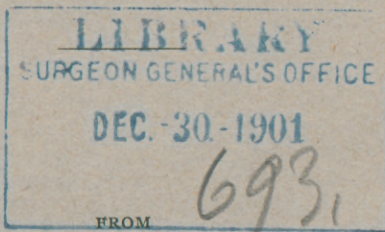


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PYURIA.

BY  
HOWARD A. KELLY, M.D.,  
OF BALTIMORE.



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**THE SOURCES AND DIAGNOSIS OF PYURIA.<sup>1</sup>**

BY HOWARD A. KELLY, M.D.,  
OF BALTIMORE.

IF I were asked what subject of all others in the range of medicine I considered it most important to bring prominently before the profession at this juncture of the advancement of our art, I think I would reply, on the spur of the moment, pyuria. Let me emphasize the importance of my subject by saying that there are to-day thousands of women in our country going about with a pyuria of undetermined origin; that in most instances the disease is progressive, going from bad to worse, and for this reason valuable time is being lost; and that the investigation of the source of a pyuria is not difficult to make, simply requiring some special instruments and a little practice in using them. It is my desire to speak to you briefly of the methods at our command for investigating and tracing a pyuria to its source, of determining the point at which the pus enters the urine, its cause, and the extent of the involvement of the urinary tract.

Pyuria signifies nothing more nor less than the presence of pus in the urine, a sign common to a variety of affections of the urinary passages. It is, therefore, but a symptom of an involvement of some portion of the urinary system, from the external urethral orifice up to the capsule of the kidneys.

<sup>1</sup> An address delivered at a meeting of the Southern Surgical and Gynecological Society, held at St. Louis, Mo., November 9, 10, and 11, 1897.

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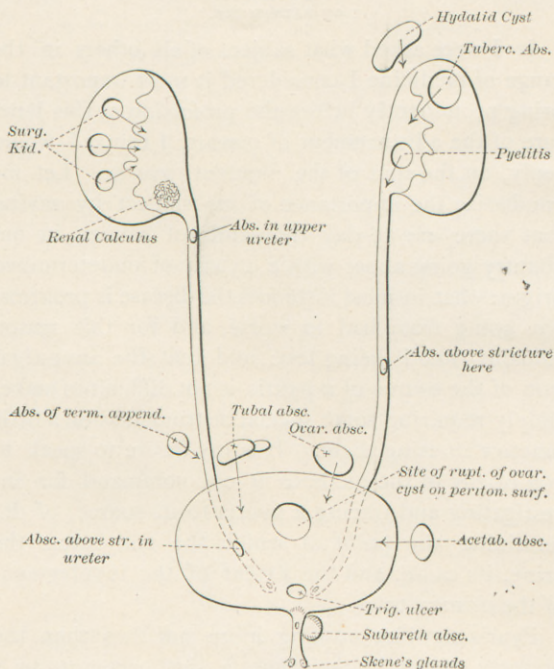
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The investigation of the cause of a pyuria must be *analytic*, taking the symptom and tracing it to its source by a process of exclusion. This is the natural

FIG. 1.

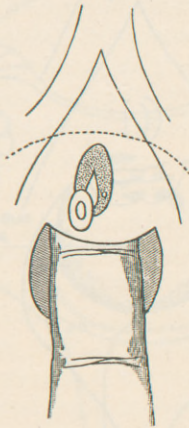


Showing a number of the sources of pyuria from the extreme lower urinary tract up to the area surrounding the kidney. The circles indicate the location of the abscess and the arrows the direction in which the abscess discharges. The character of the abscess is described on the diagram.

procedure in the routine investigation of most diseases. Your patient comes to you with a more or less definite complaint of a disturbance along the urinary

tract, often exceedingly vague, and you examine the urine and find that it contains pus, you then naturally conclude that if you can find the source of the pus you will locate the disease. While the question presents itself in this way, the means which we have hitherto had at our command for making such a determination have been generally most unsatisfactory.

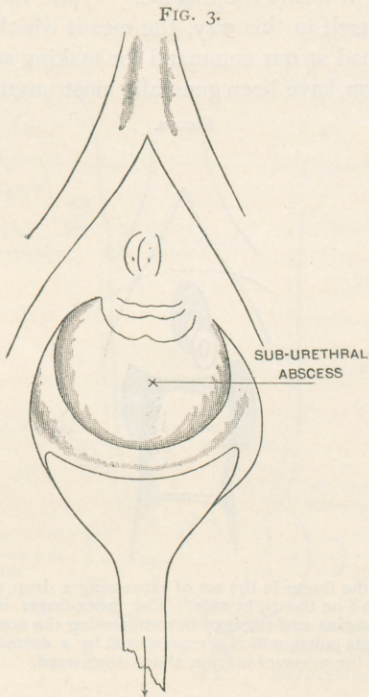
FIG. 2.



Showing the finger in the act of expressing a drop of pus from Skene's gland on the right side. The index-finger is introduced within the vagina and engaged in compressing the ureter up under the symphysis pubis, which is represented by a dotted line. The direction of the pressure is from above downward.

If an enlargement is not found in the loin suggesting a kidney containing pus, or if a point of tenderness is not found somewhere along the accessible part of the urinary tract, how is it to be determined where the pus comes from? Moreover, the clinical signs themselves may be most misleading; for a stone in the kidney or a tuberculous kidney may give no

other sign than a vesical tenesmus; and then, too, if both kidney and bladder are inflamed, how is one to ascertain this fact and to determine the extent of



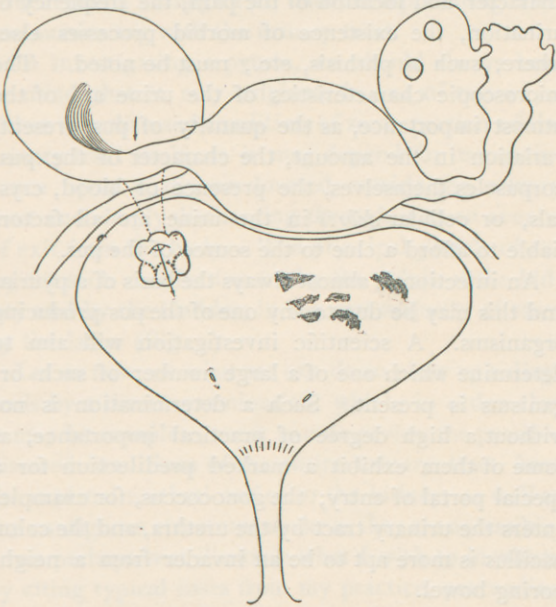
Showing the appearance of a suburethral abscess occupying the anterior wall of the vagina. The abscess is exposed by retracting the posterior vaginal wall.

the involvement of each? The question, as it stands to-day, with better means at our command, is much like the case of a man who comes to you complaining of a sore throat and purulent expectoration, and



you try to determine the exact location and extent of the malady by a series of questions and by looking at the sputum, without once asking him to open his

FIG. 4.



Showing the avenue of entrance of a right tubo-ovarian abscess through the base of the broad ligament into the bladder at its right horn. The vesical opening is surrounded by tits of swollen mucosa. The left side of the bladder illustrates the localized patchy appearance of a cystitis.

mouth, and thus looking down his throat, seeing exactly what is wrong. It is my desire, therefore, to emphasize the importance of the direct methods of inquiring into the sources of pus in the urine, and I

shall, for this reason, but briefly refer to the other accessory diagnostic procedures at our command.

The history of the case must be carefully considered, and the duration of the disease, the exact character and location of the pain, the frequency of urination, the existence of morbid processes elsewhere, such as phthisis, etc., must be noted. The microscopic characteristics of the urine are of the utmost importance, as the quantity of pus present, variation in the amount, the character of the pus-corpuscles themselves, the presence of blood, crystals, or cellular *débris* in the urine are all factors liable to afford a clue to the source of the pus.

An infection is almost always the basis of a pyuria, and this may be due to any one of the pus-producing organisms. A scientific investigation will aim to determine which one of a large number of such organisms is present. Such a determination is not without a high degree of practical importance, as some of them exhibit a marked predilection for a special portal of entry; the gonococcus, for example, enters the urinary tract by the urethra, and the colon bacillus is more apt to be an invader from a neighboring bowel.

Pyurias may differ in the following ways: In the quantity of pus; in the reaction of the urine, which may be alkalin or acid; whether or not pus is constantly present, and whether it varies in quantity at different times. A little pus, found microscopically, associated with an irritable bladder, may mean nothing more than a hyperemia of the vesical trigonum or a ureter which is irritated by a concentrated or an intensely acid urine; a large amount of pus almost



invariably proceeds from the kidney. Renal pus is usually acid, while pus from the bladder walls is often strongly alkaline; an intermittent or remittent flow of pus is most likely to come from an extravescical source, either from a kidney or an outside suppurating area communicating with the urinary tract.

In investigating a pyuria, we should always bear in mind that it may originate in one of two ways: either in a diseased condition of some portion of the urinary tract itself, or it may depend for its continuance upon a disease located outside the urinary tract and simply discharging through it as an avenue of exit from the body. The principal portals of entry for such an affection are by the pelvis of the kidney and by the bladder; in the vast majority of cases by the latter (Fig. 1).

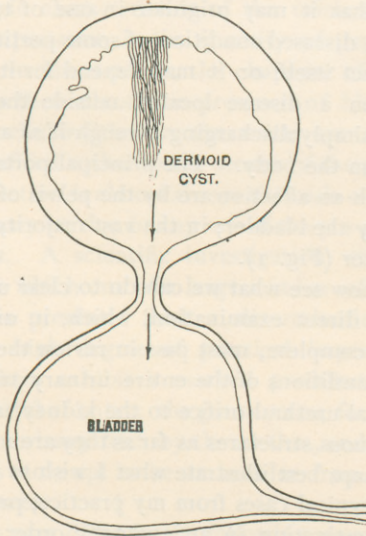
Let us now see what we can do to clear up a diagnosis by a direct examination, which, in order that it may be complete, must pass in review the possible diseased conditions of the entire urinary tract from the external urethral orifice to the kidney, as well as the contiguous structures as far as they are accessible. I can perhaps best illustrate what I wish to inculcate by citing typical cases from my practice, proceeding in our investigation in an anatomic order from below upward.

*Urethra.*—To begin with, the urethra furnishes three possible sources from which pus may enter the urine: (1) Skene's ducts; (2) a urethritis or ulcer of the urethra; (3) a suburethral abscess.

A small amount of pus, a drop or two lodged in Skene's glands, may easily escape observation unless it is made a part of the routine of every ex-

amination to milk them out by pressing first one side then the other up under the pubic arch and squeezing downward and outward. A drop of thick yellow pus may exude from the external orifice of the gland or duct of the side from which it originates. The

FIG. 5.



Showing a dermoid cyst adherent to the peritoneal surface of the bladder, suppurating, and discharging by a sinus into the bladder.

diagram (Fig. 2) serves to illustrate one of my cases in which this condition existed unsuspected.

A urethritis or a urethral ulcer will also afford a source of pus-contamination of the urine, which is easily detected by using a two-glass test in passing the urine; the first urine escaping brings with it the

pus, and consequently that which follows will be clear. The inflamed ulcerated urethra is readily observed through the cystoscope as it is withdrawn. One of the most marked cases of this kind I ever had was due to a gonorrhoeal ulcer of the posterior wall near the neck of the bladder where Littre's glands are found.

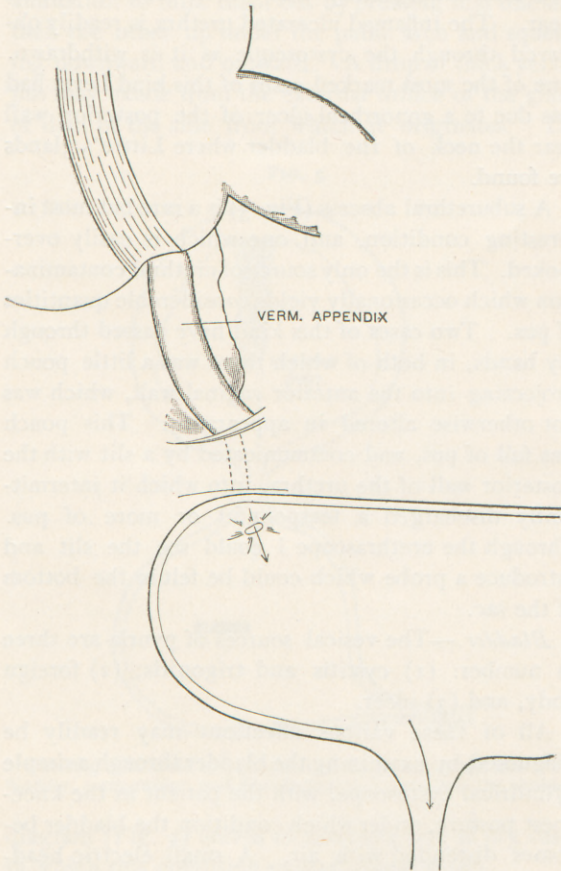
A suburethral abscess (Fig. 3) is a rare but most interesting condition, and one which is easily overlooked. This is the only source of urethral contamination which occasionally yields considerable quantities of pus. Two cases of this kind have passed through my hands, in both of which there was a little pouch projecting into the anterior vaginal wall, which was not otherwise altered in appearance. This pouch was full of pus, and communicated by a slit with the posterior wall of the urethra, into which it intermittently discharged a teaspoonful or more of pus. Through the urethroscope I could see the slit and introduce a probe which could be felt in the bottom of the sac.

*Bladder.*—The vesical sources of pyuria are three in number: (1) cystitis and trigonitis; (2) foreign body, and (3) ulcer.

All of these various affections may readily be diagnosed by examining the bladder through a simple cylindrical cystoscope, with the patient in the knee-chest posture, under which condition the bladder becomes distended with air. A small electric head-light or an electric light is held close to the sacrum and the rays reflected by an ordinary head-mirror into the bladder, when this viscus may easily be examined. I wish to call particular attention to the fact that it



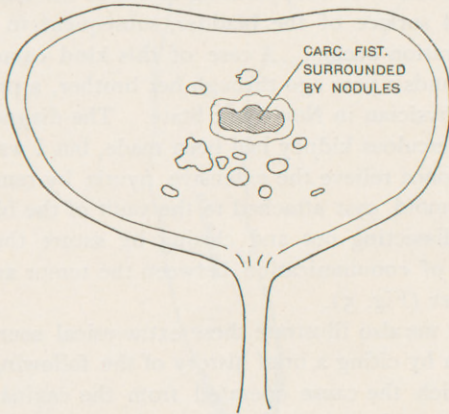
FIG. 6.



Showing an abscess of the vermiform appendix discharging by a fistulous orifice into the bladder.

is important in order that the base of the bladder may be satisfactorily inspected to let air into the vagina before dilating the bladder. This brings the floor of the bladder almost into the plane of vision, and makes the trigonum easily accessible. Ulcers are most apt to be found here, and an inflammation lo-

FIG. 7.



Showing a carcinomatous fistula at the base of the bladder surrounded by secondary nodules.

calized in this neighborhood—a trigonitis—is the commonest form of localized cystitis.

*Extravesical Sources of Pyuria.*—There are several extravesical sources of pyuria, the commonest being those connected with inflammatory diseases of the Fallopian tubes, of which I have observed a number of instances. In one of my cases (Fig. 4) a small tuberculous abscess broke into the right horn of the bladder near the base of the broad ligament,

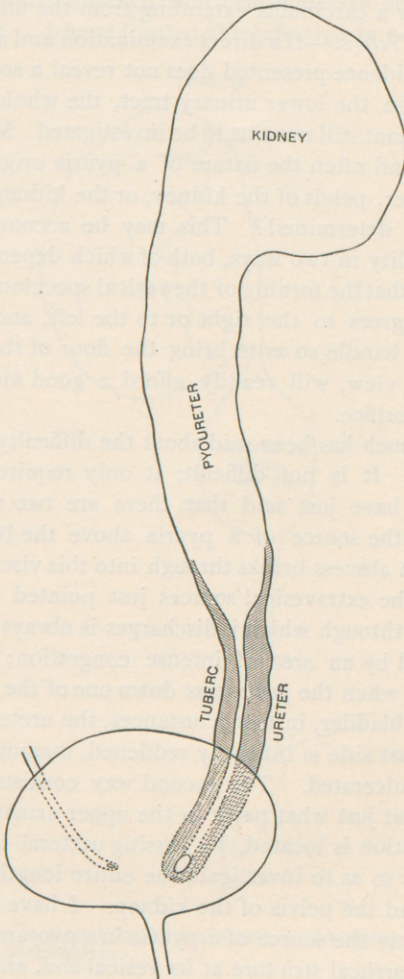
while all the rest of the urinary tract remained unaffected. I discovered its presence by means of the red mammillated edematous mucosa surrounding the concealed opening, from which, during examination, a bubble of air escaped, and when I introduced a searcher at this point its withdrawal was followed by the escape of pus. A rarer avenue of entrance is by the adhesion of a suppurating tumor to the free peritoneal surface of the bladder, subsequent to which perforation occurs. A case of this kind came into my hands a year ago through her brother, a prominent physician in New York State. The diagnosis of a tuberculous kidney had been made, but I was able to at once relieve the extensive pyuria by removing a dermoid cyst attached to the vault of the bladder and dissecting out and closing by suture the long sinus of communication between the tumor and the bladder (Fig. 5).

Let me also illustrate these extravescical sources of pyuria by citing a brief history of the following case in which the cause operated from the vagina: My patient had an atresia of the vagina. I found embedded in the perivaginal tissues the stem of a hard-rubber stem-cup pessary, the cup of which lay concealed in the upper part of the vagina above the atresia, where it had eroded a little opening into the base of the bladder through which a quantity of fetid pus was constantly discharged with the urine.

I shall not pause longer to dwell upon examples of abscess originating in extra-uterine pregnancy, or acetabular, or psoas-abscess, or an abscess from the vermiform appendix, also emptying in this way (Fig.



FIG. 8.



Showing a tuberculous strictured left ureter with a pyo-ureter and pyelonephrosis above the stricture.

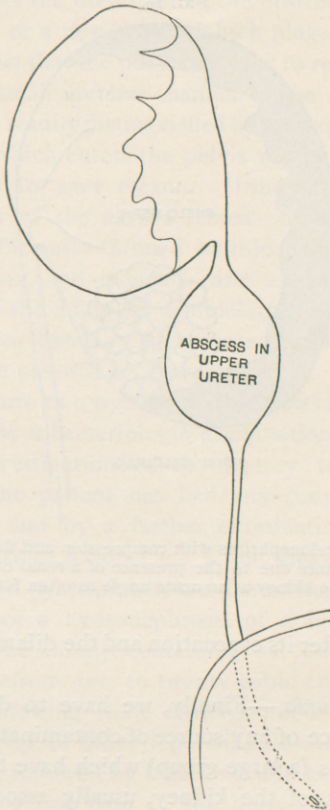
6), or the intense cystitis evoked by an intestinal fistula, or a carcinoma extending from the uterus.

*The Ureters.*—If a direct examination and analysis of the evidence presented does not reveal a source of the pus in the lower urinary tract, the whole upper urinary tract still remains to be investigated. May the source, and often the nature of a pyuria originating in a ureter, pelvis of the kidney, or the kidney itself, be easily determined? This may be accomplished with facility in two ways, both of which depend upon the fact that the turning of the vesical speculum about thirty degrees to the right or to the left, and dropping the handle so as to bring the floor of the bladder into view, will readily afford a good view of a ureteral orifice.

Too much has been said about the difficulty of doing this. It is not difficult; it only requires practice. I have just said that there are two ways of locating the source of a pyuria above the bladder. When an abscess breaks through into this viscus from any of the extravascular sources just pointed out the opening through which it discharges is always plainly indicated by an area of intense congestion; in like manner, when the pus comes down one of the ureters into the bladder, in many instances, the ureteral orifice of that side is intensely reddened, mammillated, or even ulcerated. The second way consists in determining at just what point in the upper urinary tract the infection is located, by passing ureteral or renal catheters so as to investigate the entire length of the ureter and the pelvis of the kidney. I have located in this way the source of a pyuria in a pyo-ureter due to a gonorrhoeal stricture at its vesical end, and when

I succeeded in passing a metal catheter through the tortuous stricture 150 cubic centimeters of pus at once escaped. I have located the infection in a tubercu-

FIG. 9.

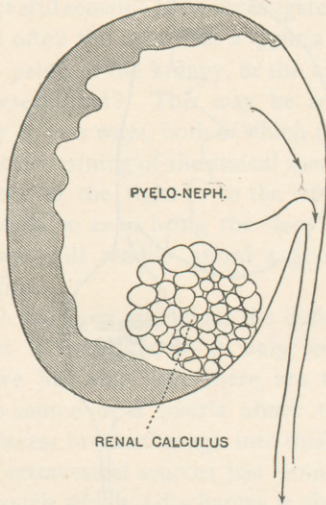


Showing an abscess in the upper part of the ureter just below the pelvis of the kidney.



lous pyo-ureter where the pus had accumulated above a stricture near the brim of the pelvis (Fig. 8). I located another in a pocket above a stricture in the upper third of the ureter (Fig. 9) and the patient

FIG. 10.



Showing a pyelonephrosis with compression and thinning out of the renal substance due to the presence of a renal calculus. The ureter enters the kidney at an acute angle as often found in simple pyelonephrosis.

recovered after its evacuation and the dilatation of the stricture.

*Renal Pyuria.*—Finally, we have to distinguish, in the absence of any source of contamination below, those pyurias (a large group) which have their origin in the pelvis of the kidney, usually associated with an obstruction at the renal opening of the ureter, causing the pus to dam up in considerable quantities.

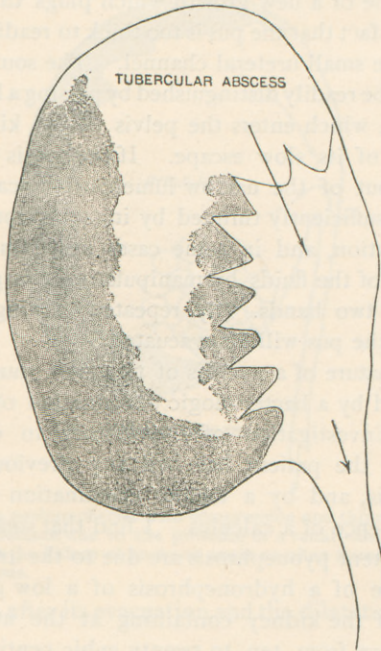
This obstruction may be due to a catarrhal puffy mucosa of the renal pelvis, or to an oblique entrance of the ureter into the pelvis causing its compression as the latter distends, or to a rotation of the kidney, which twists the ureter, or to the obstruction caused by a stone or a new growth which plugs the orifice, or to the fact that the pus is too thick to readily escape down the small ureteral channel. The source of the pus may be readily distinguished by passing a long renal catheter, which enters the pelvis of the kidney and permits of its slow escape. If the pus is too thick to run out of the narrow lumen of the catheter, it may be sufficiently thinned by injecting some boric-acid solution, and in some cases even assisting the mixture of the fluids by manipulating a large kidney between two hands. By repeated washings in this way all the pus will be evacuated.

The nature of a pyelitis of this sort must be determined by a bacteriologic examination of the pus, by an investigation of the history to determine whether the patient has had any previous hydronephrosis, and by a further examination to detect the presence of a calculus. I find that some cases of intermittent pyonephrosis are due to the unsuspected existence of a hydronephrosis of a low grade, the pelvis of the kidney containing at the utmost not more than from ten to twenty cubic centimeters of fluid. Following some undetermined cause or an attack of grip, or other depressing illness, the patient has a chill followed by high fever and general aching with more or less pain in the loins, associated with the appearance of pus in the urine. After washing

out the kidney the symptoms all subside, but a simple hydronephrosis remains.

When there is a stone in the kidney (Fig. 10) the use of the catheter may bring down a little black *débris*

FIG. 11.



Showing a tubercular abscess discharging into the pelvis of the kidney, the shaded area showing the sound portion of the kidney.

which sinks to the bottom of the vessel, and should always be looked for. A bit of the stone may stick in the eye of the catheter, or best of all, if the end of the catheter is coated with a mixture of dental wax and



olive oil, the soft polished surface of the wax will be scratched by contact with the stone, and the scratch marks may be seen by examining the wax with a low-power lens.

Other sources of pus in the urine are from tuberculous (Fig. 11) or other abscesses of the kidney substance itself, discharging into the pelvis of this organ and thus into the ureter. When tubercle bacilli are found in urine taken from the upper urinary tract, it almost always indicates a tuberculous affection of the renal substance. In rare instances a perinephric abscess, such as a suppurating hydatid cyst, breaks through into the renal pelvis, and so finds its exit from the body through the urethra. In all cases of renal origin the diagnosis will be made, and in some the exact cause determined, by using the ureteral catheters as recommended.







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