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BILATERAL SUBMUCOUS TRANSPLANTATION OF URETERS INTO LARGE INTESTINE BY TUBE TECHNIC

CLINICAL REPORT OF TWENTY CASES

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Transplantation of the ureters has been one of the most perplexing problems that have ever engaged the attention of surgeons. The reason is that heretofore this operation has been considered to be nothing more than the artisan's technic of performing a mechanical feat. Instead, it must be looked on as nothing less than the means of execution of a biologic plan for transmutation of the mammalian to the avian eliminative system. This involves the studious consideration of physics, anatomy, physiology and bacteriology, as well as mechanics, in formulating a technic.

Our concrete problem is the transmission or transfer of the relatively sterile product of a vital secreting or excreting organ, in which the pressure must be low and regular, into a muscular reservoir, infested with bacteria, in which the pressure is high and irregular. Furthermore, the patient must be alive and well after the operation.

PHYSICS

As far as I know, there is no mechanism by which fluid may be transmitted from a chamber of low pressure to one of higher pressure without the use of the valve principle.

ANATOMY

There is no place in the animal organism where the product of a secreting organ is delivered into a muscular reservoir without the use of the valve principle. In all cases the valve is made by the duct running beneath the mucous membrane of the receiving organ, for a distance, before emerging into its lumen. This plan must be duplicated surgically if the integrity of the secreting organ and its delivery duct is to be preserved.

PHYSIOLOGY

The fluid is delivered into the reservoir by intermittent muscular action or peristalsis. The peristaltic force may be in the delivery duct, in which case delivery is made by direct force. It may be in the wall of the receptacle or reservoir, in which case delivery is made by creation of a vacuum that follows in the wake of a peristaltic wave. Or it may be by the synchronous action of the two.

BACTERIOLOGY AND PATHOLOGY

The operation must be performed in such a way that infection will be avoided. In doing this, serious difficulties are encountered: First, the peritoneal cavity must be opened. It is highly susceptible to infection. To be sure, it has defensive powers in proportion; but even these defenses may prove tremendous dangers in themselves, for the gastro-intestinal tract may be impaired or actually obstructed by adhesions resulting from these defenses. Second, the retroperitoneal space must be opened. Here, nature's defense against infection is at its poorest. The slightest infection in this space, in the absence of drainage, is liable to produce fatal results. With both the peritoneal cavity and the retroperitoneal space open and exposed, the two great sewer systems, one of which may be termed a cesspool, must be opened and connected. This must be done in such a way that the greater pressure and the virulent infection of the cesspool cannot hinder or enter the other system.

At the meeting of the Clinical Congress of the American College of Surgeons at Boston in 1928, I [1] presented the results of eighteen years' experimental and clinical research in the form of a technic that had for its purport the performance of this operation in such a way as to meet and cover all the problems involved. At that time, I reported nine consecutive cases in which operation was done by this technic. When I was asked to hold clinics during the meeting of the American Medical Association, it occurred to me that I could probably do no better than confine my work to this one procedure. It seemed that this would be a good opportunity to submit the evidence to the jury which must finally decide the case; namely, urologists and surgeons.

The American Urological Society met in Seattle, July 1. At this meeting, an invitation was given to the members to attend a series of clinics to be held in Portland on this subject during the annual session of the American Medical Association. More than forty of the members signified their intention to attend these clinics. In addition to urologists, a number of general surgeons and gynecologists were invited. Three clinics were held on three days. On each day, one transplantation operation was performed. The thirteen cases in which the operation had been done up to that time were reported in full. Eight of the patients on whom the operation had been done were present and were shown at two clinics, July 9 and 11. Specimens from two patients on whom the operation had been done as a palliative measure for hopeless cancer of the bladder and who had later died of cancer metastases not involving the kidneys were exhibited. The interest manifested was considerable. The questions asked and suggestions made by those present led me to believe that a brief statement compiled from the records showing what has happened following these operations in all the cases up to the present time might be of interest. The exact operation, including preoperative and postoperative care, described elsewhere,[1] has been used in all cases. For brevity, the histories have been reduced to a minimum. Every page of bedside notes (more than 1,400) has been reviewed. All and only those incidents are reported which are of vital importance or which might cause apprehension on the part of a surgeon. The time of reestablishing food intake and bowel action has been recorded as an indication of the general reaction of the patient. No cathartics or other artificial means of producing bowel action have been used. The time shown for operation covers the time elapsed from the beginning of the first incision to the time of application of the dressings.

REPORT OF CASES

CASE 1.—A boy, aged 20 months, with exstrophy of the bladder, entered the hospital Feb. 11, 1927. The rectal temperature was 99.2. The operation was performed February 12, in two hours and fifteen minutes. The ureters were found dilated and thickened, easily admitting number 8 catheters (the largest available at that time). The patient returned from the operating room in good condition. At 5 p. m. the catheters were draining. The first postoperative day the patient vomited frequently; on the second there was occasional vomiting; on the third the bowels moved well and the patient took hot water and milk. On the fourth postoperative day the

1. Coffey, R. C.: Surg. Gynec. Obst. **47**: 593 (Nov.) 1928.

catheters were not draining and were therefore removed by cutting the ureters in the rectum under anesthesia. The patient took liquid nourishment on the sixth day. On the eleventh he was restless; he held the urine for a short time; the temperature was 104. On the nineteenth postoperative day the patient was taken home in spite of the high temperature. Ten days later he was reported to be without fever. A letter dated Jan. 23, 1929, received from the father from North Carolina, stated that the boy was doing well and was better than ever before. This was approximately two years after operation. Recently, word has come from Dr. Rives Jones of Winston-Salem, N. C., that the child died two years and five months after operation. The cause of death was acute colitis, manifested by watery stool mixed with blood and mucus. The child succumbed after seven days of acute illness.

CASE 2.—A woman, aged 38, married, had carcinoma of the cervix, vagina and bladder with extensive involvement of all pelvic organs, and had been given a hopeless prognosis. The bladder distress was intolerable. A palliative transplantation operation was performed, Feb. 22, 1928, in two hours and forty-five minutes, in the presence of the members of the Pacific Coast Surgical Association. Number 10 ureteral catheters were used. The patient returned from the operation in good condition. Both catheters were draining. On the first postoperative day the urine was slightly bloody but the patient was comfortable; on the third day she was taking broth. She had a light diet on the sixth day, and gas was expelled. There was pain in the lower portion of the abdomen on the seventh day, and the bowels moved for the first time; the urine was clear and came from both catheters. On the tenth postoperative day, urine appeared in the rectum around the catheters. On the twelfth, the catheters were removed; the twenty-second, 600 mg. hours of radium was applied in the vagina; on the twenty-seventh, 1,200 mg. hours of radium was given, and on the thirty-second postoperative day the patient walked; 1,200 mg. hours of radium was applied on the thirty-fourth, and on the thirty-seventh postoperative day the patient was discharged in good condition. There was no bladder distress. April 28 the patient returned, and the cancer was found to be extending very rapidly. On request of the patient, 2,400 mg. hours of radium was applied as a last hope. In June, 1928, she came again and it was found that the pelvis was entirely filled with a cancerous mass. The growth was encroaching on the rectum on all sides, making a cancerous tube of it, but was not involving the mucous membrane. August 4, the patient wrote that she was gradually growing weaker. October 12, approximately eight months after operation, the patient died while I was away. No postmortem was held. There was no evidence of kidney trouble at any time.

CASE 3.—A boy, aged 15, had exstrophy of the bladder. At Doernbecher hospital in association with Dr. W. H. Bueerman, the operation was done, April 4, 1928, number 12 ureteral catheters being used. In cleansing the bowel, the sigmoidoscope was pushed through the wall of the sigmoid into the hand of the operator by an extra assistant who had not assisted with this operation before. The rent in the sigmoid was closed with several layers of chromic catgut and the sigmoidoscope was reinserted and the rectum prepared as usual. The left ureter was transplanted below the accidental puncture and the right ureter above it. The time for the operation was two hours and thirty minutes. On the first postoperative day, dextrose was administered intravenously, followed by a chill. On the third postoperative day the patient took a liquid diet. On the eleventh day after operation, he vomited, and on the thirteenth day the catheters were removed. He was up in a wheel chair on the twenty-fourth day and on the thirty-fifth he dressed and went outdoors. During the progress of this case there was a good deal of distress in the region of the right kidney. Dr. Bueerman thought there was pyelitis. On the sixty-second postoperative day Dr. Bueerman removed the bladder, which was followed by a slight rise of temperature lasting a day or two. The patient was discharged on the ninety-seventh postoperative day. He entered school in September and made his grades throughout the year. He reported at the clinics, July 9 and 11, in good health and stated that he had not had any difficulty in holding the urine and there was no distress. As evidence of his enthusiasm and good health, he wrote, July 24, 1929, fifteen months after the operation: "I am getting along just fine. Went to White Salmon, Wash., all last week and picked cherries. Had a good time and made $15.19."

CASE 4.—A woman, aged 39, married, had an incurable vesicovaginal fistula. April 5, 1928, a cystoscopic examination was attempted. The bladder was found to be a knot of cicatricial tissue. One of the ureters opened directly into the fistula. Five or more attempts at repair had been made. There was no hope of repair. The operation was performed, April 10, number 12 catheters being used. The time required was two hours and thirty-five minutes. The ureters dilated to the size of a man's little finger. When opened, both ureters were thick walled and held cloudy urine; in the left ureter the urine was decidedly purulent. The patient left the operating room in good condition. Both catheters drained immediately. On the fourth postoperative day, the patient expelled gas freely; both catheters were draining, and the patient took albumin water. On the fifth day the left catheter came away, the ureter having been cut through to the catheter by ligature; on the seventh, there was pain in the right kidney region; the patient vomited several times, and the right catheter was found blocked but not loose. The end of the catheter was cut off, and drainage was reestablished thereby. There was recurrence of pain over the right kidney on the eighth postoperative day, and on the ninth the catheter was removed from the right kidney. On the twenty-fifth day the patient sat up and she was discharged on the thirty-third postoperative day. In response to a letter asking her to come for the clinics, July 9 and 11, I received the following: "Dear Doctor: Received your invitation for the doctor's convention today. Will be glad to come as I feel very good. I have not been sick a day since I came home from Portland. I have not been so well since 1918. I do all my own housework and milk six cows twice a day." The patient was presented at the clinics, where she confirmed the letter in her personal statements.

CASE 5.—A woman, aged 54, married, with carcinoma of the bladder, registered at my clinic, May 1, 1927. Examination revealed a papillomatous growth in the bladder; it was fulgurated unsatisfactorily. The trigon afterward presented a definitely malignant appearance and bled easily on being touched. May 26, a cystotomy was performed; 50 mg. of radium was screened and placed directly in contact with the growth. It was held in place by a gauze pack for twenty-four hours. The growth disappeared. By June 22, 1928, the growth had returned, and transplantation was advised. The operation was performed, July 3, number 12 catheters being used. The time required was two hours and fifty-five minutes. The patient returned from the surgery in good condition. On the first postoperative day there was occasional vomiting but both catheters were draining well. Albumin water was taken on the second day, and on the third the patient expelled gas freely. On the fifth day the patient took a liquid diet, and the bowels moved. On the ninth day there was pain over the left kidney, and on the tenth, both catheters were draining but some urine escaped into the rectum. The catheters were removed on the twelfth day, and on the twenty-fourth the patient walked on the porch. On the twenty-fifth postoperative day the patient complained of feeling chilly, and there was a rise in temperature. On the twenty-eighth, the patient was fully dressed, and on the thirty-second day, 2,400 mg. hours of radium was applied in the vagina. The patient was discharged on the thirty-fourth postoperative day. September 20, she was readmitted for a cystectomy. The wound was drained through the vagina. On the ninth postoperative day the patient had a chill; the temperature was high. There was sloughing of the breast following subpectoral infusion which accounted for the chill and fever. The patient was very anemic and much depleted following the sepsis from the sloughing. She was presented at the clinics, July 9 and 11, 1929. "She is feeling well and holds the urine without distress for two or three hours during the day. She gets up once and sometimes twice at night. The patient is rapidly gaining in health, and does the housework and cooking for a family of ten."

CASE 6.—A man, aged 28, had advanced carcinoma of the bladder of three years' duration. The case was considered hopeless. The cancerous mass extruded through the cystostomy wound. The patient was cachectic; the hemoglobin was 36; the

temperature 100.6, and the pulse rate 100. A blood transfusion was made. An operation was performed. Aug. 3, 1928, in two hours and thirty minutes. Both ureters were dilated; the right one was as large as a man's little finger, the wall being thin and avascular. The patient returned from the operating room in good condition. On the third postoperative day, beef juice was given. On the fifth, urine began to escape into the rectum; the catheters were blocked; the left catheter came away with slight traction; the right was removed with difficulty; with it, a small longitudinal piece of ureter came away. At night, the patient had a chill and a high temperature. He was nauseated on the sixth postoperative day, and on the eighth the urine and feces came through the wound and also through the rectum. On the twelfth day a blood transfusion was made. The bladder was opened with a cautery and 1,000 mg. hours of radium was applied. On the fifteenth, a smaller amount of urine came through the wound, and on the thirty-second day gas and feces escaped through the wound. The patient was in a wheel chair on the thirty-seventh postoperative day and on the forty-first, he had a chill. He was walking on the forty-eighth day, and on the fifty-fourth the fistula seemed almost healed. On the eighty-third day, 475 mg. hours of radium was applied in the bladder, and on the eighty-sixth postoperative day, the patient was discharged. He returned later for radium treatments, 2,400, 2,000, 600, 1,800 and 1,000 mg. hours, respectively. At my request, the patient returned for the clinics, July 9 and 11. The hemoglobin was then 65, against 36 a year ago. A white fibrous cavity, with very slight discharge, represented the original site of the bladder. There was no local evidence of active cancer. The patient was entirely comfortable and was not disturbed by the urine in the rectum.

CASE 7.—A man, aged 49, had very advanced carcinoma of the bladder. A malignant growth, the size of a golf ball, had been removed by Dr. J. Thomas Whitty in November, 1927. The growth returned. The chief complaint was bladder distress consisting of heavy bearing down pains and frequency of urination. A palliative operation was performed Aug. 4, 1928, to relieve the bladder distress. The time required for the operation was two hours and twenty-five minutes. The carcinoma was very extensive, coming from the right bladder wall; the right ureter passed through it and dilated above to the size of a man's finger. Number 12 catheters were employed. The lymph glands along the right iliac vessels and the ureter were enlarged to the size of walnuts and were apparently involved by the cancerous process, making the case entirely hopeless. The patient returned from the operating room in good condition. On the first postoperative day there was a tinge of blood in the urine. The next four days were uneventful. On the sixth day the patient took a liquid diet, and the bowels moved well. On the sixteenth day he was in a condition of partial stupor. Both catheters were still draining but were easily removed. On the seventeenth day, the bladder was opened with the cautery and 1,000 mg. hours of radium was used inside the bladder to control the bleeding. The patient was up in a chair on the thirtieth day, and on the forty-sixth he was discharged. Following is a report from Dr. Whitty: "Mr. K. died, Oct. 18, 1928, and the postmortem examination was made by Dr. Cefalu, pathologist. The only abdominal organ free from the malignant condition was the liver. The bowels were involved. The transplants were perfect. I have the specimen. The bladder was nearly all involved; also the bowel above the transplant. The last week he lived, he failed rapidly because of the impossibility of getting a bowel movement. I am happy he has passed away; sorry it was not more hopeful for your sake, but at that he did not suffer from the burning and frequency he had when he presented himself to you." Dr. Whitty kindly sent me the specimens which are reproduced here. The valves in the mucous membrane were perfect. The right ureter was much smaller than when transplanted. The right kidney pelvis was dilated. There was no evidence, however, to show that the kidney was more dilated at the time of death than it was at the time of operation. The left kidney appeared to be normal (fig. 1). Dr. H. H. Foskett, pathologist, who made the microscopic study, reported that a study of numerous sections from the left kidney revealed a moderate amount of parenchymatous degeneration of the epithelium as indicated in figure 2, with occasional patches of leukocytic infiltration in the cortex. The glomeruli and interstitial tissue did not show any noteworthy change and the general picture revealed only slight deviation from the normal. Sections from the right kidney (fig. 3), in which there was a dilated pelvis and ureter, revealed a more diffuse leukocytic infiltration with a somewhat greater degree of degeneration of the kidney epithelium. There were occasional areas of old hemorrhage in this kidney. Here again if one discounts the pathologic changes due to postmortem degeneration, there was a rather small amount of definite pathologic change other than that produced by the obstructed and dilated ureter in the right kidney. With proper drainage, it would seem that this kidney should have recovered its functional efficiency to a large extent.

CASE 8.—A woman, aged 54, unmarried, has carcinoma of the bladder with abdominal metastases. In January, 1927, the bladder tumor fulgurated several times. In March, 1928, Dr. C. C. Kehl removed the tumor from the bladder and later it was again fulgurated. The growth returned and was distressing and appeared hopeless. The operation was done, Aug. 20, 1928, in two hours and thirty-five minutes. In addition to the bladder carcinoma, there was extensive involvement of the lymphatic glands along the course of the right ureter, which was dilated to the size of a man's little finger. The left ureter was dilated, although less than the right. Number 12 catheters were used. The patient returned from the operating room in good condition. The catheters were draining within an hour. On the first and second postoperative days, the patient vomited a good deal. Gas was expelled through a rectal tube. On the third day the vomiting had ceased and the patient took water by mouth. On the fifth day she took a liquid diet; the bowels moved well. On the eleventh day, both catheters were removed. The following days were uneventful except for pain in the dorsal spine and stiffness of the arms. The patient sat in a chair for twenty-five minutes on the twenty-eighth day, and on the thirty-seventh the question of the patient returning to her home in Seattle was discussed, but the patient was dependent on her family, who, having been advised by me that she would probably not live more than three months on account of the metastatic cancer, decided that she should remain in the hospital as long as she lived. The operation had entirely relieved the pain in the bladder, and, owing to the extensive metastases in the abdomen above, no radium was applied. As the weeks passed, she was from time to time up and down complaining of an arthritis involving the finger joints which led us to believe that probably the pain in the back had been due to arthritis instead of metastases. About 253 days after operation, the patient became bedfast. During all this time, apparently normal urine was passed from the rectum and was discharged from six to eight times during the twenty-four hours. She never became very thin and never had an increase in temperature until 289 days after operation, when she rapidly failed and died on the following day.

A postmortem was immediately done. General carcinomatosis involved the mesenteric lymphatic glands and the retroperitoneal glands and fat, chiefly on the right side of the abdomen. The growth in the bladder had not extended materially since the time of operation. All the organs from the diaphragm downward, including the mesenteric glands and including the rectum within an inch or two of the anus, were removed. The kidneys appeared to be normal notwithstanding the fact that the right one especially was surrounded by cancerous tissue. The space in the hollow of the sacrum back of the rectum was not involved with cancer. The kidneys were exposed from behind the mass and the fat around the ureters was separated from the transplanted ureters down to the point at which they entered the sigmoid. The colon was severed approximately 4 inches above the site of implantation, and the connective tissue back of the rectum was carefully preserved with the rectum. Both kidneys were split and appeared to be macroscopically normal for a person of this age. There was no pus, and no great enlargement of the pelvis of either kidney. A small amount of clear urine was found in each kidney. The right ureter, which was so large at the time of operation, had diminished in size since then. The left ureter was not a great deal larger than normal. Each ureter was then split from behind and a white wooden probe or applicator was passed into the bowel and the bowel was split so that the valves could be observed. The specimen was immediately turned over

to Mr. Trahar, the artist, who made photographs and at the same time recorded the color existing in the fresh specimen. The specimen, after four days on ice, was then preserved in Kaiserling's solution and later in solution of formaldehyde, and was exhibited to the physicians at each of the three clinics on ureteral transplantation given during the meeting of the American Medical Association. The pictures shown in figure 4, when compared with the specimen, faithfully portray all its details.

Dr. Foskett reported that a study of numerous sections from various areas of the right kidney revealed the picture seen in figure 5. Here one finds evidence of old, chronic nephritis in the proliferation of interstitial tissue and occasional obliterated glomeruli. The parenchyma shows a rather marked degenerative process with occasional infiltrating leukocytes. The degeneration of the epithelium has progressed to the point of complete dissolution of the cells in some instances. A similar study of sections from the left kidney (fig. 6) revealed the same evidence of chronic nephritis with occasional infiltrating leukocytes. The degenerative process, however, was less marked. So far as a histologic picture makes it possible, one might estimate that the parenchyma of the right kidney was from 50 to 75 per cent destroyed, and the parenchyma of the left kidney approximately 25 per cent destroyed. If one takes into account the fact that a large amount of this degeneration was postmortem change caused by the time consumed by the artist, there apparently remained a reasonable margin of functional ability beyond absolute requirements.

Case 9.—A widow, aged 33, with an incurable vesicovaginal fistula following radium treatment for carcinoma of the cervix and the vagina, was very anemic. Operation was performed, Aug. 24, 1928, in two hours and ten minutes. Number 12 catheters were used. The bladder was distorted by scar tissue. The uterus was atrophied. The left ureter was about twice the size of the normal ureter and was thickened. The right ureter was as large as a man's index finger, very thin and tortuous. A blood transfusion of 700 cc. was done. The patient returned to bed without shock, both catheters draining freely. On the second postoperative day, the urine was tinged with blood. On the third day the right catheter was partially obstructed and was irrigated with boric acid solution. The patient took a liquid diet. The left catheter was removed on the eighth day, and on the ninth the right catheter was still retained and was irrigated. The urine returned with a sandy sediment. At this point, Dr. Spangler devised a stylet made of piano wire with a metal tip with which he cleaned the obstructed catheter. The right catheter came away on the thirteenth day, and on the fourteenth there was a slight rise in temperature. An ischiorectal abscess was opened on the fifteenth day, and on the twenty-seventh the patient was up in a chair. On the thirty-second day, she complained of pain in her leg, vomited and refused meals. She was discharged on the thirty-sixth postoperative day, with a temperature of 98; the pulse rate was 88; the bowels moved well and the patient felt well. May 7, 1929, she wrote: "I am still among the living and feeling wonderful. I weigh 140 pounds [63.5 Kg.]. Was laid up for twelve weeks with a broken knee but able to be around again. Very well at present." May 24, I invited her to be present at the clinics. Her reply in part was: "I will be in Portland by July 8, as I feel sure that I will be some encouragement to those who are skeptical regarding ureteral transplantation." Her knee became worse, requiring a cast which prevented her coming.

Case 10.—A boy, aged 5, with exstrophy of the bladder, was operated on, Oct. 23, 1928, in two hours and twenty-two minutes. There were two ureters coming from the left kidney and one from the right kidney. The two left ureters were parallel and more than a half inch apart, each of them easily admitting number 10 catheters. They were webbed together by a firm membrane and were not separated in doing the operation. Both ureters with their contained catheters were drawn through the same opening in the intestine and buried in the intestinal wall together. A number 10 catheter was used also in the right ureter. The patient was in moderate shock. He developed a severe cough, which harassed him for several days. One left catheter was dry until the sixth postoperative day, but on the eleventh day the two catheters were discharging about equal amounts, and on the thirteenth a phenolsulphonphthalein test found the kidneys functioning properly through all three catheters. The catheters were removed on the fifteenth day, and on the sixteenth there was pain in the back over the left kidney region. On the twenty-fourth day there was pain in the chest and also in the back and the left kidney region; a high temperature was present. There was tenderness on pressure over the left kidney on the twenty-seventh day, and on the twenty-ninth he vomited. On the thirty-first day he had fever, 105.6, and the abdomen was distended. On the fortieth day the patient was up in a chair, and the temperature was normal. He was discharged on the forty-ninth postoperative day. Jan. 1, 1929, the child with his parents returned to pay a New Year's call at which time he exhibited his first pair of trousers. He returned for the clinics, July 9 and 11. The mother reported that the child was rapidly gaining strength, looked well and discharged urine from the rectum about once during the night.

Case 11.—A girl, aged 2 years, with exstrophy of the bladder, was operated on, Nov. 13, 1928, in two hours and twenty-five minutes. While the sphincter control was good, the anus was small and inelastic. Instead of a sigmoidoscope, an ordinary uterine packer was inserted, through which the rectum was washed and the dry gauze introduced. The right ureter easily admitted a number 10 catheter. The left ureter admitted a number 10 catheter about 2 inches, when a stricture was encountered making it necessary to withdraw the number 10 and use a number 8 catheter. The patient returned from the operation in good condition. Both catheters were draining. She vomited frequently during the day. On the second postoperative day she took a liquid diet. Gas was passed on the third day, and on the sixth the catheters were irrigated. On the eighth day the catheters were draining freely but came away without traction. On the twenty-ninth day, the child was clothed and walked around. She was discharged on the thirty-seventh postoperative day. The mother brought the child in for the clinics. The child at this time was remarkably healthy, turning somersaults and performing all kinds of athletic feats in the bed. The exstrophied bladder had receded within the abdomen. It seemed that the scar following the drainage had contracted and the bladder had worked its way back into the abdomen and did not protrude again even when the patient vomited. There was no hernia, and the opening corresponding to the former location of the bladder barely admitted one finger.

Case 12.—A boy, aged 4 years, a feeble child, with exstrophy of the bladder, and extensive prolapse of the rectum which had to be replaced after every bowel movement, was operated on, Nov. 24, 1928, number 10 ureteral catheters being used. The time required was one hour and forty-seven minutes. The patient returned from the surgery in good condition, both catheters draining slightly bloody urine. On the first postoperative day the right catheter drained poorly; a stylet was inserted. On the second and third days the catheters were irrigated and the patient took albumin water. The stylet was used again to open the right catheter on the fourth day, and on the fifth the bowels moved well, and the patient took nourishment. The urine appeared in the rectum on the eighth day, and the catheters were removed. On the seventeenth day the patient was drowsy a good deal of the time, probably on account of high fever. On the twentieth day he vomited his breakfast, and on the thirty-seventh he vomited his dinner. On the fortieth day the temperature was normal and the patient was up in a chair. On the forty-first day there was a slight rise of temperature, after which time it remained normal. The patient was discharged on the fifty-sixth postoperative day. During the last two weeks the patient made rapid improvement, but the temperature rose to 100 occasionally. Feb. 9, 1929, Dr. Bapty wrote: "For a whole week he has been dry every night. The color is slowly coming back to his cheeks and by summer I hope to see him well and strong." May 22, his mother wrote: "My little son Thomas is progressing wonderfully. He is much better and does not sway or stoop when he walks as he did formerly. His bowel control is very good." She brought the child down for the clinics. The weight had increased and the color was improved. There was no prolapse of the rectum after the operation. The mother stated that she had to get the boy up once at night and that he soiled his clothes only at night or when he became intensely interested in his play, or excited.

Case 13.—A man, aged 48, with infiltrating carcinoma of the bladder, was operated on, Jan. 8, 1929, number 12 catheters being used, in two hours. Advanced carcinoma was found infiltrating the bladder wall, the trigon, and connective tissue on each side of the bladder, too far advanced for complete cystectomy. The ureters were moderately dilated.

On the first postoperative day, bloody urine appeared from the right catheter; the left catheter was not draining. It was therefore irrigated with boric acid solution. On the third day, both catheters drained clear urine; a glycerin suppository was given; some gas was expelled. At night the patient vomited. On the fourth day the patient coughed and expectorated. He took broth on the fifth day, and on the sixth, the bowels moved well. For the next five days the patient had the hiccups a great deal; he was in a partial stupor and slightly delirious; he perspired a great deal, and was obviously uremic. On the 13th day he improved; the catheters were removed. On the seventeenth day the bladder was opened with cautery under gas anesthesia, and 100 mg. of well screened radium was introduced directly against the growth for thirty hours. On the twenty-third day the patient had two chills, followed by a temperature of 104. After this the progress was uneventful. On the thirtieth day he was up on a back rest. He took amidopyrine to relieve pain. On the thirty-eighth day, 2,500 mg. hours of radium was given, and he was discharged on the fifty-second postoperative day. The growth was diminishing. He returned, July 9 and 11, for the clinics and reported that he was taking less amidopyrine. "He holds the urine well. There is marked recession of the growth and the patient is gaining in weight."

Case 14.—A man, aged 51, with carcinoma of the bladder, entered the hospital, July 4, 1929. The hemoglobin was 55, and the leukocytes numbered 14,000. There was a great deal of distress in the bladder. July 5, a direct blood transfusion of 500 cc. was made. The hemoglobin was brought up to 80 as a result of the transfusion. An operation was performed, July 9, during the clinic. The time required was two hours and seven minutes. A large infiltrating mass involved the right side of the bladder, which contained the right ureteral opening. The growth was firm, and was fixed in the connective tissue of the pelvic cavity. A cystectomy was impossible. Therefore, the ureters were transplanted with the view of using radium later. Number 12 catheters were used. The left ureter was moderately dilated. The right ureter was tortuous and dilated to the size of a man's finger and distended with clear fluid. Its wall was very thin. After it was slit, it collapsed into a small mass. The patient was not at all shocked by the operation, was never nauseated, and recovery was entirely uneventful. On the fourteenth postoperative day the bladder was opened with a cautery; 4,100 mg. hours of radium was screened and distributed over the cancerous area and held against the growth by gauze packed in the bladder. During the following days the patient had some rectal distress, which was apparently due to the radium. He was out in a wheel chair on the thirty-second day, and on the forty-first he was discharged, the drainage wound having practically healed. October 7, he returned for a check up. Cystoscopic examination revealed an open crater on the right side of the bladder about an inch long, half an inch wide and about as deep. The remainder of the bladder wall, which had been involved with cancer and treated with radium, appeared as a white scar. October 12, the bladder was reopened suprapubically and a 50 mg. tube of radium, well screened and sewed in gauze, was buried in this crater for forty hours and held in place by packing the bladder full of gauze. Pain was relieved by morphine in the meantime.

Case 15.—A woman, aged 24, who had been married for four years but had not had any marital relations, had exstrophy of the bladder. Her general health was fair. The systolic blood pressure of 168 indicated impaired kidneys. June 15, 1929, the kidney function was tested. The right catheter was passed with ease, but the left could be passed only an inch when a stricture was encountered. Urine was collected from both kidneys. Color appeared in four and one-half minutes. This examination was followed by a great deal of pain in the right kidney; also by fever. The patient entered the hospital July 6, with a temperature of 99, and was menstruating. An operation was done, July 11, during the clinic. The time required was two hours and eight minutes. When the abdomen was opened, a large retroverted uterus was found and lifted up. There seemed to be no round ligaments. The ureters were somewhat dilated and thickened. Number 12 ureteral catheters were used. At the close of the transplantation operation, the bladder was removed. The wound bled freely and was packed with gauze as there were no large vessels. Nevertheless, the bleeding progressed to such an extent that a blood transfusion was given. On the first postoperative day, the urine from the catheters was slightly tinged with blood. The patient vomited. On the third day the urine was clear, and the patient took liquid nourishment. On the seventh day, she vomited green fluid. The right catheter was loose and was removed on the tenth day, and on the twelfth, the patient vomited undigested food. On the fifteenth day the left catheter was removed, and on the twenty-second, there was a slight chill. A great deal of pus was discharged through the drainage wound, which healed rather slowly. Later on, after the wound has healed, it is the intention to bring the vulva across over the fibrous pubic arch. This should restore the sex organs to practically normal. The patient was discharged, September 22.

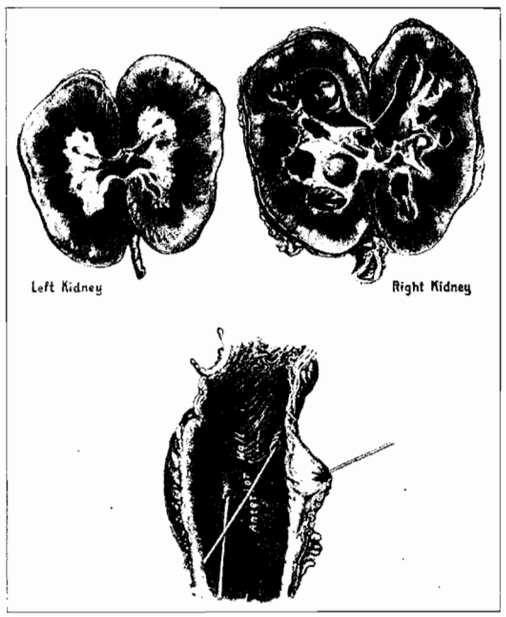

Fig. 1 (case 7).—Postmortem specimens showing a normal left kidney and ureter and a dilated right kidney and ureter, with ureteral openings containing probes entering the intestine on its anterior wall.

Case 16.—A girl, aged 4, had exstrophy of the bladder, an imperforate anus and a rectovaginal fistula. An attempt by another surgeon to establish an anus resulted in a second sphincterless opening. The operation was performed, July 12, during the clinics. The time required was two hours and five minutes, number 8 catheters being used. A larger one could not be introduced. A large fecal impaction was found in the sigmoid. This was gradually worked downward and out through the rectovaginal fistula. The bowel was then cleansed in the usual way. At this time it was decided to transplant the ureters high and at a later operation to cut the rectum below the implanted ureters, turn in the ends of the bowel above and below, do a colostomy, and use a colostomy bag. The transplantation operation, after the bowel had been cleansed, proved to be easy. The patient vomited considerably for the first two days; she had a severe cough. By the fifth day the bowels were moving well. On the sixth day she was taking liquid nourishment, and on the eleventh, the catheters were removed. The patient made an uneventful recovery and was discharged on the thirty-first postoperative day. She returned, August 27, much improved in health and appearance,

but the mother complained that the child screamed loudly and strained when the bowels moved. Examination under anesthesia revealed a urinary calculus in the rectum the size of a black walnut which could not be extruded through either fistula. It acted as a ball valve. It was crushed and removed. The ectopic bladder is much less inflamed than before the operation. Care of the child is much easier, and the mother is of the opinion that the operation is well worth while even if nothing else is ever done. She returned again, October 22, in perfect health.

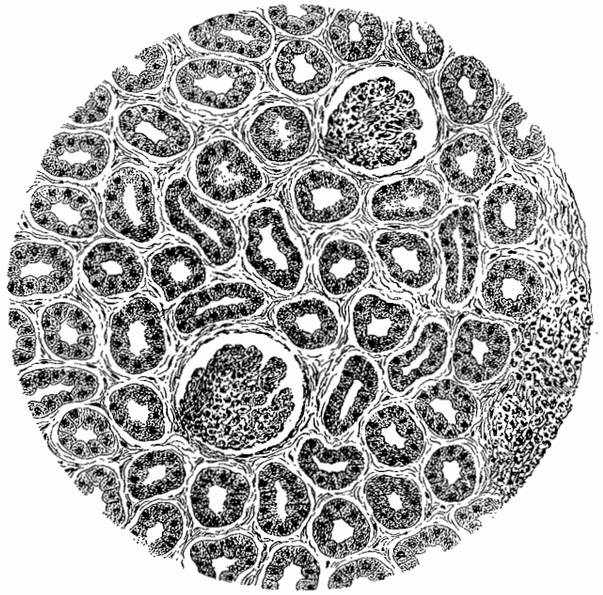

Fig. 2 (case 7).—Typical microscopic section from left kidney.

CASE 17.—A woman, aged 25, unmarried, had an ulcerating contracted bladder, probably due to tuberculosis. She had arrested pulmonary tuberculosis. The right kidney was removed four years before. Cystoscopic examination revealed small ulcers in the bladder; the bladder wall was principally made up of scar tissue, the bladder holding less than 2 ounces. Urination was frequent and painful. The kidney function was normal. The urine contained a few hyaline casts. The diagnosis of probable tuberculosis of the bladder was made. The operation was done, July 20, 1929, in one hour and fifteen minutes. The left kidney was examined and found to be unusually hard and contracted, with positive evidence of nephritis. The ureter was dilated about twice its normal size. Its mucous membrane was definitely inflamed. The operation was easy, being about thirty minutes shorter than when the two ureters are transplanted simultaneously. Recovery of the patient was entirely uneventful. A number 12 catheter came away on the tenth postoperative day. The patient was up and around the room on the twenty-fourth day, and on the thirtieth she was discharged. The patient was entirely relieved from all bladder distress with which she was suffering when she came in. She stated in a letter, October 18, that she was entirely relieved and seemed to be in perfect health.

CASE 18.—A man, aged 46, had a tuberculous bladder. In November, 1925, a right tuberculous kidney was removed. In September, 1927, the left testicle was removed for tuberculosis. The bladder was entirely tuberculous, holding about 50 cc. The patient was in constant agony. The kidney function was normal. The operation was performed, July 22, 1929, in two hours and twenty-five minutes. The left kidney was found to be about one-third larger than normal. It was smooth. The enlargement was probably compensatory hypertrophy. The ureter was distended to the size of a man's index finger and was tortuous in its course; the wall was thin; there was no evidence of interstitial or mucous membrane involvement; therefore, tuberculosis of the left kidney seemed improbable. The bladder was a large tuberculous mass, half filling the pelvis. The patient was fat and the mesentery of the sigmoid was fat, making it impossible to transplant the ureter into the deep pelvic colon as is ordinarily done; it was transplanted into the sigmoid, a number 12 catheter being used. Recovery was uneventful. The drainage wound healed rapidly and the patient was up in a chair on the twentieth day and discharged on the twenty-eighth postoperative day, completely relieved of all the bladder symptoms. A later report shows that the patient, who is a preacher, is again able to occupy his pulpit.

CASE 19.—A woman, aged 56, unmarried, an American teaching in Saloniki, Greece, had carcinoma of the bladder. The diagnosis was confirmed by cystoscopic examination. The operation, Aug. 22, 1929, done in one hour and fifty-seven minutes, revealed the growth to be more extensive than was suspected. It involved the base and neck of the bladder. The condition was apparently ideal for destructive radium treatment. The ureters were somewhat dilated and slightly thickened. Number 12 catheters were used. After the right catheter was fastened in the ureter, it was discovered that the catheter did not extend over the psoas muscle, not quite so far as usual, but no fear was entertained as to results. The left catheter began to drain immediately. The right catheter was dry. At 3 p. m. the right catheter was irrigated with boric acid solution. A few drops returned, probably only solution. The patient complained of pain in the right kidney region. At 8 p. m. a stylet was passed but no urine was returned. After this, boric acid solution was injected but did not return. During the night the patient complained of general pain in the back, being more marked in the right kidney region. Twenty-three hours after operation the patient was taken to the operating room, and through a loin incision the fatty capsule of the kidney was opened, the finger being passed along the muscle wall until the ureter was felt, when it was brought backward with a small flat curved retractor. The ureter was somewhat dilated and seemed congested; it was slit with a sharp knife, and a few drops of turbid urine escaped. A small baby soft rubber catheter was introduced about 2 inches into the pelvis of the kidney. Four small gauze wicks were placed around the catheter to hold it in place and two sheets of rubber tissue around this to provide drainage. The operation required only a few minutes, and there was no shock. The catheter began to drain a few drops of turbid urine, but within two hours clear urine was coming from the kidney. On the fifth postoperative day, methylene blue (methylthionine chloride, U. S. P.) was introduced through the distal right ureteral catheter and immediately came through the dressings. Several ounces of water was then run through this ureter. The loin catheter and gauze

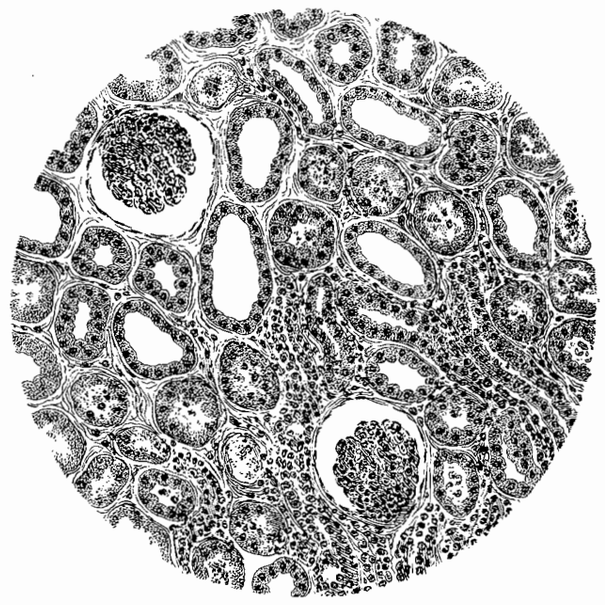

Fig. 3 (case 7).—Typical microscopic section from right dilated kidney.

wicks were removed. The second day afterward, the rubber tissue was removed and the wound was left to heal by granulation. This procedure is much simpler and much less dangerous than to deal with an obstructed catheter through the rectum.

September 6, 4,500 mg. hours of radium was applied inside the bladder through a suprapubic cystotomy wound and held in place by packing the bladder with gauze. The patient is now in the hospital for application of 2,500 mg. hours in the vagina.

CASE 20.—A boy, aged 6, had exstrophy. The ureters were sufficiently dilated to admit number 12 catheters easily. The operation, Aug. 22, 1929, was performed more quickly than any I have ever done in such a case, one hour and twenty-five minutes. One complication was encountered: The peritoneum on the left pelvic wall was very thin, and while it was being drawn over to the intestine the stitches tore through it, leaving a breach at the upper end of the left posterior peritoneal incision which could not be satisfactorily covered. Both catheters began to drain immediately and freely.

On the first postoperative day the patient was nauseated and vomited several times. On the second day the vomiting continued; the stomach was washed and a large amount of dark fluid was recovered; the pulse was weak and rapid; no gas escaped from the rectum, only a slight bloody oozing. Distention was rapidly increasing. The stomach was washed and more foul liquid was found. The patient was taken to the operating room, August 25, on the second postoperative day. The abdomen was opened through a right rectus incision. There was no evidence of peritonitis. The cecum and all the lower half of the small intestine were found collapsed. It was of normal pink. The upper portion of the small intestine was enormously distended and was purplish. As was feared, when the hand was passed over to the left pelvic wall it was found that the intestine had adhered to the one raw surface left exposed. This was easily separated. The small intestine was brought to the surface and the intestinal contents were stripped down through the small intestine into the cecum. As no gas or intestinal contents had passed through the rectum, it was feared that the contents of the ceum might not readily pass out through the rectum. Therefore a stab wound was made in the cecum and in the emergency a convenient perforated soft rubber T tube was hurriedly dropped into the cecum and the cecum brought up into the wound as with a cecostomy. Some bloody fluid escaped. The distention was relieved. During the night, some gas and intestinal contents passed out through the tube. The next day, August 26, the fourth postoperative day, the upper portion of the abdomen was again distended. The stomach was washed, and 600 cc. of dark fluid was found. The patient was again taken to the operating room and under local anesthesia, a loop of jejunum was brought to the surface and a catheter inserted by submucous implantation. At this time the disturbing observation was made that the small intestine had grouped itself around the cecostomy and adhered in a mass. A certain amount of fluid escaped from the catheter in the jejunum. Soon dextrose was introduced, 100 cc. at a time; 250 cc. at the same time was introduced through the cecal tube. During the night brown fecal matter began to escape through the cecal tube when it was unclamped. During the fifth postoperative day, fluid began to flow freely through the rectum. The fluid taken into the jejunum rapidly passed into the cecum, apparently digested. There was no more vomiting, and no marked distention. Throughout the fifth postoperative day and night the bowels moved well; the temperature was normal; the pulse was fairly rapid but good. The catheters drained a normal quantity of perfectly clear urine. During the last, or sixth twenty-four hour period, the discharge of clear urine from the kidneys was: right, 205 cc.; left, 275 cc. Everything went well until the afternoon of the sixth postoperative day, when the stool suddenly became greenish, as was the discharge from the cecostomy tube. Late in the afternoon of this day, August 28, the patient suddenly began to fail, the temperature rose to 105.6 and at 10:45 p. m. he died. The postmortem showed that the small intestines were firmly fixed around the cecum. In the center of the mass was an abscess. In the abscess was the end of one of the arms of the rubber T tube, which had turned

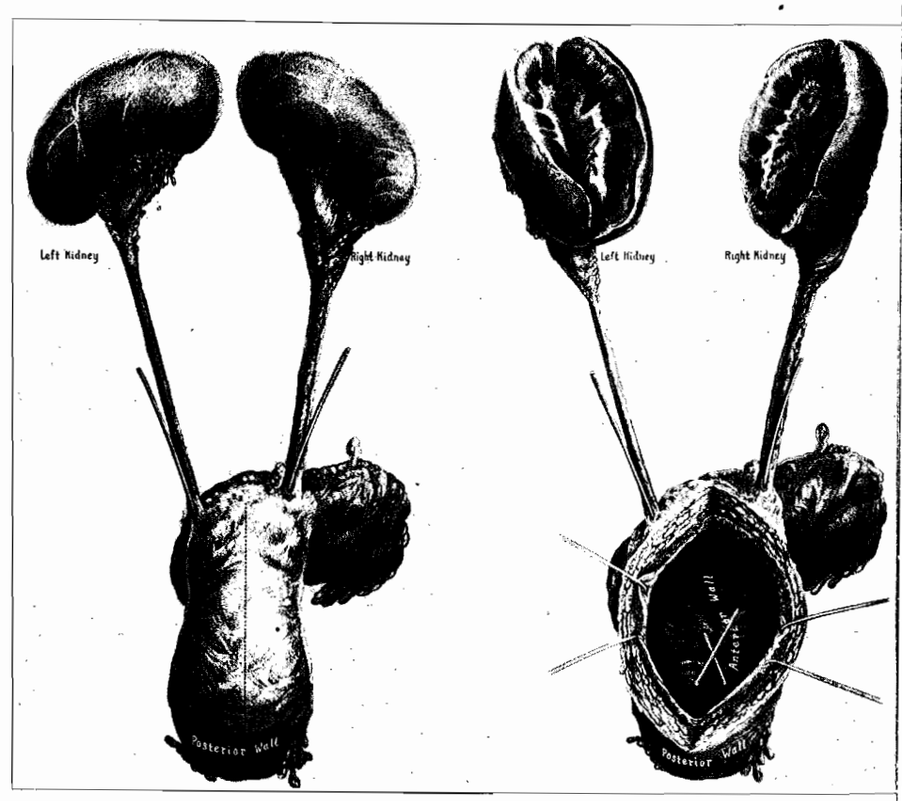

Fig. 4 (case 8).—Postmortem specimens: kidneys normal in size and contour and fairly normal in macroscopic section; ureters entering intestine on anterior wall.

crosswise and by pressure necrosis had penetrated the wall of the cecum. The kidneys were removed and were examined by the pathologist, who found them entirely unharmed.

SUMMARY

Twenty cases are reported as follows: cancer of the bladder, eight; exstrophy, eight; tuberculous bladder two, and incurable vesicovaginal fistula, two.

Cancer of the Bladder.—In three hopeless cases (2, 7 and 8) of metastases, the operation was satisfactory for the relief of bladder distress:

Patient 2 died eight months after operation of general metastases. There was no evidence of kidney trouble at any time. Postmortem examination was not made.

Patient 7 died seventy-five days after operation of general metastases which had encroached on the bowel at some point above the implantation. The kidney function seemed perfect to the end. A postmortem specimen showed the right kidney dilated and seriously

injured; the left kidney was almost normal. The valve action was good.

Patient 8 died 290 days after operation of general metastases. Kidney function was apparently perfect to the last. A postmortem specimen was preserved and a color picture made. Macroscopically, the kidneys

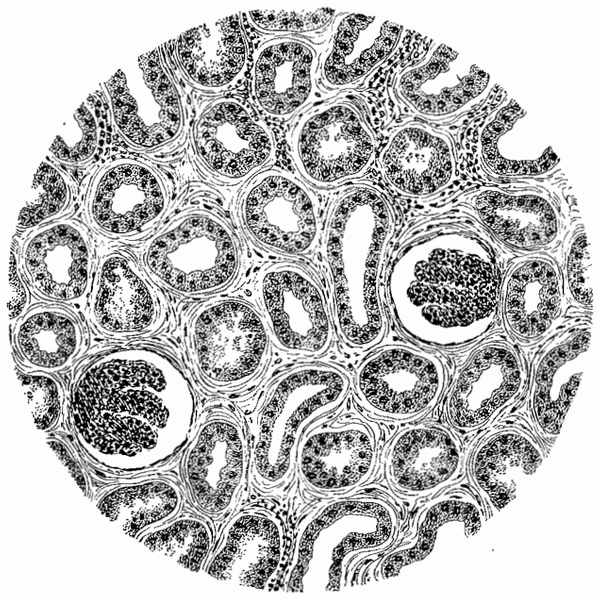

Fig. 5 (case 8).—Typical microscopic section from left kidney.

were practically normal for one of 55 years of age. Microscopically, the parenchyma was badly injured. The right ureter, which was dilated at the time of operation, had diminished since the operation. The left ureter was normal in size at postmortem. The valve action was good.

In case 6, hopeless because of the extent and duration of the cancer, a tremendous dosage of radium has been used by which the bladder has been completely destroyed and the growth has been kept down locally, so that the patient is still comfortable and his blood picture is better than when he was operated on a year ago.

In two cases (13 and 14) of cancer infiltrating the base of the bladder, no remote metastases were discovered:

Patient 13 took drugs to relieve his pain before operation. He still takes amidopyrine. He has gained weight. The cancer is diminishing after radium treatment.

Patient 14 has been relieved of the bladder distress and is gaining in health.

In case 5, total cystectomy was done a year ago. The patient is still well.

In case 19, in which there is a cancer of the base and neck of the bladder, 7,000 mg. hours of radium was used (4,500 in the bladder and 2,500 in the vagina). The patient is still in the hospital. A cure is expected.

Exstrophy of the Bladder.—Patient 20 died a surgical death following operation. Patient 1 was reported well two years after operation but died of acute colitis two years and five months after operation.

Five patients (3, 10, 11, 12 and 16) recovered and are now well and comfortable.

In case 15, in which a cystectomy was also performed, the patient is still in the hospital awaiting complete closure of the drainage wound before the operation for closure of the skin over the pubic arch is performed. The general condition is good.

Tuberculous Bladder.—In two cases (17 and 18), in each of which one kidney had been removed and a tuberculous bladder remained, the patients are comfortable.

Incurable Vesicovaginal Fistula.—In two cases (4 and 9), the patients are well.

DISQUIETING INCIDENTS

Fever.—Abnormally high postoperative temperatures have been observed in seven cases: The high temperature has been attributed in two cases (10 and 15) to lighting up of a preexisting pyelitis; in one case (3), to pyelitis resulting from infection following accidental puncture of the rectum with a sigmoidoscope; in one case (6), to retroperitoneal infection from a ureteral leak caused by excessive traction in removing a catheter. In the other three cases, no cause has been assigned.

Chills.—Four patients had definite chills: In case 3, the chill was attributed to intravenous introduction of dextrose; in case 6, to a leaking ureter in the retroperitoneal space; in case 13, it was uncertain as to whether it was due to radium or pyelitis. In case 15, the chill was due to preexisting pyelitis which before operation had been sufficiently severe to cause chills.

Pain.—In five cases (3, 4, 5, 10 and 18) there was pain in the kidney region: In cases 4, 5 and 18, pain occurred at the time the catheters began to loosen and disappeared after the catheters were removed. In case 3 the pain was likely due to pyelitis. In case 10 there were two left ureters with double kidney pelvis, in one of which apparently pyelitis was present at the time of operation.

There have been five major accidents or misfortunes worthy of note, which may be attributed to the

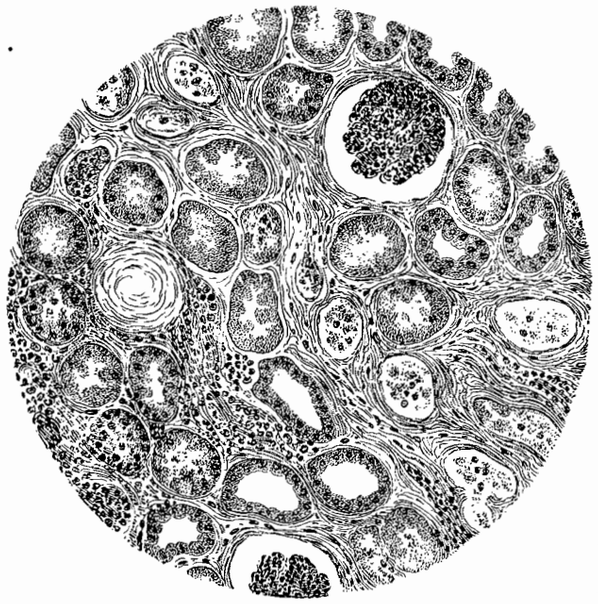

Fig. 6 (case 8).—Typical microscopic section from right kidney.

human frailty of those conducting the operation. In case 3, a sigmoidoscope was passed through the rectal wall carrying infection into the field. In case 5 there was sloughing of the right breast following subpectoral infusion. In case 6, too much traction was made on the ureteral catheters, which had become blocked, thereby disturbing the anastomosis and causing a urinary fistula. In case 19 the right ureteral catheter became blocked. This was thought to be due to failure to introduce the catheter past the psoas muscle. In case 20 there was an intestinal obstruction caused by an unrepaired break in the peritoneum over the left psoas muscle. After the obstruction had been removed, the pressure of the cecostomy tube made an opening which resulted in local peritonitis and death.

REMEDIAL SUGGESTIONS

1. Traction on the catheters for the purpose of detaching them from the bowel should be avoided.
2. The assistant who prepares and packs the bowel should be familiar with the use of the sigmoidoscope.
3. The inlying ureteral catheter should extend well above the psoas muscle probably to within 2 inches of the kidney pelvis and possibly to the pelvis itself.
4. The catheters occasionally become blocked with mucus, small blood clots and other débris. This may usually be cleared by syringe, with 2 per cent boric acid solution. To avoid carrying infection upward, the discharging ends of the catheters are kept in bottles containing 1:1,000 solution of mercuric chloride.
5. To lessen the danger of incrustation in the lumen or at the eye of the catheter, sodium biphosphate may be given.
6. If a catheter is completely blocked for twenty-four hours, nephrostomy or high ureterostomy should be performed.
7. In case an unrepaired breach in the peritoneum is left as was done in case 20, it is suggested that an extra sheet of gutta percha tissue laid over the space and extended outward with the quarantine might forestall an intestinal obstruction.

MORBIDITY

There has been no demonstrable evidence of serious postoperative kidney infection or peritonitis, as not infrequently occurred with the former two stage submucous transplantation without tubes. With a ligature firmly tying the ureter to the catheter above the rubber cuff and the ends of the catheters draining into 1:1,000 solution of mercuric chloride there is no possible way in which infection can enter the ureter or kidney directly. After the rectum has been isolated with a clamp, cleansed with solution and dried with gauze, and after the incision in the wall has been made between traction loops, a quarantine completely segregating and draining the operative area practically eliminates peritonitis.

There has been no demonstrable evidence of permanent injury to the kidneys in any of the twenty cases which could be definitely attributed to the operation. In each of the two cases (7 and 8) in which postmortem specimens were examined, the right kidney showed marked degeneration. However, it will be noted that in each case the cancer was located in the right side of the bladder involving the ureteral opening and producing marked dilatation of the ureter above at the time of the operation. There was extensive enlargement of the lymphatic glands along the course of each of these right ureters at the time of the operation, and the ureters lay in a bed of metastatic cancerous tissue at the postmortem. It may safely be presumed that these kidneys were already damaged and without operation would probably have been even more seriously involved. The observation in these two cases led to the suggestion that the first duty of the surgeon, after the abdomen is opened and before intestines are packed out of the field, is to palpate both kidneys carefully and make an accurate record of their condition.

MORTALITY

In twenty cases there has been one surgical death, 5 per cent mortality. This could not be considered high mortality for such an extensive operation on handicapped patients, but it is humiliating for me to know that death was not due so much to the inherent danger of the operation as to a defect in my application of the general principles of abdominal surgery.

MAGNITUDE OF OPERATION

The average elapsed time from the beginning of the first incision to tying the last suture in twenty cases was two hours and fourteen minutes, divided approximately as follows: twenty-two minutes for opening the abdomen and preparing the rectum; twenty-two minutes for closing and applying the dressings; one hour and thirty minutes for the actual performance of the double transplantation. The average elapsed time for the last ten cases was one hour and fifty-nine minutes. The time required for transplanting a single ureter is about thirty minutes less.

After the intestines are packed away out of the field the manipulations are delicate and shockless and require a minimum of anesthesia. There should be no serious shock connected with this operation. Therefore accuracy should be the chief desideratum. While the technic of this operation is far more exacting, the inherent danger is incomparably less than that of such major abdominal operations as subtotal gastrectomy for cancer of the stomach or the main operation in radical removal of the rectum for cancer. The total elapsed time is about the same in the three operations.

CONCLUSION

I believe that this operation is now complete in principle and that it is applicable for all conditions in which it is necessary or advisable to dispense with the bladder as a reservoir for urine. It is justifiable in the following cases:

1. Exstrophy of the bladder.
2. Incurable cancer of the bladder with a life expectancy of more than six months in which morphine or a palliative cystostomy is required.
3. Inoperable carcinoma of the base of the bladder or prostate in which large doses of radium are required in order to justify a hope of cure.
4. Certain cases of early removable carcinoma in which fulguration and similar agencies are now used.
5. Incurable tuberculosis of the bladder in which one kidney has been removed and the other remains free from tuberculosis.
6. Tuberculosis of the prostate and seminal vesicles with or without perineal fistulas.
7. Incurable vesicovaginal fistulas.
8. Extensive, incurable, multiple perineal fistulas resulting from various causes.
9. Certain cases of painful, contracted bladder resulting from infection or ulceration.
10. Traumatic injuries which make the use of the bladder impracticable.

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