

EXPLANATION OF PLATE XXXIX.

Post-mortem Appearances in a Case of Chronic Diffuse Urinary Tuberculosis. (Patient of Dr. F. Tilden Brown.)

FIG. 1.—Aspect of Right Kidney after Being Laid Open. The changes to be noted are the following: Compensatory hypertrophy and tuberculosis spreading from within; the presence of tubercles in the pelvis, representing presumably a direct extension from those located in the right ureter; and the destruction of one pyramid. Attention is also called to the fact that there are no cortical lesions.

FIG. 2.—Inner Aspect of the Left Kidney. The glandular tissue of this organ has been wholly destroyed and each pyramid replaced by caseous material.

FIG. 3 represents the kidneys, ureters, and bladder (belonging to the same patient) in their natural connection. The ureters and bladder have been laid open so as to expose to view the mucous membrane which lines them. The kidneys, however, are shown as they appeared before they were opened. On the surface of the right kidney (R) there are no evidences of the presence of tubercles in the cortical portion of the organ, but a few may be seen on the surface of the left kidney (L.) The ureter belonging to the latter appears to have escaped infection, unless the stricture at LU is to be explained as the result of tuberculous ulceration. On the other hand, the lining mucous membrane of the bladder and of the right ureter shows the presence of an abundant crop of tubercles.

The drawing as a whole is believed to illustrate an original blood implantation of tuberculosis in the left kidney; direct secondary infection, from this source, of the bladder; then an ascending ureteritis, pyelitis, and nephritis of the opposite (right) urinary tract.



POST-MORTEM APPEARANCES IN CHRONIC URINARY TUBERCULOSIS.

(CASE OF DR. F. TILDEN BROWN.)

[Organs moderately reduced in size in the drawings.]

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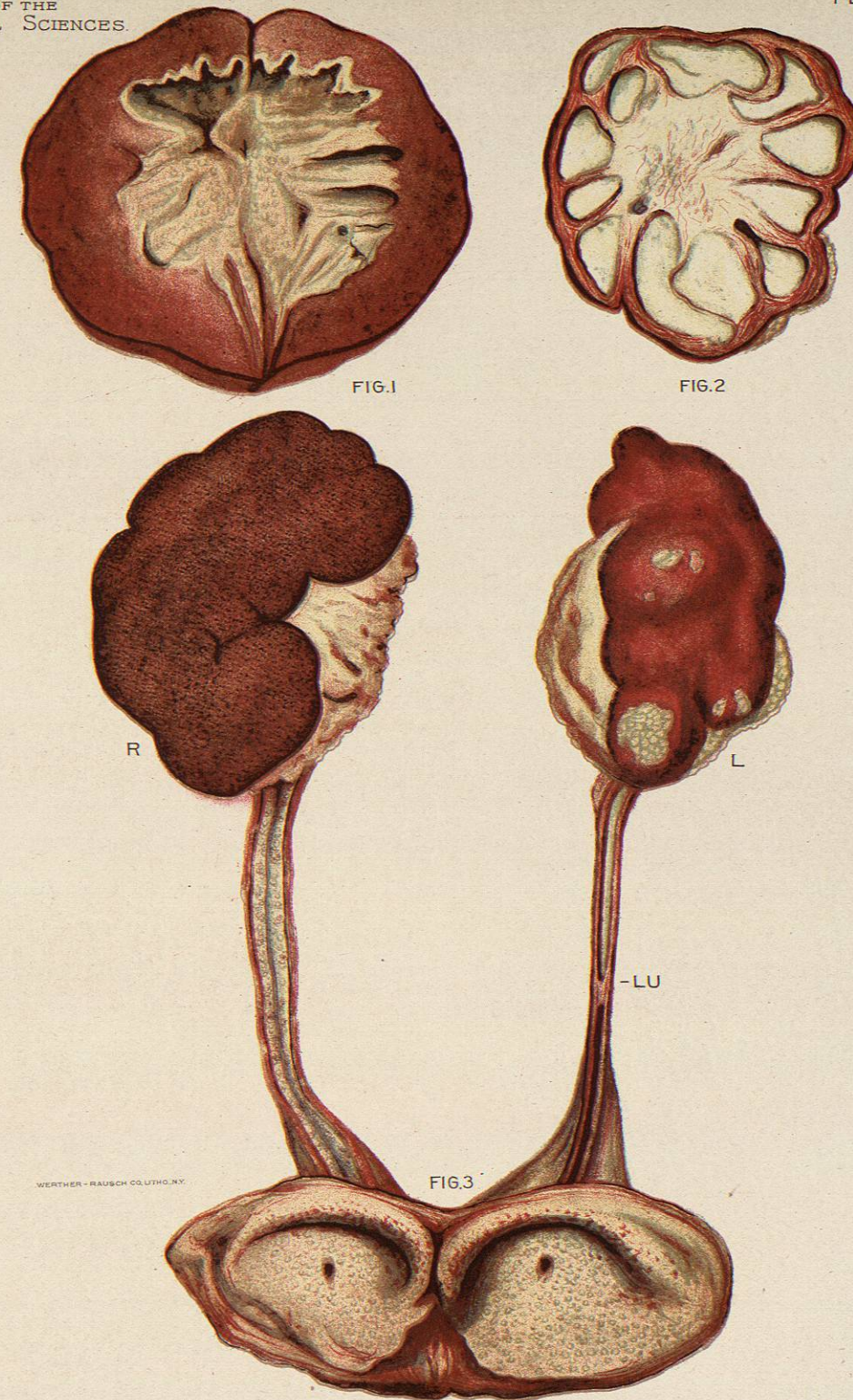
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lial cells, no casts or crystals, and *not a trace of other micro-organisms*. The examiner, after such a preliminary test, can feel pretty strongly assured that if now the future mounts are stained for tubercle bacilli some will be found sooner or later.

The pyrexia, except in the most advanced stages and when toxæmia is excessive, remains well within a range of two and a half degrees. Almost all of these patients have a faulty color even in the early stages, a combination of slight anemia with softening of the tissues, a kind of flabbiness but not œdema. They are, however, frequently rotund and well-muscled. Of course, in the advanced stage, malnutrition and every evidence of excessive invalidism are marked.

By far the most striking symptom of renal tuberculosis is *thamuria*.^{*} Commonly patients will maintain that they never had any urinary symptoms until they were suddenly aware of the obligation to urinate more frequently than had been their custom, and that this annoyance is just as great during the night as in the daytime, perhaps greater, and not infrequently they recount having had several recoveries from this frequency while each recurrence has been more persistent than the last.

This symptom is susceptible of a different explanation at two stages of the disease. At first, when the renal function is much stimulated by the recent tuberculous infection and before these lesions become large enough to rupture and communicate with the urinary channels, a sufficient polyuria may be maintained to tax the bladder capacity and thus lead to a relative degree of frequency. Again, when the renal lesions have become open ones, although they still cause a somewhat greater filtration of fluid than comes from the normal gland on the opposite side, the polyuria is not so marked as at first. Now, however, the slight but constant output of pus, bacilli, their toxins, and the general tuberculous debris, is probably in some cases sufficiently irritating to the base and neck of the bladder to cause frequency of urination. The writer once looked upon *thamuria* as the classical and almost pathognomonic symptom of renal tuberculosis. Further observation tends to show, however, that in the majority of cases this typical symptom does not appear until the lower segment of the ureter has acquired a genuine tuberculous lesion, or, at any rate, until marked hyperæmia and œdema have developed together with an irritable state of the mouth of the ureter, so that when the peristaltic waves of this tube, made unduly intense by the infectious lesion, are conveyed to and obliquely through a limited part of the bladder muscle, they become instrumental in exciting the detrusor muscles of the latter organ. As every inflammatory process seeks repose for its best comfort, it is probable that the pressure and increasing tension to which the diseased tissues at the mouth of the ureter are subjected by urinary accumulations in the bladder, furnish the main incentive to *thamuria*, it

^{*} *Θαμυρία*, often, and *ὀφρυρία*, urine, a substantive compounded by the writer in 1896, with the approval of Dr. Frank P. Foster. There had hitherto been no word to express frequency of urination, although some had used polyuria as a synonymous term.

being assumed of course that the bladder itself and posterior urethra are exempt.

Diagnosis.—The diagnosis of the disease is absolute or presumptive. Although in eighty per cent. of cases the former is at the present day a result to be expected, there may be a remaining twenty per cent. in which, for reasons presently to be considered, patients must come to operation with only a tentative diagnosis.

Presence of the tubercle bacillus in the urine of either kidney, taken in connection with, or even without, most of the already mentioned symptoms, is the sole require-

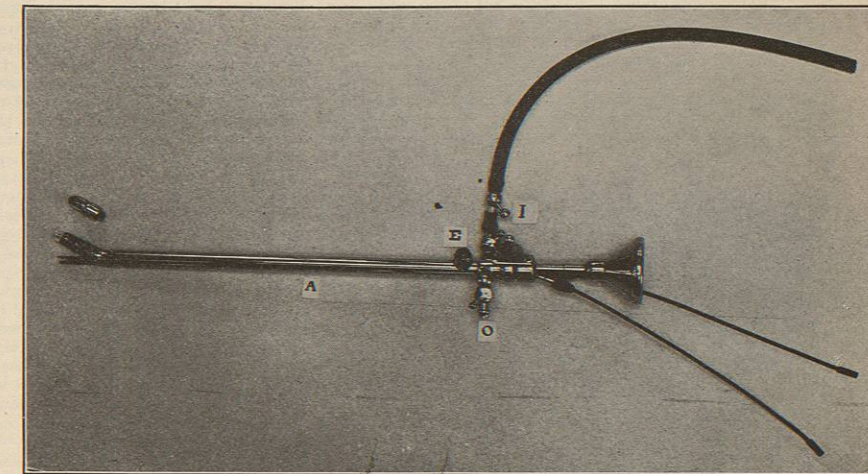


FIG. 3068.—The Writer's Irrigating Cystoscope for Bilateral Catheterization. A, Irrigation and light-carrying sheath for various telescopic parts; E, screw post for electric-light connections; I, inlet cock for water or air as bladder-distending medium; O, outlet cock for same.

ment for absolute diagnosis. Two events rendered this modern advance possible: first, Koch's discovery; secondly, the perfection of mechanical contrivances by means of which the urine of each kidney can be gathered from its ureter before commingling with that of its fellow in the bladder. In this way may be determined the diseased state of one or both organs as well as the functional capacity of each. The bilateral ureter-catheterizing cystoscope is the most effective instrument for accomplishing this purpose in both sexes, since not alone can the condition of the bladder, and especially that of the mouths of the ureters, be observed, but, by means of the flexible sterile catheters placed in the lower three inches of each ureter, both kidneys can be drained conjointly while the same nervous influences pertain and the same physiological processes are active. With specimens thus synchronously collected, minor quantitative and qualitative variations in the excretions of the two glands may be given a valuation they could not be allowed if the specimens were gathered in the still generally prevailing fashion, that is, by a single catheter used first on one side and then on the other.

In the presence of *thamuria*, that ofttime misleading symptom, it is proper to emphasize the importance of always looking beyond the bladder for its possible explanation, but particularly so when cystoscopy reveals an œdematous or hyperæmic state of one or the other ureter opening. Then one can be very nearly certain of finding the corresponding kidney diseased. But the existence of a normal ureter mouth does not preclude the existence of a kidney with open lesions in the early stage of tuberculosis. The ureter-catheter test is the only one which can determine in such cases the localization of the process.

Fig. 3068 shows the writer's latest modification of his original double-barrelled ureter cystoscope. For a fuller

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description of the instrument and general technique see the "Presbyterian Hospital Medical and Surgical Reports" for 1902.

While separate urines are being collected in this way for chemical, microscopical, and perhaps animal-inoculation tests, it is well to let four or five drops from each ureteral catheter fall upon the media of blood serum tubes labelled right and left; for although the results of growing tubercle bacilli on special culture media as a means of diagnosis have not been sufficient to inspire general confidence, it is well to be informed in all suspected kidney cases as to the presence or absence of other pathogenic micro-organisms. Despite all these aids to diagnosis there are undoubtedly a few cases of renal tuberculosis, even with open lesions, in which the individual urine simply indicates the presence of a marked pyelonephritis, and nothing more. The specific bacilli are so sparsely shed as greatly to minimize the chances of detecting them by aid of the microscope. After removal of such a kidney it may require a very prolonged search to secure a bacillus or two, although tubercle tissue is quite general. Dr. Bolton's case was one of this kind (see *Annals of Surgery*, June, 1900, p. 749). In such an instance even animal inoculation might prove negative unless practised on a large scale, while the less positive tuberculin test would probably be affirmative.

Then there are some cases in which the disease begins as a plainly evident urinary tuberculosis, but in which there are such advanced and painful vesical and urethral lesions as to defeat all efforts to secure the separate urines by cystoscopic ureter catheterization. In cases like this, if suprapubic drainage is established to secure repose of the bladder, advantage should be taken of the presence of an opening and of the existence of full anesthesia for the introduction, if possible, of the ureter catheters, because, if one kidney is thus found to be tuberculous and the other healthy, a nephrectomy will yet afford the best chance for prolongation of life and comfort (see *Boston Medical and Surgical Journal*, May 30th, 1901, p. 515). But merely resorting, in a case of renal tuberculosis, to epicystotomy for the relief of vesical spasm is an illogical procedure; nothing can be gained by it so long as tuberculous products continue to descend into the viscera from above.

Dr. F. C. Wood says, in respect to tuberculin as an aid to diagnosis in this disease, that its injection, for the purpose of determining the presence or absence of a genito-urinary tuberculous lesion, has come widely into use. The normal temperature variations of the patient are first determined for twenty-four hours, preferably by hourly observations; after the injection the temperature must again be taken at intervals at least equally frequent or a slight reaction may be overlooked. The original Koch's tuberculin, which is a glycerin extract of the bodies of the tubercle bacilli, is to be used, and not one of the newer preparations. One-half to one milligram of the tuberculin is to be injected, the smaller quantity in children, the larger in adults. These quantities can be easily measured by properly diluting the original strong solution. The injection should be made into the deeper tissues with a hypodermic syringe which has been sterilized by boiling. If after the first injection a rise of temperature of 0.5° C. is observed the diagnosis of a tuberculous lesion is probable. This rise regularly occurs within the first thirty-six hours after the injection, usually within four or five hours. If no rise is observed a second or even a third injection may be given, with a dose not to exceed 10 mgm.; anything above this will cause a rise of temperature in healthy adults. A positive result affords very strong evidence of an active tuberculous lesion in the body; a negative result is not quite so valuable, as in a certain number of cases of old encapsulated tuberculous lesions a positive reaction does not occur, even when considerable doses are administered. This is probably due to the poor circulation in such nodules which prevents the escape of the toxins of the bacilli and equally the entry of the tuberculin.

The careful use of well-prepared tuberculin is not dan-

gerous. It contains no tubercle bacilli. Unfortunately the significance of a positive reaction is in these renal cases not always so strong as could be wished, since it has been well established that a considerable proportion of individuals showing no evidence of pulmonary tuberculosis have focal and quiescent lesions of the apices and pleura.

An element of confusion which does not come into consideration in the case of properly collected ureter-catheter specimens of urine, occupies an important place in the records of all the earlier steps leading to a diagnosis of genito-urinary tuberculosis in general. This is the smegma bacillus, a micro-organism which occurs with great constancy and in varying numbers in the smegma of the prepuce of the male, in the grooves between the labia majora and minora in the female, and about the perineum and anus of both sexes. It has also been demonstrated in the cerumen of the ear, on cutaneous surfaces, and in various parts of the body, especially in the folds of the groin, the armpits, and the grooves of the umbilicus, and also on the mucous membrane of the mouth. Careful examination of the sediment of voluntarily voided urine will, in most cases, reveal the smegma bacillus. For obvious reasons the urine of females contains larger numbers of this organism than that of males. Grünbaum found them in the sediment of centrifuged urine of females in fifty-nine per cent. of the specimens examined.

They may be readily stained by basic aniline dyes; carbol-fuchsin gives the best results. The most striking peculiarity of this bacillus is its remarkable resistance to decolorizing solutions; in which respect it resembles the tubercle bacillus. The red color of aniline-fuchsin stain may often persist for some time after the specimen has been subjected to the action of five-per-cent. sulphuric acid, twenty-per-cent. nitric acid, alcoholic sulphuric acid, alcohol, or other decolorizing agents. It is, however, a well-established fact that the smegma bacillus is somewhat more sensitive to acids than the tubercle bacillus, and on this fact were based the numerous earlier differential stains. But it remained for Grethe to show, in 1896, the unreliability of these methods and that the difference in the resistance of the two organisms to acids is an exceedingly slight one. At the same time he showed that the smegma bacillus loses its stain much more readily than the tubercle bacillus when the specimens are treated with alcohol. Of the many differential stains based on this principle, the following procedure can be recommended: (1) Stain the specimens with carbol-fuchsin, heating gently; (2) pour off the excess of dye and decolorize the specimen with ten-per-cent. sulphuric or nitric acid; (3) remove the excess of color with strong alcohol; (4) treat the specimen with aqueous methylene blue; (5) examine for bacilli stained red and mark the field containing them; (6) place the specimens in strong alcohol for eight hours and re-examine the marked fields which contained the red-stained bacilli. If, on the second examination, the bacilli are still red, it may be assumed that the organisms are tubercle bacilli and not smegma bacilli.

A second method advocated by Wood is that of Pappenheim and depends for differentiation of the two organisms on the combined decolorizing effect of alcohol and rosolic acid (known also as corallin and aurin): (1) Spread on a slide and fix as usual. Stain with hot carbol-fuchsin for two minutes; (2) pour off the surplus dye without washing; (3) counterstain and decolorize by pouring over the slide, from three to five times, a one-per-cent. solution of corallin in strong alcohol; saturate the above solution with methylene blue and add twenty parts of glycerin; (4) wash off in water, dry with blotting paper and then in the air, and examine. The tubercle bacilli are stained red, the smegma bacilli blue.

All specimens of urine which are to be examined for tubercle bacilli should be obtained through a catheter to avoid contamination with the smegma bacillus which exists in the most anterior portions of the urethra and external genitals. The external urethral orifice should be

cleansed with some antiseptic solution and the urine obtained through a sterile catheter. The importance of these precautions is shown by Bunge and Trautenroth, who, examining in this way, found the urine constantly free from the smegma bacillus. It is advisable to precipitate the sediment by centrifuge, then to make cover-glass preparations, and finally to stain them by one of the methods mentioned. It is important that the urine be examined as fresh as possible, since alterations in the reaction somewhat affect the staining properties of the tubercle bacillus.

It is well to centrifuge a good quantity of the suspected urine. If much thick pus is present in the urine the method of Biedert for softening is recommended. This consists in gently heating the thick sediment with a small quantity of a ten-per-cent. sodium-hydrate solution, until the pus is changed into a thin and fluid consistence. The mixture is centrifuged and the supernatant fluid poured off, and the sediment is then washed with distilled water, thus removing as much of the alkali as possible. A small amount of thin egg albumen is added to the sediment. This facilitates the fixation of the bacilli to the slide when heat is applied.

It is now a well-established fact that the direct examination of urinary sediment for tubercle bacilli can be utilized to only a very limited extent, and it is always open to certain sources of error. The inoculation of the sediment into guinea-pigs is the most reliable test at our disposal, and when possible it should always be made. The inoculation may be made subcutaneously below the folds of the groin. This has the advantage over the intraperitoneal inoculation in that the animals are less likely to die from other infections, and it also permits of a somewhat earlier diagnosis of the tuberculous lesions. The inguinal glands are first involved, and these may be examined at the end of three or four weeks for tubercle bacilli without sacrificing the animal.

Prognosis.—This varies according to circumstances, in individual cases, from very bad to fair, but while proper treatment is of great moment, it may be said that under any form of treatment now known the ultimate prognosis can seldom be good. This is because, despite what may promise at the time to be a successful removal of localized disease by a uretero-nephrectomy, the chances are that some other unrecognized tuberculous focus exists, liable at some future moment to make trouble.

The occasional extreme chronicity of renal tuberculosis, together with the fact that intervals of improvement may alternate with exacerbations of symptoms, makes any decided opinion ill advised as to just what the patient's condition will be six months or a year later with or without treatment. For a review of some cases that show this see the *Boston Medical and Surgical Journal*, May 30th, 1901, p. 513.

While recognizing the pathogenicity of germs, I must emphasize the fact that two appreciable but as yet immeasurable factors have to do with their presence: first, the variability of germ species or their degree of virulence; second, the variability in the resisting power possessed by the tissue soil of different individuals.

Important experimental researches bearing on the former have been made by Theobald Smith, Lartigau, and others, but as yet they have given us no practical working basis for establishing a prognosis. And as for the second factor, I venture to express the hope that the same may not have to be said of Koch's latest individual work on immunity and agglutination in tuberculosis, for it appears to be established in this disease that intensity of agglutination and degree of immunity stand in direct relation to each other. When this test is on a practical footing and can be applied in a routine manner to all clinical material after a positive and localizing diagnosis has been made, it may then be necessary to rewrite the following remarks on treatment.

Lampugnani concludes from an analysis of the diazo reaction, as it occurred or failed to occur in a large number of sick and healthy individuals, that it is of some

value in the prognosis of tuberculosis; for in twenty-six cases of the pulmonary form the reaction occurred in nine, and in all of these nine a fatal result soon followed.

Treatment.—If in the early stage of this disease absolute physiological rest could be given to the organ, as practised in similar disease of the joints, while at the same time the patient's greatest vitality is maintained by hygienic and climatic resources, we might, reasoning from analogy, expect a certain number of cures to take place. This chimerical scheme is only mentioned as a partial explanation for the writer's belief that there is little to be hoped for except from surgery. If the dangerous kidney can be detected and removed before any other part of the urinary tract is contaminated, the individual will certainly be in the safest possible condition, although a dormant focus may lie undetected in some other part of the body.

Even when the diagnosis is not made until the corresponding ureter and part of the bladder are involved, the majority of surgeons recommend, when the opposite kidney is healthy, as early and complete a uretero-ne-

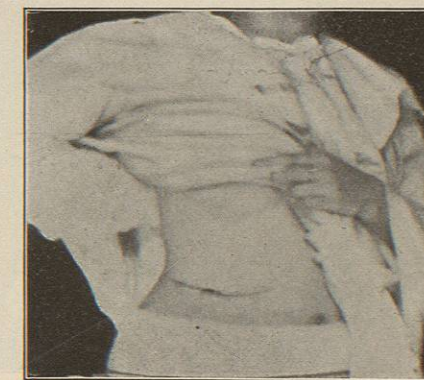


FIG. 3069.—Anterior Incision, Extraperitoneal Nephrectomy. Three Weeks after Operation. Nine years previously the right breast had been partially excised for tuberculous disease. (Writer's case.)

phrectomy as possible. And the greater the experience of a surgeon in these cases the more inclined is he to take greater chances in attempting to prolong life by removing a kidney that is badly diseased, and that serves as the source of a constantly increasing toxemia, even when the opposite organ is known to be affected, but to a less extent.

The writer has had a recent experience (*Annals of Surgery*, May, 1902, p. 638) which illustrates this point. In this particular case benefit had first been sought by hygiene and climate, then by an operation which consisted in dividing the right ureter near the bladder and giving it an outlet in the lumbar region (Fig. 3069); but the only result of the operation was that absorption from the bad right kidney was more ominous than it had been before. Removal of this right urinary tract was then effected with surprisingly good result, although the left kidney was diseased.

The writer has never had reason to regret the operation of nephrectomy in any of his seven cases of tuberculosis; while in a few instances in which the operation was either not advised by him or not accepted by the patient, he has seen exacerbations or disasters follow which he believes would have been prevented by nephrectomy.

It is unnecessary to say more than a word regarding partial nephrectomy and nephrotomy in this disease. The former is a more dangerous surgical procedure than complete nephrectomy. In case of a tuberculous kidney, with pus escaping into its pelvis, a sudden occlusion of the ureter may call for immediate nephrotomy, but the expectation of getting any progressive benefit