

CHAPTER XXXII

OPERATIONS UPON THE URETER

EXCLUDING the special operations for uretero-vaginal fistula (p. 484), the operative surgery of the ureter may be considered under two heads: Plastic Operations and Extirpation.

Plastic Operations.

1. For kinks, valves, and strictures. (See *Hydronephrosis*.)

Ureterotomy.

Pyelo-ureterotresis (uretero-pyelo-neostomy).

Pyeloplication (or nephropexy).

(Any operation in the list below.)

2. For wounds, strictures, necrosis, disease or fistula entailing loss of continuity of the duct.

Uretero-ureteral anastomosis.

Cysto-ureterotresis (uretero-cysto-neostomy).

Closure of the ureter or nephrectomy.

3. For exstrophy of the bladder (p. 337).

Cutaneous fistulization.

Entero-ureterotresis.

Maydl's operation.

Recto-vesical fistulization (Frank).

Extirpation.

Partial ureterectomy.

Complete ureterectomy.

OPERATIONS FOR KINKS, VALVES, AND SIMPLE STRICTURES

Kinks, valves, and strictures of the ureter manifest themselves by causing hydronephrosis (or pyonephrosis or atrophy of the kidney), and are accordingly discussed in that connection (p. 545). These obstructions may occur at the upper or the lower extremity of the ureter or somewhere in its course (usually at the point where

it crosses the brim of the pelvis). Their only treatment is operative. Cures have been reported through dilatation with ureteral catheters; but our experience with strictures of the urethra, the rectum, and the esophagus produces the conviction that dilatation must prove inadequate in the majority of cases. Catheterization can scarcely be relied upon to affect a valve or a kink. The knife only remains.

Now these obstructions may be divided arbitrarily into two classes: Obstructions which may be relieved by operation upon the ureter only, and obstructions which cannot be relieved without operation upon the kidney or its pelvis.

Obstructions Remediable by Ureterotomy.—Such obstructions are commonly strictures, congenital or due to the presence of ureteral stone or disease of the ureter or of the adjacent viscera. These strictures occur at the lower orifice of the ureter, where they cause intravesical ureteral cyst (p. 480), (the treatment of which is transvesical incision), or at or above the pelvic brim. Strictures in this latter location are reached after evacuation of the hydronephrosis by inguinal prolongation of the oblique lumbar incision (p. 637).

A probe introduced into the ureter from the renal pelvis will at once detect the site of stricture (some surgeons prefer a preliminary ureteral catheterization for this purpose). The peritoneum is lifted forward and the ureter followed down until the strictured point is reached. It will here be found adherent to the peritoneum, which may be torn before the ureter can be freed. Such a tear should be immediately sutured. The ureter is then brought up into the wound and an attempt made to perform ureteroplasty on the principle of the Heinecke-Mikulicz operation for pyloric stenosis. The accompanying figures show the method by which a longitudinal incision is sutured transversely (Figs. 127, 128, 129). The sutures enter the lumen of the duct and must therefore be of catgut. They may be re-enforced by suture of the peritoneal tissues.

If, for any reason, this operation cannot be performed: if the ureter cannot be freed, if it is accidentally torn across, if the stricture is too wide or the wall of the ureter above it too friable to permit the sutures to be satisfactorily applied, the ureter must be divided, resected, and some form of ureteral anastomosis employed.

Obstructions requiring Operation upon the Pelvis or the Kidney.—Such obstructions, usually due to nephroptosis, and often the cause of intermittent hydronephrosis, are relatively common. The obstruction is at or near the junction of ureter and pelvis, and usually consists of a kink closely surrounded by adhesions and perhaps associated with a valve or a stricture.

In attempting the operative relief of such an obstruction it is well to remember that the object of the operation is simply to insure a free outflow of urine. To this end kinks must be straightened, stenosis relieved, and the ureteral orifice placed at the most dependent point of the pelvis. In order to accomplish this threefold purpose the simplest operation—viz., reposition of the prolapsed kidney, after the liberation of adhesions—is usually all-sufficient. The pelvis having been emptied of its contents and adhesions having been freed as far as necessary, the internal ureteral orifice is palpated and inspected through the incision in the pelvis. If it is not constricted and a probe passes freely down the ureter, the kidney is replaced high up under the ribs, and it will probably be found that, with the organ in this position, the dilated pelvis falls into a funnel shape with the ureter leading directly from its apex. In such a case nephropexy (p. 527) is all that is required.

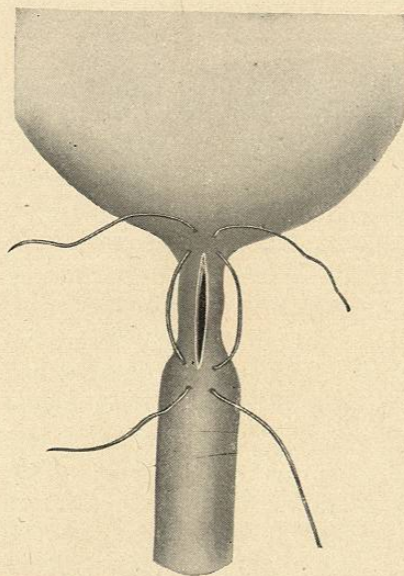


FIG. 127.—URETEROPLASTY OR PYELO-URETEROTRESIS (after Morris).
The stricture is incised longitudinally and two sutures are inserted.

But conditions may be complicated in three ways:

1. *It may be Difficult to find the Orifice of the Ureter.*—The search may be facilitated if the hydronephrosis is large by everting the sac (Fenger) and subjecting its internal surface to a careful scrutiny, or by identifying the ureter below the constriction and pulling upon it in order to dimple its orifice, or by introducing a probe (through a longitudinal incision) upward along the ureter, or by ureteral catheterization.
2. *There may be Stricture of Valve.*—This may be relieved by ureteroplasty or by pyelo-ureterotresis (Figs. 127, 128, 129).
3. *The Pelvic Dilatation may have occurred irregularly, so that when the Kidney is replaced high up in the Loin there is still a Pouch hanging below the Ureteral Orifice, calculated to invite Infection of the Retained Urine and to lead to Renewed Nephrectasis.*—This condition is unusual, and its treatment depends upon whether or not it is associated with valve or stricture. When there is a simple pouching of the pelvis which cannot be remedied by nephropexy

it may be obliterated by suturing the two walls of the pouch together (pyeloplication) after scarification of the mucous membrane (Israel, Albarran). Albarran even went so far in one case as to resect the

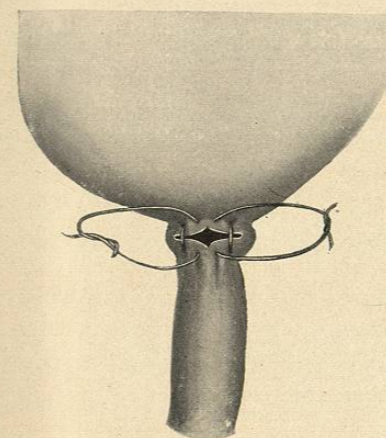


FIG. 128.—URETEROPLASTY OR PYELO-URETEROTRESIS (after Morris).
The sutures are drawn so as to make the incision transverse.

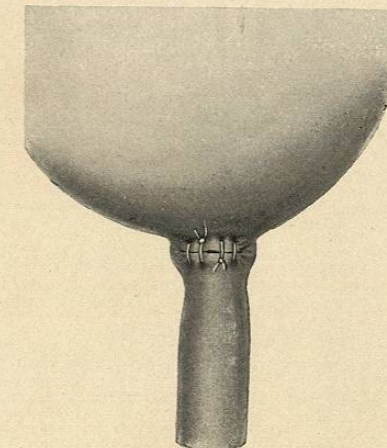


FIG. 129.—URETEROPLASTY OR PYELO-URETEROTRESIS (after Morris).
The result.

lower pole of the dilated kidney with the adjoining portion of the pelvis.

When ureteral stricture and pelvic pouching coexist the best operation is lateral anastomosis of the ureter with the pelvis (pyelo-ureterotresis). A longitudinal incision in the ureter below the stricture is sutured with fine catgut to a corresponding incision at the most dependent point of the pelvis. This operation has been performed unsuccessfully by Helferich, successfully by Delbet and Albarran.

Yet, in spite of the success that has attended almost every plastic operation proposed for the relief of renal retention, it is a suggestive fact that Tuffier has cured 17 consecutive cases by nephropexy, and that Guyon, as recently as 1898, maintained that simple nephrotomy with drainage is superior to every other operation for the relief of this condition. Certainly the great majority of hydronephroses were cured by these methods before the days of plastic ureteral surgery, and, while our wider knowledge of the subject makes it the surgeon's duty not to be satisfied until he has identified the source of obstruction, he may rest assured that fixation of the kidney in its proper place and removal of calculi—if any be present—will almost always suffice to relieve the obstruction and to prevent its recurrence.

URETERAL ANASTOMOSIS

Under this caption may be grouped all operations for the purpose of re-establishing the flow of urine through a ureter divided by accident or design, together with an estimation of the obstacles to the success of such an operation and a consideration of the proper procedure to elect in case anastomosis is impossible. Thus we shall review the technic and merits of, 1, anastomosis of the ureter with itself and with the bladder; 2, anastomosis with the intestine and cutaneous fistulization; 3, closure of the ureter and nephrectomy.

URETERO-URETERAL ANASTOMOSIS

A rough history of the development of this operation has already been given. Since the end-to-end anastomosis of the earlier operators is now generally condemned as predisposing to stricture, there remain but three operations to be considered—viz.:

1. End-in-end anastomosis.
2. Oblique end-to-end anastomosis.
3. Lateral anastomosis (end-in-side).

End-in-end Anastomosis.—This operation was first suggested by Poggi, and has been modified by Mayo Robson¹ and Gubaroff.²



FIG. 130.—END-IN-END ANASTOMOSIS (Poggi).

The upper end of the ureter is cut obliquely (to prevent stricture) and the lower end dilated (Poggi) (Fig. 130) or incised longitudinally (Robson). The upper end is then drawn into the lower by a single suture, as in Van Hook's operation, the longitudinal incision closed by Lembert sutures of fine silk, and the union strengthened, if the operator deems it necessary, by a circle of fine silk Lembert sutures around the external line of union.

Oblique End-to-end Anastomosis (Wesley Bovée).—Both ends are cut obliquely, dilated,³ and sutured with rectangular and simple interrupted sutures of silk traversing only the outer coats of the duct and re-enforced by a few Lembert sutures (Fig. 131).

It is convenient in this, as in most of the other plastic operations upon the ureter, to suture the tube after the introduction (from the bladder) of a ureteral catheter, or, as Howard Kelly⁴ has sug-

¹ Internat. Med. Ann., 1896, p. 602.

² Centralbl. f. Chir., 1901.

³ It has been observed by various writers that the ureter could be dilated with ease to twice its normal size.

⁴ J. of the Am. Med. Ass'n, 1900, xxxv, 860.

gested, a guide introduced through a longitudinal incision in the wall of the duct.

Lateral Anastomosis (Van Hook).—To quote the author's lucid description:

"a. Ligate the lower portion of the tube $\frac{1}{8}$ or $\frac{1}{4}$ inch from the free end. Make with fine sharp-pointed scissors a longitudinal incision twice as long as the diameter of the ureter in the wall of the lower end, $\frac{1}{4}$ inch below the ligature.

"b. Make an incision with the scissors in the upper portion of the ureter, beginning at the open end of the duct and carrying it up $\frac{1}{4}$ inch. This incision insures the patency of the tube (Fig. 132, A).

"c. Pass two very small cambric needles armed with one thread of sterilized catgut through the wall of the upper end of the ureter $\frac{1}{8}$ inch from the extremity, from within outward, the needles being from $\frac{1}{16}$ to $\frac{1}{8}$ inch apart, and equidistant from the end of the duct. It will be seen that the loop of catgut between the needles firmly grasps the end of the ureter.

"d. These needles are now carried through the slit in the side of the lower end of the ureter into and down the tube for $\frac{1}{2}$ inch, where they are pushed through the wall of the duct side by side (Fig. 132, B).

"e. It will now be seen that the traction upon this catgut loop passing through the wall of the ureter will draw the upper fragment of the duct into the lower portion. This done, the ends of the loop are tied together securely, and, as the catgut will be absorbed in a few days, calculi do not form to obstruct the passage of urine (Fig. 132, C).

"f. The ureter is now enveloped carefully with peritoneum. This may be done by lifting the duct gently into the cavity of the peritoneum, drawing down the serous membrane carefully behind the ureter, and after pulling the peritoneum around it, stitching it in a position to permanently inclose and protect the tube."¹

¹ Van Hook is here speaking of an intraperitoneal operation, which ureteral anastomosis almost always is. If, however, the duct has been approached from behind the peritoneum, the risk of opening that structure into a cavity over which urine of at least doubtful cleanliness has been poured would scarcely be compensated for by the advantage of a peritoneal investment. It would seem much more to the

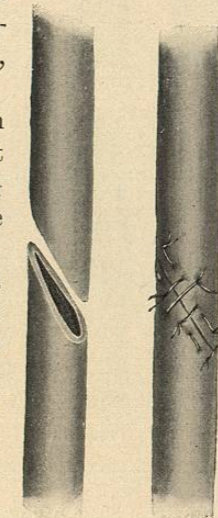


FIG. 131.—OBLIQUE END-TO-END ANASTOMOSIS (Bovée).

Bache Emmet employs three sutures to drag the upper segment into the lower one. This for the purpose of puckering the upper segment, if it is considerably dilated (Fig. 133).

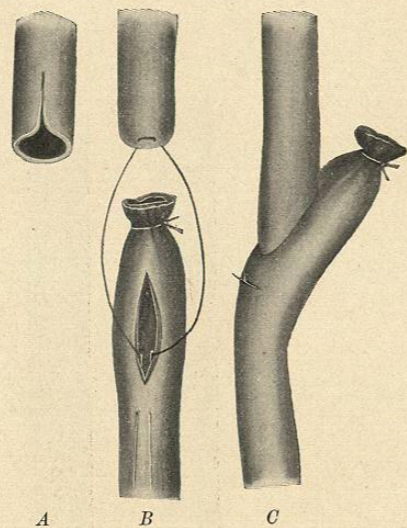


FIG. 132.—LATERAL ANASTOMOSIS (Van Hook).

have been cut away.¹ He has also suggested that in case of need the kidney may be loosened and stitched low in the loin.

4. Whatever method is employed it is customary to use catgut for all sutures that enter the lumen of the duct, and silk for the others: this in order to avoid calculous incrustation. (Yet it is known that silk sutures in the kidney do not become incrustated, and it is at least possible that ureteral sutures might escape.)

5. When the lower end of the ureter is

We may justly disregard the discussion of the relative methods of the three procedures, but the following observations seem apposite:

1. All of the operations have been equally successful.

2. Invagination, whether end-in-end or end-in-side, may be performed more easily and rapidly than Bovée's operation.

3. End-in-side anastomosis wastes more of the length of the duct than either of the other two. Bovée claims that his operation may be performed even though as much as 3 inches of the duct

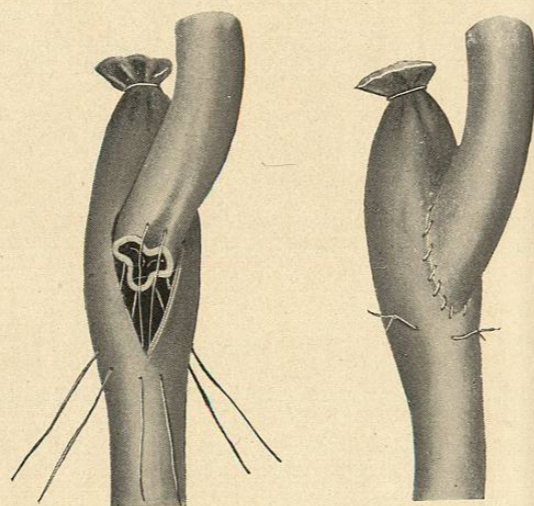


FIG. 133.—LATERAL ANASTOMOSIS (Bache Emmet).

point to scarify the mucous membrane of the lower segment in order to make it adhere to the upper.

¹ J. of the Am. Med. Ass'n, 1901, xxxvii, 254.

lost or useless for any reason, cysto-ureterotresis is the operation of choice. When this is impracticable the choice lies between entero-ureterotresis and nephrectomy (or shutting off the ureter with the object of causing atrophy of the kidney—a dangerous though simple procedure), with a preference for the latter, if the opposite kidney is able to support life.

CYSTO-URETEROTRESIS

Cysto-ureterotresis (uretero-cysto-neostomy) has been employed usually for the relief of uretero-vaginal fistula, rarely for other conditions when ureteral anastomosis proved impracticable.

Poggi in 1887 made the first experiments in reference to this operation. Novaro and Bazy were the first to perform it.

Three routes have been chosen—viz., vaginal, sacral, and abdominal. The best of the vaginal operations has already been described. The sacral route has nothing to recommend it.

Almost every surgeon who has performed the abdominal operation has devised his own technic. The various methods have been enumerated by Boari¹ and Morris.² To avoid confusion, it is best to describe only a type operation. The peculiarities of each case will suggest the necessary modifications.

Whether the ureter is to be attached intraperitoneally or extraperitoneally is often decided by the features of the case. It is safer to operate extraperitoneally through the lumbo-inguinal incision when possible, elevating the peritoneum until the bladder (distended with boric-acid solution) is entirely exposed, freeing the ureter from the peritoneum and drawing it down.

The bladder is then emptied by catheter and incised on the point of a sound at the most convenient point, as near as possible to the trigone. The ureteral orifice is then split to prevent stenosis, and attached to the bladder by means of a catgut traction suture (as in the Van Hook anastomosis). It is convenient at this juncture to introduce a ureteral catheter and upon it to suture the outer layers of ureter and bladder. When the operation is performed within the peritoneum the line of union should be protected by a peritoneal or an omental fold.

While the Boari button has twice been employed successfully, it has the obvious disadvantages of its prototype, the Murphy button—viz., possibility of stricture and difficulty of extraction (it cannot be used in the male for this reason), and these more than counterbalance the advantage of time-saving.

¹ Guyon's Annales, 1899, xvii, 1059, 1141.

² *Op. cit.*, ii, 563.

After operation it is customary to leave the ureteral catheter in place for four or five days.

In several instances the ureter has seemed too short. An inch or more may be gained by loosening the pubic attachments of the bladder (Witzel, Kelly, Penrose) and suturing its fundus to the lateral pelvic wall. Boari has succeeded experimentally in bridging a greater gap. He dissected up as a flap the whole thickness of the anterior bladder wall an inch wide with its base at the fundus. This he turned back and sutured as a sleeve about a ureteral catheter and the extremity of the ureter. He then closed the wound in the bladder. Such an extensive line of suture would require protection by drainage for fear of leakage. Dislocation of the kidney to gain slack has not been performed in connection with cysto-ureterotresis. An isolated loop of intestine has been employed experimentally to bridge the gap between ureter and bladder.¹

STATISTICS

Having discussed the chief operations of ureteral surgery, a brief review of the clinical statistics will fitly impress the brilliant practical results of these procedures in marked contrast with those which we have yet to note.

Plastic Operations at the Upper End of the Ureter.—Christian Fenger,² who has himself performed 10 out of the 30 operations for renal retention which he is able to collect, clearly and succinctly sets forth the brilliant results of these operations.

One case of division of pelvic partitions and transpelvic section of spur was successful.

Nine cases of valve were operated upon transpelvically by incision of the valve and transverse closure.

Of these, 1 died of uremia, 1 of ileus.

Five were completely successful.

Two relapsed.

Eleven cases of valve and stricture were subjected to extrapelvic incision and transverse suture.

Of these, 10 were successful, 1 unsuccessful.

Six cases were subjected to resection and reimplantation of the ureter (uretero-pyelo-neostomy).

Of these, one died of sepsis or iodoform poisoning. Three proved successful, and 2 failed; 1 because of an extensive stricture

¹ J. of the Am. Med. Ass'n, 1901, xxxvii, 323.

² Ann. of Surgery, 1901, xxxiii, 369.

lower down the ureter, the other because of the friability of the tissues.

While 3 cases were subjected to pyeloplication and capitonnage, and all 3 were successful, in 2 a valve was incised as well.

We may disregard 1 case of unkinking the ureter.

In 2 cases a ureteral stricture was successfully divided and sutured transversely. These may be grouped with the 12 extrapelvic incisions:

To summarize:

Ten intrapelvic operations—

Two deaths.

Six successes.

Two relapses.

Thirteen extrapelvic operations—

No deaths.

Twelve successes.

One failure.

Six uretero-pyelo-neostomies—

One death.

Three successes.

Two failures.

One simple pyeloplication successful.

With no deaths directly attributable to the operation, and only 25% of failures among these first attempts, we may well look forward to a brilliant future for this class of work.

Ureteral Anastomosis.—Bovée¹ has collected 12 cases of transverse end-to-end anastomosis with 2 deaths not directly attributable to the operation, 1 oblique end-to-end successful, 9 end-in-end with 1 death, and 5 end-in-side with 1 death. In all 27 cases with 7.5% mortality. That no case of obstruction by contracture of the scar is reported possibly illustrates the inaccuracy of statistics. Yet even this negative evidence has some weight, and certainly the enthusiasm of surgeons over the brilliant series of successes in these cases is not unwarranted.

Cysto-ureterotresis.—Bovée records 79 operations, 42 for the cure of fistula (1 death) and 37 for operative accidents (2 deaths). While the attempts at vaginal operation have been remarkably unsuccessful, the worst complication of the abdominal procedures has been a temporary leakage of urine, and even this has been extremely rare. The theoretical objections to the operation are stenosis of the ureteral orifice and ascending pyelo-nephritis in case cystitis occurs,

¹ Ann. of Surgery, 1900, xxxii, 165.