carried on a metal tray to the laboratories where the previous day's accumulation, having been converted over night into butter-milk, awaits removal to the ice-chest. The flasks are immediately transferred to the steam sterilizer where they are subjected to a temperature of 212 degrees F. for 1 1-2 hours. The actual preparatory sterilization of the milk needs no apology in view of the facts already outlined. The taste of the finished buttermilk, contrary to the general contention, is but slightly affected and there is much satisfaction in the knowledge that prior to inoculation the milk contains in the way of live bacteria only a few spore-bearing organisms, which probably succumb to the heightened acidity as soon as the lactic acid content approaches the neighborhood of 0.60 per cent.

After sterilization the milk is cooled as rapidly as possible to about 70 degrees F., and set aside at that temperature, protected from dust by covering over with clean towels until about 5 o'clock in the afternoon. The cotton plug of each flask is then burned off, removed and about 25 c.c. of a pure 24 hours' culture of the lactic organism introduced. A sterile cork stopper is inserted, the contents thoroughly shaken and the cotton plug replaced. The cork stopper is thus carried from one container to another, saving the cotton from soiling during the mixing process. The usual bacteriological precautions must of course be carefully observed. The flasks are then stored, covered over as previously, in a protected place in the inner chemical laboratory where it has been found that a very constant temperature of about 70 degrees F. is maintained. About 8 o'clock on the following morning the milk will be found to have thickened into an even almost solid coagulum, there being no perceptible whey. The flasks are again actively agitated when a thick, even creamy emulsion results. The finished buttermilk is then transferred at once to the diet kitchen refrigerators, and thoroughly chilled before use. A word regarding the matter of containers may be useful at this point. Formerly it was our habit to employ empty bottles of from 500-c.c. to a liter capacity, of whatever character available, provided they fitted into the sterilizers. It was found that breakage during sterilization was an altogether too common experience, and a supply of 500-c.c. flasks of resistant material, known to the chemist as gas bottles, was obtained. These serve an additional purpose as will presently appear.

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TWO CASES OF DIVERTICULUM OF THE BLADDER TREATED BY OPERATION.*

BY ARTHUR L. CHUTE, M.D., BOSTON.

Within the past two years I have had an opportunity to operate upon two bladder diverticula that I feel belong to the same general type. A study of these cases brought out several points that have been of interest to me.

The first patient was a man of thirty-four who had suffered from several attacks of gonorrhea, the first about twelve years before. Following his gonorrhea he developed a tight stricture of the deep urethra, which, however, had been fully dilated at the time I first saw him in the spring of 1910. This patient had a very turbid urine that was slightly foul. It contained pus in moderate amount and myriads of colon bacilli. Besides bladder washings, he had been given a long and thorough treatment with vaccines, but without appreciable result. It was found that his bladder contained five and one-half ounces of residual urine. His reflexes were normal.

A cystoscopic examination showed an opening just to the outside of his left ureter that was about the size of an ordinary lead pencil. It had the characteristic appearance of the opening of a diverticulum. Both ureters were catheterized and gave a good amount of normal urine. A radiograph with a styletted catheter coiled in the diverticulum gave a rough idea of its size and position. (Fig. I.)

The man had little frequency and only occasionally slight pain in urination. As he was much concerned about his long-continued turbid urine, and as I felt that the turbid residual was a menace to his kidneys, operation was decided upon.

October 5, 1910, an incision was made through his left rectus, from just above the pubes to a point well up toward the umbilicus. Previous to operation the bladder was washed thoroughly. A catheter was passed well up the left ureter, and another ureter catheter coiled up in the diverticulum with the idea that it would help to define its boundaries. A retention catheter was passed into the bladder and the bladder distended with air. The abdominal incision was carried down to the perivesical space just above the symphysis and the peritoneum peeled back from the bladder. This separation of the peritoneum was quite extensive, being carried well to the right of the median line behind. A mass was found to the left of the bladder which was about the size of a large egg. (Figs. II and III.) It was covered with a layer of fat that was denser than that covering the bladder. This mass was gradually dissected free everywhere but below. Above, certain muscular fibres ran from the bladder wall, but were soon lost on the surface of the diverticulum. I was unable to identify the opening of the diverticulum into the

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FIG. I.

bladder as the ureter catheter I had coiled in it had slipped out. I therefore opened the diverticulum and, with the opening in the bladder located, was able to dissect it free below, so that I had a sac with a small neck at the point of

communication with the bladder. The base of the diverticulum was at least an inch lower than the opening into the bladder, and apparently

somewhat lower than the floor of the bladder itself. The neck was tied, the sac cut and the

FIG. II.

communication with the bladder. The base of the diverticulum was at least an inch lower than the opening into the bladder, and apparently

FIG. III.

bladder wall brought together with catgut in two layers over the stump. The catheter in the left ureter was of the greatest help in placing the

sutures. The ureter was so near that it was only by the greatest care that injury or compression was avoided. I do not believe it would have been possible without the ureter catheter to have shown its exact position. Tube drainage was carried down to the bottom of the perivesical space on the left and a rubber wick placed in the space behind. The wound was closed in layers about the tube and wick. A retention catheter was left in the bladder. There was considerable suppuration in the perivesical space, and it was five weeks before the wound was solidly healed. It would have been wiser, I believe, to have drained the perivesical space from below.

This patient was seen from time to time following operation, and he usually showed a small amount of turbid residual, though for a short time immediately after operation he emptied his bladder completely. Cystoscopic examination showed the wall smooth at the point where the opening had been. As his small residual of turbid urine persisted, and as there was a place where the tip of a sound caught at the entrance to his bladder, I removed in the fall of 1911 with a urethral punch a little piece of the bar at his bladder outlet. When last seen, March 9, 1912, this man had a transparent urine containing a few fine shreds.

In spite of my dread of allowing a patient to go on with a considerable amount of infected residual, I felt at times that perhaps I had subjected this patient to an unjustifiably severe operation, considering that he was having practically no subjective symptoms; any misgivings that I had on this score were, however, dispelled by my second case, which illustrated what I believe is simply a more advanced stage of the same condition.

This patient was a man fifty-nine years old. I did a perineal prostatectomy for him in 1908, removing rather small lateral lobes and a pedicled intravesical obstruction as large as a small olive. The latter had acted as a ball valve, and he had been absolutely dependent upon a catheter for some time previous to operation. After operation he passed urine voluntarily, but I found that he had, on several occasions, a residual of from seven to twelve ounces. This I attributed to an atonic bladder that I expected would in time regain its contractility. At the time of operation his urine was purulent, of low gravity, albuminous and low in solids, the picture of a hydronephritis. I hoped that the relief of his back pressure would better his renal condition.

Following operation this man was very comfortable for two and a half years. He then had an attack of acute cystitis with a very foul urine. He was found to have a residual of eight ounces.

Cystoscopy showed what I took to be an intravesical projection on his left, near his bladder outlet; my notes stated however that I could find no hypertrophied muscle bundles or trabecula-

tion. I found the explanation of this later. When a moderate amount only of fluid was injected into his bladder it simply filled the diverticulum. This crowded the bladder forward so that the entrance to the diverticulum was immediately behind the internal meatus, and my cystoscope went directly into it. The mass I saw on the left was a part of the septum between the bladder and the diverticulum.

Believing I had to do with an intravesical mass that I had overlooked at the previous operation, I opened his bladder suprapubically in July, 1910. There was no mass, but low down on his right I found a circular opening that would admit the tip of my forefinger. This opened into a considerable cavity, the floor of which looked wholly different from the bladder surface. Instead of being red and velvety it was smooth and pearly white. I dilated the opening, put a tube into the cavity and brought the end out the suprapubic incision. The suprapubic wound closed slowly. In October, 1910, this man was free from subjective symptoms, but showed a slightly turbid residual of nine and one-half ounces, for which he was advised to use the catheter once a day.

In December, 1910, he had a recurrence of his bladder distress, also gastric symptoms which, with his low gravity urine low in solids, suggested renal insufficiency. His frequency gradually increased until on one occasion he had to get up twelve times during the night to urinate. He was not successful with the use of a catheter, though it could sometimes be passed directly into his diverticulum. On these occasions it went in ten inches and drained a large amount of slime and crystalline detritus. On one occasion a soft rubber catheter, inserted through the urethra, was tied into the diverticulum for a few days with great relief, but it could not be retained.

The last of February, 1911, it was decided to attempt the removal of his diverticulum. An incision was made through the right rectus just above the pubes and carried upward. The peritoneum was gradually separated from the bladder and then from the upper surface of the diverticulum; in doing this it was torn through twice. When the diverticulum was exposed it was found that it was very large and that it partially undermined the bladder. The right ureter opened into the diverticulum, and not into the bladder. There was only a suggestion of a few muscle bundles running from the bladder out on to the surface of the diverticulum. (Fig. IV.)

The man's condition was such as to make it seem improbable that he could bear the excision of the diverticulum and transplantation of the ureter. The incision was therefore closed. For several days following operation this man's condition was critical; he had vomiting, hiccup, distention and a very scanty urine.

As we had accomplished nothing in the way of bettering this man's condition I reopened his

FIG. IV.

incision two weeks later, cutting part way across the right rectus. The bladder was opened on its right side, and with a thermo-cautery I made three radiating incisions in the circular septum that separated the bladder and diverticulum. This enlarged considerably the opening between the cavities. The wound closed slowly. When last seen, in July, 1911, this man had been able by the use of his catheter and irrigations to keep his urine much cleaner. He had little in the way of discomfort referred to his bladder.

The general subject of diverticulum of the bladder has been considered relatively recently in papers by Young, Von Eberts, Fischer and others, and I shall not consider the subject in general, but only the type presented by these two cases. This type, I believe, differs essentially from the clearly congenital double bladders, on the one hand, and also from the little herniæ of the bladder that are directly due to pressure and usually arise near the vertex.

Diverticula, such as those in the reported cases in my opinion cannot strictly be called congenital yet I believe they always have their origin in the little pits that one sees from time to time just to the outside of the ureteric orifice and which are undoubtedly faults or anomalies in the development of the bladder. I have seen these pits on a number of occasions. Usually they have been unilateral, but a man whom I had under my care about a year ago showed little openings on both sides which would admit

a ureter catheter for about a quarter of an inch.

I have been unable to find a definite explanation for these little openings but, arising as they do so near the ureter, it seems probable that they must represent anomalies in its early development. Embryologically buds from the fetal ureter, which might easily lead to such little pockets, are supposed only to arise to the inner side of the ureter, while these are seen on the outer side.

Many writers note the frequency with which diverticula appear just outside the ureter, but I have seen no explanation offered for this. I believe the most probable explanation lies in these little congenital pits or pockets which probably represent some anomaly in the very early development of the ureter. These little pockets are not confined to males. Within a short time I saw one in a woman. The presence of one of these little pockets is not in itself sufficient to bring about the formation of a diverticulum; it simply predisposes. There must be the determining agent as well, which is an increase of the intravesical pressure. This may be due to obstruction at the bladder outlet, or anywhere along the urethra, or I believe that a sharp cystitis, attended with violent bladder spasms, may be sufficient.

Given the congenital defect in the bladder wall which, judging from the one case I have investigated, goes pretty well through the muscular layer, and we have determined the point where there will be a hernial protrusion if the intravesical tension is raised beyond a certain point. Once the protrusion has begun the process will be progressive because of the lack of contractility of the wall of the diverticulum.

In certain other respects too these diverticula situated near the ureteric orifice deserve special consideration. They present dangers that do not apply to those that are differently situated.

With the increase in size of such diverticula there is a tendency for the bladder surface near the diverticulum to be everted or drawn into it and to carry with it the opening of the ureter. This, I believe, must always be attended sooner or later with hydronephritis on the side involved, and eventually with very serious crippling, if not destruction, of that kidney. If there is not this pulling of the ureteric orifice into the diverticulum the pressure of the enlarging diverticulum against the ureter will interfere with the drainage and predispose to ascending infection. As these diverticula increase in size they tend at times to burrow toward the bladder outlet and by pressure to interfere mechanically with its ability to empty itself. The more the bladder has to work to empty itself the greater will be the pressure in the diverticulum and the faster it will increase in size. I do not know that this type of diverticulum shows any particular susceptibility to the formation of calculi or to malignant degeneration.

Usually these deeply placed diverticula will not present symptoms such time as they are in-

fects but with a certain amount of stagnant urine infection is bound to come sooner or later. Then even the symptoms will not often be distinctive but will be those of bladder infection in general. The finding of any considerable amount of residual urine in a young man and a considerable number of these cases have appeared in the thirties will be highly suggestive. The actual diagnosis will usually be made by cystoscopy and the recognition of a characteristic round opening just outside a ureter. A graphic method showing the approximate size of a diverticulum of this sort is by means of a radiograph after one has coiled a styletted ureter catheter in the diverticulum. This method, I believe, was first shown by Brown and Osgood. Filling the diverticulum with collargol is said to give good results though I have not used it.

Once a diagnosis of this condition has been made I believe one can advise nothing but the excision of the diverticulum if the patient's condition will warrant it. Palliation by means of the catheter has not usually been a success.

Fischer in his article says the mortality in forty-eight cases collected from the literature was 66.7 per cent. He simply states that some of these cases were treated by means of operation and some without it. In six cases however that were treated by primary or secondary resection he states all recovered and were well.

Von Eberts collected eleven cases of excision of diverticula: of these eight were cured, two had fistulae at the time they were reported, one died. He rightly says that "the age at which these cases occur imposes a grave responsibility upon the surgeon," for, as stated above, many of these are in young men.

We have two general methods of excision. Young has reported successes by working from inside the bladder. Von Eberts operated successfully by a combined method. He approached the diverticulum by the extraperitoneal route and separated it extraperitoneally, but was guided in his dissection by a finger introduced into the diverticulum through a suprapubic incision. I cannot help feeling that the extraperitoneal operation, when it can be carried out is the more surgical procedure. When this method is adopted a catheter should be put in the ureter on the affected side to serve as a protection against injury to the ureter when closing the opening in the bladder wall.

Young has devised a very ingenious flap operation to allow him to replace the ureter in the bladder, without resection and transplantation, when it has been dragged out into the diverticulum. It was successful in the case in which he used it but I should suppose it would hardly be practicable if there was much displacement of the ureteric orifice into the diverticulum.

When the ureter cannot be brought into the bladder by Young's manoeuvre it will be necessary to resect it and reimplant it in the bladder. If one can be sure there is a good kidney on the well side and is in doubt as to the condition of

the one opening into the diverticulum, I believe the preliminary removal of the kidney on the side of the diverticulum should be considered and would probably be a conservation measure. With a ureter opening into a diverticulum it will probably rarely be possible to get the urine directly from that side by means of catheterizing that ureter. However, it should be possible to occlude the well ureter sufficiently to get a pretty accurate idea of the value of the kidney on the diseased side.

Both Young and Von Eberts employed drainage of the perivesical space by means of a tube brought out through the perineum. They both, however, state that they believe that this is not necessary. I did not employ drainage through the perineum, and had a considerable suppuration in the perivesical tissue; I believe that perineal drainage is a wise precaution, considering that there will almost invariably be some infection and the great disadvantage of "up-hill" drainage in such a place.

In cases in which, like my second, it seems improbable that a patient can withstand so severe an operation as the excision of one of the deep-lying diverticula is bound to be, our only recourse is to make the opening between the bladder and diverticulum as free as possible. This can be done by cutting the septum with scissors or a thermo-cautery through a suprapubic wound. It is merely palliative.

I would especially call attention to the probable cause of this sort of diverticulum: the little defects in the bladder wall near the ureteric orifices; also to the importance of recognizing these diverticula early and excising them before the neighboring ureter has been drawn into the sac, or the sac has become of such size as to make its excision unnecessarily difficult.

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THE PRESENT STATUS OF SALVARSAN.*

BY ABNER POST, M.D., BOSTON.

WHEN one speaks of the present status it allows the inference that there has been a change in opinion and that there will be further change in the future. It is true that salvarsan is not quite the wonderful drug that we were led to expect. It does not cure syphilis by a single massive dose.

It is also true that the repetition of the dose does not make a dangerous race of sprochetæ and a worse form of disease.

But the tales first told of 606, that it causes symptoms to disappear in an incredibly short space of time are true. It acts with incredible rapidity on the moist lesions of syphilis—those

* Read at the annual meeting of The Massachusetts Medical Society, June 12, 1912.