the latter about 20 oz. of blood-tinged fluid was evacuated. The interior of the sac was inspected through the incision and the ureteral orifice was sought for but not found. After some dissection the duct was exposed on the outer wall of the sac, against which it was flattened for about $\frac{1}{2}$ in. of its length, its insertion into the pelvis being about 3 inches vertically above the lowest margin of the dilated pelvis. A small longitudinal wound was made in the ureter from the outside and a probe was then passed upwards into the renal pelvis, the opening into the latter just admitting the probe. A fine probe-pointed bistoury was then passed into the sac and pushed into the ureteral opening, and both ureter and sac wall were cut down from the inside as far as the most dependent point, and the edges thus made were sutured together in front and behind. In this way the ureter was made to communicate with the renal pelvis by a long slit-like opening about $\frac{1}{2}$ in. in length. The wound in the sac wall was then sutured, and lastly that in the parietes.

Reference.	Situation.	Symptoms.	Treatment.	Result.
Kelly (<i>Johns Hopkins Hosp. Bullet.</i> , Sept., 1900)	Opposite cervix uteri	Pain; irritability of bladder	Uretero-vaginal fistula with dilatation	Permanent fistula.
Küster (<i>Arch. f. klin. Chir.</i> , 1892, p. 830) ...	One stricture near pelvis, another 2 c.cm. below	Hydronephrosis	Resection with implantation of ureter into pelvis	Recovery.
Van Hook (<i>Journ. Amer. Med. Assoc.</i> , Dec. 16th, 1893)	Just below pelvis	Pyonephrosis	Resection and implantation, but second discovered lower down and nephrectomy done	—
Mynter (<i>Amer. Surg.</i> , 1893, p. 658) ...	Junction with pelvis	Pain every few months for 12 years; slight haematuria	Mynter's plastic procedure	Recovery.
Delbet (<i>Gaz. hebdom.</i> , 1899, p. 13) ...	Just below pelvis	Intermittent pain in left loin	Mynter's operation	Recovery.
Israëli (<i>Berl. klin. Woch.</i> , 1899, p. 201) ...	3 c.cm. above the bladder	Frequent and painful micturition; pyuria	Implantation of ureter into bladder wound	Recovery.
Helferich (<i>Dissert. Kiel</i> , by Christensen, 1902)	Ureter obliquely inserted into pelvis	Hydronephrosis	Dilated pelvis plicated with suture	Recovery.
Helferich (<i>Dissert. Kiel</i> , by Christensen, 1902)	Stricture near pelvis	—	Section and implantation of ureter into lowest point of pelvis (Küster)	Nephrectomy.
Hildebrand (<i>Centralbl. für Chir.</i> , 1902) ...	Near pelvis; kinked and bound down	Hydronephrosis	Implantation into lowest point of pelvis (Küster)	Recovery.
Freyer (<i>Polyclinic</i> , 1903, 121) ...	Kink and stricture; adhesions	Hydronephrosis; movable kidney	Dilatation; nephropexy, drainage of pelvis	Recovery in six weeks.
Fenger (<i>Chir. Med. Rec.</i> , 1893, p. 164) ...	At pelvic junction	Intermittent pain and tumour, occasional pyuria	Fenger's plastic	Recovery.
Fenger (<i>Amer. Journ. Med. Sci.</i> , Dec., 1896)	Just below pelvis	Intermittent tumour, pyuria	Fenger's plastic; drainage of pelvis	Recovery.
Morris (<i>Surg. Dis. Kidney and Ureter</i> , II, p. 444)	Stricture above calculi	Pain 15 years with interval, pyonephrosis	Excision of narrowed ureter and implantation; then nephrectomy	Recovery.
Morris (<i>Surg. Dis. Kidney and Ureter</i> , II, p. 444)	Oblique insertion into pelvis	Nine years' intermittent hydronephrosis	Fenger's nephropexy	Recovery.
Morris (<i>Surg. Dis. Kidney and Ureter</i> , II, p. 444)	Stricture at pelvic junction	Intermittent pain 5 months, frequency of micturition, pyuria	—	Recovery.
Morris (<i>Surg. Dis. Kidney and Ureter</i> , II, p. 444)	Valvular stricture just below pelvis	Intermittent pain, pyrexia, haematuria	Fenger	Recovery.
Morris (<i>Surg. Dis. Kidney and Ureter</i> , II, p. 444)	Stricture just below pelvis	Pain, diminished urine, haematuria	Fenger	Recovery.
Trendelenburg (<i>Samml. klin. Vortr.</i> , 1890, p. 335)	Oblique insertion into pelvis	?	Implantation into lowest point of pelvis (Küster)	Death from ileus.
Bazy (<i>Rev. de Chir.</i> , 1897, p. 400) ...	At renal pelvis compressed on sac	Left hydronephrosis	Transperitoneal operation; implantation into lowest point of sac (Küster)	Recovery.
Bazy " " " " " "	Near pelvis	Anuria, calculi above stricture	Implantation into lowest point of sac (Küster)	Death; infection.
Bardenheuer (<i>Centralbl. f. Chir.</i> , 1894, p. 1115)	Near pelvis	—	Resection and implantation into sac (Küster)	Recovery.
Richardson (<i>Trans. Amer. Surg. Assoc.</i> , 1897, p. 555)	Oblique insertion into pelvis	Occasional attacks; lumbar pain	Longitudinal incision united transversely (Fenger)	Recovery.
Krogius (<i>Centralbl. f. Chir.</i> , 1902) ...	Kink over abnormal vessel	Pain since childhood. Haematuria	Fenger's plastic. Later ureter cut and implanted into sac	Recovery.
Morgan (<i>Ann. Surg.</i> , XXXVI, p. 528) ...	Stricture due to adhesions close to bladder	Four years. Severe pain, radiating to bladder. Frequency of micturition	Three operations. Plastic operation by extraperitoneal route	Recovery.
Young (<i>Amer. Med.</i> , Aug. 9th, 1902) ...	Close to bladder, below calculus	—	Incision of stricture. Extraperitoneal operation	Recovery.
Young (<i>Ann. Surg.</i> , XXXVII, p. 668)	Close to bladder	—	Dilatation	Recovery.
Hartmann (<i>La Séparat. de l'Urine, Lugs.</i>) ...	At pelvic junction	—	Fenger's operation	Recovery.
Harrison (<i>BRIT. MED. JOURN.</i> , Dec. 10th, 1904)	Valvular obstruction at pelvis	—	" "	Recovery.
Moynihan (<i>BRIT. MED. JOURN.</i> , vol. I, 1904, p. 1010)	Stricture near pelvis. Adhesions to sac	Pain in loin 17 years	Longitudinal incision. Transverse suture. Later section and implantation	Recovery.
Moynihan (<i>BRIT. MED. JOURN.</i> , vol. I, 1904, p. 1010)	Spur at pelvic junction, oblique insertion	Pain in loin 7 months	Longitudinal incision. Transverse suture	Recovery.
Monsarrat... " " " " " "	Close to bladder	Paroxysmal pain in right iliac region. Bladder tenesmus	Dilatation from bladder	Recovery.
Monsarrat... " " " " " "	At pelvic junction	Hydronephrosis. No lumbar pain	Mynter's plastic	Recovery.
Monsarrat... " " " " " "	" "	Lumbar pain. Pyuria	Forcible dilatation. Drainage of pelvis	Recovery.

For the next ten days the urine contained blood in considerable quantity, showing the patency of the ureter; a few days after the blood disappeared pus occurred in the urine and continued for about three weeks—that is to say, she had pyelitis. This cleared up at the end of the three weeks.

The success of this plastic operation on the ureter is shown by the fact that there has been no recurrence of the hydro-nephrosis, and no other symptoms except occasional discomfort in the loin. It is doubtful, however, whether the kidney is doing much work.

CASE III.

A boy, aged 21, was admitted to hospital on September 19th, 1903, with a history that ten days previously he had suddenly been attacked with violent pain in the left lumbar region. This pain continued intermittently until admission.

On examination, there was marked tenderness to bimanual palpation of the left lumbar region, and muscular resistance prevented a satisfactory examination. The urine contained pus in small quantity, and microscopically a few red cells were also seen. He was examined by the x ray, but the radiograph showed no renal calculus.

His pain continued after admission, and on September 26th the left kidney was explored. The renal pelvis was distended and contained about 8 oz. of pus; no calculus was present. A careful examination of the pelvis and ureter showed that where the former passed into the latter was a very narrow constriction, above the level of the superior isthmus. This admitted of dilatation with a fine pair of dressing forceps pushed into the stricture from inside the pelvis. The pelvis was freely irrigated with water and the incision into its wall was closed; the wound in the soft parts was closed with drainage.

The after-history is interesting: For five days pus and blood were present in the urine in diminishing quantities, but on the sixth both had disappeared. The total amount of urine passed became markedly increased; from a mean of 30 oz. before operation it rose to an average of over 70 oz. for the twenty days following. The wound healed satisfactorily. I have seen this patient recently. On August 19th he had some pain in the left loin again for the first time since operation. I kept him under observation for a month, during which time he had no return of the pain or discomfort and no abnormal constituent in the urine.

REMARKS.

I wish to remark on the influence of renal stasis as illustrated in this third and other cases as a factor in the production of pyelitis and pyonephrosis. Cases of pyelitis (excluding the tuberculous form) are not uncommon where the affection is primarily of the renal pelvis and where no very definite cause for the condition is discovered. Fagge is content to dismiss such cases as probably due to renal calculi which have disappeared. It is known that the kidney is a regular channel of escape for bacteria during apparent health. It has been shown in dogs that with experimental bacteriuria a unilateral pyelitis can be produced by ligation of one ureter, the opposite kidney remaining apparently normal. It appears very probable that a certain number of the cases of primary pyelitis of obscure origin are dependent on renal stasis due to some defect in the mechanical conditions under which urine is expelled from the renal pelvis.

Pyonephrosis, as distinct from pyelitis, is no evidence that there was any primary obstruction to the urinary discharge, for we know that a pyelitis which is due to ascending infection from the bladder not infrequently becomes pyonephrosis from the obstruction caused by swelling of the mucous membrane and the impaction of shreds and detritus.

In this third case I think it may be assumed that the ureteral stricture was a determining factor in the pyelitis; what we know of the kidney as a portal of escape for the bacteria of the body, and what experimental work has shown to be the effect of ureteral ligation in the presence of definite bacteriuria, justifies the supposition that interference with the mechanics of renal discharge may play an important part in the etiology of similar cases of primary pyelitis.

The plastic procedure adopted in the second case is that which is usually spoken of as Mynter's method. It is suitable for those cases in which the stricture is situated at the junction of the renal pelvis and ureter or close below. For strictures below the level of the lower pole of the sac some other method has to be adopted. For these Küster's procedure is to be recommended, or the stricture may be excised and the

ends of the divided ureter brought together by ureteral anastomosis, as I have recently done in such a case.

The table on p. 1324 shows a high percentage of recoveries after plastic operations for ureteral constriction. In addition to the cases tabulated there are others quoted by other writers to which I have not been able to obtain access. They are as follows: Israel, 2 cases in his *Chirurgische Klinik der Nierenkrankheiten*, quoted by Moynihan, *BRITISH MEDICAL JOURNAL*, 1904, vol. 1, p. 1010; Gerster, 1 case, quoted in Bryant's *Operative Surgery*; Cramer, Elliot, and Albarran, quoted by Grosset, *Gaz. hebdom.*, 1900, p. 373; and a case, quoted by Young, in which Meyer found a stricture 6 in. below the kidney, complicated by calculus in the lower part of the ureter (*Medical News*, September 22nd, 1900).

The 33 cases given in the table include 11 which are quoted by Morris. In 5 no plastic operation was done on the ureter; of the remaining 28, in 4 the stricture was situated close to the bladder, in 24 at or close to the junction of ureter with renal pelvis. The latter were treated by three methods: (1) Fenger's operation, which resembles the Heinecke-Mikulicz pyloroplasty; that is to say, longitudinal incision and transverse suture; (2) Mynter's operation, as in Case II, described in this paper, which resembles the Finney operation for pyloric stenosis; (3) Küster's operation, section of the ureter below the stricture, and implantation into the lowest part of the renal pelvis. Fenger's operation was done in 12 cases, Mynter's operation in 3, Küster's operation in 11. In 2 of the cases Fenger's procedure was first done, and Küster's operation later owing to recurrence of the hydro-nephrosis; in the remaining 10 cases the operation was successful. The 3 cases treated by Mynter's method were all successful. Küster's method does not show so good a record—6 successes and 5 failures—but the operation should not be credited with some of the latter. In 1 case (Morris) nephrectomy was done on the table for the reason that the success of the plastic implantation seemed doubtful; in the remaining 4 cases the causes of failure were as follows: Ileus (Trendelenburg) after transperitoneal operation; necrosis of kidney (Helferich), second stricture lower down (Van Hook), infection (Bazy). In no case could the non-success be ascribed to a defect in the plastic operation itself, and it is to be noted that the 2 cases in which implantation was undertaken after the failure of Fenger's operation were successful.

Mynter's operation is particularly suitable for the cases in which the ureter is inserted high and obliquely into the renal pelvis; it gives a long slit-like opening, and when the incisions are extended sufficiently it has all the advantages which are afforded by implantation into the lowest point of the pelvis. The latter presents more technical difficulties; it is the method of choice when the stricture is below the level of the lowest point of the renal pelvis and involves so much of the channel that the longitudinal incision and transverse suture of Fenger is not applicable. Even where Fenger's operation is practicable, implantation is theoretically preferable, especially where the pelvis is markedly dilated, as it affords a more perfect drainage channel.

THE VALUE OF THE USE OF A SHADOWGRAPH URETERIC BOUGIE IN THE PRECISE SURGERY OF RENAL CALCULUS.

[EXTRACT FROM A POST-GRADUATE DEMONSTRATION.]

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[WITH SPECIAL PLATE.]

BEFORE the routine employment of expert radiography in cases of renal pain, the diagnosis of stone in the kidney and ureter was merely speculative. The clinician was rarely certain as to whether a stone was present or not, or if he was assured in his own mind that a calculus did exist, he could not say whether it was imprisoned in the kidney or whether it had passed into and had become arrested in the ureter; so similar are the symptoms evoked by stone in either position. The surgeon was forced, therefore, to explore first the kidney and then the ureter before he could declare the patient free from stone.

Expert radiography* has, however, entirely altered the

* I do not allude to amateur, but to expert work. The statistics relate to Mr. Harnack's routine in our x-ray department.