

paralysis. As tests for it, Ross and Jones recommend (1) Noguchi's butyric acid reaction, and (2) the ammonium sulphate test.

Of the simplified methods described, the two which seem to promise best, alike for convenience and reliability, are the Porges-Meier test and Noguchi's dried paper method.

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SURGERY.

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SOME RECENT CONTRIBUTIONS TO THE SURGERY OF THE URETER.

WOUNDS of the ureter, up to a comparatively recent time, were of the rarest occurrence. The progress of modern surgery in the treatment of intra-pelvic diseases has considerably altered this state of affairs, and in recent years a large number of cases have been recorded where the ureter has been unavoidably or intentionally divided.

URETERAL FISTULÆ AS A SEQUELÆ OF PELVIC OPERATIONS.

Sampson¹ has recently contributed an article on the above subject. It deals only with cases in which fistulæ have developed after pelvic operations in the female. He mentions that in 156 hysterectomies for carcinoma of the uterine cervix in Dr. Kelly's clinique at the Johns Hopkins Hospital, in nineteen cases the ureter was accidentally injured, but only eleven instances of ureteral injury occurred in 4513 other major gynæcological operations. Injuries of the ureter have been reported in the operative treatment of nearly every pelvic condition, but, excluding those cases where the cause was contributory negligence, the ones in which wounds of the ureter have occurred during the performance of an intra-pelvic operation have either been those where the ureter was bound to the sheath, in which it lies by adhesions of inflammatory or neoplastic origin, or where a mass of tissue has become

adherent to the peritoneum over the ureter, and during the course of its removal that channel has been torn, wounded, or clamped. Where the ureter is adherent to its sheath, it is often unavoidably brought into the field of operation during the performance of a hysterectomy. Thus the ureter has been most frequently wounded in cases where this operation was being performed for cancer of the uterine cervix.

If the ureter is completely cut across, and there is an avenue of escape for the urine, a fistula usually develops, which shows no tendency to spontaneous cure by re-establishment of the normal channel; spontaneous occlusion of the ureter, with dilatation of it and of the renal pelvis above, and ultimate disintegration of the damaged kidney, may result. Sampson found, in his experimental investigations conducted on dogs, that the escape of urine into the peritoneal cavity or the pelvic cellular tissue planes was liable sometimes to lead to a fatal issue, and in debilitated subjects, especially where an associated infection is present, this may occur. He also found that longitudinal incisions of the ureter healed readily, and often with little escape of urine, when the channel below was fully pervious. The temporary application of a clamp may so devitalise the wall of the ureter as to lead to necrosis, sloughing of it, and the formation of a ureteral fistula a few days later. In the dog, a ligature tightly applied may sever the wall of the channel, and its lumen be afterwards completely re-established by a natural end-to-end anastomosis—a state of affairs which has also been observed by Clairmont and Ranzi² to occur when a ligature is applied in a similar manner round the small intestine of that animal. Injury to the blood-supply of the ureter; the periureteral arterial plexus, which extends the entire length of the ureter and up over the pelvis of the kidney and accompanies the ureter through the bladder, is liable to be followed by partial or complete necrosis of the wall of the channel. This results either in ureteral stenosis or in the formation of a fistula, according to the degree of damage done. Too free dissection of the ureter within its sheath, or too severe handling, may lead to a similar result, by leading to the extravasation of blood into its coats, and ultimate necrosis.

In the diagnosis of a ureteral fistula, it is very important to determine whether the fistula is partial or complete, as in the former case spontaneous cure, with restoration of the channel, is to be expected, but in the latter this is a very remote possibility. In this connection valuable information may be gained on cystoscopic examination, by observing the silent ureteral opening in cases of complete fistulæ. The use of the separator, combined with the injection of a soluble pigment, such as indigo carmine, which is excreted in the urine, renders the diagnosis absolute. Where the diagnosis of fistula has been made after operation, Sampson prefers to wait until the patient has regained strength before attempting any direct treatment

for the cure or alleviation of the accident. When operative treatment is indicated for complete or partial fistula, it may be undertaken in one of three ways:—uretero-vesical implantation, nephrectomy, or uretero-ureteral anastomosis. The latter is seldom possible; of the two former, implantation into the bladder should only be carried out where it can be done without submitting the ureter to too free dissection, or throwing too severe tension on it.

URETERO-VESICAL IMPLANTATION.

Sampson strongly recommends the intra-peritoneal route. He has had experience of six cases in which he adopted the inguinal extra-peritoneal route, but he finds that this method is accompanied by greater difficulty in exposing the ureter, and that in it, it was necessary to free the ureter more than in the intra-peritoneal method. He uses a median incision. The peritoneum is incised below and parallel to the pelvic brim, and the ureter lifted up in a peritoneal flap. This serves to preserve the blood-supply of the ureter, and is of use in fixing it to the bladder. The bladder is drawn up and fixed to the side of the pelvis. The ureter is united to the former by three or four sutures. Extra-peritoneal drainage *per vaginam*, or through the groin, is adopted.

In cases where the ureter has been divided during the course of an operation, and uretero-vesical or end-to-end anastomosis is impossible, ligature of the ureter has been employed successfully—the patient recovering, and no subsequent fistula forming. Sampson, however, considers the better procedure to be, to deliberately establish a ureteral fistula by bringing the divided end of the duct up, and fixing it to the wound, and later, when the patient has recovered from the shock of the first operation, to perform total nephrectomy if necessary.

Weibel,³ in reviewing the lesions of the ureter, which have occurred in abdominal hysterectomies for carcinoma in Wertheim's clinique, mentions that out of four hundred such cases in only eleven was the ureter directly wounded during the operation. Eight times the ureter was completely cut across, once it was ligatured by mistake, and twice a lateral wound was made into it. In one case there was a double ureter on one side and one of these was cut through. It was immediately united to its undamaged companion, and no bad effects followed. After ligature of one ureter in a case of horse-shoe kidney, the patient died of uræmia. . . . In all the other cases the divided ureter was immediately implanted into the bladder, with a good result.

In addition to the risk of being wounded during the operation, the ureter in the radical operation for uterine carcinoma is exposed to the danger of subsequent necrosis. According to Weibel, in as many as 60 per cent. of cases this danger of necrosis is present.

In twenty-four cases fistulæ developed after operation, and three of these involved both ureters. Necrosis leads to the formation of a fistula at the earliest on the seventh day, and never later than the eighteenth day. The critical time is about the end of the second week. Most fistulæ heal spontaneously between the third and twelfth weeks, and spontaneous healing has been observed after three months. In thirteen cases spontaneous healing occurred. In seven, nephrectomy was performed successfully—one was cured by implantation of the ureter into the bladder. In three a fatal issue ensued.

In many cases where spontaneous healing had occurred, the functional after result, as demonstrated by cystoscopic and other examinations, was found to be impaired, and a weakening of the stream of urine was present on the affected side. Weibel advises that when symptoms of a pyelitis of increasing severity supervene from the presence of a ureteral fistula, nephrectomy in preference to vesical implantation should be carried out.

The experiences of the Jena and Freiburg clinics are reported by Rauscher.⁴ He has especially investigated the functioning power of the kidney after uretero-vesical anastomosis. This was determined by cystoscopic inspection, by sounding the ureters, by colour cystoscopy, and the other usual methods for testing the functioning power of the kidney. Resection of the ureter and subsequent implantation of it into the bladder had been carried out in thirteen cases of carcinoma of the uterus. Of these, three were cases in which both ureters had been divided. Seven times the uretero-vesical anastomosis was carried out by Krause's method, and of these, five showed a good functional result. In one case the renal activity was impaired, and in one a cicatricial stenosis was present at the site of implantation. In six cases the ureter was united to the bladder after the Sampson-Franz method, and in five of these the functional result obtained was excellent. In the three cases in which a double uretero-vesical anastomosis was performed this was done by the latter method. Both kidneys showed perfect functional activity, and this persisted. On these and other grounds Rauscher recommends the Sampson-Franz operation.

THE TREATMENT OF EXTROVERSION OF THE BLADDER BY IMPLANTATION OF THE URETERS INTO THE RECTUM.

There is now on record a large number of cases in which the above-mentioned procedure has been adopted, and a sufficient time has elapsed to allow of the estimation of the functional results which follow it. Thomson⁵ and Dowden⁶ have recently recorded in this *Journal* cases in which they have united the ureter to the large bowel. In the latter case the procedure adopted was to implant the duct into a loop of bowel excluded by lateral anastomosis of the iliac and pelvic colon.

Buchanan⁷ has also recorded a case. His paper deals mainly with the remote results of implantation of the ureters, and especially with those cases in which the Bergenheim method (Peters's operation, as it is usually called in this country) has been performed. He gives a very complete and lucid analysis of the after result of uretero-rectal and trigono-sigmoid anastomosis. Trigono-sigmoid anastomosis—the intestinal implantation of the intact ureters with part of the bladder wall attached—which was first performed by Maydl in 1892, has now been performed, strictly according to the original method, upon eighty patients, with a mortality of 28·7 per cent. Of the twenty-three patients dying after Maydl's operation, the cause of death has been recorded in twenty, and of these, seven died of peritonitis, and nine of pyelo-nephritis and anuria.

Bergenheim, in 1894, was the first to implant the ureters separately, and with a rosette of bladder attached, into the rectum by the extra-peritoneal route. Records are available of twenty-six cases in which Bergenheim's operation has been performed. The mortality has been 11·5 per cent., and in two of these cases it was due to ascending renal infection. Of the ninety-eight patients who survived Maydl's and Bergenheim's operation, eleven died subsequently of ascending renal infection. These cases, however, must not all be considered as ones in which the infection had travelled up from the bowel, for, as Berger has shown, of seventy-four patients born with extroversion of the bladder and undergoing no surgical treatment, only twenty-three lived up to the age of twenty, the others dying of pyelo-nephritis, which the exposed position of the ureters is liable to cause. In some of the cases mentioned it is therefore probable that the damage had been done before the operation was undertaken. Of the sixty-four cases which were alive when last reported, fifteen had survived the operation for from six to twelve years.

The important factors in the prevention of ascending infection after ureteral implantation, according to Buchanan, are—that each ureter should pass in a direct course without kink or twist to the point of entrance into the bowel. There should be no injury by forceps, knife or needle of or near the ostium that could cause a cicatricial narrowing of the passage. The intra-intestinal portion should keep its position without tension. No injury should be done the ureter by retention sutures. The ureteral catheter should be used as a guide in dissection during operation, but not as a conductor of urine afterwards. No dilatation of the sphincter ani should be practised, and only a rubber tube used to prevent distension.

In order to minimise the risk of infection of the kidney from the bowel, Ball,⁸ in the case of a boy upon whom he performed extra-peritoneal uretero-rectal anastomosis, gave 5 grs. of salol three times a day for a week prior to operation. The alimentary canal was

cleared out by the free administration of calomel, and the usual enema given. Opium was given to check peristalsis, and when the child was on the table the rectum was washed out with cyllin.

The complete relief from their state of former misery which so many of the patients obtain after this operation is illustrated well in a case recorded by Rigby.⁹ The infant upon which he performed a modified Maydl's operation was aged six months. It was in excellent health eight months later, and its mother stated that it usually passed urine at intervals of from two to three hours, and sometimes as long as seven hours intervened. Nocturnal incontinence was the exception.

There is still an occasional surgeon who is dissatisfied with the usual treatment adopted for ectopia vesicæ. Diakonow¹⁰ has devised an operation which is a modification of Subbotin's vesical rectal anastomosis. In his operation a cuff of bladder wall is dissected up, and from it a new urethra made, which passes within the sphincter ani and opens in front of the rectum. It is performed extra-peritoneally, and requires a subsequent operation to form an anterior bladder wall. He claims by his operation to render a kidney infection by intestinal content impossible.

Knaggs¹¹ describes a modification of Bergenhem's operation which he has performed for extroversion of the bladder, in a woman of thirty-one years of age. A preliminary hysterectomy was performed to allow of the implantation into the rectum of a portion of the bladder containing the ureteral openings.

Beresnegowski¹² gives the results which have followed the implantation of the ureters into the rectum in Tichow's clinique. The operation was performed twenty-nine times, for cases of ectopia vesicæ, incontinence of urine after perineal lithotomy, and inoperable vesico-vaginal fistulæ. Nine cases died after operation. The method practised was by the performance of a laparotomy, division of the ureters above the bladder, and the anastomosis of these with the rectum through a flap of bowel. He recommends, for extroversion of the bladder in the male, Maydl's or Bergenhem's operation; in the female, the implantation of a flap of bladder; in vesico-vaginal fistula, Tichow's operation.

URETEROSTOMY.

Short circuiting of the urine in advanced cancer of the bladder and prostate.

Hurry Fenwick¹³ advises, for the relief of the suffering which such patients endure, that a bilateral ureterostomy be performed through small transverse incisions over both iliac crests. By means of a preliminary ureterostomy, he claims he can now remove the entire bladder with much greater likelihood of a successful issue.

URETERAL CALCULI.

These, although common, do not often require removal when *in situ*.

Woolsey,¹⁴ in a recent article, gives cases illustrative of the close similarity which may exist in the clinical features of acute appendicitis and calculi in the ureter. In his opinion, it is an excellent rule to examine all cases of appendicitis without typical signs of inflammation for hæmaturia, and especially, if the latter be found, to subject these to an X-ray examination before performing appendectomy. He warns against mistaking false shadows arising, *e.g.* from calcified lymph nodes, ossified areas in the pelvic ligaments, for the true calculi. These and other sources of photographic error are also referred to by Rochard.¹⁵ When removal of a calculus in the pelvic ureter by operation is necessary, Woolsey recommends that the peritoneal cavity be opened through a small incision, as he has found this of so great value in locating and exposing the stone. Prior to the removal of the stone the peritoneum is carefully closed. After removal of the calculus he introduces only two or three sutures of fine catgut, and does not attempt accurate apposition of the edges of the divided ureter. Slight leakage of urine usually occurs; this, however, soon disappears.

SUTURING OF THE URETER.

In an article describing an elaborate experimental investigation of this subject, Alksue¹⁶ mentions, that of the dogs upon which he performed end-to-end anastomosis of the ureter, 10 per cent. died, and 24 per cent. developed a temporary fistula. In those that recover, the chief danger is the development of stenosis.

In his investigations he exposed the urinary tract in certain cases, by splitting the bladder and laying bare the ureters in the living animal, and by this means saw that the normal wave of contraction always suffered an interruption at the place of suture. The urine became dammed back, in consequence, at this level, and it was only when a sufficient quantity had collected that the distal portion of the ureter was stimulated to contract. Temporary hydronephrosis and leakage were liable to result from this state of affairs.

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OBSTETRICS AND GYNECOLOGY.

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THE ROLE OF THE PERINEAL BODY DURING LABOUR AND THE RESULTS OF ITS RUPTURE.

PARAMORE (*Trans. of the Royal Society of Medicine*, Obstetrical Section, January 1909), following on previous papers by himself and others, further elaborates his views regarding the support of the pelvic viscera and the part played by the fascial and muscular structures of the pelvic floor. He maintains that "the perineal body plays no part in the support of the viscera, nor does its rupture facilitate prolapse." He further holds that the influence of the perineal body during labour is anything but a favourable one. The head ought to come down to the pelvic outlet fully flexed, and the presenting part is thus ovoid in shape. In order to pass in the easiest manner possible it is essential that this ovoid should come down at right angles to the plane of the pelvic outlet. The lower pole passes the aperture of the sphincter muscle of the vagina—the pubo-rectalis part of the levator ani—in this position, but immediately this pole is through it impinges upon the resistant perineal body which is below and in front of the posterior commissure of the sphincter muscle. This resistance in the posterior wall of the vagina determines extension of the head, so that the ovoid becomes at right angles to the plane of the vulvar aperture. This means that the ovoid is no longer at right angles to the plane of the aperture of the pubo-rectalis, with the result that this muscle has now to grasp, not a circle of the foetal head, but an ellipse. This subjects the muscle to an increased pressure, resulting very often in its overstretching or laceration, and this he believes to be the cause of prolapse. If, on the other hand, the perineal body is lacerated early, the extension of the head is not required, so that an elliptical part of the head does not engage in the sphincteric plane and no laceration of the muscle is