the bowels should be very thoroughly emptied beforehand.

4. Other Methods of Examination.

These investigations—cystoscopy and its adjuncts and radiography—can only be carried out by those who have the necessary instruments and the experience to use them. There are other methods of investigation, however, from which much may be learnt that is indispensable in the interpretation of urinary disease. One of the most important of these is the chemical and microscopical examination of the urine. The significance of the constant or periodical presence of small quantities of blood, pus, or casts in the urine cannot be exaggerated. A naked-eye examination of the urine for blood or pus is not sufficient; microscopical search of the centrifugalized urine must be insisted on.

The bacteriology of the urine, especially the search for tubercle bacilli, must be carried out very thoroughly and exhaustively, and repeated several times if negative and tuberculosis be suspected. Care must be taken not to mistake the smegma bacillus for that of tubercle. It is an acid and often spirit-fast bacillus, which in appearance and staining reactions almost exactly resembles the tubercle bacillus. It enters the urine by contamination from the urethra and foreskin or labia during micturition. It may be eliminated, therefore, by examining only catheterized specimens. It is by no means uncommon to

Fig. 4—A full size drawing of a maldeveloped kidney. This is one of five found in the post-mortem room during the last eighteen months.

find it in urines, especially of females; and to condemn a patient to a diagnosis of urinary tuberculosis because he happens to have smegma bacilli in his urine would be an awful mistake and one which might have far-reaching consequences. In women I always insist on a catheterized specimen, but in men in whom the passage of a catheter is a more serious undertaking, I find that specimens obtained after thorough cleansing of the glans and foreskin, with rejection of the first few ounces of urine passed, and the collection of the remainder without contact with the foreskin, are reliable.

The tuberculin tests, Calmette's conjunctival reaction, and von Pirquet's skin reaction, are of negative value only, for it must be borne in mind that tuberculosis of the urinary organs is never the primary deposit in the body: there is always some other focus from which they become infected via the blood stream.

Such methods of examination as sounding and washing out the bladder are not so reliable as cystoscopy, and should therefore only be employed in conjunction with it, or when it is not available.

One method of examination yet remains to be mentioned: it is I am afraid a much neglected and by no means pleasant one, but it is one from which very often conclusive evidence may be obtained—I refer to rectal examination. With a finger in the rectum, the prostate, seminal vesicles, lower end of the ureter, and the base of the bladder, may be thoroughly examined, and from information thus obtained I have often been able to clear up what were otherwise puzzling cases.

THE Jessop Hospital for Women, Sheffield, will receive £2,000 under the will of the late Mr. J. E. Cutler of that city.

THE Yorkshire Automobile Club members' competition for four-cylinder touring cars brought together a good number of 15-h.p. vehicles. The order of finish in the opening heat was Sunbeam, Argyll, Talbot, Arrol-Johnston. The Argyll made its first appearance in a race. The car was a standard 15 h.p., and weighed fully a ton.

ON THE EARLY DIAGNOSIS AND TREATMENT OF TUBERCULOUS KIDNEY.*

By ANDREW FULLERTON, M.D., F.R.C.S.,

ASSISTANT SURGEON TO THE BELFAST HOSPITAL FOR SICK CHILDREN AND THE ROYAL VICTORIA HOSPITAL, BELFAST.

OUT of a recent series of 400 cases of all sorts of bladder and renal complaints requiring the use of the cystoscope for diagnosis of which I have more or less extensive notes, 24—that is, 6 per cent.—were cases of tuberculous kidney, and as most of them have been seen in the course of private practice, enabling me to follow up their subsequent history, it has occurred to me that an analysis of them might be of some interest to the members of this society. In 13 of these the diagnosis was confirmed by operation, 9 having been operated on by myself and 4 by other surgeons. In a few, other tuberculous foci were found in other parts of the body—for example, lymphatic glands, epididymis, testicle, prostate, or lungs—but these associated lesions were entirely overshadowed by the renal or vesical condition. In the large majority the bladder was secondarily involved. I may remark, in passing, that I have not been able to satisfy myself that I have yet seen tuberculous disease limited to the latter organ. In most cases the kidney has been involved, and in the remainder the epididymis, testis, or prostate. From my own small experience, I believe that the most frequent cause of tubercle of the bladder is descending infection from the kidney.

Sex.

Eleven cases occurred in the male sex and 13 in the female. This shows a slight preponderance in the female, which accords with the general experience of genito-urinary surgeons.

Age.

The youngest patient was a boy aged 11 years. The case was an undoubted one, tubercle bacilli having been found in the urine, with enlargement of the left kidney, and characteristic ulcers in the bladder, chiefly on the same side. Another case was that of a girl aged 12 years. One was a boy, aged 17, who had, in addition, signs of early phthisis at the apex of the right lung. Eight occurred between the ages of 20 and 30, eight between the ages of 30 and 40, and three between the ages of 40 and 50. The general experience of surgeons is that the most susceptible age is between 20 and 40, and this is well borne out by the statistics I have just quoted, nearly 70 per cent. of my cases having been met with at this period of life.

Family History.

In 8 cases I was able to elicit a distinct history of tubercle in the immediate relations. In all but one of the remainder a family history of all forms of tubercle was denied. In one case I failed to find any note on this point. In about 33 per cent., therefore, there was a distinct family history of tubercle. In one case with, however, a history of pulmonary tubercle on the maternal side, the onset of the disease was attributed to the patient having had in her house for a year a parlourmaid in an advanced state of pulmonary phthisis.

Side Affected.

In 11 cases the right kidney was affected, as revealed by clinical methods; in 11 the left; in 1 both kidneys were obviously diseased, and in 1 the second kidney was suspected.

I am aware that it is impossible to say that a kidney is unaffected with tubercle even if the urine coming from its ureter shows no abnormality. Tubercles may be present in the kidney and give no sign of their presence. I shall return to this point at a later stage.

Presence of Tubercle Bacilli in the Urine.

I regret that the search for tubercle bacilli in the urine of these patients was not carried out so frequently or so persistently as I could have wished. They were found in 11 cases. In some of the remainder the diagnosis seemed so obvious that the search was not persisted in. I am satisfied that a prolonged search on many successive occasions is often necessary before the bacillus is found.

* Read at a meeting of the Ulster Medical Society.

It was not found in some of the cases of operation in which a typical tuberculous kidney was removed.

Symptoms.

The discovery of unsuspected tubercle in the kidneys after the patient had died from other causes proves that he may have the condition I am describing, at any rate for a time, without any symptoms whatever. I recently operated on a gentleman whose right kidney showed a tuberculous abscess in its upper pole walled off by thick fibrous walls in which calcareous material had been deposited, and which had evidently been present for many months if not years. His symptoms were of very recent date and were due to the fact that, starting probably from this old focus, a large number of recent tubercles had become scattered throughout the organ involving finally the pelvis and ureter. I have been struck in looking over my notes to find how often I have recorded the fact that the general health of the patient appears to have been perfect. Even in fairly advanced cases, in which the bladder has been extensively involved, I have several times noticed that the patient has appeared to be robust and strong. This accords with my experience of other local forms of tubercle, notably tuberculous glands in the neck in children. The appearance of perfect health, therefore, is no guarantee that the patient is not suffering from tuberculous bladder or kidney. In other cases, however, the general health is obviously affected. In a young lady on whom I operated a couple of years ago, no complaint was made at first of kidney or bladder. She was losing flesh, easily tired, and felt that she was not well without being able to ascribe a reason. Routine examination by her medical attendant disclosed the fact that there was pus in the urine, and tubercle bacilli were subsequently discovered. At the operation, which was carried out a few months later, we found that the right kidney was extensively diseased. Fever may be entirely absent. When present it is usually of the intermittent hectic type. The local symptoms fall under two heads: first, those referable to the kidney and ureter, and secondly, those referable to the bladder and lower urinary organs.

The symptoms referable to the kidney are pain and soreness in the lumbar region, which may extend along the course of the ureter and so closely simulate renal colic due to calculus that a diagnosis of the latter is often made. In Case xiv, a policeman aged 25, apparently in good health, there was a history of seven or eight attacks of typical renal colic on the left side, attended with hæmaturia and frequency of micturition. Operation disclosed a tuberculous kidney with several abscess cavities involving the upper two-thirds of the organ. In some cases the kidney is enlarged and tender, with thickened ureter as felt per vaginam or per rectum. Too much stress must not, however, be laid on enlargement of the kidney or thickening of its ureter. I have seen an enlarged kidney condemned until ureteral catheterization proved it to have been actually the healthy organ, the other being the diseased one. Again, a girl, aged 25 years, had had symptoms of severe cystitis for about eight years. She had no localizing signs on either side, except that the ureter on the left side could be felt per vaginam to be thickened. On cystoscopic examination I could not find the orifice of the right ureter. Indigo-carmin appeared in the efflux from the left in twenty-five minutes after injection into the gluteal muscles, the patient being under an anaesthetic, but nothing came from the right. On exploration, the right kidney was found to be converted into a series of cysts, and the ureter was atrophic. The thickening of the left ureter was due to the fact that it carried the urine from the only functioning kidney, and had to perform a double duty. In 11 of my cases there was no localizing sign in the renal region when first seen, in the form either of pain or swelling. The diagnosis was made by the cystoscope and ureteral catheter. In Case xi there was pain in the right kidney. The ureteral catheter proved that the left was the offending organ, and this was duly confirmed by subsequent operation.

Symptoms Referable to the Lower Urinary Organs.

In almost every case of tubercle of the kidney symptoms of vesical irritation supervene sooner or later. This is not to be wondered at when one considers how frequently the

bladder is involved; but even in cases in which there is no evidence of involvement of the latter, beyond perhaps changes at the orifice of the ureter of the affected kidney, vesical symptoms are present. In a few of my cases there was no obvious involvement of the bladder itself, but in the great majority that viscus was secondarily affected. In almost every case some frequency of micturition was present from the very first. This was accompanied or followed by smarting on micturition, and pain in the meatus in the female, or at the point of the penis in the male. Some passed a few drops of blood at the end of micturition, and in one case very severe hæmorrhage occurred from an ulcer on the floor of the bladder. In addition, some complained of pain in the suprapubic or perineal regions. When the bladder becomes involved in this disease the symptoms are frequently progressive until the unfortunate patient is in a most pitiable condition from smarting, pain, frequency, and general urinary distress. He is often worse at night, sometimes having to rise every few minutes, until he is worn out by want of sleep. The symptoms are thus those of a very aggravated form of cystitis, and are frequently attributed by the patient or his attendant to the presence of stone in the bladder. Any attempt to wash out the latter is usually attended with violent spasm and pain, and if the bladder is forcibly distended bleeding is very apt to take place. Consequently, these patients are very hard to examine. In some cases, indeed, the attempt is hopeless, even under an anaesthetic. It is also not unattended with danger, especially if there is a mixed infection. One sometimes sees the temperature run up and the symptoms become aggravated by injudicious attempts to irrigate in cases of this sort. It is a matter of common observation that irrigation with nitrate of silver in weak solution has not the beneficial effect in this affection that it has in ordinary cases of cystitis. Indeed, the patient is often made worse rather than better by this treatment.

Most Striking Cystoscopic Appearances.

I have already alluded to the difficulty of examining these patients, and it will be readily understood, therefore, that the view obtained of an irritable bladder in a struggling patient, especially when there is attendant bleeding, is in many cases most unsatisfactory. Even under an anaesthetic the examination is not always easy. It is important, therefore, to have these cases cystoscoped early before the bladder is extensively involved, as it is only then that a safe and satisfactory examination can be made. It is not enough to diagnose tuberculous bladder. The primary focus in the genito-urinary tract must be sought for if possible, and this will be found most frequently in one or other kidney. Even in an early case there are usually changes at the orifice of the ureter of the affected kidney. Various authors—notably Mr. Hurry Fenwick—have described characteristic changes at the ureteral opening from which the nature and extent of the involvement of the kidney may be diagnosed; but there are few observers who are willing to stake their reputation upon a prediction from ureteric meatoscopy, especially when the patient is shortly to be operated on, as to what the surgeon will actually find when the kidney is explored. It is enough to be able to feel certain that the kidney is diseased, and I think this can be done by the cystoscopist with a moderate amount of practice. The chief change in my cases was, I think, an orifice which instead of being a slit had become converted into a circular opening. The surroundings of this opening, instead of being pale and flat like the healthy bladder, were congested, swollen and oedematous. In some cases there was evident ulceration of and around the orifice. In one or two the ureter opened like a pit on the summit of a little mound formed by the swollen mucous membrane of the bladder at the point of entrance. In Case xv, already referred to, I could not find the ureter on one side on account of degeneration of the corresponding kidney. In Case i the ureter of one side has after many years become dry, and the corresponding kidney has much diminished in size. When first examined I found pus discharging from its orifice. In Case xviii one ureter squeezed out at intervals thick inspissated pus which formed a collection on the floor of the bladder like a worm cast. In Case vi the orifice of the affected ureter seemed to recede and approach during expiration and inspiration respectively. This I attributed to

the kidney with its rigid ureter being forced down during inspiration by the descent of the diaphragm and receding during expiration. Mr. Fenwick's dragged out orifice is a valuable sign in some very chronic cases.

In addition to the changes at the ureteral orifice of the affected side, and in many cases completely overshadowing them, are the appearances seen on the walls of the bladder. If the beginner sets out to find typical grey and yellow tubercles scattered over the bladder wall he will be doomed to disappointment. No doubt tubercles occur on the bladder wall, but the cases in which they can be seen by the cystoscope are not very frequent. The earliest appearances are red areas, which have been compared to foot-prints in the snow. These occur around the ureteral orifice, but may be widely scattered. They are submucous deposits, the mucous membrane over which will presently be shed, giving rise to tuberculous ulcers. The intervening areas of the bladder walls are quite healthy looking, at any rate at first. When ulceration is present it is usually more marked on the affected side, but this is by no means always so, as in Case vi, in which there was more ulceration on the side of the apparently healthy kidney. I have been struck with the frequency of ulceration and patches of redness on the anterior wall of the bladder. The explanation is probably that when the bladder is empty the anterior wall is in contact with the trigone and adjoining portion of the bladder, and therefore easily infected therefrom. In Case xv the chief feature was the large oozing ulcer on the anterior wall. In addition to ulceration, and indeed when this is as yet absent, one often finds well marked cystitis, due probably to a mixed infection. In Case xxi this was so marked that I at first thought that I was dealing with a case of rather severe cystitis. Tubercle bacilli were, however, found in the urine. After washing the bladder out with a weak solution of protargol, the symptoms almost entirely disappeared, and I was able to make a much more satisfactory examination. I believe this patient had a mixed infection, and that the protargol relieved the cystitis. The walls of the bladder on the second occasion were almost healthy, but the surroundings of the left ureter were dull red and swollen. This was the only indication of the side affected. After ureteral catheterization I removed a kidney in the early stage of tuberculosis. I believe the supervention of other micro-organisms upon the tuberculous infection contributes largely to the terrible distress from which these patients suffer in the later stages. In this very rough sketch of the most striking cystoscopic appearances seen in my cases, I fear I have given a very imperfect idea of the conditions found, but the time at my disposal is limited, and my paper must necessarily be short.

Information Obtained by the Ureteral Catheter.

I am aware that many authorities strongly deprecate the use of the ureteral catheter in cases of tubercle of the kidney and bladder, on the ground of liability to infection thereby of the sound kidney through abrasions of its ureter. I hope and believe that this is a theoretical objection if proper precautions be taken, as the information supplied by this means is so valuable that personally I should be very sorry to have to return to the older methods. I have not had in my own practice any accident with the ureteral catheter, though I have used it in all sorts of cases over 160 times. In none of the cases of tuberculous kidney—18 in number—in which I used it has there been any trouble attributable to its use. I have heard of surgeons opening the peritoneum and passing the hand across the abdomen to attempt examination of the opposite kidney, deeply situated behind the colon and peritoneum of the opposite side. If they are satisfied that such an examination can give them reliable information as to the condition of the kidney I have nothing more to say. In my own practice I have occasionally had some difficulty in pronouncing an opinion on the condition of a kidney lying bare on the loin until I had made an incision into it. Case xxi was one of this sort. Indeed, a bystander was sceptical that there was anything wrong with the kidney until it was opened and a tuberculous abscess disclosed in the lower pole.

Segregators of all kinds I have discarded long ago. I prefer more reliable and accurate methods. Whether

they may be of service to those unaccustomed to the use of the cystoscope seems to me doubtful. One is working in the dark, and the slightest leak from one side to the other vitiates the whole examination. The chief use of the ureteral catheter in my hands has been to ascertain the condition of the second kidney if present. In all but 4 of the 18 cases in which this method was used the second kidney has given urine of a specific gravity of 1015 or over, free from pus and albumen—in a few cases a mere trace of albumen was found. I do not say that this is sufficient evidence of the integrity of the gland, but it is surely a great step in advance on the older methods. Personally, after one very severe lesson, I do not intend to remove any kidney, no matter how apparently diseased it may appear, till I have satisfied myself that the other kidney is moderately sound. If the opposite kidney secretes the usual quantity of urine, of a specific gravity of 1015 or over, and is free from albumen, pus, and casts, and if in addition it allows colouring matter like indigo-carmin to come through in from fifteen to twenty-five minutes, I have very little hesitation personally in removing the manifestly diseased one. Chromo-cystoscopy has served me very well, and I believe it is a good test of the functional capacity of the kidney. Cryoscopy, the phloridzin test, and the estimation of urea are more troublesome and difficult to carry out, but one or all of them ought not to be neglected if there is any doubt that the second kidney will be equal to the demands about to be made upon it by the removal of its fellow. Of the four exceptional cases in which the condition of the second kidney did not satisfy me, one, Case xxiii, had catheters in both ureters for an hour or more, but indigo-carmin did not appear on either side during the examination, which had to be conducted under chloroform. In fact, the colouring matter did not appear till the next day. Both kidneys were enlarged, and both were probably tuberculous. In Case x there were a few pus cells in the urine from the presumably healthy side. No operation was undertaken. In Case xii, a girl of 12 years, the urine on the presumably healthy side was normal, except for the specific gravity, which was low—1005. I was afraid to operate without further examination. In Case xxiv the urine from the presumably healthy side had a specific gravity under 1005, and contained a fair quantity of albumen, but no pus. I have not yet decided what to do with him.

In addition, however, to the use of the ureteral catheter for the purpose of investigating the condition of the opposite kidney, I have found it of inestimable value in enabling me to decide with certainty which was the affected side. I have, of course, seen marked changes at the ureteral orifice and alteration in the character of its discharge, but there are cases in which I cannot say that I should sacrifice the kidney solely on account of the appearances seen on meatoscopy. The changes at the orifice may be slight, and the amount of pus may be so small as to be invisible with the cystoscope. Besides, it is more definite and conclusive to obtain by catheter purulent urine from one side and normal urine from the other. I lay particular stress, as I have stated in previous papers, on the specific gravity of the urine obtained from each side, and also on the quantity obtained from each side in the same time. For this purpose a double catheterizing instrument must be used, and the patient ought not to have had any fluid for three hours. I am of opinion that purulent urine of low specific gravity coming in increased quantities from a ureter indicates early disease in the corresponding kidney, whereas similar urine coming in drops only indicates extensive disease. For instance, in Case vi purulent urine came in very small quantities from the affected side. I found on exploration that most of the kidney substance was destroyed by the disease. In Case xx, on the other hand, there was abundant urine of low specific gravity, containing pus, from the affected side. Operation disclosed an early stage of the disease. In short, tubercle in the early stage, like renal calculus, acts as an irritant, causing increased flow of limpid urine of low specific gravity.

In the later stages it destroys the kidney substance, so that the urinary salts are not secreted by the tubules and only a small quantity of fluid is filtered off by the remains of the gland structure. In 10 cases urine was obtained from both sides by the ureteral catheter. In no less than 9 the urine of the affected side had a specific gravity of

1005, as against 1015 to 1025 on the sound side. In the tenth the specific gravity on the affected side was 1010, as against 1025 on the sound side. In every case, therefore, there was a diminution on the affected side as compared with the sound side. In none of these 10 cases was there any pus on the opposite side. A trace of albumen was found in one or two. In 16 out of the 18 cases, in some of which I only catheterized the sound side, the urine from the latter was free from pus or any other definite evidence of tubercle. So far as it goes this evidence is in favour of the unilaterality of the lesion. I am aware, as I stated earlier in this paper, that tubercle may have been present in the apparently unaffected kidneys, but I record the observations for what they are worth. Finally, I have sometimes noticed that the ureteral catheter is with difficulty advanced into the affected ureter. I attribute this to the thickening and rigidity of the latter which is so characteristic of this disease.

Treatment.

In an affection of such a chronic nature as tubercle of the kidney, it is hard to apportion the due amount of credit to any particular line of treatment. It is important to consider what Nature does in these cases. I have reason to believe that in Case i the disease in the kidney is becoming quiescent after having lasted for at least nine years. There is still, however, ulceration of the bladder, and the patient had a few days ago a severe attack of haematuria. The kidney has apparently become obsolete, and the redness around the ureter has disappeared. The ureter is dry, no efflux being visible, even after injection of indigo carmine into the gluteal region. The colour is seen in less than twenty minutes from the ureter of the healthy side. It is interesting to note that the latter is still apparently free from infection. The affected kidney has diminished greatly in size, and is almost free from tenderness. The treatment has been almost exclusively injection of tuberculin by Dr. Houston. In Case xv I failed after very careful examination to find the ureteral orifice on the right side. I explored the corresponding kidney, and found it diminished in size. The capsule was adherent, and on section the pelvis was found to be filled with fibrous tissue. The cortex contained numerous smooth-walled cysts, most of which were filled with clear fluid; the remainder showed, in addition, a few flecks of pus. A probe introduced into the upper part of the ureter from below showed that the latter had become impervious. The pathologist who examined the specimen was of opinion that the condition was a hydronephrosis. The ureter was not thickened. On microscopical examination, a large amount of fibrous tissue replaced much of the kidney substance. The glomeruli and tubules remaining showed colloid degeneration. The arteries were greatly thickened. The condition was thought to be due to an old chronic inflammation, the cause of which was not determinable by section. As the patient's urine contained tubercle bacilli, and the bladder showed rather extensive ulceration, I am of opinion that the primary focus was the kidney just described. It is now nine and a half years since the onset of the patient's symptoms, and it would appear as if an attempt had been made by Nature to limit or cure the disease. In Case xx, already referred to, there was an old abscess cavity, in the walls of which calcareous material had become deposited—an effort at spontaneous cure. Fresh infection took place, however, evidently from the old focus, and I had to remove the affected kidney. These cases are the only ones in my series in which any attempt has been made by Nature to cure the disease. I shall be pleased to have particulars of any authentic cases in the practice of others. These facts in my own practice, in a more or less carefully observed series of 24 cases, have led me to believe that operation affords the best chance for the patient in the large majority of cases, and I have further evidence, apparently sufficient to justify me in urging early interference. In Case xx, just mentioned, the progress of the case from the onset of the symptoms of recrudescence was so rapid that in a month's time a large ulcer had formed in the previously healthy bladder. In Case xvii, ulceration of the bladder proceeded so rapidly that I was forced to interfere early, in the hope of relieving the progressively increasing urinary distress. In this case there were no cavities in the kidney, but scattered through it

were numerous small tubercles. Tubercles undergoing caseous change were found in a somewhat dilated pelvis. The ureter was much thickened. In Case vi, also, the ulcers increased rapidly in number in a few weeks' time, and this in spite of tuberculin injections by an expert. I could give further instances of this progressive downhill course until arrested by operation, but those I have mentioned will suffice. Though I have seen ulceration disappear after nephrectomy, as in Case vi, and presume that it has disappeared in Cases ix and xi operated on by other surgeons, and now quite well, I am bound to say that, once started, it is most difficult to cure. In the two cases of long standing, previously referred to as tending to spontaneous cure, there is still ulceration of the bladder which shows very little disposition to disappear. As a broad rule, therefore, I would advise early nephrectomy, especially in those showing a tendency to become progressive, before ulceration of the bladder has taken place, and before the kidney has become fixed by extensive adhesions, or a perinephritic abscess has had time to form, provided, of course, that the other kidney is efficient and the patient is otherwise healthy. I have no experience of partial operations, never having seen a case in which the disease was so limited as to allow of any portion of the kidney being preserved. In suitable cases I am in favour of tuberculin injections, and I think these are especially indicated after nephrectomy, when the main focus has been removed, in the hope that any residual tubercle may be destroyed thereby. As regards palliative treatment, I have found very little benefit from irrigation of the bladder, or injections into it. In a few cases protargol in weak solution seems to have benefited a coexisting cystitis. Weak solutions of perchloride of mercury may do some good, and plain sterilized water will occasionally relieve by washing away some of the irritating matter. Nitrate of silver is absolutely contraindicated. It irritates the tuberculous bladder, and is greatly resented by patients. Ordinary hygienic treatment must, of course, be followed out, and opium or morphine may have to be given to relieve pain.

I have not time or space to describe the various pathological appearances found in the kidneys removed. They represented practically every stage of the disease, and corresponded with the descriptions found in works on this subject. When the kidney had become intimately adherent to its surroundings I had the greatest difficulty in removing it, as in Case xviii, in which a perinephritic abscess had formed. This patient died six weeks after operation from sepsis. Early operation would have been advisable, before the abscess had formed and before dense adhesions had made removal almost impracticable.

Results.

In 9 cases I removed the affected kidney; 1 died, as above mentioned, six weeks after operation. Case iv lived for a year, making an apparently good recovery for a while, but succumbed later from pulmonary phthisis. Case viii developed tuberculous epididymitis shortly after nephrectomy, and I had to remove the affected epididymis with the testicle. He still has nodules in his prostate, and is occasionally troubled with a small sinus over the position of the stump of the divided vas. In spite of this he is now in excellent health, being 3½ st. heavier than he was at the time of his operation two and a half years ago. Case vi, whose vesical ulcers had disappeared when examined four months after nephrectomy, is still keeping well three years later. The others are so far doing well. In 4 cases the affected kidney was removed by other surgeons. Two of these, operated on respectively by Messrs. R. J. Johnstone and John Campbell, are quite well more than two years after. A third, under the latter surgeon, is only a few months done. The fourth case was operated on by Mr. H. Stevenson, and died a few days later. I understand that the operation was, as in my case (No. xviii), attended with the greatest difficulty on account of adhesions. This gives an operative mortality of about 15 per cent, but the cases dying after operation were undertaken almost too late to expect a good result, so that one can, I think, look forward to a death-rate in early cases of not much more than that of gastro-enterostomy or appendicectomy, provided, of course, that the corresponding organ on the opposite side has been found to be efficient. Of the cases not operated on, one (Case vii) died

four years after the onset of symptoms, from epileptiform convulsions, two have been lost sight of, and the others are living in a more or less miserable condition, with the exception of Case I, in which, as I have already stated, an attempt at natural cure has taken place.

CASE I.—Female, aged 42. Family history of tubercle present; right side. Early symptoms: Renal colic, frequency of micturition; there were both pain and swelling in the affected kidney; tubercle bacilli were found in urine. On cystoscopic examination: Purulent urine from right ureter, orifice of which was enlarged and rounded; area around orifice congested. Right ureter not catheterized; urine from left, specific gravity 1015, normal. Treatment: Tuberculin injections. Result, so far as known to date: Slow but steady improvement; when seen lately, four years after first cystoscopy, and nine years after onset of symptoms, right ureter dry.

CASE II.—Male, aged 33. Family history of tubercle present; right side. Early symptoms: Frequency of micturition, etc.; neither pain nor swelling. No tubercle bacilli found in urine. On cystoscopic examination: Neighbourhood of right ureteral orifice red and oedematous; urine from right, specific gravity 1010, contains pus; urine from left, specific gravity 1025, normal. Treatment: Medical. Result so far as known to date: Able to drive out occasionally, provided with a urinal; general health fair; report three years after first cystoscopy.

CASE III.—Male, aged 22. Family history of tubercle present; left side. Early symptoms: Frequency of micturition, etc.; no swelling or pain until late, then swelling in left kidney; tubercle bacilli found in urine. On cystoscopic examination: Left ureteric orifice obscured; red patches and streaks on bladder walls. Treatment: Tuberculin injection at a late stage; nephrectomy by another surgeon; died a few days after operation, six years after onset of symptoms.

CASE IV.—Female, aged 25. Family history of tubercle probable; right side. Early symptoms: Slight frequency and scalding; at first neither pain nor swelling, later right kidney enlarged; tubercle bacilli found in urine. On cystoscopic examination: Orifice of right ureter enlarged and rounded with a number of small vessels around it; urine from right, specific gravity 1005, contained pus; urine from left, specific gravity 1020, normal. Treatment: Nephrectomy and tuberculin injections; died a year after operation from pulmonary phthisis and tuberculous meningitis, a year and a half after onset of symptoms.

CASE V.—Female, aged 20. Family history of tubercle absent; left side. Early symptoms: Frequency of micturition and pain in mictus; neither pain nor swelling; no tubercle bacilli found in urine. On cystoscopic examination: Ulcers behind left ureteral orifice, on anterior wall, and on right side of bladder wall. Treatment: Medical. Result, so far as known to date: Rather worse, two years after cystoscopy.

CASE VI.—Female, aged 36. Family history of tubercle absent; right side. Early symptoms: Scalding in urethra after micturition; right kidney enlarged; no tubercle bacilli found in urine. On cystoscopic examination: Right ureteral orifice dilated, with redness round it; sucked in and out during inspiration and expiration; several large ulcers on bladder wall, especially left side of base, and on trigone; urine from right, 1005, with pus; urine from left, 1015, normal. Treatment: Nephrectomy and injections of tuberculin. Result, so far as known to date: Patient quite well, three years after first cystoscopy and three years and a half since onset of symptoms; all the ulcers have disappeared.

CASE VII.—Female, aged 30. Family history of tubercle absent; left side. Early symptoms: Left renal colic, frequency of micturition, and smarting; no swelling; no tubercle bacilli found in urine. On cystoscopic examination: Several ulcers and haemorrhagic patches. Treatment: Injections of tuberculin; died with epileptiform convulsions, about four years after onset of symptoms.

CASE VIII.—Male, aged 47. Family history of tubercle absent; right side. Early symptoms: Pain in bladder, which travelled up to right kidney; no swelling, but pain in right kidney; tubercle bacilli found in urine. On cystoscopic examination: Orifice of right ureter surrounded by, and somewhat obscured by, a number of polypoid processes; urine from right, pale, with flakes of pus; from left side clear and normal. Treatment: Nephrectomy, and injections of tuberculin. Result, so far as known to date: Epididymis on affected side became tuberculous, and was removed with testis; sinus occasionally leaks in upper part of wound over stump of vas; otherwise quite well, two and a half years after operation and three years since onset of symptoms. Has gained over 3 st. in weight since operation.

CASE IX.—Female, aged 20. Family history of tubercle absent; right side. Early symptoms: Severe pain in right kidney; later, scalding and frequency. Pain and swelling both present in affected kidney. No tubercle bacilli found in urine. On cystoscopic examination: Ureteral orifice enlarged and open; several well-marked ulcers on right side of bladder; right ureter not catheterized; urine from left normal. Treatment: Nephrectomy by Mr. R. J. Johnstone. Result, so far as known to date: Is now, two and a half years after operation, and three and a half years after onset of symptoms, quite well. No frequency, and no pain anywhere.

CASE X.—Male, aged 36. Family history of tubercle absent; left and right side. Early symptoms: Frequency of micturition; neither pain nor swelling. Tubercle bacilli found in urine. On cystoscopic examination: Left ureteral orifice surrounded by swollen mucous membrane, which was oozing; ulceration on

left side. Urine from right contains a few pus cells and gives a perceptible ring with HNO_3 ; left not catheterized. Treatment: Injection of tuberculin. Result, so far as known to date: Keeping fairly well; frequency still very troublesome, but bleeding less; report two and a half years after cystoscopy, and about three years after onset.

CASE XI.—Female, 31. Family history of tubercle absent; left side. Early symptoms: Pain in right (or presumably healthy) kidney; none in left. Left kidney enlarged. No tubercle bacilli found in urine. On cystoscopic examination: Left ureteral orifice obscured by raised, swollen, and oedematous mucous membrane. Urine from right, 1020, normal; urine from left, 1005, contains pus in abundance. Treatment: Nephrectomy by Dr. John Campbell. Report, December, 1909, states that patient had given birth to a fine baby three months before; patient quite well two and a quarter years after operation and three and a quarter years after onset.

CASE XII.—Female, aged 12. Family history of tubercle absent; left side. Early symptoms: Frequency of micturition and suprapubic pain; neither pain nor swelling; no tubercle bacilli found in urine. On cystoscopic examination: Left ureteral orifice dilated; bladder walls inflamed and ulcerated; dull red and black patches; urine from right, 1005, otherwise normal; from left, 1005, contains pus. Treatment: Medical. This is a doubtful case of tuberculous kidney; she still, two years after cystoscopy, and two and a half since onset of symptoms, suffers much from frequency of micturition and foul-smelling urine.

CASE XIII.—Male, aged 11. Family history of tubercle absent; left side. Early symptoms: Frequency of micturition, etc.; left kidney enlarged; tubercle bacilli found in urine. On cystoscopic examination: Several ulcers, chiefly on left side. The patient was lost sight of.

CASE XIV.—Male, aged 25. Left side. Early symptoms: Left-sided renal colic and frequency of micturition; both pain and swelling in affected kidney; no tubercle bacilli found in urine. On cystoscopic examination: Left ureteral orifice looked like a mound, with slit-like opening at apex. Treatment: Nephrectomy. Result, so far as known to date: Had when last seen (about a year after operation) a little sinus in loin; otherwise quite well.

CASE XV.—Female, aged 25. Family history of tubercle absent; right side. Early symptoms: Frequency of micturition; neither pain nor swelling; tubercle bacilli found in urine. On cystoscopic examination: Right ureteral orifice invisible, even after intramuscular injections of indigo-carmin; ulcers right side and anterior wall of bladder; right ureter could not be found; left, urine, specific gravity 1015, with a trace of albumen, but no pus. Treatment: Nephrectomy; kidney atrophied and cystic. Result, so far as known to date: Doing well two months after operation and about nine and a half years after onset of symptoms.

CASE XVI.—Male, aged 17. Family history of tubercle absent; left side. Early symptoms: Frequency of micturition, etc.; neither pain nor swelling; no tubercle bacilli found in urine. On cystoscopic examination: Left ureteral orifice open and round; surrounded by a good deal of redness; red and haemorrhagic patches at base of bladder; urine from right, specific gravity 1025, normal; left, specific gravity 1005, with a few pus cells. The patient, who had signs of early phthisis at the apex of right lung, was lost sight of.

CASE XVII.—Male, aged 40. Family history of tubercle present; right side. Early symptoms: Frequency of micturition, etc.; pain in right kidney a year previously, which went away. No tubercle bacilli found in urine. On cystoscopic examination: Orifice of right ureter dark, irregular, and ulcerated, walls of bladder inflamed and ulcerated over a wide area; urine from right, specific gravity 1005, contained pus cells; left, 1020, with a trace of albumen. Treatment: Nephrectomy and injections of tuberculin. Result, so far as known to date: Improving slowly when last seen (January 10th), about nine months after operation, and one year and nine months after onset of symptoms.

CASE XVIII.—Male, aged 36. Family history of tubercle present; left side. Early symptoms: Typical renal colic in left side; no bladder symptoms; both pain and swelling; a perirenal abscess. No tubercle bacilli found in urine. On cystoscopic examination: Orifice of left ureter dark red, round, and projecting at intervals threads of pus; left side, no urine; right, urine, specific gravity 1020, normal. Treatment: Nephrectomy, dealing at same time with a huge perinephritic abscess. Died six weeks later from exhaustion. Wound became septic and made no attempt to heal; this was three and a half years from first onset of symptoms.

CASE XIX.—Female, aged 36. Family history of tubercle absent; right side. Early symptoms: Right renal pain and frequency of micturition; right kidney enlarged; no tubercle bacilli found in urine. On cystoscopic examination: Several ulcers at base and on anterior wall of bladder. Treatment: Medical. Result, so far as known to date: No improvement twelve months after onset of symptoms.

CASE XX.—Male, aged 38. Family history of tubercle absent; right side. Early symptoms: Frequency of micturition and smarting; neither pain nor swelling; tubercle bacilli found in urine. On cystoscopic examination: Right ureter somewhat patulous; urine from right, specific gravity 1005, with pus cells; left, specific gravity 1015, normal. Treatment: Nephrectomy, and injections of tuberculin. Result, so far as known to date: Doing well (three months after operation and about a year after onset of symptoms).

CASE XXI.—Female, aged 24. Family history of tubercle absent; left side. Early symptoms: Frequency of micturition,

etc.; neither pain nor swelling; tubercle bacilli found in urine. On cystoscopic examination: Dark red swollen mucous membrane round orifice of left ureter; urine from right, specific gravity 1020, normal; left, 1005, containing pus. Treatment: Nephrectomy, and injections of tuberculin. Result so far as known to date: Doing well (three months after operation).

CASE XXII.—Female, aged 28. Family history of tubercle present; left side. Early symptoms: Frequency of micturition, etc.; neither pain nor swelling; tubercle bacilli found in urine. On cystoscopic examination: Left ureteral orifice surrounded by swollen, woolly-looking mucous membrane; patches of redness on left side of bladder; urine from right, specific gravity 1020, normal; left, specific gravity 1005, containing pus. Treatment: Nephrectomy by Dr. John Campbell. Result so far as known to date: Doing well (two months after operation).

CASE XXIII.—Female, aged 31. Family history of tubercle absent; both kidneys affected. Early symptoms: Left-sided renal colic, and frequency of micturition; both kidneys enlarged; no tubercle bacilli found in urine. On cystoscopic examination: A large irregular ulcer at base of bladder; left ureteral orifice buried in this; right orifice just at edge of ulcer; under CHCl₃ with catheters in ureters, no urine; even after injection of indigo-carmin none could be seen flowing into bladder. Result so far as known to date: *In statu quo*; had anuria for twenty-four hours after examination.

CASE XXIV.—Male, aged 23. Family history of tubercle present; right side. Early symptoms: Right-sided renal colic; right kidney enlarged; tubercle bacilli was found in urine. On cystoscopic examination: Right ureteral orifice round, red and dilated; red patches in neighbourhood; right ureter not catheterized; left, specific gravity under 1005, containing albumen. Treatment: Medical. Result so far as known to date: Going progressively downhill.

SUPRAPUBIC DRAINAGE OF THE BLADDER AS AN ALTERNATIVE TO PROSTATECTOMY AND AS A RELIEF OPERATION.

By J. B. PIKE, M.R.C.S. ENG.,

HONORARY SURGEON, LOUGHBOROUGH HOSPITAL.

PROSTATECTOMY in selected cases, performed by an operator who has ample experience, is doubtless a satisfactory measure. If a large margin of risk had not to be allowed for no surgeon would condemn a patient to the inconveniences of catheter life. Suprapubic drainage is a middle course, and in many things a middle course, avoiding Scylla and Charybdis, is advisable. In cases of cancer of the bladder radical removal is a thing to be aimed at, but how often does it succeed? The bladder is removed and the ureters are transplanted, either in the abdominal wall or the rectum. In both methods the result is very doubtful, even though at first a good result may appear to have been gained. There are, however, some cases in which removal, either of the growth or the organ, seems hopeless, and here as a relief measure suprapubic drainage appears to have a valuable place. The two following cases illustrate these remarks:

CASE I.

J. M., a farmer, of good physique, aged 69 years, was admitted to the Loughborough Hospital on October 25th, 1904. He was suffering from acute retention, due partly to enlarged prostate and partly to a very tight traumatic stricture of the membranous portion of the urethra. Catheterism was unsuccessful, and aspiration gave temporary relief. On the following day a puncture was made above the pubes with a trocar, and a Jacques catheter inserted through the cannula. The patient managed somehow to get this out in the night, and thus rendered cystotomy imperative under somewhat unfavourable conditions. The bladder was stitched to the edges of the wound and a large tube inserted.

The question of prostatectomy was brought before the patient in consultation with Mr. Bond of Leicester, and the operation was not pressed. The patient decided against it. In about six weeks he returned to his home and drained the bladder with some sort of rubber tube for about two years.

Having allowed the sinus to close he came to the hospital with retention in March, 1907. Relief was given by aspiration, and he passed water by the natural channel with increasing difficulty until November, 1907, when he sent for me to visit him. The only thing to do was to reopen the bladder, and this was done through the scar tissue, partly by incision, partly by trocar, the cannula being retained. We made various experiments with silver tubes, and at last got one to our liking. Since that time there has been very little trouble with the water, and the general condition has for the most part been good, his life having been quite active for a septuagenarian.

CASE II.

This was a case of multiple papilloma above the trigone. An exploratory cystotomy was done by Mr. Bond. Owing to the

multiple nature and situation of the growth, it was decided that nothing further could be done. As I felt persuaded that the frequent micturition would become very painful if the wound closed, I kept a rubber tube permanently in the bladder. The cystotomy was done in March, 1909, and for many months great relief was obtained.

In these very painful cases the alternative is a poor thing at best, but slight relief is something to the good, and it may be desirable that life should be prolonged. I think these cases may be taken in evidence of the value of suprapubic drainage of the bladder.

THE INCIDENCE OF TUBERCULOSIS IN CHILDHOOD.*

By PRIV. DOZ. DR. FRANZ HAMBURGER,

VIENNA.

IN conjunction with R. Monti, I have endeavoured, by extensive investigation, to determine the incidence of tuberculosis among the children of Vienna. We adopted the method of examining only children who were suffering from acute infectious diseases (scarlatina and diphtheria). In this way we obtained material which represented fairly accurately the real state of child-life in Vienna. All the children were first tested by Pirquet's cutaneous reaction. Those reacting negatively were, after two days, subjected to a subcutaneous tuberculin injection of 1 mg. Those of the children who showed a distinct inflammatory reaction at the injection point of at least three days' duration, were looked upon as tuberculous, as well as those showing a positive reaction.

In this way Monti and I found that out of 532 patients suffering from diphtheria or scarlatina 271 reacted positively—that is, about 50 per cent.

Out of 23 children in the	1st year	0 reacted—	0 per cent.
" 45 "	2nd "	4 "	9 "
" 56 "	3rd "	11 "	20 "
" 75 "	4th "	24 "	32 "
" 50 "	5th "	26 "	52 "
" 63 "	6th "	32 "	51 "
" 46 "	7th "	28 "	61 "
" 30 "	8th "	22 "	73 "
" 35 "	9th "	25 "	71 "
" 26 "	10th "	22 "	85 "
" 29 "	11th "	27 "	93 "
" 19 "	12th "	13 "	95 "
" 17 "	13th "	16 "	94 "
" 17 "	14th "	16 "	94 "

These results show how the frequency of tuberculosis in childhood increases from year to year.† When childhood is divided into six periods, the following percentages with regard to the frequency of the disease are obtained:

1. First year	...	...	2 per cent.‡
2. Second year	...	...	9 "
3. Third to fourth year	...	...	27 "
4. Fifth to sixth year	...	...	51 "
5. Seventh to tenth year	...	...	71 "
6. Eleventh to fourteenth year	...	...	94 "

It follows that nearly all persons in Vienna of over 14 years of age are already "tuberculous." This fact appears extraordinary and almost incredible. It is only appreciated when we investigate the fact further, and consider that tuberculosis in childhood is a relatively harmless disease. It runs its course commonly without giving rise to any symptom. This explains the fact why so many children give a positive tuberculin reaction without at the same time developing any stronger symptoms of disease. It may even be said that the majority of children who are only affected by tuberculosis after the fifth or sixth year show no signs, or at least very few signs, of disease. That is the result of the constant increase of the frequency of tuberculosis on the one hand and the decrease of the tuberculous morbidity with increasing age on the other. This is further demonstrated by Pollak's clinical observations.

It must be fully understood that tuberculous infection and tuberculous morbidity are two conceptions which it is difficult to separate. While in the first, and also in the second, year the majority of children infected with tuber-

* Read at the Tuberculosis Conference, Edinburgh, July, 1910.

† The percentage for the first year is not reliable, because the number of children examined (23) is too small. The real incidence of tuberculosis in this age, according to Sperr, is about 2 per cent.

‡ Corrected figure, according to Sperr.