Further inquiries have confirmed me in that opinion. It is as clear as anything can be that the question of plague or no plague in this country is a question of Nature's balance between cats and rats. We may assist the cat by using traps and poison, but we can never hope to compete with the cat, and a great point is the strong religious feeling in favour of keeping cats. The people in this district have seen for themselves that where there are cats it is the rare exception to find plague; and I feel that the weak point in this paper is my failure to convey an idea of the very strong opinion that cats are the best plague preventers, which is held by those who have seen for themselves the freedom from plague of those villages and mohallas where cats are numerous and of those houses in which cats were present. I fully admit that there will be a difficulty in the case of Jains and some Marwaris, and with some of the worshippers of Vishnu.

Of course it would take some time to get a sufficient number of cats, but in the meantime other measures should be pushed with vigour. What I should like to lay special stress on is the importance of recognizing that the ultimate method of preventing plague will be by keeping cats. Cats breed twice a year in India, and have about three kittens each time. Many of the kittens now die from neglect, or are eaten by the males, and it is only when the value of the cat is recognized that sufficient protection will be given to the young cats.

P.S.—Professor Kitasato, Director of the Institute for the Research of Infectious Diseases, writes from Tokyo, July 13th:

Your paper on cats as plague preventers was read with special interest (BRITISH MEDICAL JOURNAL, May 30th, 1908). Professor Koch of Germany, who is now staying with us in Japan, has strongly recommended the keeping of cats as a good method for plague prevention for our epidemic, in consequence of his success in keeping cats on board the ships bound for tropics to make them clear of the rodents. Consequently we have been just going to carry his suggestion into practice. When the things were thus far going on, I have received your paper, and immediately showed it to Professor Koch, who expressed his sincere admiration on your idea as one of the most useful reports on the matter.

A CASE OF IMPLANTATION OF THE URETERS INTO THE RECTUM FOR EXTROVERSION OF THE BLADDER IN A WOMAN, BY A MODIFIED PETERS'S OPERATION.

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EXTRAPERITONEAL transplantation of the ureters into the rectum, or Peters's operation, for relief of extroversion of the bladder, has now been frequently done, but so far as I am aware no case has yet been recorded in which an operation upon the lines of a Peters has been carried out in a female.

It must be at once obvious that the uterus and broad ligaments, interposed as they are between the back of the bladder and the rectum, form the chief obstacle to the extraperitoneal method, and to enable it to be performed with as little departure as possible from Peters's plan in the male it is necessary for the uterus to be removed.

To be rid of this viscus is very desirable from the patient's point of view, because the menstrual periods add very materially to her distress, both bodily and mental; and by the retention of a pool of decomposing fluid in the misplaced vagina the disgusting urinous odour from which she is never able to escape is rendered peculiarly fetid; indeed, so far as my experience goes, the condition of a woman who suffers from ectopia vesicae is far worse than that of a man.

From the ethical standpoint no one could dream of raising any objection to a proceeding that would render these unfortunate people less loathsome to themselves and to others, and give them a very welcome relief from continuous suffering.

The developmental and anatomical relations of the genito-urinary system are so intimate, that when a grave congenital defect such as extroversion is present it would not be astonishing if a departure from the normal were

met with in one or other of the associated structures. But when, in this instance, consent for the operation had been obtained, great difficulty was experienced in obtaining any information as to the possible peculiarities of the female genital arrangements in such cases.

Textbook accounts are invariably based upon male cases, and though occasional references to the malformation in the female are to be met with in the literature of the subject,* they are not sufficient to be of definite assistance, but just enough to justify the impression that maldevelopment may not be confined to the bladder and urethra, but may involve the genital passages and organs. The want of knowledge on this point was productive of the one unexpected difficulty met with during the operation.

For the opportunity of operating in this instance I am indebted to the kindness of my colleague, Mr. Ward, who, being aware of my interest in these cases, transferred the patient to me.

History.

Mary G., aged 31, had been operated upon by the late Mr. Jessop for extroversion of the bladder at the age of 4. Evidently the old flap operation of Wood had been performed, and the object aimed at had been achieved, for the bladder mucous membrane was completely concealed, and the urine escaped from a large cavity by a dependent opening at the top of the vulva. As she grew up, however, her unfortunate state became one of great misery, for the vulva was kept in a state of chronic inflammation owing to the irritation of decomposing urine, which deposited phosphates upon the hair, and of an offensive purulent discharge from the interior of the cul-de-sac, which was probably either vaginal or uterine in origin. Her sufferings were aggravated at the menstrual periods, and, owing to the soreness of the skin, she was unable to wear a urinal, so the condition of her clothes can be imagined. The usually foul and offensive odour which permeated her vicinity was alone sufficient to explain the misery depicted in her face and the shrinking timidity of her manner. Her broken spirit could not at first be brought to the point of facing any operation, but, as matters grew worse, she eventually consented, and was admitted on June 10th, 1907.

Operation.

After careful preparatory treatment, to subdue the eczematous condition of the labia and perineum and thighs, the following operation was performed on June 26th:

The patient having been anaesthetized and the field of operation carefully shaved and cleaned, the first step was to remove the anterior wall of the cul-de-sac by cutting through its attachment to the abdominal wall and labia with scissors. A large area covered with smooth skin from which a few short, fine hairs grew, was exposed, and at its lower part was the extroverted bladder with its two ureteral orifices filling in the gap left by the divergence of the lower ends of the recti. The mucous membrane of the bladder and urethra was continuous with the mucous membrane in the vulval cleft, and about 1½ in. below the orifices of the ureters was a small aperture from which some dirty mucus exuded. This was thought to be the os uteri, as it appeared to coincide with the position which a previous examination of the rectum had shown the cervix of a retroverted uterus to occupy.

Next, the exposed bladder, whose area was about two square inches, was incised all round at its junction with the skin and with the urethral mucous membrane and dissected up from the underlying peritoneum. In this way the bladder with both ureters attached was isolated, and a strip of gauze passed between the ureters was used as a retractor to draw it upwards and out of the way for the next stage of the operation, namely, the removal of the uterus.

The intention was to open the exposed peritoneum transversely, but on attempting to do this, instead of entering the peritoneal cavity, a sac containing, perhaps, a couple of ounces of dirty offensive mucus was exposed. This proved to be the vagina, and the aperture which had been mistaken for the os uteri was its external orifice. It was carefully sponged out and cleaned, and then with the help of an assistant's finger in the rectum as a guide, the peritoneum was opened just above it for about 1½ in. Into this opening the uterus was made to present, was seized with a vulsellum and drawn out. First the left and then the right broad ligament was divided and ligatured, the ovaries being left behind; next the posterior vaginal wall was cut across just at the point where it ceased to be applied to the anterior surface of the rectum, and the uterus with the anterior vaginal wall was removed after the uterine arteries had been tied and the few remaining points of attachment divided. This part of the operation was very easy. If this account has been carefully followed it will be seen that the hole left in the peritoneum after the removal of the uterus had for its lower border the edge of the peritoneum where it is reflected from the posterior vaginal wall on to the anterior wall of the rectum and

* The clitoris in the female is split in two portions, corresponding to the nymphæ, the anterior commissure of the vulva being wanting, and the bladder and urethra thus opening between the labia, and directly into, or immediately above, the vagina. The uterus is usually well formed.—Harte, *Annals of Surgery*, vol. xli, p. 466, 1905.

that the lower edge of the gap in the tissues was formed by this peritoneal reflexion and the upper edge of the posterior vaginal wall (Fig. 1).

Into this gap the anterior wall of the rectum, just above the line of peritoneal reflexion from the posterior vaginal wall, was pushed by the assistant's finger in the rectum and the circumference of the gap was attached to it by a continuous suture in such a way as to leave a circle of anterior rectal wall, about $1\frac{1}{2}$ in. in diameter, shut off from the general peritoneal cavity.

This will be more easily understood by a reference to Fig. 2, from which also it may be seen that the vaginal cul-de-sac which was ultimately left was produced by a folding upon itself of the posterior vaginal wall.

The last step—the introduction into the rectum of that portion of the bladder on which the two ureters opened—was accomplished in the usual way through a transverse incision about 1 in. long in the exposed anterior rectal wall.

First catheters were fixed in the ureters. A pair of long forceps was then passed through the anus, and out through the transverse incision, and made to grasp the catheters and draw them down into the rectum and out at the anus, and in this way, with a little manipulation, the previously-trimmed bladder was pulled through the incision and lay within the bowel. The edges of the incision into the rectum were then united by a continuous silk Lembert suture between the ureters, so that the two ureters entered the bowel at the two ends of the incision and there was a line of suturing between them. A few additional sutures were used to fix the ureters and prevent retraction. Finally, the catheters were removed and the excavated raw surface left by the operation and the vaginal cul-de-sac were packed with sterile gauze.

The uterus was normal in shape, about $2\frac{1}{2}$ in. long. There was no body cavity, but a narrow channel divided into two, one narrow track going to each superior angle.

After-Progress.

All the urine passed by the anus for about a week, when signs of a leakage became apparent. The leakage increased

Fig. 1.—The lines A and B indicate the limits of the parts removed.

and when the sloughy surface of the wound became quite clean, the orifice of the right ureter was seen discharging urine in the depths of the depressed granulating surface. A probe could be passed by its side into the rectum.

Second Operation.

On July 29th the patient was again anaesthetized, and the right ureter was isolated for about 2 in. A catheter was fixed in it, and its termination was drawn into the rectum through another incision, this time in the recto-vaginal wall. Various sutures were used to ensure a broad surface of adhesion and to counteract the traction of the ureter. During the proceedings some unexpected suppuration was discovered about the silk suture that had closed the incision into the rectum at the previous operation.

Again the urine passed by the anus for a few days, but on August 2nd a fresh leak was noticed, the urine welling up from the depths of the wound beside the ureter. The leakage, though considerable, was never so copious as before the second operation. It gradually diminished, and in October was of a comparatively trivial character. At this period the patient had occasional febrile attacks, and a little pus would frequently well up with the urine. She became an out-patient on October 15th, and by the end of the year she was in good health, pus had long ceased to escape, and the leaking fistula had apparently reached a stationary condition. A probe could be passed along it into the rectum, but the quantity of urine that escaped was so slight that it was only necessary for her to change a small pad of wool three times in the twenty-four hours to keep herself quite dry. The parts were perfectly clean and healthy, there was no irritation of the surrounding skin, and all unpleasant odour had vanished. Urine could be retained for four and sometimes five hours, and she was accustomed to get up twice in the night, and only wet the bed if the public pad got displaced. Her general condition was immensely improved, and she had lost the aspect of shrinking misery which had been so striking before operation. She was sufficiently satisfied with her condition at that time to refuse to submit to any attempt to close the fistula by

the cautery, but her desire to be in a state in which she could go to work and earn her own living eventually overcame her reluctance. Two attempts have therefore lately been made. After the first the opening became so small that a fine probe could no longer be passed, but the leakage was not materially altered. The last has only just been carried out.

One more point may be mentioned. At the present time an examination of the rectum discloses at the point where the left ureter enters the bowel a small hernia-like sacculle, into the orifice of which the tip of the finger just fits. There is no trace left of the tissues that were introduced with the end of the ureter into the bowel. The situation of the right ureter, which it will be remembered was finally made to pass through the vaginal as well as the rectal wall, is marked by a steep funnel-shaped recess which it is impossible to explore digitally.

The main object of this paper is to record the steps of the operation in the case of a female.

It will not be out of place if the opportunity is taken to refer to the results of Peters's operation for extroversion in the 3 other cases in which I have performed it:

CASE I was that of a boy of 4. The operation took place in August, 1905, and was a great success. The bowel retains the urine about four hours, and he keeps himself quite dry through the day. It is only in bed that there is trouble, as he does not always wake to relieve himself. Nearly three years after he is in good health.

CASE II was a male infant aged 8 months. The parents were advised to postpone operation till the child was 2 years old; but, being obliged to leave the neighbourhood, they were anxious to have it done before they went. The child made a rapid

Fig. 2.—A marks the position of the transverse incision in the anterior rectal wall.

recovery from a satisfactory operation. There was never any leak, and the power of retention up to two hours was very quickly established. Arrangements had been made for the child to go home when some disorder of uncertain nature set in. It was attended with pyrexia, slight sore throat, and vomiting, and ended in death from convulsions in forty-eight hours. No explanation of death was forthcoming at the autopsy. The ureters were very slightly dilated.

CASE III.—A man, aged 29, had had three operations performed upon him for extroversion during childhood and youth. He was sent to me by Dr. Allan, of the Leeds Union Infirmary. Owing to the great depth of the pelvis the utmost difficulty was experienced in bringing up the rectum and in introducing the ureters into it, and there was an undesirable degree of traction upon the ureters. The operation was a partial success. A leak developed, and it was never possible to say whether the urine escaped from the rectum or by a ureteral fistula. The major part of the urine passed by the rectum, and control was acquired. The man's condition was greatly improved by the operation, and he was able to keep himself comfortable with a wool pad. For some time he had pyrexial attacks, which eventually subsided, but he died within the year. The cause of death was not made clear at the post-mortem examination. Both kidneys were markedly hydronephrotic, but there was no ascending nephritis.

In all these cases the catheters were removed from the ureters at the close of the operation. Usually they are left to carry off the urine until they come away by themselves. This has always seemed to me unnecessary and more likely to assist ureteral infection than to prevent it. In order, however, to ensure that the rectum is not distended by urine before a certain amount of union has occurred I have always dilated the sphincter at the same time that the rectum is cleansed before the operation is commenced.