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URETEROVESICAL ANASTOMOSIS: AN IMPROVED METHOD; REPORT OF TWO CASES.*†

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Ureteral surgery has advanced with such tremendous strides during the past fifteen years that one hesitates to attempt to contribute anything radically new to the subject.

Of the many expedients resorted to for the restoration of function of an injured ureter, ureterovesical anastomosis is now recognized as the one preferable in the greatest number of cases. The conditions in which this operation is applicable may be classed under three heads:

First. It is now customary to repair immediately surgical injuries to the ureter, and the uterovesical anastomosis will often be preferable to a lateral repair or a ureteroureteral anastomosis.

Second. In operating for malignant disease, at times one finds it necessary or advantageous to deliberately cut across the ureter in a healthy portion in order to remove a wide involvement of the broad ligament region. A bladder implantation should follow.

Third. In ureteral stricture from any cause, if the obstruction be near the bladder; in post-partum and post-operative ureterovaginal and ureterouterine fistulæ; and in cases of abnormal congenital ureteral openings, this will often be the operation of choice.

Those who have attempted the ureterovesical anastomosis know the difficulties of finding a method of suture that will give secure union

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†I wish to express my obligation to Dr. Howard A. Kelly for his uniform kindness and encouragement in all my work on the urinary system. And my thanks are due his artist, Mr. Horn, for the excellent drawings accompanying this article.

when under considerable tension. It was after seeing a failure by one of our best operators that I was led to seek some method of suture that would resist traction. In presenting the following suture I claim for it simplicity, efficiency, and non-interference with function in a larger percentage of cases than can be obtained by other methods. I first applied the method upon two cadavers in the summer of 1900. I then performed the anastomosis on a dog, which, unfortunately, died from anesthesia just as the operation was completed, but the feasibility of the method was assured. Nine months ago I was fortunate enough to test the method on a patient with good result. I then operated on another dog, and three months later killed the animal and found a most interesting condition. The bladder and lower end of the ureter were surrounded and bound together by dense adhesions. The ureter was dilated and very thick walled. The kidney was much smaller than normal, pale in color, of firm consistency, and its capsule stripped off with some difficulty. The ureterovesical orifice was almost occluded. Microscopically, there was evidence of subacute cystitis, a great thickening and some inflammation of the ureteral walls, while the kidney showed a marked interstitial nephritis with areas of cloudy swelling in its parenchyma. The poor result in this case may be attributed to several factors. Our technic at the operation was not carefully aseptic, hence the infection. The condition of hypertrophy and dilatation of the ureter may have been due to stenosis at the site of anastomosis, but I am of the opinion that it was due in greater measure to the adhesions around the bladder and ureter. The ureter had been distorted until its lower end was of an S form and so attached to the bladder, that, with the filling of that organ, the ureter must have been sharply kinked on itself, and thus subjected to distension until the bladder was again emptied.

In April of the present year Dr. Kelly kindly asked me to demonstrate the anastomosis on a second patient.

Before reporting my two cases I will describe in detail the method. Besides the instruments necessary for an abdominal operation, one needs two pairs of toothed mosquito forceps, two small round needles with calyx eyes (French needles), fine black silk, catgut and a retention catheter.

Method: The ureter is severed at the desired point and the hemorrhage about the lower stump controlled. The renal end of the severed ureter, which is to be inserted into the bladder, is split along its anterior and posterior walls for a distance of one centimeter, thus forming two lateral flaps. An incision two or three centimeters long is then made in the fundus of the bladder (see Fig. 1). This may be called the "work-

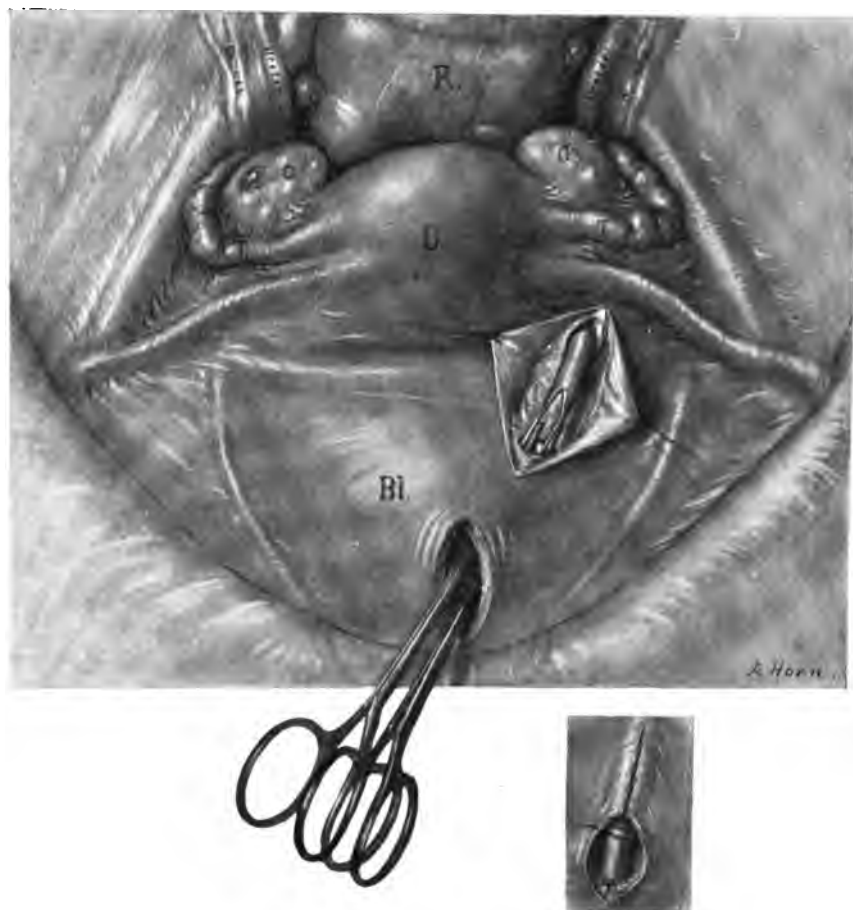


Fig. 1. Showing the working incision in the vertex of the bladder, the anastomosis opening, and the method in those cases where the pelvic organs remain in situ.



Fig. 2. Showing the anterior and posterior mattress sutures placed and ready to draw the ureter into the anastomosis opening.

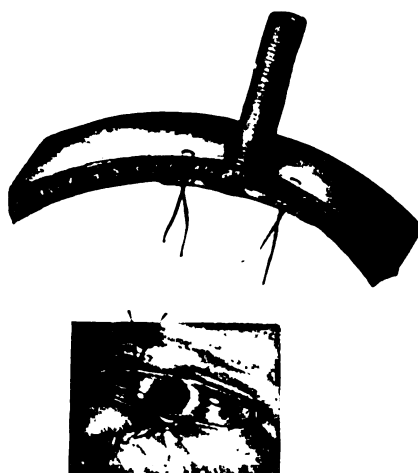


Fig. 3. Showing the square suture passed through bladder wall and lateral flaps and ready to tie within the bladder.

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ing" incision, and it should be large enough for the ready insertion of the index finger.

Now, after choosing the point where the ureter will enter the bladder wall to the greatest advantage, usually high up and as far lateral as possible, a small incision is made by inserting a scalpel through the working incision and quickly pushing it through the bladder wall from within. Two toothed mosquito forceps are then passed through the working incision and out through the anastomosis opening, each forceps grasping one of the lateral flaps of the ureter.

We are now ready to pass the first two of the four sutures necessary for the anastomosis (see Fig. 2). These are mattress sutures, preferably of black silk, which pass through the serous and muscle coats only, and serve to draw the ureter into the bladder and to fasten its anterior and posterior walls to the anastomosis opening in the bladder wall.

The posterior suture, being more difficult to introduce, is passed first. It enters the bladder wall from the posterior direction, and after penetrating the serosa and muscularis, leaves the wall very close to the anastomosis opening; it then takes a similar hold in the posterior ureteral wall, about one-half centimeter above the level of the split, and crossing above the split it grasps the posterior wall again and descends to enter the bladder wall on the other side of the anastomosis opening; entering this time from the anterior direction and passing posteriorly. A similar suture is set for the anterior ureteral wall. After denuding the flaps of their serous coats, the forceps draw them into the bladder, and the two external sutures are tied. Care must be exercised in passing the suture twice through either the anterior or posterior ureteral wall not to get the two strands too widely separated, for this would tend to constrict the lumen when they are tied.

These two sutures alone make a very firm anastomosis, but the addition of a square suture fastening each lateral flap to the bladder wall is a simple procedure and gives to the operation its claim to absolute safety (see Fig. 3). The flaps, still held by the forceps, are everted into the working incision and a rectangular piece of the bladder mucosa, corresponding to the size of each lateral flap, is cut from either side of the anastomosis opening. The flap sutures penetrate all coats of the flap except the removed serosa and all coats of the bladder except the excised mucosa.

They should be passed near the end of the flap to interfere as little as possible with the bladder circulation about the anastomosis. They may be of silk or catgut. If of silk, they must be tied inside, and the cut ends left about two centimeters long, to be easily found at a later time, when,

through the cystoscope, the loops may be cut and removed. If of cat-gut, they are tied either inside or outside the bladder, and the ends cut close.

Unless suprapubic cystostomy is indicated, the working incision is now closed.

Various minor points become important in individual cases and are dealt with according to indications.

In suitable cases the entire operation may be done extraperitoneally through an inguinal incision. Whenever possible, the field of operation should be entirely covered by peritoneum, as in my second case reported below.

In Figs. 1 and 4, I present the best method for making the anastomosis in those cases where it is not necessary to disturb the pelvic organs. The ureter is brought through the broad ligament above the

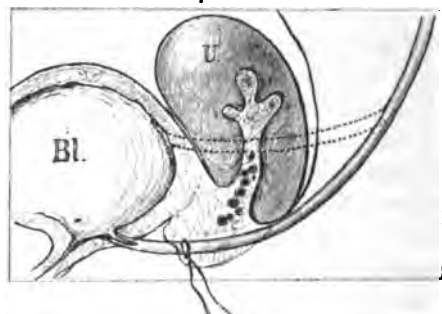


Fig. 4. Showing in lateral view the transplanting of the ureter to its new position, penetrating the broad ligament above the uterine vessels.

uterine vessels, and after the anastomosis it is covered with peritoneum. The cases where this is applicable are extremely rare. Stricture due to tuberculosis is excluded, and this leaves the rare cases due to other inflammatory processes, those following stone and pressure from tumors, and the cases of abnormal congenital ureteral openings.

Instead of cutting away the serosa of the flaps, it might be dissected up and finally sutured to the bladder serosa about the anastomosis opening; but I object to unnecessary sutures and consider one of the chief advantages of the method to be the small number of sutures used, thereby giving facility, non-interference with circulation, and lessened danger from kink.

In certain post-operative conditions associated with ureteral fistula there may exist a contracted bladder. This should be determined and the capacity increased by forced injections for a few weeks before doing the anastomosis.

Boldt⁴ makes a practical suggestion for determining the best point for the anastomosis. He filled the bladder with fluid and made an incision down to the mucosa before withdrawing the fluid.

Thomas Smith²⁷ and Tuffier²⁹ speak of the necessity of loosening the ureter with as much of its surrounding tissue as possible, to avoid loss of circulation. Feitel⁸ has recently made a most important anatomical contribution to show how the lower half of the ureter may be freed with preservation of its blood supply.

To overcome the difficulties of a short ureteral stump, Kelly¹⁸ first displaced the bladder upwards by freeing its pubic attachments; Bovée⁵ experimented on dogs, getting a greater length of ureter by loosening the kidney from its moorings, depressing it sufficiently, and then anchoring it in its new position. C. A. Smith,²⁶ following the suggestion of previous authors, experimented on cadavers and on dogs to determine how much the ureter could be stretched. He found on the cadaver that the elasticity of the ureter warranted a stretching of one-half to one inch, considerably less than proposed by some writers. There was but little tension in either of my cases.

Case I. Mrs. L. H., aged 23, was admitted to the service of Dr. Kelly September 24, 1900, complaining of inability to control her bladder and bowels. Her trouble began at the birth of her only child five months previously. She was in labor five days and finally had a severe forceps delivery. The child was abnormally large and was still-born. The patient was in bed nine weeks and was still very weak at the time of her admission. Since the labor she has never voided voluntarily and when the bowels are loose, control is lost.

Notes from Dr. Kelly's examination: There is complete laceration of the rectovaginal septum. The sphincter ends are separated two and one-half centimeters and present the typical sphincter pits. Two centimeters above and anterior to the sphincter pits is a cushion of red rectal mucosa. The vaginal orifice gapes widely. The vagina is four centimeters in length, ending in a cul-de-sac. Its anterior wall is almost completely destroyed, the finger entering at once into the bladder through an orifice of two by three centimeters. The external urethral orifice is five millimeters in diameter, the urethra is twenty-one millimeters long, and the internal sphincter muscle seems to have been completely sacrificed with the anterior portion of the bladder base.

First operation; Dr. Kelly; repair of the rectovaginal septum with restoration of the sphincter ani muscle; repair of the base of the bladder with the plastic operation on the internal sphincter urethræ. A small opening was left in the base of the bladder to be closed at a later operation. Result: Per primam healing of the entire field of operation.

At the next two menstrual periods, severe pelvic pains were present with no menstrual discharge. Dr. Kelly decided to remove the atresic uterus by the abdominal route and at the same time make an attempt to close the vesicovaginal fistula from within the bladder. The fistula operation had to be abandoned

because of the close proximity of the left ureteral orifice and the dense adhesions of this region to the pubic bone.

The patient returned home in March and gained in health until September, 1901, when she again entered the Hospital because of frightful pains in the left kidney region which had appeared during the previous two weeks. I suspected stricture of the ureter because of the conditions at the former operation. Cystoscopy showed the bladder to be very small, but its mucosa was normal. The left ureteral orifice could not be found. I determined to perform a ureterovesical anastomosis, and at the same time to separate the left bladder wall from the pubic bone with the hope that the fistula might be filled in by granulations if the surrounding tissues were freed from the bone.

I operated September 10, 1901, carrying out the above plan. The left tube and ovary were very adherent and were removed. The left kidney seemed about two-thirds normal size and of increased firmness. The ureter was dilated to a diameter of 14 millimeters and its walls were thickened. It was extremely adherent throughout its lower pelvic portion. By blunt finger dissection I freed it down to its adhesions near the pubic bone and then by main force I pulled it loose. The bladder after its long period of rest was very small, but the large size of the ureter made the anastomosis, according to the above described method, a comparatively easy operation. At the close of the operation the ureter extended obliquely across the true pelvis from the pelvic brim to the bladder. It was too tense and too high to be covered with peritoneum even if that tissue had not been buried by inflammation, therefore, the bowels were allowed to settle about it as they would.

Because of the certainty of urine leakage from the basal fistula, a suprapubic bladder opening was left and a small gauze drain was dropped about the anastomosis.

The patient recovered normally and had no more symptoms of renal colic. The vesicovaginal fistula failed to close, and through the suprapubic opening I later discovered it to be a vesicourethrovaginal fistula, as it left the bladder just within the urethral portion of the internal urethral orifice. Three attempts to close this fistula from the vaginal side resulted in failure.

The patient was discharged March 3, 1902, in good general health, and I still hope to close the fistula.

Case II. Mrs. T., referred to Dr. Kelly March 10, 1902, by Dr. J. Fletcher Lutz, of Glen Rock, Pa. Thirty years of age; married seven years; one child four years of age. Complaints of severe pain in the right side; "kidney colic."

Two brothers of her father died of tuberculosis, otherwise the family history is excellent. She was healthy as a child, but has never been robust. Never had scarlet fever, diphtheria, typhoid, or pneumonia. Says she had rheumatism six years ago, and there is a suggestive history of lung trouble eight years ago. She began menstruating at twelve, the periods occurring every six or seven weeks for the first four years. Since her sixteenth year the periods have been of the thirty-day type, lasting four days, not excessive in amount. There has always been cramp-like pain with the menstruation, particularly severe on the first day. For the past four years she has had leucorrhea, the discharge being whitish, foul smelling and irritating.

Her present illness began early in her pregnancy four years ago with great frequency of urination. She had a difficult instrumental labor, but a normal

puerperium except for "slight milk fever." She had no trouble with her bladder until her child was three months old, when she began to urinate frequently and to have attacks of kidney colic. These attacks began in the right back with a sensation "as though the kidney would burst." The pain often moved down the right side toward the bladder. She often had chilly feelings, but no distinct chills. The attacks have been very irregular, oftentimes occurring every day, but occasionally only at intervals of several weeks. Micturition was painful, but not accompanied by burning sensations. The urine contained pus. The bowels were usually constipated. She has not been subject to headaches.

Physical examination: The patient is a small, well formed, well nourished woman. Skin and mucous membrane of good color. No jaundice, chest well formed; expansion good; percussion normal; auscultation normal except for slight tubular modification at both apices. Heart sounds normal. The abdomen is rounded and soft on palpation. On deep inspiration the edge of the spleen is easily palpated, also the lower pole of the left kidney. On quiet breathing, the lower pole of the right kidney can be palpated two centimeters above the transumbilical line; and on deep inspiration the organ can be grasped and held with the upper pole in this same position. The kidney seems normal in size and somewhat lobulated in outline.

Pelvic examination revealed a thickened and sensitive right ureter. Pressure over the base of the bladder or over the lower end of the right ureter caused a desire to urinate.

Cystoscopic examination: Dr. Kelly first examined the patient at his private sanatorium and failed to catheterize the right ureter. I made several cystoscopic examinations after the patient's admission to the Johns Hopkins Hospital. The bladder was normal in appearance except in the region of the right ureteral orifice, where there was reddening and edematous thickening over an area one to two centimeters in diameter. Holding a speculum under the right orifice, I could catch almost as much urine in a given time as from the left orifice. The urine from the right side was decidedly turbid. It showed a trace of albumen, quite a large number of pus cells, and some epithelial cells. No casts and no tubercle bacilli were found. The urine from the left side showed a very few pus cells. It was impossible to introduce renal catheters into the right kidney, but metal sounds could be passed for a distance of three centimeters beyond the right ureteral orifice. In view of the free secretion of urine it was decided that the sounds entered a pocket in the lower ureteral region. An X-ray photograph was negative for stone. The tuberculin test was not administered.

Diagnosis: Stricture of the right ureter.

Operation: March 22, 1902, ureterovesical anastomosis; vaginal drainage; suspension of the uterus.

Dr. Kelly began the operation and asked me to demonstrate the anastomosis. A long abdominal incision was made in the median line. The left kidney was found of normal size and consistency, fairly well fixed in its normal position.

The right kidney was rather larger and softer than normal. Its lower half was carefully inspected and appeared normal. No stone could be palpated in the kidney or ureter. The ureter at the pelvic brim was about thirteen millimeters in diameter. Its walls seemed normal, except at the lower end, where, in the deep pelvis an elongated thickened mass could be palpated beside the cervix. To free the pelvic portion of the ureter, the right ovarian vessels and the right round ligament were tied and cut; the posterior peritoneum was opened and

the ureter freed down to the uterine vessels. At this point the ureter was manifestly diseased, and although the uterine vessels were tied and cut, no further freeing of the ureter was possible. A heavy suture was passed through the ureter and tied both ways. The ureter was cut across just above this suture and slightly above the level of the uterine vessels. Its walls at this point were somewhat inflamed.

Anastomosis: The bladder peritoneum was stripped back from the vesico-uterine fold toward the symphysis, thus exposing the muscular wall of the vertex. This was pinched up in forceps and incised for a length of two to three centimeters. A scalpel inserted through this incision was pushed through the bladder wall in its upper right quadrant at a distance of two centimeters from the first incision. The anastomosis was finished according to the method above described. The working incision was closed by two series of catgut sutures, the first series of No. 1 catgut closing the mucosa layer, and the second series of No. 3 gut closing the muscosa. A vaginal opening was made posterior to the cervix and iodoform gauze was passed through this, draining the region of the lower ureteral stump. The bladder peritoneum was replaced and the ureter and the entire pelvic floor were covered by peritoneum, thus making the drainage extraperitoneal. The uterus was suspended by one catgut suture and the omentum was brought down between the uterus and intestines. The abdominal incision was closed in layers with catgut. A retention bladder catheter was inserted.

The patient had a fair convalescence. She complained of great pain for the first three days, but slept seven to eight hours during the second night. The retention catheter was connected with a bottle at the bedside, and during the first twenty-four hours beginning at midnight she secreted 1,024 cubic centimeters of urine. The bowels failed to move on the third day and thus caused considerable discomfort. The gauze drain back of the cervix was removed and the bowels moved on the fourth day. April 4, the thirteenth day, the retention catheter was removed. April 6 the patient was up in a wheel chair.

On April 14 I examined the patient in the knee-chest posture. The bladder was reddened throughout most of its extent. In the right vertex was a large opening into the ureter, five millimeters in diameter. The bladder mucosa for a distance of one or two centimeters about this opening was ulcerated. I touched this ulcerated area on several different occasions with 20-per-cent. silver nitrate solution, with very little if any improvement in the appearance. The patient insisted on returning home May 3. Her temperature had a daily range between 99° and 100° F. She had suffered no pain in the kidney region and her general health seemed good. The urine contained considerable pus.

The ulceration about the anastomosis opening led me to suspect tuberculosis as the foundation for the ureteral stricture. Unfortunately, we had taken no tissue for microscopical examination.

I would not recommend interference with the circulation of the pelvic organs. In this case the inflammatory conditions were such that the ureter could not be followed beyond the level of the uterine vessels even after severing the vessels on the right side. If the ureter be normal for a greater distance, the uterine vessels may be displaced downward and the ureter exposed even to its bladder attachment. I have removed a tuberculous ureter and a section of the bladder wall about the ureteral orifice by displacing the uterine vessels downward and drawing the ureterovesical region up underneath the vessels.

As a deplorable but instructive sequel I was called by Dr. Lutz and Dr. Carrol Gerry, of Shrewsbury, Pa., to see this patient on the 4th of June, ten weeks after the first operation.

She had been gaining in weight and strength since her return home, but on Sunday, June 2, she was suddenly seized with abdominal pain. Dr. Gerry was called and found the patient in pain but with a normal temperature and pulse of eighty. He ordered cathartics, and on Monday two bowel movements were obtained by the aid of enemata, but the pain increased and vomiting began. Another small movement followed an enema on Tuesday, but vomiting continued. The pain required morphia. On Wednesday morning the pain was very severe, there was evident distention, her temperature was 100° and pulse 112.

I saw the patient Wednesday afternoon. Her temperature was 100.8°, her pulse 128, and she was vomiting a clear frothy material. The abdomen was moderately distended and tympanitic throughout, and intestinal peristalsis could be seen synchronous with the cramps of pain. The patient complained of great tenderness, but there was no muscle spasm. The lower pole of the right kidney could be palpated without causing more complaint of pain than was elicited by deep palpation elsewhere. Vaginal examination revealed a small, hard mass to the right of the uterus.

The lower end of the former abdominal incision was reddened and edematous looking, and the patient said it had been "weeping" at times since her return home.

On opening the abdominal cavity considerable bloody fluid was found and the intestines were covered by numerous opaque tubercles. The omentum was very adherent to the abdominal wall, particularly on the right side. Three loops of bowel were densely adherent to the anterior wall, and on cutting them free, the parietal peritoneum was found to be so thickened that it cut like cartilage. Several loops of intestine, together with the right tube and ovary, were densely adherent to the right pelvic floor, and in freeing them the muscle coat of the bowel was sacrificed in several places. One of these loops, which had descended from the upper part of the abdomen, after becoming adherent, apparently constricted another loop, and thus caused the obstruction. The appendix and cecum were involved in the adhesions but otherwise appeared normal. Beginning at the ileocecal valve the small bowel was followed up until all kinks were eradicated. The distended ureter was apparently of the same caliber as at the former operation, the site of anastomosis being buried in adhesions. The abdomen was filled with normal salt solution and closed with interrupted silk-worm-gut sutures.

The patient stood the operation well, her pulse being 130 and of fair volume at its conclusion. As soon as she recovered from ether she was given a rectal infusion of salt solution, and dram doses of epsom salts by mouth were begun. The bowels moved three times the following forenoon, two of the stools being liquid and one formed. In the afternoon an enema of two liters of normal salt solution was slowly given and was soon expelled well colored and containing considerable formed fecal material. The report twenty-four hours after operation says, "Her temperature is 101° and pulse 116. She is comfortable and bright and has no nausea. She is taking albumin water freely, and stands the abdominal massage well." I left orders with the nurse to use hot water stupes

every hour and to give abdominal massage twice daily as deeply as it could be endured.

The literature concerning ureteral surgery has been so thoroughly presented by such writers as Fenger,⁹ Boldt,⁴ Noble,²⁰ MacMonagle,¹⁷ Bovée,⁵ and Smith,²⁶ that another review at present would be superfluous. A few of the important landmarks, however, may be of interest to the reader who does not care to go more deeply into the subject.

The first case of ureteral surgery I find recorded was that of Mr. Simon,²⁸ of London. In 1851, he effected anastomosis between the ureters and the rectum by passing a suture through the ureteral and thence through the rectal wall, thus gaining his end by the process of necrosis. He "succeeded in getting a free communication between the lower ends of both ureters and the rectum, so that a large part (though not all) of the urine flowed into the bowel." His patient, a boy of thirteen years, suffering with exstrophy of the bladder, died at the end of a year "of an affection of the ureters and kidneys, with large calculous accumulations in the ureters."

Thomas Smith²⁷ refers to Simon's case and publishes one of his own in which, for the same affliction in a boy of seven, he did a retroperitoneal lumbar anastomosis of each ureter into the colon of the corresponding side. The operation on the left side was done June 19, 1878, and fourteen months later the right ureter was implanted. The boy died fifty hours after this second operation, apparently from uremia. The left kidney was atrophic and the hypertrophied right kidney with the upper end of the ureter were distended with urinous fluid. "A small probe could with difficulty be made to pass from the ureter into the cavity of the colon." His method was brilliant for that day, but he wisely concludes, "setting aside all difficulties that have to be overcome, and the immediate risks of the operation, it would appear that a permanent and direct communication between the ureter and bowel is of itself a fatal lesion."

The ureterointestinal anastomosis gave uniformly bad results, when practiced upon man, while experimental operation upon dogs were hardly more satisfactory until Maydl¹⁹ preserved the ureteral sphincter protection by transplanting the entire trigonum with both ureteral sphincters into the bowel. He reports five cases of exstrophy of the bladder treated after this method, with but one disaster, and that was a death from prolonged anesthesia.

The first end-to-end ureteroureteral anastomosis was done in 1886 by Schopf.²⁴ His patient died seven weeks later of tuberculosis, and it was found that considerable stricture existed at the site of anastomosis.

He proposed in the future to unite the ends over a renal catheter, which would be carried out through the urethra and left in the ureter until healing has taken place. Poggi²³ in Italy practiced the end-in-end anastomosis on dogs, and MacMonagle¹⁸ first used this method successfully on man in 1894. The end-to-side anastomosis was first practiced upon dogs by Van Hook³⁰ of Chicago; while Kelly,¹⁴ in 1893, was the first to use the method successfully upon a patient. Bovée in 1896 introduced the oblique end-to-end anastomosis.

Conversion of the vagina into a urinary receptacle and complete extirpation of the bladder was done successfully by Pawlik²² in 1888. The first ureterovesical anastomosis was executed in 1892 by Baumm.³ Witzel³³ performed this operation by the combined intra- and extraperitoneal routes, and Kelly¹⁵ first used the extraperitoneal route alone. Veit³¹ in 1894 made clever use of the suprapubic wound in performing an extraperitoneal ureterovesical anastomosis. Baumm's work had been anticipated by von Nussbaum,²¹ 1875; Tauffer,²⁸ 1877; and Hegar,¹² 1886; each of whom had successfully established a ureterovesical fistula, thus draining a ureteral reservoir and curing a skin fistula. Alsberg¹ first reported the treatment of stricture by bougie dilatation, and Fenger¹⁰ applied the principle involved in the Heineke-Mikulicz pyloroplasty. Küster¹⁶ overcame a stricture high in the ureter by dividing below the stricture and implanting the cut end into the pelvis of the kidney. Casati and Boari⁷ and others have experimentally implanted the cut end of one ureter into the side of the other, but I find no record of this being done on the human subject. Viet³² reports a case in which Schröder unwittingly removed a long section of ureter with an intraligamentary ovarian tumor. The kidney end of the ureter must have been tied. The patient was carefully watched and no symptoms occurred suggesting acute hydronephrosis. Fütth¹¹ accidentally removed a long section of ureter with a large myoma. He discovered his blunder before closing the abdomen and deliberately tied the kidney end of the ureter and dropped it. Some feeling of fullness and backache were the only untoward symptoms. Bastianelli² had had the same experience.

Undoubtedly the greatest service rendered mankind by the vast array of ureteral literature has been to emphasize the frequency of accidents even in the hands of the most conscientious surgeons, thus teaching them to be ever on the alert in doing pelvic work. We realize as never before the dangers in operating for pelvic inflammatory disease, as well as in removing benign tumors which have undergone partial or complete intraligamentary or subperitoneal development; but most particularly, the danger of ureteral involvement in malignant disease with lateral extension.

Moreover, in addition to these lessons of warning, we have presented a storehouse of ways and means for the preservation of the kidney function following disease or injury of the ureter. But I feel that this is the place to sound a word of caution. Just as in medicine, the invention and dependence upon multitudinous instruments of precision tends to weaken the more acute powers of observation and judgment, so in surgery, the equipment with almost unlimited means and methods of overcoming a certain difficulty tends to lead us into that difficulty, when the more rational and conservative plan would be to attack the ultimate problem from an entirely different route.

This proposition is well illustrated by both of my cases. In Case I, when Dr. Kelly operated the second time, and attempted to close the vesicovaginal fistula from within the bladder, the ureter was already dilated and hypertrophied, probably from pressure at its bladder end by the scar tissue following the mutilation at labor. When she returned six months later with the attacks of pain in the kidney region, I felt convinced that there must be great destruction of kidney tissue from the long standing urinary obstruction, and palpation at the time of my operation revealed considerable atrophy of the kidney. Again I felt that there was great probability of infection of the upper tract; and, if it had escaped, it would certainly become infected after an anastomosis in the presence of the vesicovaginal fistula. It was a question, therefore, whether nephrectomy would not be the conservative operation.

Case II emphasizes the necessity for the utmost care in diagnosis. The history was somewhat suggestive of tuberculosis of the lungs eight years previously. An X-ray photograph was negative for stone. Tuberculosis was suspected and the urine examined for bacilli. Knowing the difficulty of finding tubercle bacilli we should have applied the tuberculin test. At least the pathologist should have been present to examine a frozen section of the tissue at the operating table, which would probably have shown the true condition and the necessity for performing nephroureterectomy.*

* This patient recovered from her peritoneal symptoms and returned to the Johns Hopkins Hospital in November. She looked very well, but was troubled with backache, symptoms of cystitis, pyuria and a slight daily rise of temperature. Dr. Kelly removed the right kidney on Nov. 19. The lower third of the kidney was converted into a tuberculous abscess walled off from the kidney pelvis. Other small foci of tuberculosis were scattered through the medullary portion of the kidney. A daily search for four days previous to the operation failed to reveal tubercle bacilli.

To sum up, I think all bowel implantations, with the possible exception of Maydl's, should be condemned; and the latter considered as a desperate remedy reserved for those deplorable cases of leakage due to exstrophy of the bladder. As too great stress cannot be laid upon the preservation of the ureteral sphincter muscle, ureteroureteral anastomosis should be done wherever possible. But in many cases the lower end of the ureter must be sacrificed, and this fact, together with the facility of execution and the adaptability to both primary and secondary operations on the ureter, will tend to continue ureterovesical anastomosis as the operation most frequently performed.

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