per cent. of these patients excreted formaldehyde. This important fact is constant under all conditions: age, sex, well or sick individuals, normal or pathological conditions of the kidneys, reaction of the urine—all these conditions do not influence the ratio of excreting and non-excreting kidneys, and we were able to foretell the results of a given number of specimens of urine before beginning the tests, with considerable accuracy. Repeated tests of the urine of the same patients, but at different times, always gave the same results, that is to say, negative urine in the original test showed the presence of formaldehyde even though the dosage was increased (60 grs. per day), or the reaction was changed (acid to alkaline or vice versa). No positive urine ever became negative under the same changes.

The time of the appearance of the drug in the urine is about one hour after ingestion by mouth; the earliest seen was thirty minutes, and the average was at about the end of one hour. The continuation of the excretion extended for from four and one-half to six hours, with maximum at about two hours. In view of these facts it is necessary, to get uninterrupted excretion, to repeat the drug every four hours.

No symptoms caused by the drug were reported by patients not excreting formaldehyde, a very noticeable and important fact. Of the patients showing formaldehyde in the urine by the Burnam test, five reported symptoms, and the severity of the disturbances varied from a slight hematuria and burning along the urinary tract to a vague malaise. All symptoms stopped with the discontinuance of the drug.

We are testing the urine of all the patients of the Genito-Urinary Department who are taking urotropin or formaldehyde-containing drugs as to the presence of formaldehyde. If the test is negative some other urinary antiseptic is prescribed. With patients going to some distance who are to return for instrumentation, a trial dose of urotropin is given and the patient requested to remain in the clinic to permit the testing of urine at suitable intervals (thirty minutes, one hour and one and one-half hours after taking). On the result of the test depends the continuation of this group of urinary antiseptics.

The Burnam test was applied to the urine of more than 250 patients taking urotropin by mouth. The urine of some patients received several tests at various times under variable conditions. The results of 250 urines were that 130 or 52 per cent. showed the presence of formaldehyde (or were positive); 120 or 48 per cent. did not show the presence of formaldehyde (or were negative).

Our deductions from the results of the foregoing tests and observations are confirmatory of Dr. Burnam's very important and valuable work.

CONCLUSIONS.

1. Formaldehyde appears in the urine in only 52 per cent. of patients taking urotropin.

2. Reaction of the urine of no importance.
3. Alkalies taken with or in combination with urotropin have no effect on excretion.
4. Duration of excretion of formaldehyde is about four to six hours.
5. Increase of dosage does not affect excretion in negative urines.
6. Urotropin practically symptomless in average dose.
7. The urine of all patients taking urotropin should be tested for formaldehyde.
8. Patients not excreting formaldehyde are symptomless regardless of the amount of urotropin taken.

For the outline of Dr. Burnam's paper and clinical material I wish to express my most sincere thanks to Dr. Hugh Cabot; and for their assistance, to Doctors O'Neil, Smith, and Barney, and at the Chelsea Soldiers' Home to Dr. Achorn.

Clinical Department

TWO CASES OF INJURY OF THE VENA CAVA DURING THE REMOVAL OF PYELONEPHROTIC KIDNEYS.*

BY ARTHUR T. CABOT, M.D., BOSTON.

MANY years ago I pointed out and taught students that it was often wise to open and drain large pyelonephrotic kidneys before proceeding to their final removal.

By this operation in two stages the dangers of the procedure are considerably diminished. The subsidence of inflammation that follows the drainage brings about a great shrinking in the size of the tumor and some loosening of the adhesions to parts about; so that at the time of the final removal the deep parts, where the sac is in close contact with the vessels, are more accessible to hand and eye.

Since that time it has happened to me many times to remove these kidneys at one sitting where for one reason or another this course seemed wise.

In the course of these years, however, I have had two experiences which illustrate the dangers one must sometimes expect to meet in these operations. They are as follows:

CASE I. Isabella B., aged 35. Married and mother of six children, youngest ten months old. No family history of tuberculosis. Entered Massachusetts General Hospital April 15, 1905.

For past ten or twelve years has had much dull pain intermittently in right side of abdomen close to costal border.

Six years ago first noticed a lump in this region which has lately been increasing in size.

Micturition more frequent for past three or four years. Seven or eight times in day, once at night.

Urine seen to be cloudy for several years. No blood noticed.

Has lost some weight.

* Read before the New England Branch of The American Urological Association, March 5.

In right abdomen is a large elastic tumor extending from costal border well down towards pelvic brim and over to the middle line and filling also the lumbar region.

Cystoscopic examination shows jets of very cloudy urine from right ureter, clear urine from the left.

Segregation shows four times the quantity from left kidney as from right.

April 21, 1905. Operation. Kidney very adherent over upper, inner and posterior parts. Large veins in its posterior wall.

These were clamped and separated from the capsule. After the sac was removed it was found that one of these large veins was the collapsed vena cava.

It had a rent in its wall where the renal vein had been separated. This was closed by two silk stitches.

The adhesion of the sac was so close and firm that a considerable portion of the peritoneum came away upon it.

This was closed with chromic gut but beneath the liver there was a gap of about two inches where it could not be brought together. Wicks were so placed as to prevent the escape of the bowel through this aperture and after the wound was closed, a tight binder was put on to hold the deep parts in close apposition. Recovery was uneventful, the temperature never going above 100.5° F.

The fluid gave no growth and inoculation into a guinea-pig gave no result.

In one of the calyces of the complicated sac was a branched concretion.

CASE II. Mrs. S. Seen Feb. 4, 1908.

She remembers that as a child she had some difficulty about her water.

Some years ago, after confinement, she had an attack similar to the present one, with pain in the right side, swelling of the kidney. It was thought at that time to be due to mobility of the kidney. Felt better in a recumbent position, with her hips raised.

A week ago the present attack developed, with continued swelling of the kidney and a good deal of pain in the side. Pain was acute at first, afterwards a steady ache. Temperature raised to between 101 and 102.

Kidney is enlarged, tender, extends down to about the level of the umbilicus and over to the middle line.

At this time the urine was slightly cloudy, with a rare leucocyte and one granular cast discovered.

On the 14th an operation was done. By a long incision from the rib down to the outer border of the erector spinae muscle, tumor was reached, trocar introduced, about a quart and a half of thin creamy pus was withdrawn. This left a large, flabby, collapsed sac with little appearance of kidney substance upon it. It seemed as if its removal ought to be easy and it shelled out without much difficulty until the inner posterior aspect was reached, where it was found firmly adherent to the psoas muscles and the great vessels, making the separation with the fingers difficult. This was done as carefully as possible but had to be without the aid of the eye, as it was high up and behind the sac. There was considerable oozing, which was stopped by packing. When the tumor was finally freed, with difficulty, and lifted into the wound, what appeared to be the pedicle was found to contain no vessels, only fatty tissue, which was tied and separ-

ated and the kidney lifted out. On removing the gauze packing there was extensive venous hemorrhage in the depth of the wound. Pressure was made with the fingers and the gauzes removed, when it was found that the hemorrhage occurred from a couple of small openings in the side of the vena cava, apparently where the renal veins had been torn across in removing the tumor. These were clamped and an attempt was made to suture the opening in the depth of the wound, but the patient's condition made this impossible. Clamps were therefore placed on the vena cava and when these were in position so as to control the hemorrhage, they included about half of that vessel.

Wound was closed with large drainage wicks down alongside of the clamps and a large dressing was applied so as to protect the handles of the clamps from pressure. The patient was very much exsanguinated and subpectoral saline infusion was given under both breasts, also a shock enema.

Dr. Whitney examined the specimen, which showed great dilatation of the pelvis and calyces, with no evidence of any ureteral opening. By microscope there was but little kidney tissue left. The sac was lined with granulation tissue. No tubercles were found.

Culture showed a pure culture of colon bacilli.

Patient remained in a serious, threatening condition,—due largely to anemia, with some fever—for at least a week after the operation.

An examination of the urine showed that it contained colon bacilli in considerable amount and the fever continuing, it was thought wise to prepare an autogenous serum from the urinary sediment. Immediately after the use of this serum was commenced the temperature quite markedly fell, and steadily improved until it reached practically normal. At the end of a week the clamps were removed from the vena cava. From this time on, slow but steady progress set in. An annoying circumstance was that the tissue under the left breast, where the subpectoral infusion had been given, sloughed quite extensively. This sloughing was a dry slough which showed very little tendency to separate. The other breast, also, showed some induration but never caused any sloughing.

The patient slowly gained strength, which was much hampered by backache due to relaxation of the sacro-iliac ligaments. The urine continued to hold bacilli of the colon group until early in May, when the urine finally became bacteria free. Over a year later, in December, 1910, no colon bacilli were found, although a few colonies of pneumococci or some closely allied organism were obtained, which seemed to probably come from some contamination.

In Case I. the condition of the kidney seemed to be the result of a calculus; in Case II. of some mobility of the organ associated with colon bacillus infection. Both cases illustrated the extreme difficulty of shelling out these suppurating kidneys and offer justification of the more conservative treatment of an operation in two stages in many of these cases. In both cases the separation of the outer part of the sac was so easy that I was encouraged to hope that the removal would be easier than it was.

I think moreover in selecting the operative procedure in these cases it is proper to remember that when the right kidney is affected there

is greater danger of injuring the soft-walled, yielding and non-palpable vena cava than there is in removing the left kidney, where the vena cava does not come in contact with the sac and the arteries can be readily made out.

The next most interesting feature was the ease with which the wound of the vena cava was closed, in the first case, where with a thin-walled abdomen the parts could be brought readily into sight, and how great the difficulty, on the other hand, in the second case, where we had thick dorsal muscles and a stout abdominal wall. Also, it was interesting to note how in Case II. with clamps including a large part of the wall of the vein, Nature succeeded in forming a cicatrix which adequately held the vessel when the clamps came away. In the second case, also, a point of secondary interest was the excellent action of the colon vaccine in bringing about a cessation of the fever and apparently in helping to a final disappearance of colon bacilli from the urine.

We were finally much interested in endeavoring to find an explanation of the curious dry slough beneath the left breast, in which the saline solution was given. While we were getting the patient to bed several assistants were preparing the machinery for subpectoral injection and something was said about putting a little adrenalin in the solution. The assistant who gave the solution thought that this adrenalin was not given but my nurse, who had charge of my materials, said that the adrenalin solution was used, in a very dilute solution. Certainly the character of the sloughing was different from anything that I have ever seen before and seems to be accounted for by the belief that some adrenalin was administered in this way. As it is not very uncommon to use adrenalin for this purpose, it seems worth while to put this case on record as an instance where perhaps the adrenalin produced unfortunate results.

THREE CASES OF UTERO-VESICO-VAGINAL FISTULA.*

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ALL acquired vesical fistulae connecting with the genital tract, aside from those arising from foreign bodies in the bladder and vagina, accident, or the ravages of malignant disease, are the result of trauma during labor.

The last-mentioned may be divided into two classes: first, where necrosis of the soft parts results from long-continued pressure of the head in a small pelvis; second, those cases in which the anterior surface of the uterus is split to a greater or less degree, and with it the bladder, during extraction of the head, or as the result of some operative procedure.

* Read before the New England Branch of The American Urological Association, March 5.

In the past, when the artificial termination of labor was less commonly undertaken than today, fistulae arising from sloughs were more common; but at the present time, exactly the reverse appears to be true.

All the accidents reported in this article resulted from high forceps extractions and they may serve to remind us of the dangers which happen in improperly conducted deliveries.

As the two types mentioned above differ in etiology, so they also differ in their initial manifestation and in healing. Thus the sloughs separate slowly and the fistula appears after the lapse of a number of days; while with tears, the incontinence is immediate.

Such fistulae as result from gangrene present more scar tissue and large defects, and so far as the experience of the writer goes, most often affect the vesico-vaginal septum, while the tears, starting in the anterior part of the cervix, invade the uterine wall to a greater or less degree and then extend to the bladder and even the urethra, with retraction of the tissues.

If the urethra is involved, the consequences are extremely serious, as the sphincter can seldom be repaired, although serious tears of the anterior surface of the uterus often heal kindly and to an amazing extent. Luckily, the laceration usually ends before reaching the vesical sphincter, owing to the tendency of the vaginal walls to roll outward and the giving way of the perineum.

Small fistulae of the vesico-vaginal septum, from both causes, may close spontaneously or become so small as to give little trouble, and while the uterine substance may fully heal, in the cases with extensive laceration of the anterior uterine wall and bladder, a small fistula usually persists and the uterine scar is thin.

CASE I. I. K. Married; age, 36 years. In December, 1908, instrumental delivery at full term, the child living but a few hours. Two weeks after labor was admitted to the Boston City Hospital with an abscess of the left broad ligament which was discharging slightly through a tear of the cervix extending into the left vaginal vault. Temperature 101; pulse 99. The abscess was drained through the posterior cul-de-sac and on Jan. 25, the patient was discharged with the wound nearly healed, but with some induration in the pelvis.

On March 5, 1910, the patient was again delivered of a full term child, with an ossified head, after much difficulty, the "doctors working all night."

On March 5, 1910, she was again admitted to the hospital with a fresh tear extending into the left broad ligament for two inches. The symphysis pubis was separated for three fingers' breadth and the prevesical space opened into the vagina, allowing the entrance of the finger for three inches.

There was a median tear of the whole anterior surface of the uterus, the whole vesico-vaginal septum and the proximal half of the urethra.

The vagina was irrigated and a symphysiotomy belt applied. The general condition was fair. The vagina was irrigated daily and there was no sepsis.

March 30 an x-ray showed the symphysis separated three-quarters of an inch.