H. WILLIAMS AND C. THURSTAN HOLLAND: AN UNUSUAL CASE OF URETERAL STONE.

FIG. 1.—First of our radiographs of the pelvic region.

FIG. 2.—After the introduction of the "supposedly opaque" catheter. Note change in position of shadow of stone.

FIG. 3.—After the injection of umbrenal into the catheter.

FIG. 4.—After partial withdrawal of catheter. Stone shown as a negative shadow.

FIG. 5.—Half an hour after removal of catheter. Mixed urine and umbrenal in dilated ureter. Stone faintly shown.

holder (Fig. 4). This is a very simple piece of apparatus which was put together in a few minutes. It consists of an ordinary office stool 2 ft. 6 in. in height, above one side of which projects a vertical board 2 ft. in height and 1 ft. in breadth, supported on a pillar which is screwed to the stool. The lower edge of the board is 9 in. above the seat. The patient sits facing the board with his legs protruding beneath it, one leg on each side of the pillar. The film in its cassette having been placed upon the board, the patient presses his chest against it with his arms folded behind the board. This position not only immobilizes him, but also has the incidental advantage that it causes the maximum abduction of the scapulae, with, in consequence, the least possible obstruction of the lung fields by these bones.

FIG. 4.—Stool and film stand used for tele-radiography.

The stool is placed so that the film is 6 ft. from the tube. The positions of the tube and stool have been previously adjusted so that the central ray passes through the mid-line of the body at the level of the third costo-sternal articulation. These positions are standardized once and for all, allowance being made for varying heights of patients. Suitable marks are made on the upright and arm of the tube-stand, while the position of the stool is marked on the floor. Tube and stool can therefore be adjusted rapidly in the correct position.

For patients who have to be examined in the recumbent position, the best method is to put the patient on a stretcher on the floor and to use a vertical stand with the tube as high as the pillar will allow. It is not necessary to turn the patient over on his face, for the following reason. The ordinary close-up antero-posterior view of the chest (the rays passing from front to back) is unsatisfactory, since the heart and great vessels lying nearer the front than the back wall of the chest cast an exaggerated shadow. With the tube at 6 ft., however, this exaggeration is reduced to a minimum. In fact, there is very little difference at 6 ft. distance between the antero-posterior and the postero-anterior view. It will therefore be seen that the method is very simple, the only trouble being involved in the initial standardization of the position of stool and tube.

Fig. 11 is the same chest as Fig. 1, but taken in this way. It will be observed that coin B is almost directly behind A and approximates closely to it in size; D, however, is slightly to the outside of C, owing to the fact that the patient is turned slightly to his left. This can readily be determined by comparing the positions of the two sterno-clavicular articulations in relation to the edges of the vertebral column. It will be seen that the inner end of the left clavicle is slightly farther out than that of the right. Had the patient been sitting quite square D would have been almost directly behind C.

Again, taking the case of a structure situated 8 in. from the film, let XY be the actual diameter of the structure and X'Y' the diameter of its shadow. We have

$$\frac{X'Y'}{XY} = \frac{OX'}{OX} = \frac{6 \text{ ft.}}{5 \text{ ft. } 4 \text{ in.}} = \frac{9}{8};$$

$$\text{while } \frac{\text{area of } X'}{\text{area of } X} = \frac{81}{64}$$

The exaggeration in area is therefore about nine-sevenths, as compared with nine-fourths in the close-up view. It will further be observed that the outlines of coins B and D, instead of being blurred as in Fig. 1, are now as well defined as those of A and C.

Space prevents my showing many instances of the various conditions in which the superiority of the tele-radiogram is manifest. I shall confine myself to one case, illustrated in Figs. III and IV. These show in the left lung an egg-shaped ring shadow, probably due to a cavity. The position and extent of the cavity are indicated by cross-lines. Fig. III was taken at a distance of 2 ft., and Fig. IV at

6 ft. It will readily be understood that in the process of reduction the difference has become considerably diminished. I have therefore reproduced in Figs. V and VI the cavity in its true projected size; Fig. V is at 2 ft., Fig. VI at 6 ft.

Enough has been said to show how misleading the ordinary radiogram of the chest may be. Owing to the error in size the film always shows the case to be more serious than it really is, while the error in position must often lead to considerable discrepancy between the radiological evidence and the evidence deduced from physical signs. It is also clear that, as records of the progress of a case—for example, the changing size of a tumour, cavity, or aneurysm—successive radiograms lose much of their value unless they are taken under the same standard conditions. It seems to me to be highly desirable that for comparative purposes a conventional standard should be adopted, the two constants being the distance of the tube from the film and the level of the central ray. This, of course, is not to say that other views are unnecessary. I should be the last to minimize the importance of special views, such as the Kreuzhohl view suggested by Fleischner for revealing interlobar effusions, but I feel sure that the adoption of a standard tele-radiogram would be a step forward in the radiology of the chest.

I have to thank Mr. Mann, radiographer at Addenbrooke's Hospital, for his skilful technical assistance.

REFERENCE.

¹ Cotton, W.: *Archives Röntgen Ray*, 1902.

AN UNUSUAL CASE OF URETERAL STONE.

BY

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(With Special Plate.)

THE investigation of this case presents many features of interest both from the urological and radiographic points of view. The short history of the case is as follows.

Miss M., aged 46, in May, 1927, had a sudden pain in the left loin lasting from four to five hours, accompanied by frequency of micturition. The temperature was normal.

In October, 1927, she had very severe pain in the left loin; she was writhing in agony and could not keep still. This was associated with a rigor, sweating, and violent retching. There was no great frequency of micturition, but the urine was acid and contained a slight amount of albumin, pus cells, staphylococci, and coliform bacilli. In ten days she was well again.

In November, 1927, she had a similar attack to the last, but it was more severe and lasted a fortnight.

Between the attacks she had persistent frequency of micturition and sharp pain in the urethra after the act, persisting for varying times afterwards.

In December, 1927, an x-ray examination was made elsewhere. Various shadows were found in the pelvic region, and it was also suggested that there might be a stone in the pelvis of the left kidney.

On February 2nd, 1928, C. T. H. examined her and took the usual films to cover the whole stone area. These radiographs showed that there was no stone in either kidney, and both kidneys appeared to be normal in size and position. In the pelvic area were shown the same shadows which had previously been found, and all of them were in exactly the same position. (See radiograph, Fig. 1.) This showed that no stone had passed in the interval from the left kidney. It was obvious that the only shadow to be considered was the rounded one on the left side of the pelvis. This was not in the usual line of the ureter, it was round in shape, and it was in exactly the same position in two radiographs taken at intervals of a few weeks. C. T. H. very definitely decided against it being a shadow of a ureteral stone.

Now came the first piece of luck. C. T. H. was out when the surgeon in charge of the case (H. W.) came in to see

the films. C. T. H.'s partner (J. H. M.) showed him the films and also agreed that it might be a stone in the ureter. The result of this was that it was decided to have an opaque catheter passed; arrangements were accordingly made, and the patient was told all about it. The point is that in all probability if C. T. H.'s opinion had been given in the first place then no further x-ray proceedings would have followed.

Having explained everything to the patient, it was settled that the opaque catheter should be used notwithstanding, and, under general anaesthesia, the cystoscope was passed (she refused to undergo cystoscopy with a local anaesthetic). The left ureteric orifice was inflamed and an area of cystitis extended from it on to the trigone. The ureteral catheter (sold as an opaque one) passed easily right up the ureter without a hitch of any kind.

Stereoscopic radiographs were taken and the films immediately developed. Our consternation was great when no shadow of the catheter was present. (See Fig. 2.) (It is to be noted that the patient knew exactly what to expect and would have to see the radiographs.)

The next step was not very obvious, as no other catheter was available and the patient was coming round from the anaesthetic; then, very fortunately, it occurred to one of us that as the catheter was not opaque there should be a lumen into which opaque fluid could be injected. Umbrenal was injected and a radiograph (Fig. 3) obtained; the catheter was partially withdrawn and the radiograph shown in Fig. 4 taken. The catheter was then entirely withdrawn, and these two films were developed. It is obvious that a satisfactory explanation of these films was not easy. Some of the opaque fluid had apparently passed down beside the catheter, which was not touching the doubtful stone shadow, and just about one inch above the shadow had passed away from the catheter as if to enter a sac, and had surrounded the shadow, which in the second of these films (Fig. 4) appeared as a negative shadow—that is, as a less dense area in the middle of the umbrenal shadow.

It then occurred to us to take one more plate, and this was taken about twenty minutes after the withdrawal of the catheter, when urine and umbrenal filled the lower ureter. (See Fig. 5.)

The exact diagnosis then became clear. The ureter was enormously dilated from the spot where it entered the bladder wall, and the shadow was, in fact, caused by a stone in the dilated ureter. Originally there appears to be no doubt but that the stone was impacted at the site of the entrance of the ureter into the bladder, and then, having caused the dilatation of the ureter, had moved upwards. It was really a stroke of luck that the catheter was non-opaque to x rays, as if it had been opaque nothing further would have been done and it would not have helped to an accurate diagnosis. Then, again, it was most fortunate that it was hollow, and that some opaque fluid was at hand. Even then, without the somewhat lucky last radiograph, there would still have been some doubt as to the exact position of affairs. One other thing we should, of course, have done was to have taken a radiograph of the kidney after the injection. In the heat of the fray this was forgotten.

On February 9th, 1928, the non-protein nitrogen in the blood = 37 mg. per cent. The next day, under ether anaesthesia, cystoscopy was again done, for the double purpose of carrying out the dye excretion test and attempting to bring the stone down into the bladder. Dye appeared from the right ureter in five minutes, but none appeared from the left in fifty minutes. An "Eynard" ureteral dilator was used in the attempt to bring down the stone. This was unsuccessful, and all that came away was some septic-looking granulation tissue.

This procedure induced another attack of pyelonephritis, and examination of the urine revealed the presence of blood, pus, squamous epithelium, mobile bacilli, and staphylococci. The attack lasted five days.

The question of operation for removal of the stone had now to be considered. The easiest method of approach would have been through a suprapubic incision with displacement of the peritoneum. This route was decided against because the patient was particularly anxious not

to have more than one operation. The effluent from the left kidney was grossly infected, the ureter was markedly dilated, and the patient had had three attacks of pyelonephritis. In the case, therefore, of the stone being removed by direct exposure of the pelvic ureter it was impossible to promise that the kidney would recover and not require subsequent removal. It was accordingly decided to expose the kidney by the usual lumbar incision, then if the condition of the kidney called for removal, this could be carried out; if, on the other hand, it was considered recoverable, it could be left, and the stone removed through an incision in the ureter.

At operation the kidney was found to be slightly enlarged, and the pelvis and calyces a little dilated. The ureter was dilated to a moderate degree, and on incising it some turbid urine containing flakes of pus escaped. The mucous membrane of the ureter was glistening and did not show any gross inflammatory changes. It was therefore decided not to remove the kidney.

A short incision was made into the ureter.

A special bent long spoon (Fig. 6) was passed down to its lower end and a small oxalic acid stone was brought up the first time. The incision in the ureter was closed and the lumbar wound sutured and drained.

The patient made a normal recovery and left the nursing home on April 12th.

On June 21st she reported that she had had no further attack of pain in the loin; there was no frequency of micturition or pain at the end of the act. Her general state of health was very good and she could walk three miles.

No cystoscopic examination has been carried out since the operation, nor is she likely to consent to one being done.

The case is extraordinarily instructive from the radiographic point of view, and demonstrates clearly the difficulties which may sometimes arise, and the ease with which an exact diagnosis might have escaped us.

It is a very easy matter nowadays to show stone shadows and the shadows of other things. Differential diagnosis of these shadows may be, and often is, a matter of great difficulty, and even a large experience may fail one.

From the urological point of view it shows the difficulty of giving an opinion as to the exact condition of the kidney by means of the ordinary urological investigation. Such investigation in this case suggested the presence of an extensively disorganized kidney, or at any rate one of very little functional value. Exploration at operation, however, indicated a recoverable kidney and one well worth saving, a decision that has been thoroughly justified by the subsequent history of the patient.

AFTER-EFFECTS OF SURGICAL PROCEDURES IN CASES OF PULMONARY TUBERCULOSIS.

I.—THE SURGEON'S POINT OF VIEW.*

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THE surgical treatment of pulmonary tuberculosis has become of increasing importance during the last few years, and although a large amount has been written about it, I do not propose to take up your time with a recapitulation of published results, but shall confine myself entirely to my own personal experiences.

The final test of any method or methods of treatment can only be judged by their end-results, but the satisfactory results of pneumothorax treatment, in properly selected

* A paper read in opening a discussion in the Section of Tuberculosis of the Annual Meeting of the British Medical Association, Cardiff, 1928.

FIG. 6.