

## DISEASES OF THE URETHRA, BLADDER, AND URETERS.

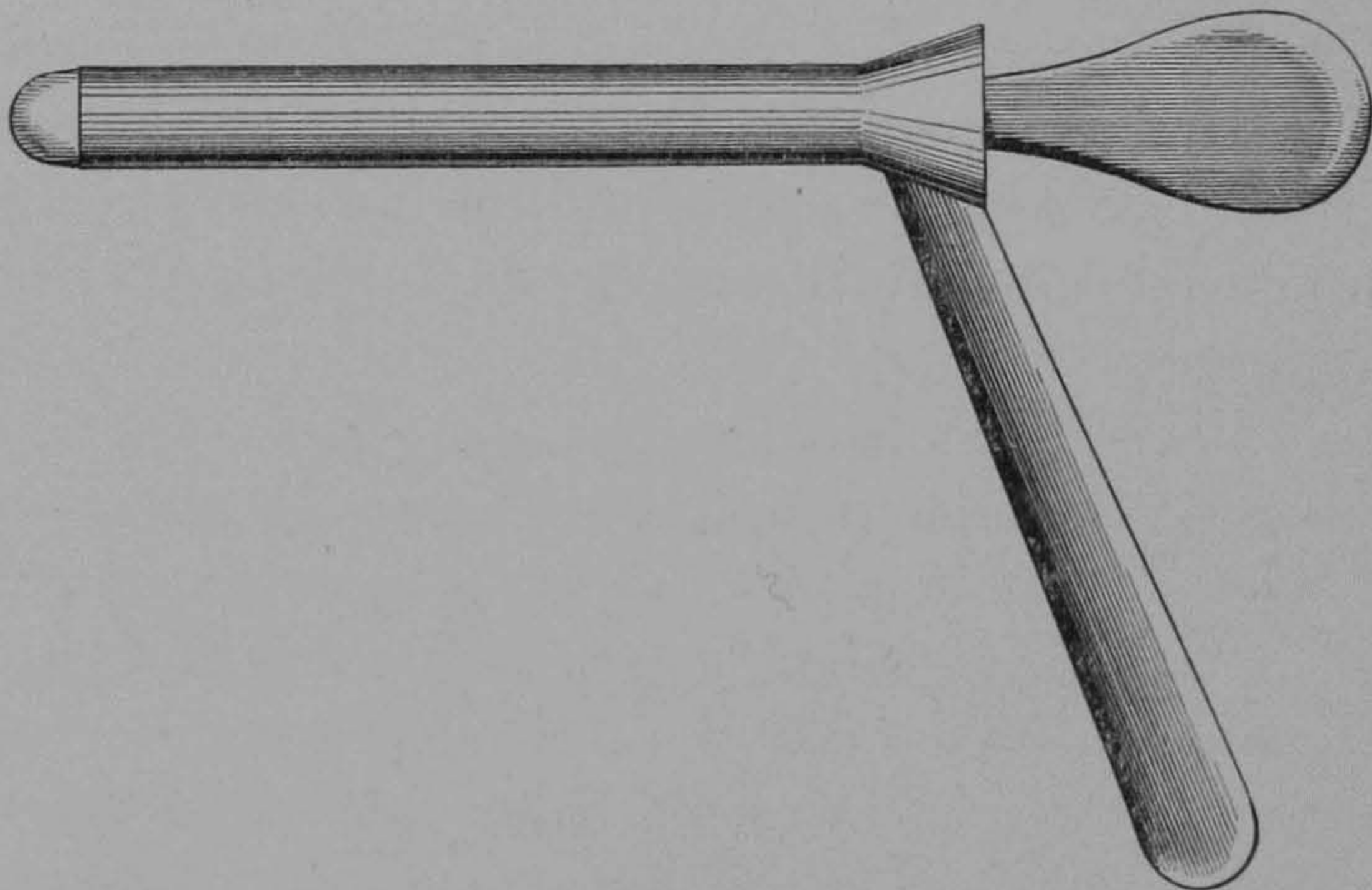
### METHODS OF EXAMINATION.

*Inspection.*—Without using instruments the only portion of the urethra which can be examined is the meatus urinarius externus and a small portion of the canal which lies immediately above it. We here note the shape of the orifice, whether intact or everted, its color, the presence of tumors or ulcerated areas or of a purulent discharge. The lips are then drawn apart and the orifices of “Skene’s glands,” which open just within the meatus, are examined for any evidences of inflammation.

While no portion of the bladder or ureters can be inspected directly without the use of instruments of some sort, the lower abdominal zone may show a rounded tumor or prominence above the symphysis pubes where the bladder is dilated or hypertrophied.

By the use of instruments we obtain the most reliable results in studying the diseases of the urethra, bladder, and ureters. The essential features of the examination are—(1) atmospheric distention

FIG. 324.



Cystoscope.

of the bladder secured by position, (2) the introduction of a simple straight open speculum, and (3) the inspection of the mucous sur-



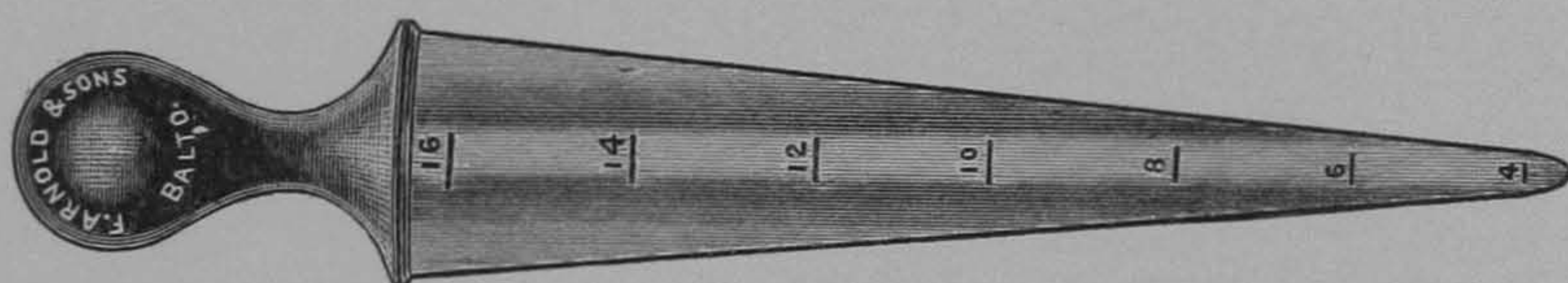
faces of the bladder, urethra, and ureteral orifices by means of a light reflected into the bladder.

### INSTRUMENTS.

The necessary instruments for such an examination are—(1) a set of Kelly's cystoscopes, (2) a conical dilator, (3) a suction apparatus, (4) a pair of delicate mouse-tooth forceps with long shanks, (5) a searcher, (6) applicators, (7) ureteral and renal catheters, and (8) a reflecting mirror and a good light.

The cystoscopes are nickel-plated cylinders, 8 centimeters long and equal in diameter from end to end. These cystoscopes are made of varying diameter, and a complete set will contain cystoscopes increasing in size from a small one measuring 6 to a large size *1-2 3/4 inches in circumference.*

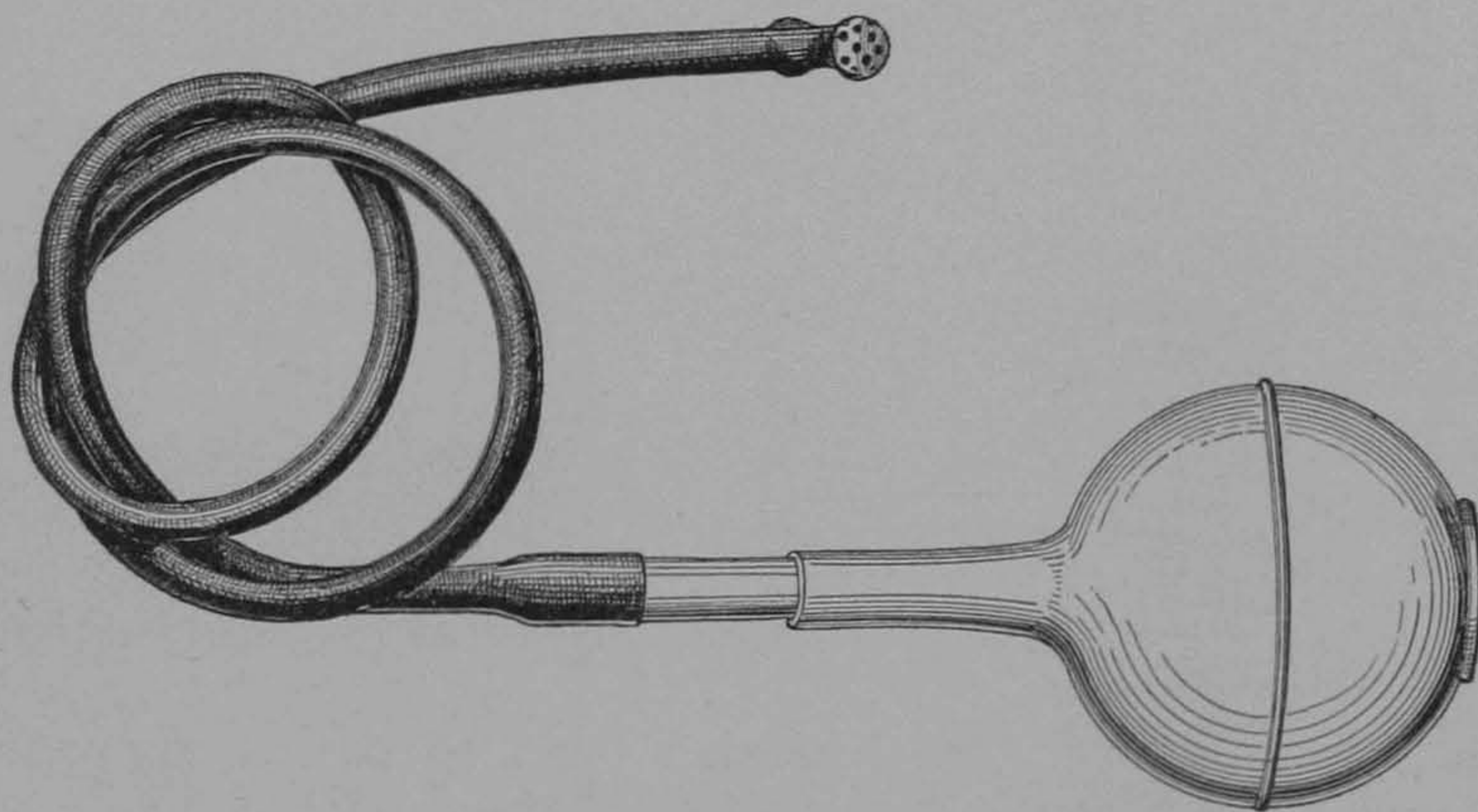
FIG. 325.



Conical Dilator: short lines indicate the diameter in millimeters.

measuring 12 or 14 millimeters, and it will be found convenient, if much work is to be done, to have cystoscopes measuring

FIG. 326.



Suction Apparatus.

respectively,  $8\frac{1}{2}$ ,  $9\frac{1}{2}$ , and  $10\frac{1}{2}$ , millimeters, these intermediate sizes often being useful.

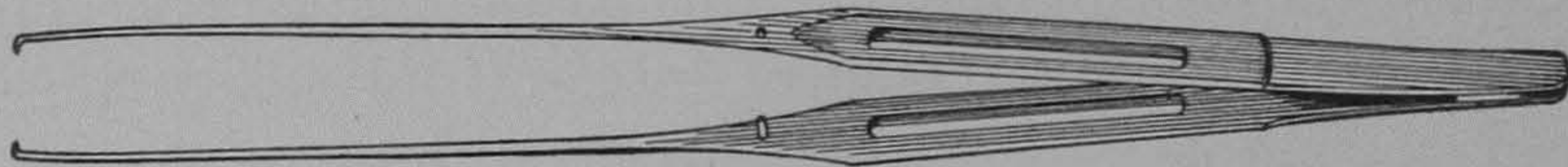
The applicators are instruments shaped like the searcher, but roughened on the end to allow of their being wrapped with cotton.

The light is a most important adjunct, and its intelligent use will



go far toward making the examination successful. An electric drop-light with an oval tin reflector painted white is the best to work with, as it can be more easily managed and held close to the body,

FIG. 327

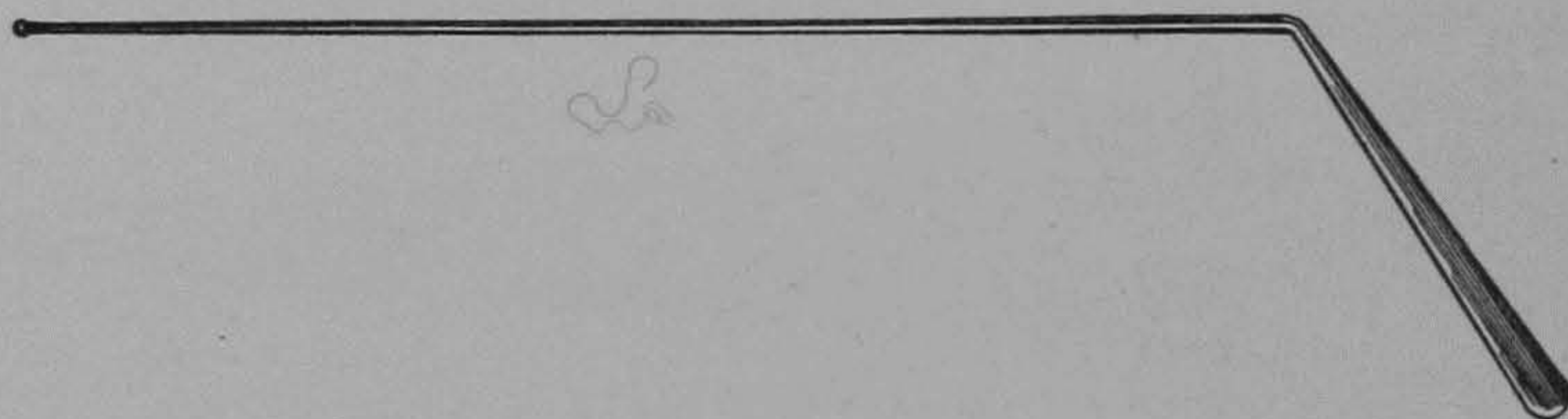


Delicate Mouse-toothed Forceps.

and the light is steadier. If, however, this is not obtainable, a gas or oil lamp can be used with good results.

The reflecting mirrors are like those used by the laryngologists, and should be about three inches in diameter.

FIG. 328.



Ureteral Searcher.

For the examination of the ureters long flexible catheters are used; these are made of braided silk, coated with varnish and rubbed

FIG. 329.

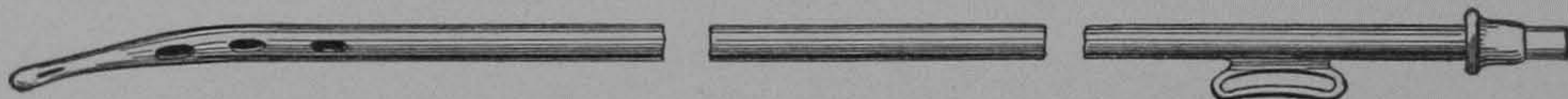


End of long flexible Ureteral or renal Catheter.

perfectly smooth. They are made in two lengths, the short ones, 30 centimeters long, being spoken of as ureteral catheters, the long ones, 50 centimeters, being the renal catheters. The diameter varies from  $1\frac{3}{4}$  to 3 millimeters, and they are numbered according to the measured diameter.

Metal ureteral catheters are also used to catheterize the lower

FIG. 330.



Metal Ureteral Catheter.

portion of the ureter, and those of larger caliber can be employed as dilators for strictures in the lower portion of the ureter.



THE PREVIOUS PREPARATION OF THE PATIENT.

The patient should have had the bowels well moved before any examination is attempted. The clothes around the waist must be loosened or removed, and the corset should always be taken off. The urine must be passed immediately before she is placed in position on the table, and the bladder is more apt to be completely emptied if the urine is voided standing or if a catheter is used and the bladder is squeezed out bimanually.

The room where the examination is to take place is so arranged

FIG. 331.



The patient in the knee-breast position with the cystoscope in the bladder. The small dilator marks the position of the rectum.

that it may be darkened at will, the examining table being either a plain wooden table covered with a thin mattress or a regular office table.

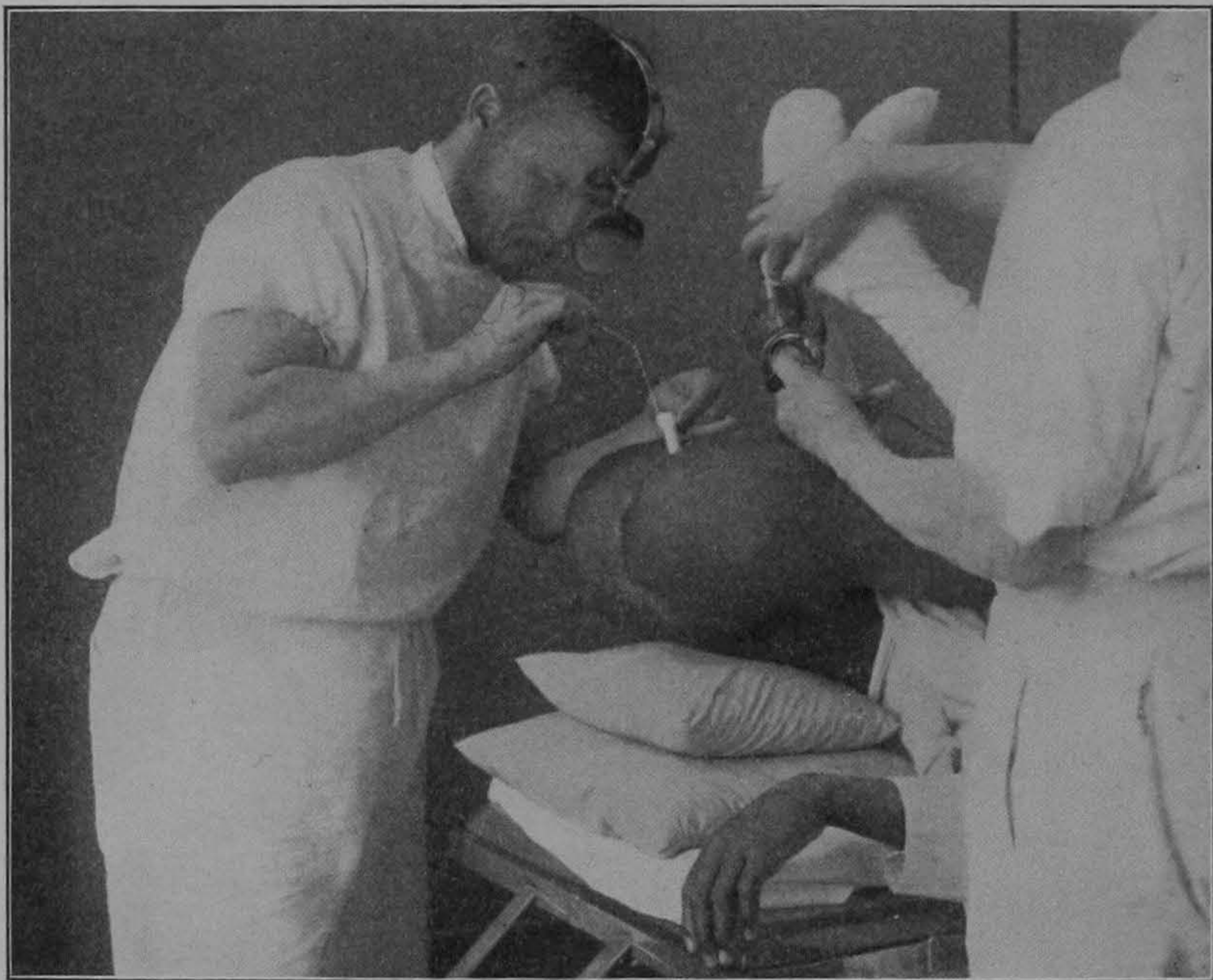
The instruments are placed on another table near the examiner's hand.

The knee-breast position is the most useful one in the majority of cases. The buttocks and legs of the patient are covered with a



sheet, in which there is either a long slit or a square opening to prevent unnecessary exposure. The labia are gently separated, and the genitals, especially the meatus, are carefully washed with a boracic solution, and then an applicator wrapped with cotton and moistened with a 10 per cent. solution of cocaine is introduced a few moments into the urethra; or in place of the applicator a small pledget of cotton moistened with the same solution may be laid against the urethral orifice. This is allowed to remain in place four

FIG. 332.



Searching for the ureteral orifice with the patient in the dorsal position.

or five minutes, then removed, and the patient is ready for examination.

The use of an anesthetic is usually not necessary, though where this is the first examination, especially with nervous patients, anesthesia will be of great assistance.

The patient may be also examined in the dorsal position, the hips raised six or eight inches above the table, bags filled tightly with bran being placed under the buttocks. In thin women this position is more practicable, but with a large, stout woman it will often be found impossible to get the bladder well dilated, and in any case the examination is much more difficult than with the patient in the knee-breast position.



THE INTRODUCTION OF THE CYSTOSCOPE AND EXAMINATION OF  
THE BLADDER AND URETHRA.

The patient being in position and ready, the examiner separates the labia, and, first measuring the size of the urethra with the conical dilator, determines which cystoscope can be most easily introduced. The cystoscope is then grasped, the handle being held in the fingers, the thumb pressing steadily against the handle of the obturator, holding it in position and preventing it from sliding back when the cystoscope is introduced; the end is lubricated with boro-glycerin solution, and it is ready for introduction.

With the patient in the knee-breast position the general direction of the urethra is nearly directly horizontal; and this is the direction in which the cystoscope is held and introduced, a gentle curve being described around the under surface of the symphysis. It should after passing the meatus glide easily and with but little resistance. A mistake which is almost always made at first is the attempt to use cystoscopes of large diameter, these hardly ever being introduced without exerting much force and hurting the patient greatly; therefore, if the cystoscope which was at first tried will not pass easily, a smaller one should be used.

If it be necessary, the urethra may be safely dilated to a diameter of 14 or 15 mm., the only bad result being slight laceration of the external meatus, incontinence never resulting where no greater dilatation than this is attempted.

The dilatation is best carried out by using the graduated Hegar's dilators or the conical dilator before described. Anesthesia will almost always be found necessary in these cases.

As soon as the cystoscope is introduced the obturator is withdrawn, and the air rushes into the bladder, and distends it with an audible suction sound. The light is held by an assistant in such a manner as to make the angle of reflection the smallest possible, and the mirror is manœuvred so as to keep the pencil of light constantly thrown into the bladder during the examination. The first point viewed when the obturator is removed, if the bladder is well dilated with air, is the posterior wall.

It is best to always have a routine system to follow in bladder examinations, and there must be some landmarks to allow of description and for reference in future examinations or treatment. These landmarks may be divided into (1) artificial, (2) natural.



*Artificial.*—The two points, the internal urethral orifice and that part of the posterior wall opposite to it, may be referred to as the anterior and posterior poles of the bladder; and with these as centers the bladder-walls may be divided into an anterior and posterior hemisphere and quadrants by imaginary lines bisecting the two poles; we can thus speak of changes occurring, for instance, in the upper posterior left quadrant, and at the next examination will be able to locate again the same area by reference to our imaginary lines.

Another method, which although not so definite is simpler, is to divide the bladder into the vault, the anterior, the posterior, and two lateral walls, and the base.

*Natural Landmarks.*—These are the internal urethral orifice, the ureteral eminences, the two ureteral folds, and the interureteric fold.

The internal urethral orifice may be recognized by withdrawing the speculum until the urethra commences to close over the end, and then pushing it in again for about  $\frac{1}{2}$  centimeter.

The ureteral orifices are important landmarks, and with the patient in the knee-breast position are often found at the summit of a small eminence, or the so-called "mons ureteris." The ureteral fold or ridge is formed by the lower end of the ureter in its passage through the bladder-wall, and another landmark is the interureteric fold or ridge, which is found extending from one ureter to the other, and forms one boundary of the vesical triangle, or the "trigonum vesicæ."

The normal groundwork of the bladder as it appears through the cystoscope is of a dull whitish color, everywhere divided by a network of branching vessels.

By elevating and depressing the handle of the cystoscope and moving it from side to side all parts of the posterior hemisphere can be brought into view. By moderately elevating the handle of the cystoscope the vault of the bladder is seen, and, as a rule, there will be found here a few cubic centimeters of urine which must be removed by the suction apparatus before all the parts can be distinctly seen.

The trigonum is brought into view by withdrawing the cystoscope until the internal urethral orifice just begins to close over it, and then pushing it in slightly. This portion of the bladder is always a little more injected and rosy than the rest of the mucosa. The ureteral orifices may be found by turning the cystoscope about



30° to the right or left, with the end projecting about 1 or 2 cm. into the bladder.

The urethra can be viewed from end to end as the cystoscope is withdrawn from the bladder: the walls fall together and form a funnel-shaped figure over the end of the instrument. The color of the normal urethra is a rosy-red, darker in brunettes, and exhibits radiating bands slightly lighter in color.

On closer inspection the orifices of the small urethral glands are seen, being more thickly placed on the lateral walls.

#### PALPATION.

The whole length of the urethra can be palpated through the vagina, and it is noted whether on pressure pus can be squeezed out,

FIG. 333.



Squeezing pus out of the urethra with the finger in the vagina.

then whether there is any tenderness present, either localized or general; the shape and consistency of the urethral tube, whether more rigid than normal or increased in thickness, and whether it can be rolled under the finger or is fixed by periurethral changes.

The base of the bladder may be palpated with the finger in the



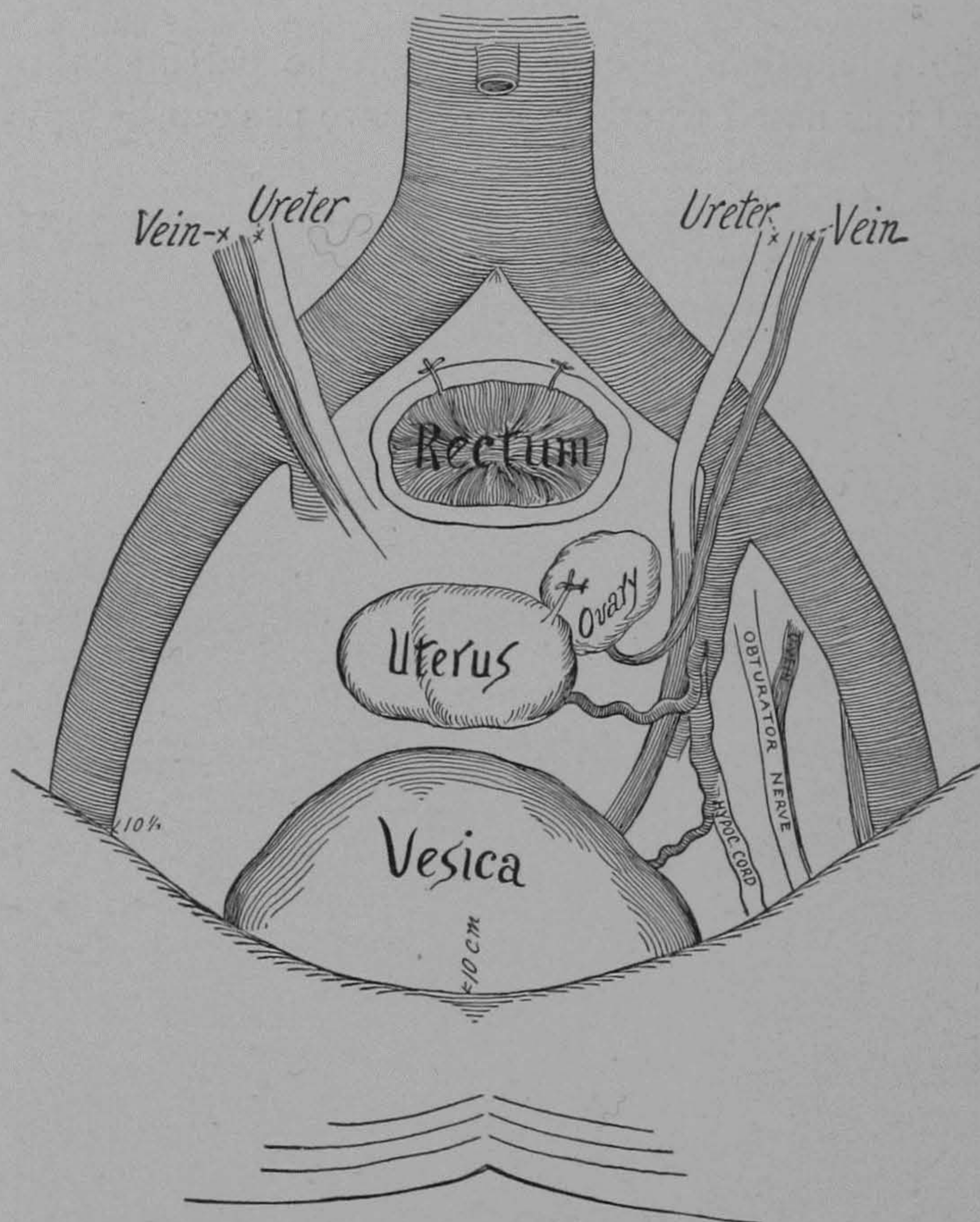
vagina, and thickening of the bladder-walls or the presence of foreign bodies may be made out by bimanual palpation, with the patient either in the usual dorsal position or with the patient in the knee-breast position.

#### EXAMINATION OF THE URETERS.

No portion of the ureters can be examined visually, save the ureteral openings into the bladder, unless an exploratory incision be made.

We have at our disposal two methods of examining the ureter:

FIG. 334.



Pelvic Portion of the Ureter viewed from below,

(1) Indirect, by means of the ureteral catheter or bougie; (2) By direct palpation through the vagina, the rectum, and the abdominal wall.

*Indirect Examination.*—The cystoscope is introduced as described, the orifice of the ureter located, and cleansed, if necessary, with a small pledget of cotton held in the mouse-tooth forceps.



PLATE XXXVIII.

FIG. 1.



FIG. 2.



COURSE OF THE URETERS AND PELVIC BLOOD-VESSELS.

FIG. 1.—A, abdominal aorta; CI, common iliac arteries; U, U, U, ureters; V, renal vein; K, kidney.

FIG. 2.—U, U, ureters; B, bifurcation of the common iliac artery; A, common iliac artery; A, A, internal and external iliac arteries; V, common iliac and mesenteric veins.



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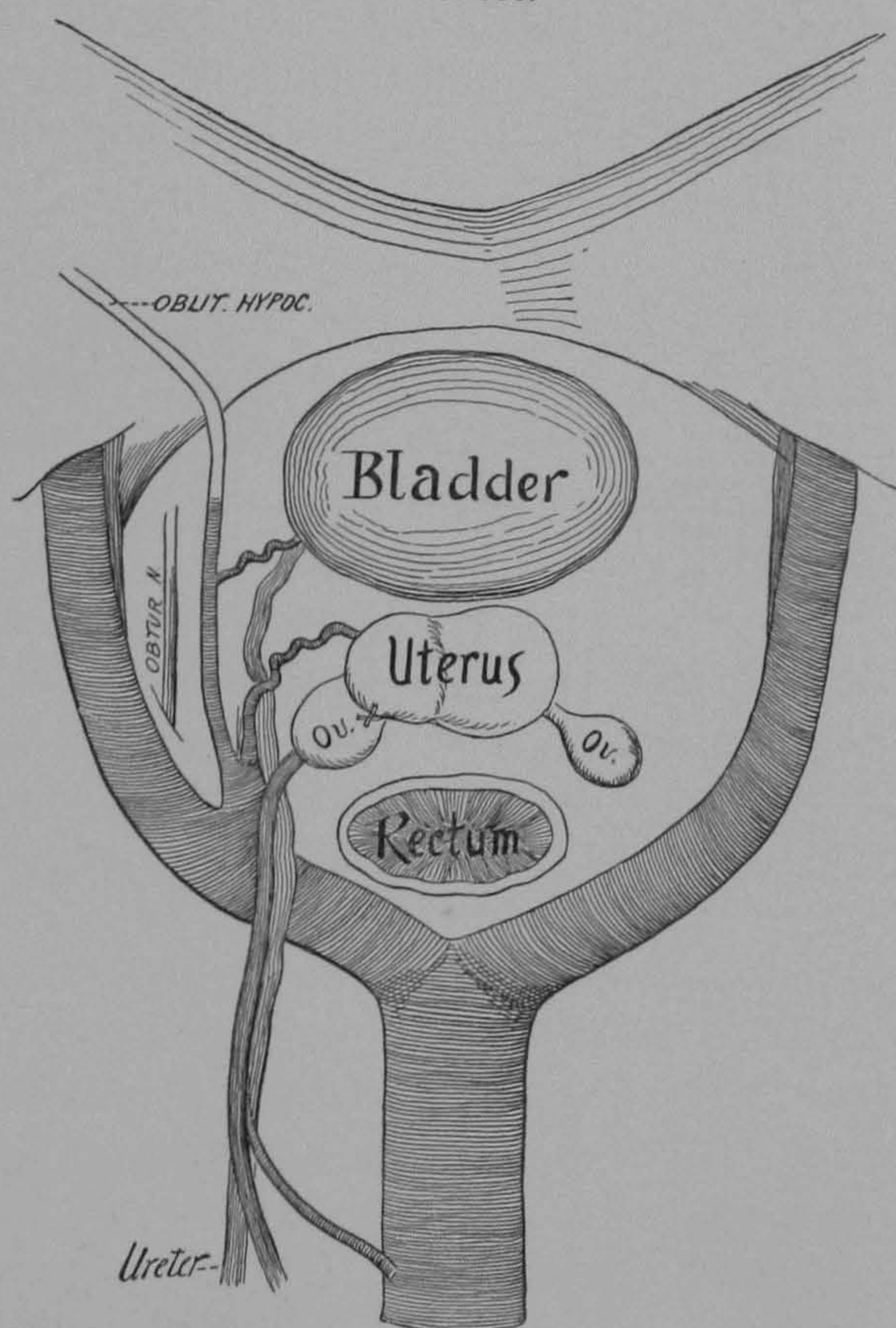
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India-rubber finger-cots are then placed on the thumb and fore finger of the hand to be used, and the long or short ureteral catheter is guided through the cystoscope and into the ureteral orifice, the point having been previously moistened with the boroglyceride solution. The assistant supports the outer end of the catheter, prevents

FIG. 335.



Pelvic Portion of the Ureter viewed from above.

it from touching the head or face of the examiner, and slowly withdraws the wire stylet as the catheter advances. But little force is necessary to carry the catheter upward, the feeling as soon as the orifice is passed being that the catheter is in a large free space.

By this means strictures of the ureter are discovered and localized. Stones lodged in the ureter may be detected in this way, and any distortion or twisting of the ureter will be seen in the shape that the catheter takes on its removal. The urine from the side catheterized is also collected and examined for any abnormal constituents.



*Direct Palpation.*—By the vagina the lower portions of the ureter, from its point of entrance into the bladder to the lateral and posterior walls of the pelvis, can be easily palpated, especially if changed and hardened by disease; and by the rectum it may be felt in its course along the posterior wall nearly or quite to the brim.

The abdominal portion of the normal ureter can only rarely be palpated directly through the anterior abdominal wall, but not infrequently a ureter hardened and thickened by disease can be so palpated, and almost always in ureteral inflammatory disease;

FIG. 336.



Course of the Ureters marked on the Abdomen.

marked tenderness can be elicited on pressure on points about 3 cm. (1 inch) to the right or left of the promontory of the sacrum, which is first located by deep palpation.

## DISEASES OF THE URETHRA.

### MALFORMATIONS.

*Complete Absence of the Urethra.*—This is a very rare condition, and is usually accompanied by other abnormalities of the genito-urinary tract.



The bladder opening is generally seen as a transverse slit on the anterior vaginal wall, and there is in most cases incontinence of urine, though occasionally the urine can be retained for a short time.

*Partial Absence of the Urethra.*—In this condition only a portion of the urethra is defective, the defect being either of the external or internal portion. If of the internal urethra, there is usually incontinence of urine, as the neck of the bladder is apt to be involved.

*Hypospadias.*—This is an absence of more or less of the inferior wall of the urethra, the anterior and part of the lateral walls being present, forming a groove where the urethra should naturally lie.

The condition varies greatly in degree, from the cases where the urethral orifice is only slightly displaced to those where the orifice is found in some position on the anterior vaginal wall, and is not to be seen on inspecting the external genitalia, the urine appearing to be discharged from the vagina.

Another variety of hypospadias is seen where there is persistence of the sinus uro-genitalis. In these cases there is only one opening present between the perineum and the clitoris, this being the outer ending of a canal which divides above to form the urethra and vagina.

*Atresia.*—This occurs as a congenital condition affecting either the whole urethra or only some portion of it. The urethra also may only be separated from the bladder by a thin septum, the septum being usually found at the junction of the urethra and bladder.

In some of the cases there exists an opening at the umbilicus through a patulous urachus, by which the fetus during its intra-uterine life discharges the urine, and the same condition will persist after birth as a patulous urachus, unless an opening is substituted below by operation.

Frequently, however, the fetus with a urethral occlusion has no avenue for the discharge of the urine, and the abdomen in such cases becomes so much distended as to require puncture before the delivery can be effected. In these cases there is, besides the marked dilatation of the bladder, double hydroureter and hydronephrosis.

**TREATMENT.**—Many of these affections do not call for treatment, either occasioning death during the intra-uterine period or being associated with other such serious malformations of the genitals as to exclude entirely the idea of any curative treatment.



The defects in the urethral wall may be closed by a plastic operation, taking flaps from the vaginal wall and forming with them a canal which should be a little larger than the normal canal to allow for the subsequent contraction.

Atresia, if due to a septum, may be perforated with a small trocar and cannula, thus establishing a communication which may be enlarged subsequently.

Other methods of treatment will be suggested by the character of the case.

### PROLAPSE OF THE URETHRAL MUCOSA.

CAUSE.—This condition is most frequently seen in young children, though it has also been noticed in women past the middle age. It appears following severe attacks of coughing or from straining at stool, and vesical calculi, urethritis, and rectal irritation from pressure, hemorrhoids, or prolapsus are also frequently associated with it. In women it is usually an eversion of that part of the mucous membrane lying adjacent to the external orifice. In little children, on the contrary, the eversion is from the deeper urethra.

SYMPTOMS.—Frequent and painful micturition and tenderness about the urethral triangle are the chief symptoms. It is also frequently attended by painful coitus and may interfere with walking.

X DIAGNOSIS.—As the symptoms are not diagnostic, a visual examination is necessary. The prolapsed portion of the urethral mucous membrane appears as an intensely red, highly vascular tumor, in the center of which the urethral opening is found. In children the tumor is apt to be more prominent, and is usually of a deeper red or bluish color. If the prolapsus is of long standing, the mucous membrane may present a glazed, dry, or excoriated surface.

A condition of prolapse of one or the other of the ureteral eminenences has been noted, simulating prolapse of the urethral mucosa; the diagnosis is, however, easily made by the presence of the ureteral orifice, and by the use of a small probe, which shows, when passed between the prolapsed portion and the urethral wall, where the eversion begins.

TREATMENT.—In recent cases, especially in children, after the prolapsed mucosa is replaced the patient should remain in bed for a few days, and astringent urethral suppositories or topical applications of dilute carbolic acid or iodine may assist in retaining the mucous membrane *in situ*.

X a prolapsus has always a broad base and is easily reduced.



The bowels should be kept loose, as straining at stool always increases the prolapsus, and the bladder should be carefully explored for stone, tumors, or polypi.

If the condition is persistent and does not yield to local treatment, the redundant mucous membrane should be excised and the external and urethral edges brought together by fine silk sutures. The sutures must be passed through the urethral mucosa before the incision is made to prevent retraction of the severed edges into the urethra.

#### DILATATION OF THE WHOLE URETHRA.

CAUSES.—This condition frequently follows unwise attempts to explore the bladder by rapid dilatation and the introduction of the index finger. It has been occasioned by dragging a large stone out of the bladder through the urethra, or by the spontaneous expulsion of large stones or pieces of tumor.

It is not uncommon in women suffering with either congenital or acquired atresia of the vagina, coitus being practised *per urethram*; and there are also instances where the dilatation was due to the daily insertion into the urethra of wax candles or other large bodies for the relief of sexual excitement. *✓✓*

SYMPTOMS.—Persistent incontinence of the urine and the irritation of the surrounding parts are the most trying symptoms, but, curious to state, in the cases in which the dilatation has been due to coitus *per urethram* there is rarely incontinence, the urine only escaping on coughing or some sudden exertion.

DIAGNOSIS.—This will be made as soon as the labia are separated and an examination attempted, the finger slipping into the dilated urethra while searching for the vagina, the dilatation being in some instances great enough to allow two fingers to be inserted through the urethra into the bladder.

TREATMENT.—The relaxation due to coitus should not be touched unless the vaginal canal can be restored, especially as the symptoms occasioned by this form are apt to be slight. If operative help is decided on, an area on each side of the external urethra may be divided and sutures passed in such a way as to produce tension, lifting the posterior wall of the urethra firmly up against the anterior. In this way the urine is held back until the obstruction is overcome by pressure from above.

The best method, however, of treating this condition is by excis-



ion of a portion of the anterior vaginal wall and of the posterior wall of the urethra, the excised portion of the urethral wall measuring 4 or 5 mm. in breadth. The edges of the wound are brought together by silkworm-gut or silk, the sutures holding together the edges of the urethra being carefully placed, approximating the edges of the wound exactly, and not entering at any spot the lumen of the canal.

The incontinence may also be controlled in some cases by using a pessary which will press against the urethra.

#### PARTIAL DILATATION OF THE URETHRA.

This condition is also known under the name of "urethrocele" or "sacculated urethra," and is usually situated in the middle third of the canal.

CAUSES.—Stricture or lessening of the caliber of some portion of the canal, either by a hyperemic condition of the mucosa or by pathological changes following inflammation; and pressure on the urethral wall behind the obstruction following from the retained urine. Childbirth may also be a cause, the pressure of the child's head during delivery bruising or wounding the middle portion.

FORMS.—The muscular wall may be thickened and hypertrophied around the sacculated portion, this form being usually seen where there is some obstruction to the outflow. On the other hand, the sacculation may be due to a prolapse of the mucosa through the muscular coat.

SYMPTOMS.—Frequent desire to micturate, with perhaps some incontinence of urine on exertion. In some cases, besides the frequent desire, a straining or difficulty in micturition will be seen. There are also the symptoms of urethritis present, as this condition usually accompanies the urethrocele.

DIAGNOSIS.—This can be made by passing into the urethra a sound with the point bent slightly downward, the area and degree of dilatation being mapped out between the sound and a finger inserted into the vagina. This lesion must not be mistaken for a simple prolapse of the anterior vaginal wall, the difference being easily made out when the sound is introduced: as in prolapse of the vagina, the axis of the urethra is in the normal direction. A cyst in this position can also simulate an urethrocele, but the differential diagnosis is made by the relations which are demonstrated by the sound.



It can be differentiated also from a suburethral abscess by the symptoms, the prominent tumor, and the pain on walking or coitus.

TREATMENT.—If only of slight degree, astringent bougies or applications, with relief of a stricture or other local condition, will usually effect a cure.

In the more marked cases the only method of relief is by operation. A wedge-shaped piece of tissue over the dilated portion is excised, removing the surplus tissue, including the whole thickness of the septum. The edges of the wound are brought together by silkworm-gut sutures, and a catheter is retained in the canal for two or three days.

#### STRICTURE OF THE URETHRA.

The strictures seen in the female urethra are generally circular and more or less localized, though they may affect the whole canal. They are of uncommon occurrence.

CAUSES.—Ulceration of the urethra as the result of chancroid or a very severe gonorrheal infection is apt to cause a localized stricture by the subsequent contraction of the scar.

Injury to the urethra during childbirth is also a frequent cause of stricture, as are other varieties of trauma.

Tubercular ulceration may also cause a narrowing of the lumen in one or more areas.

Neoplasms of the urethra are rare causes, though in the early stages, before ulceration has set in, they may narrow the urethral lumen.

General narrowing of the urethral canal may be the result of a severe urethritis or periurethritis, the tissues being the seat of a small-celled infiltration and subsequent contraction. There may also be narrowing due to carcinomatous or sarcomatous infiltration of the tissues around the canal.

SYMPTOMS.—In a large majority of the cases no symptoms are complained of, and the condition is only discovered accidentally. In a certain number of cases, however, the complaint of frequent and difficult micturition, gradually increasing, is made, and in rare cases there is incontinence, or, on the other hand, there may be infrequent micturition, at times approaching retention. In cases of long standing, cystitis or dilatation of the bladder may result.

DIAGNOSIS.—As the symptoms are not sufficiently suggestive, the urethra should always be examined. A vaginal examination usu-



ally shows thickening at some point on the anterior wall corresponding with the course of the urethra. If a sound be introduced, it will meet with resistance at this point, and it may be impossible to pass it farther.

PROGNOSIS.—This should always be guarded, as the stricture will again occur unless it can be dilated at intervals. Cystitis or dilatation of the bladder is always a dangerous symptom and gives a more unfavorable prognosis.

TREATMENT.—Gradual dilatation should be practised by means of Hegar's dilators, starting with one of the small sizes and gradually increasing the size until a No. 10 or 12 is reached. Care should be used not to rupture the urethra by too rapid dilatation, as incontinence may result from such an accident. Very rarely, when the cicatricial tissue is dense and unyielding, division of the stricture according to "Otis' method" in stricture in the male may be required.

In the rare cases where the stricture cannot be dilated an opening between the urethra and the vagina behind the stricture may be made, and the edges of the urethral mucosa stitched to the vaginal mucosa by fine silk sutures. In making this incision the neck of the bladder must be carefully avoided, as otherwise incontinence will result.

### URETHRITIS.

CAUSES.—In a large majority of the cases the urethritis is due to a gonorrheal infection, and is only part of a general infection of the genital tract. In other cases the inflammation is due to the presence of the tubercle bacillus. In other cases, again, the urethritis follows a trauma, as in childbirth, a suppurative or diphtheritic cystitis, or inflammation of the neighboring organs. There is also a certain mild form of urethritis seen in women where there has been no opportunity for infection by contagion, and where there can be no suspicion of gonorrhea, and which runs its course in a few days. *Catarrh?*

SYMPTOMS.—In the milder forms of urethritis the principal complaints are of a burning pain on micturition, of an increased frequency in the desire to pass the urine, and of a slight purulent urethral discharge. There is also some tenderness on pressure on the urethra, and perhaps swelling and a slight tendency to prolapse of the swollen mucous membrane.



In the gonorrheal urethritis there is at first, following the infection, an itching sensation in the urethra, followed in a day or two by the sensation of burning or stabbing pain on micturition, and generally increased frequency of the desire to void the urine. If the urethra is examined during the first day or two, very little can be made out: there is a slight serous or sero-purulent discharge from the meatus and some pain on pressure. Later the discharge becomes purulent, and on pressure can be squeezed out of the urethra, appearing at the meatus as a yellowish drop.

The meatus will be found reddened, the edges everted with a tendency to slight prolapse of the mucosa, and if a speculum be introduced the whole urethral mucosa is found reddened and much swollen. On pressure through the vagina the urethra is tender.

Tuberculosis of the urethra is usually seen as an ulcerated area, and it is almost always secondary to bladder tuberculosis, and the symptoms are therefore apt to be masked by the bladder condition.

DIAGNOSIS.—This should be based on the symptoms, the burning pain on micturition being quite characteristic. A visual examination should also always be made, noticing first the condition of the meatus, then with the finger in the vagina pressing on the urethra and noting the pain, and also whether pus can be squeezed out. The pus squeezed out of the urethra should always be examined microscopically, determining in this way the presence of the gonococcus or other organism present.

A local examination should always be insisted upon, as the symptoms are usually not characteristic enough to allow of a differentiation between urethritis and certain forms of cystitis, and it is of great importance in the treatment that this differentiation be made.

TREATMENT.—In the very acute forms rest in bed is necessary. A light, easily digested diet should be ordered, advising also the use of some mineral water to lessen the acidity of the urine, or the citrate of potash, taken in 20 gr. doses three or four times a day, may be used for the same purpose. Locally, hot applications to the vulva or the hot vaginal douche, containing, if there is a suspected gonorrhea, the bichloride of mercury in solution, should be ordered. 3:1000-

Later urethral irrigations may be practised, using dilute solutions 1:1000- of the bichloride of mercury or of nitrate of silver.

Medicinal agents may also be applied to the urethra in very soft ointments, being introduced through a small-sized cystoscope.

mercury  $\frac{1}{40}$  gr to 3j - olive  
 silver  $\frac{1}{60}$  gr to 3j  
 hydrate gr X to 3j



In the chronic forms, where there are ulcerated or granulating areas, local application through the cystoscope of weak nitrate-of-silver solutions is the best form of treatment.

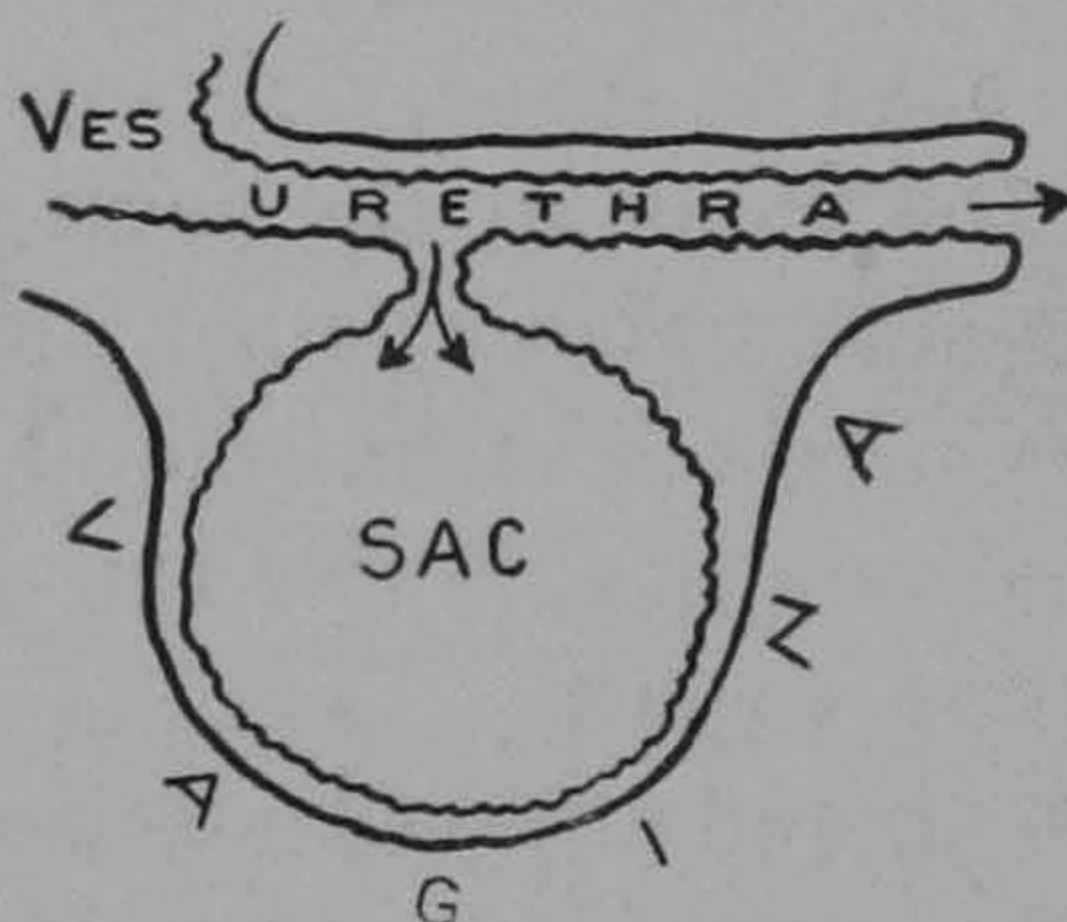
### SUBURETHRAL ABSCESS.

CAUSE.—This condition is quite rare, and the cause is uncertain, though it is usually attributed to distention and ulceration of one of the glands in the floor of the urethra, or in other cases to rupture of fibres of the urethra, with a sagging at this point, where the urine accumulates and decomposes, occasioning inflammatory changes and abscess-formation.

SYMPTOMS.—Usually painful micturition, gradually increasing in severity, and a discharge of ammoniacal urine or pus on changing the position or on coitus. Pain during coitus and the presence of a painful tumor in the vagina.

DIAGNOSIS.—This is easily made by examination, there being found in the anterior vaginal wall a tender ovoid fluctuating tumor,

FIG. 337.



Urethral Diverticulum, containing pus and residual urine.

which partially disappears on pressure, the pus being squeezed out into the urethra. It can be differentiated from cysts of the vaginal wall by the tenderness and by its communication with the urethra, and from a "urethrocele" by the great tenderness, the presence of a circumscribed tumor, and the general symptoms.

TREATMENT.—The best method is by excision, removing an elliptical piece of the vaginal mucosa, and carefully dissecting out the whole cyst-wall down to the urethra, which is left intact, followed by immediate closure of the wound by silkworm-gut sutures.

A slower method is by an incision through the abscess-wall, the cavity being packed with gauze, thus keeping the incision open and allowing it to heal by the formation of granulation tissue.



## NEOPLASMS OF THE URETHRA.

The portion of the urethra most apt to be affected is the external orifice, though growths in other portions are not uncommon.

The neoplasms are divided into (1) the benign, and (2) the malignant neoplasms.

## CARUNCLE.

*{ microscopic exam. shows these tumors full of dilated capillaries and nerve fibers = angiomas or neuromata.*

This is a tumor usually located at the external meatus, involving one or both lips and appearing as a raspberry-red tumor, exquisitely sensitive and bleeding readily upon touch.

SYMPTOMS.—As the growth is usually exquisitely sensitive, the acute pain on micturition is easily explained. There is also great pain on coitus, simulating at times a condition of vaginismus, and in some cases there is pain on walking. The bleeding is small in amount, never giving rise to free hemorrhage.

These tumors are made up of connective tissue in which courses an extensive network of blood-vessels covered by flattened epithelial cells. *Are generally pedunculated and are non-reducible.*

It is not precisely known to what the sensitiveness is due—whether, as is most probable, to an unusual nerve-supply, or whether to the baring of the nerve-endings by the destruction of the epithelium of the surface.

TREATMENT.—Excision is the only treatment which will give relief. This may be done under cocaine anesthesia, any hemorrhage which may appear being controlled by the sutures which are passed immediately, bringing together the edges of the wound.

A better result is obtained by using general anesthesia, as the growth may then be more carefully removed and better coaptation of the edges of the wound will be obtained, as the patient is perfectly quiet.

CONDYLOMATA. = *venereal warts.*

CAUSES.—These warty growths are usually found in connection with similar disease of the other parts of the external genitals, and are most frequently seen in cases of gonorrhea, though they are occasionally present where there is a non-specific irritating discharge. Filth and dirt are also causes.

SYMPTOMS.—The small growths give rise to no symptoms; the larger growths are troublesome only from their size.

DIAGNOSIS.—This is easily made from an inspection of the external genitals. The growths, usually multiple, are of a pale pinkish



color, usually tipped with white, more or less pedunculated, and with a tendency to confluence and the formation of large tumors. The microscopical picture is that of a warty growth, the groundwork of the tumor being connective tissue in which the blood-vessels are distributed; the layer of epithelium covering it is increased in thickness.

TREATMENT.—Each condyloma is to be snipped off with a pair of sharp scissors, and the bleeding point touched with the thermo-cautery. The larger growths may either be removed by the thermo-cautery or with the knife. If the knife is used, the thermo-cautery or a few fine silk sutures will be necessary to control the hemorrhage.

#### URETHRAL POLYPI.

These are rare growths, sometimes appearing in the adult and sometimes being congenital. They may be multiple, or only a single tumor may be present, consisting of a groundwork of closely packed connective-tissue fibers, covered with several layers of pavement epithelium and having the same appearance as fibromata elsewhere.

TREATMENT.—They may be removed with the curette and scissors, or, if there is only a single one deeply seated in the urethra, a snare may be used.

#### CYSTS OF THE URETHRA.

CAUSES.—These are usually formed by the occlusion of the orifice of a urethral gland. They are not limited to any one age, and, though not extremely rare, are uncommon. (*also dermoid cysts*).

SYMPTOMS.—The cysts are apt to occasion difficulty in micturition, and if situated near the external orifice may protrude through it, giving rise to a tumor which must be differentiated from prolapsus, caruncle, or fibroma.

TREATMENT.—Puncture of the cyst, or, if it is troublesome, removal by urethrotomy, the wound in the urethra being closed immediately by fine silk sutures. Care must be taken that in introducing the sutures they do not pass entirely through the mucosa and enter the lumen of the urethral canal.

#### CONGENITAL MALFORMATIONS OF THE BLADDER.

*Complete Absence of the Bladder.*—This is a very rare condition, and in most cases it is rather a marked atrophy of the organ than a complete absence. If the bladder is, however, completely



absent, the ureters open either into the urethra or into the rectum. Usually, as most of these cases are accompanied by other marked abnormalities, the child is either dead born or dies soon after birth.

*Double Bladder.*—Cases of true division of the bladder into two halves are exceedingly rare, and it is probable that most of the cases described as double bladder by the older authorities were, in fact, cases of extreme sacculation. There have been, however, some cases reported where there was undoubtedly a division of the bladder into two halves. Usually the septum runs antero-posteriorly, there being one ureteral orifice present in each half. The urethra opens into either the right or left half, and there is an opening in the septum to allow the urine to pass from the other half into the urethra. The condition of double bladder, besides the sacculation above spoken of, which is usually the result of disease or of displacement, may be simulated by a dilated urachus, though from the position this is easily recognized.

It is also possible for a congenital cyst in close proximity to the bladder to simulate a supernumerary bladder.

None of these conditions demand any treatment, the condition being only discovered at the autopsy table. *Turning inside out*

*Extroversion or Exstrophy of the Bladder.*—This anomaly is far more frequent in the male than in the female sex, it occurring about once in the female in every five cases seen. The abnormality varies greatly in degree. According to Güterbock, the following forms may occur:

(1) A diastasis of the abdominal muscles and of the symphysis pubes, the bladder, covered by the normal skin, projecting through this opening.

(2) A diastasis of the muscle, symphysis, and skin, the closed bladder projecting from this opening, connecting, however, in the usual manner with the normal urethra.

These two forms are usually classed as hernia of the bladder, though they evidently arise in the same manner as the more marked forms of extroversion.

(3) The true extroversion is divided into (a) "fissura anterior totalis vesicæ," and (b) "fissura anterior partialis vesicæ," which is a much rarer form, the opening being either above at the upper portion of the bladder or below near the base. Under this second form may be classed also the patulous condition of the urachus.



On examining these cases of true extroversion a separation of the abdominal walls and of the symphysis pubes will be found, the space between the pubic bones being either slight or extensive, and either filled in with fibrous tissue or existing as an unobstructed opening. In the opening thus formed will be found the bladder pushed forward by the viscera crowding down upon the posterior surface. It appears as a red, spongy-looking mass, usually encrusted in places by the urinary salts, or there may be ulcerated spots in various parts of the wall. The ureteral orifices will be found either at the summit of small eminences or perhaps hidden in a fold of the bladder-wall, and there will be seen every few moments a spurt of urine from one or the other side. The clitoris is usually found divided, lying on the two sides of the opening, although in some cases there is entire absence of any attempt at the formation of this organ.

The vagina may be normal or may appear as an elongate transverse fissure.

The uterus and its appendages are usually normal.

**SYMPTOMS.**—The symptom complained of most bitterly is the constant flow of urine over the surrounding parts, giving rise, unless great cleanliness is observed, to troublesome excoriations. The constant urinous odor which always attends these patients is also a great source of mortification.

Pain is also complained of from the irritation and rubbing of the clothes on the protruded bladder, and there is apt to be slight hemorrhages from this source. There is also apt to be inflammation of the mucosa with ulceration, and this adds to the discomfort from the pain and profuse purulent discharge, as well as to the danger to life from an ascending ureteritis and pyonephrosis.

**TREATMENT.**—The treatment of this anomaly is a subject of no little importance, from the great distress occasioned by the constant dribbling of the urine and the excoriation of the parts. In all cases the treatment, whether operative or mechanical, is only palliative, as the function of the bladder cannot be completely restored. Various mechanical devices have been employed for conducting the urine away from the bladder, but they are usually unsatisfactory, and the repair of the defect by a plastic operation should always be attempted. On account of the impossibility of keeping the field aseptic, failure is frequent, and many operations may be required to accomplish the result desired.

A number of ingenious operations have been devised for exstro-



phy of the bladder, but those employing a central flap made from above, with lateral flaps, appear to be the most advisable. Thiersch's operation embraces these principles, and is frequently successful. The deformity of the urethra should first be corrected before the vesical defect is repaired.

The method as devised by Thiersch consists, first, in the lifting up of a flap from the centre of the abdomen above the opening. This flap should be of sufficient size to close the bladder, and must have a pedicle. The edges of the abdominal opening are freshened, and the flap is brought down in such a way as to throw the skin surface against the mucous membrane of the bladder. The margins of the flap are then stitched to the denuded edges of the abdominal opening.

Bridge-like flaps are dissected up from the inguinal region on either side of the opening, leaving both ends attached. Iodoform gauze is packed beneath these flaps until granulation springs up and the nutrition of the parts is well established, when the upper ends may be cut and the flaps pushed over upon the granulating surface of the central flap and secured in place by suture. In this way the first flap is reinforced and the lateral edges of the divided opening are protected. In all these cases there will be incontinence of urine, as the sphincter muscles are absent, and so far no method of treatment has been advanced to replace their function. For this reason some form of ambulatory urinal is required.

Thiersch, in order to do away with the necessity of using a urinal in women, has established an artificial channel from the bladder to the rectum. This is not advisable, as the rectum is not tolerant to urine, and if it loses its function the condition of the patient is more deplorable than it was in the beginning.

Billroth advises making a small opening through the central flap, as the recti muscles often close the opening sufficiently to retain the urine. Skin-grafting may be used if the skin does not extend to the center of the flap.

Preceding operations for the restoration of extroversion, the surrounding parts must be restored to a healthy condition by the liberal use of the zinc-oxide ointment. The urine should be kept bland by the proper drugs if it tends to produce irritation. The general nutrition of the patient should be carefully looked into, and no operative measures instituted before she is in good health. If the operation be successful, some form of ambulatory urinal may be



prescribed, and the patient is able to live more comfortably, as the excoriation and inflammation of the surrounding parts, the disgusting odor and constant dribbling of urine, are obviated.

#### DISPLACEMENT OF THE BLADDER.

These may be divided into—(1) Upward displacement, (2) Downward displacement, (3) Prolapse of the bladder.

*Upward displacements of the bladder* are most frequently observed in large myomatous tumors of the uterus, where, as the tumor develops, the bladder is dragged up with it.

**SYMPTOMS.**—There are usually no symptoms complained of, though occasionally there may be frequent urination.

**TREATMENT.**—The only method is by the removal of the tumor.

*Downward Displacements of the Bladder.*—This condition is seen in its mildest grade, where, with a laceration of the perineum, there is a tendency to downward displacement. The so-called cystocele or prolapse of the anterior vaginal wall, which is so common in multiparous women, must not be confused with this condition.

A more marked displacement is seen accompanying partial or complete prolapse of the uterus, and rarely, with complete prolapsus of the uterus, the whole bladder may be displaced outside of the body.

**SYMPTOMS.**—As there is in these cases almost always some residual urine, there is apt to be a cystitis present. There is usually, too, complaints of inability to pass the urine, and in some cases the uterus and bladder have to be replaced by the hand before the urine can be passed. Calculi may also form in the dependent portion of the sac.

**DIAGNOSIS.**—This can be easily made by passing a somewhat curved sound into the bladder, and with this finding its limits above and in the prolapsed portion.

**TREATMENT.**—This is the same as that for prolapsus uteri—namely, amputation of the cervix if necessary, repair of the relaxed vaginal outlet, and possibly suspension of the uterus to the anterior abdominal wall.

*Prolapsus of the Bladder through a Patulous Urethra.*—This condition is rarely seen, and is most probably due to a trauma or severe strain.

**SYMPTOMS.**—The presence of a tumor at the urethral orifice, incontinence of urine, pain and tenderness on walking and moving, and probably inflammation of the prolapsed portion.



DIAGNOSIS.—This may be made by the appearance of the tumor, one or both ureteral orifices being seen on it, and by passing a sound along the side of the tumor it will be found to enter the bladder.

TREATMENT.—After the prolapse is reduced the patient should remain on her back for some days. The bowels must be carefully regulated, and the urethra, if not much dilated, may be reduced in size by the use of astringent suppositories or applications.

If the urethra is much dilated, a plastic operation for the narrowing of its lumen must be practised.

#### FOREIGN BODIES IN THE BLADDER.

Foreign bodies may gain entrance to the bladder—(1) from above, through the ureter; (2) from below, through the urethra; (3) from ulceration through the bladder-wall; or (4) calculi may be formed in the bladder itself.

The foreign bodies entering the bladder from above, through the ureter, are usually calculi, though blood-clots, clots of inspissated pus, or small echinococcus cysts may also enter the bladder from the kidney or ureter.

The foreign bodies gaining entrance through the urethra are either catheters which have been introduced by physicians and slipped into the bladder suddenly, or they are bodies introduced by the patient herself, such as hairpins, knitting-needles, bodkins, stems of grass, etc.

Foreign bodies gaining entrance through the wall of the bladder are rarer than the other varieties. They may enter the bladder from the vagina by ulcerating through the partition walls; for instance, a pessary may gain entrance in this manner. Teeth and hair from a dermoid cyst have also been found in the bladder, as have fecal concretions from an appendicitis which has ruptured into this viscus. The commonest foreign bodies which gain entrance through the bladder-wall are sutures or ligatures which have been used during operations on the uterus or other pelvic organs.

In fractures of the pelvis small pieces of bone may be forced through the bladder-wall or through a rupture of the wall into the vesical cavity.

Calculi formed in the bladder itself are the most common foreign bodies, and may either be composed of the earthy phosphates, urates, or uric acid, or several of these; the other varieties of vesical calculi are more rare.



**SYMPTOMS.**—Usually during the first few hours no symptoms are present; after the lapse of from twelve to twenty-four the usual symptoms of a cystitis—namely, greatly increased frequency of micturition, with probably bladder tenesmus, the passage of bloody urine, and with constant pain in the vesical region—will make themselves apparent.

**DIAGNOSIS.**—This, in a certain number of the cases, will be easily made from the history of the case; in a certain percentage, however, no history at all can be obtained of the introduction of the foreign body into the bladder, and the physician must make the diagnosis from a general study of the patient, from sudden acute onset of the symptoms with no apparent cause, by a vaginal examination, feeling for the foreign body through the vaginal walls, and lastly by a cystoscopic examination.

**TREATMENT.**—There are three ways of removing from the bladder a foreign body—namely, (1) through the urethra; (2) by an incision through the vaginal walls into the bladder; or (3) by the “section alta” or suprapubic cystotomy.

Removal through the urethra method should always be attempted first, especially if the body is long and narrow, as a glass catheter, bodkin, hairpin, etc. The operator introduces one or two fingers in the vagina, attempting to engage one end of the body in the internal urethral orifice; if this can be done, it may either be pushed on with the vaginal finger or caught by a pair of forceps introduced into the urethra and pulled out in this manner.

Articles which are soft and easily bent may also be removed through a medium- or large-sized cystoscope, using for the purpose a special pair of forceps or a small tenaculum. When the above method fails entrance into the bladder through the vagina may be practised. The anterior vaginal wall is exposed, and an incision through the wall in the median line is made, thus exposing the wall of the bladder, which is then opened, taking care that the incision through the bladder does not touch or include the internal urethral orifice. The foreign body is caught with forceps and removed, the wound being closed in the same manner as a vesico-vaginal fistula.

**VESICAL CALCULUS.**—Vesical calculi rarely occur in women, because of their short and patulous urethræ. Renal calculi which are expelled into the bladder, and in men often form the nucleus for a much larger stone, are in women swept out during the first micturition. It is probably very seldom that a stone descends from the



*Nidus = nest, cluster; focus of infection*

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kidney and remains a sufficient time in the female bladder to gain by accretion a size which prevents its expulsion through the urethra. The fact that a large proportion of calculi in women are discovered after the repair of vesical fistulæ goes to prove that they are formed in the bladder, and are not simply the enlargement of stones from the kidney. After vesico-vaginal operations, if the stitches are allowed to pass through the mucous layer of the bladder, it is probable that the nidus for the stone may be furnished by the exposed suture. Emmet claims that such operations are the most frequent source of stone in women. Calculi may be of various kinds, as uric acid, urates, triple and amorphous phosphates, oxalate of lime, or cystine. Phosphatic stones are more frequent in women than in men, while those of uric acid are less frequent. It is rather difficult to account for this difference in their occurrence in the two sexes, but it is possibly due, as explained by a number of writers, to the more frequent tendency of men to a gouty or lithemic diathesis. Foreign bodies introduced for various purposes by hysterical women may form the nucleus of a stone. Thus, hair-pins, bits of wax, buttons, beans, etc. have been found as the centre of vesical calculi. Usually the bladder contains but a single calculus, but occasionally two or more are found. The most common shape is a flattened ovoid, although they may be somewhat rectangular or irregularly rounded, while phosphatic stones are occasionally curiously branched.

On account of the patulous urethra in women, calculi of small dimensions are rarely found; they vary from the size of a pea to that of a walnut and are often much larger. The density of the calculus depends upon its chemical composition, the phosphatic variety being the most friable and easily crushed. The situation of the stone varies with the position of the patient. When she is in an upright position, it will usually be found at the base of the bladder or blocking the orifice of the urethra, but if recumbent the stone will drop back toward the fundus. It may be encysted or caught by a fungous mass or retained between the rugæ of an hypertrophied bladder-wall. If there be a diverticulum in the bladder, as is often seen accompanying prolapsus uteri, the stone will be found at the bottom of this sac. Occasionally it is lodged in the orifice of an ureter. The author removed a stone within the last two years which he had previously located in the mouth of the left ureter by means of the ureteral sound.

ETIOLOGY.—The causes of calculi are obscure. The reason for



the deposit of urinary salts about a foreign body is perfectly patent, but the origin of a stone in the centre of which no foreign body can be found is not so clear.

In those cases of prolapsus uteri in which a vesical diverticulum exists, calculi are prone to form, as these sacs usually contain residual urine, and when one observes, under the microscope, the manner in which urinary crystals are often entangled in the shreds of mucus, it may quite as reasonably be expected that the same result will take place in the diverticulum of the bladder, thus leading to the formation of a calculus.

**SYMPTOMS.**—The symptoms which are most characteristic of stone are frequent micturition, with sudden stoppage in the flow, hematuria, and pain. An irregular, halting, and painful flow of urine is, of all symptoms, the most characteristic. It usually occurs when the stone is small, and is sucked into the vesical mouth of the urethra, acting as a ball-valve. As it grows in size this tendency often entirely disappears. Frequent micturition is usually a constant symptom, the patient being compelled to void her urine many times during the day, especially when she is on her feet or doing active work. During the night this urgent and frequent desire to void the urine disappears, and the patient may pass a whole night without once getting up. Horseback riding or driving over rough roads often causes severe pain.

The pain in vesical calculus is of two kinds—that directly caused by the stone, and that produced by the cystitis which almost invariably follows as the result of vesical irritation. There is constant, heavy, dull pain over the pubes, radiating down into the legs and external genitalia and upward to the groin. The pain, which is characteristic, is sharp and lancinating, and occurs at the end of micturition, frequently being referred to the external genitalia, and is so severe at times as to cause the patient to scream. Violent straining accompanies micturition, and the attending pain may be referred to the rectum or perineum, especially if there are hemorrhoids or if prolapsus of the rectum exists, as frequently results from the straining efforts.

In little girls the pain may be entirely referred to the vulva, and lead to a habit of constantly dragging or picking at the parts, which causes hypertrophy and excoriation of the labia.

Hematuria is frequent, but is characteristic only when a few drops of bright-red blood appear at the end of micturition.



DIAGNOSIS.—Any of the above symptoms may cause the surgeon to suspect stone, but a definite diagnosis is impossible until a careful exploration of the bladder is made. This may be done in one of three ways—by the sound (which is the best), by digital exploration, or by the cystoscope.

The same precautions should be observed in sounding for stone as in catheterization, as this manipulation furnishes an opportunity for the introduction of septic material if the technique is not perfect. The patient should be placed in the lithotomy position, with the thighs flexed upon the abdomen. The vagina and external genitalia should be thoroughly washed with soap and water, then rinsed with boiled water, and then with bichloride-of-mercury solution (1:1000), and again with water.

A piece of gauze one yard square should be spread between the thighs over the buttocks, and a hole made of sufficient size to permit the free manipulation of the sound. It is also well to have the patient's legs enveloped in sterilized stockings or towels. By the observance of these small details the best aseptic technique is obtained. The bladder should be emptied of its urine, and partially distended with boracic-acid solution or sterilized water. The surgeon either stands or sits between the patient's thighs when introducing the sound, which should previously be warmed and anointed with sterilized vaseline. In sounding a definite plan should be followed: The base of the bladder should first be carefully explored, and then the sound should be caused to make excursions upward and to the sides. During this manipulation two fingers of the hand should be introduced into the vagina, and it will be almost impossible for a stone to elude the search.

If this examination be negative and the surgeon is still in doubt, he may resort to the cystoscope, or the urethra can be dilated to the size of the index finger and a digital exploration made. In this way an encysted stone may be detected. In chronic cystitis or where vesical neoplasms exist in the walls of the bladder, or in the presence of a tumor encrusted with urinary salts, a peculiar grating sound may be elicited by contact with a metallic instrument.

The main points of difference as elicited by the sound between this condition and stone is the extensive area of deposit and the lack of resistance when the instrument is pushed against it. The surgeon should always bear in mind that a calculus may be asso-



ciated with a vesical tumor, a fragment of which has served as the nucleus of the stone.

PROGNOSIS.—If the stone be detected early and removed before marked changes in the bladder have occurred, the prognosis is quite favorable. On the other hand, if cystitis exist associated with hypertrophy and contraction of the wall of the bladder, or if there is secondary disease of the kidneys, the prognosis is unfavorable, the patient dying or from the progress of the renal disease. This, however, is very rare, as the symptoms of stone are usually so urgent as to lead to its detection before such grave lesions occur.

TREATMENT.—There are three modes of treatment employed in cases of vesical calculi in women: by dilatation of the urethra and removal of the stone, if small, by forceps, or if large by crushing; by kolpo-cystotomy; and by suprapubic cystotomy. As the urethra is capable of considerable dilatation, the first method will, in a certain number of cases, be the most available. The urethra should not be dilated larger than the girth of a medium-sized forefinger, as the sphincter fibres may be lacerated, causing permanent urinary incontinence. After the urethra has been dilated the surgeon introduces his finger into the bladder and locates the stone. If not larger than the tip of the little finger, it may be grasped with delicate forceps and removed, or coaxed up to the neck of the bladder and out through the urethra by means of two fingers in the vagina. Should the stone be large, it is not advisable to remove it intact, as the urethra may be so overstretched that incurable incontinence will result.

Lithotrity is usually considered the best mode of treatment when the stone is not too large or too dense to permit of crushing. The patient is placed in the same position for this operation as when examined for stone. The urine should be withdrawn, and the bladder partially distended with tepid boracic-acid solution. The surgeon, sitting between the patient's thighs, introduces the lithotrite, previously warmed and anointed with sterilized oil or vaseline, into the urethra in a line almost perpendicular with the long axis of the body. The handle of the instrument is then depressed, when it gently glides into the bladder.

Two fingers of the disengaged hand should then be introduced into the vagina and the stone located. An assistant now opens the blades of the lithotrite, and with a little manipulation the stone will be seized, when the instrument should be very gently rotated to



obviate the danger of catching the mucous membrane, and the screw slowly turned until the stone is crushed; this will be sudden or gradual according to its composition. The blades are then separated and again closed, catching one of the larger fragments, and so on until the stone is reduced to small particles. It is rarely necessary to resort to an evacuator, as repeated irrigations of the bladder are sufficient to remove the fragments. During the irrigations the bladder should be manipulated gently between one hand introduced into the vagina and the other placed above the pubes.

Every particle of the stone should be removed, as small fragments, if left behind, may form the centres of other calculi. If the stone be thoroughly pulverized, there is no danger of fragments being impacted in the urethra. In case, however, a part of the stone eludes the grasp of the lithotrite and later becomes impacted, it may be removed by means of delicate urethral forceps, or, if lodged in the mouth of the urethra, it can be pushed back with a sound and crushed with the lithotrite.

Urethral fever is not an infrequent complication following the introduction of instruments into the bladder, especially after lithótrity. It is characterized by the occurrence of rigors, with headache and vomiting, followed by febrile reaction. It is especially liable to occur in nervous women, but is not a serious complication, and usually passes off in one or two days. Temporary aggravation of the already existing cystitis may result from manipulation of the lithotrite.

*Contra-indications to Lithótrity.*—Lithotrity should not be resorted to in girls under thirteen years, as the urethra is too small to allow sufficient manipulation of the instruments, and as lithótomý = *incision*, is such a safe operation at this age, it should always have the preference. The size of the stones should be estimated carefully, as a stone of greater diameter than once inch can more easily be removed by kolpo-cystotomy. In those cases of sacculated bladder occurring in prolapsus uteri or in cystocele, lithotrity is not practical, as small particles of the calculus are likely to be left in these dependent pouches. Chronic cystitis usually coexists in these cases, for which reason cystotomy is preferable, as we thus not only remove the stone, but also secure free drainage, which will often be necessary to cure the accompanying inflammation of the bladder.

If the calculus be associated with a vesical neoplasm, lithotrity is contra-indicated, as the manipulation of the lithotrite might induce



a profuse hemorrhage, and the removal of the stone, if the tumor be left behind, would give little or no relief.

Cystotomy is the next operative measure to be considered if removal of the stone through the urethra be contra-indicated. In women kolpo-cystotomy is almost invariably the operation of preference, as it is comparatively easy and free from danger, and is applicable to the largest number of cases. This operation is best performed according to Emmet's method, as follows: A sharply-curved sound is introduced into the bladder so as to depress the vesico-vaginal septum. The vaginal side of the septum is then caught with a tenaculum and a small opening made, which may be enlarged with scissors by cutting upward toward the cervix, keeping in the median line and thus avoiding the ureters. If there is only a mild grade of cystitis, the fistula should be closed immediately after extraction of the stone; on the other hand, should the cystitis be chronic, with considerable pus and exfoliated epithelium in the urine, the opening should be left, thus securing constant drainage.

Suprapubic cystotomy is rarely necessary, but may be required in those cases in which the stone is too large to admit of vaginal lithotomy. Greater care is necessary in opening the abdomen of women than of men not to wound the peritoneum.

The treatment after all operations for stone is simple. In those cases in which the fistula is left open or in which dilatation of the urethra is performed, the bed should be well protected with old linen, as there will be a constant discharge of urine.

The parts with which the urine is liable to come in contact should be anointed with vaseline, and if there is any tendency to the formation of incrustrated urinary salts, the parts should be scraped gently and anointed with oxide-of-zinc ointment. A light diet must be insisted upon, and the urine kept bland by means of an abundant ingestion of pure water. Citrate of potash should be administered if the urine is acid, and benzoic acid if it is alkaline. The patient should return to the surgeon for examination at least once every year after the removal of a calculus, to ascertain if there be any recurrence.

#### CYSTITIS.

ETIOLOGY.—This is the most important question that meets us in the study of cystitis, and, though much important work has been



done, there are many questions which are still unanswered. That the exciting cause of every cystitis is the presence of pathogenic organisms in the bladder is beyond question, and the first point is to determine the various channels by which bacteria may gain an entrance to this viscus.

(1) Organisms may enter the bladder through the urethra. That the normal urethra is the abiding-place of various organisms is well known, and it is easy to see how these organisms might be carried into the bladder by the use of even an aseptic catheter or other instrument.

Again, pathogenic organisms may be carried into the bladder on instruments or catheters which are themselves septic. And undoubtedly, in certain cases where the urethra is dilated and patulous, the organisms may enter the bladder directly from the urethra without using instruments.

(2) Organisms may enter the bladder through the ureters. A secondary tubercular cystitis following a renal tuberculosis is a good example of this method of infection. There is also another variety of descending infection, the organisms being present in the circulation and excreted by the kidney, entering the bladder by this means without injuring severely the kidney itself. *Which?*

(3) Organisms may enter the bladder from inflammatory areas in the neighboring organs.

This method of infection has been definitely proved, both by clinical cases and experimental work, and serves to explain the frequent occurrence of cystitis in women suffering with inflammatory diseases of the uterus, the tubes, or the ovaries.

(4) Organisms may enter the bladder-walls through the bloodstream.

This manner of entrance must also be admitted, as in no other way can we explain the occurrence of primary tuberculosis of the bladder and also the occurrence of abscesses in the bladder-wall.

The next questions to be taken up are the predisposing causes of cystitis, as we know that the mere presence in the normal bladder of pathogenic organisms is insufficient in itself to start up a cystitis, and that besides the presence of the organism there are other conditions necessary.

Some of these conditions we know, both from clinical experience and experimental study, but unfortunately there are still many cases in which the predisposing cause is entirely unknown.



(1) Retention of the urine is undoubtedly one of the predisposing causes, and under this head may be classed the cases where there is prolapsus of the bladder, and therefore incomplete emptying.

(2) The passage of irritating substances through the bladder, causing a congestion of the bladder-walls, under this division coming the cases of cystitis following the ingestion of irritating drugs, as cantharides, turpentine, etc.; also the use of highly seasoned food and stimulating drinks; and also we may class here a portion of the cases of cystitis following operation, the urine being irritating because of the high specific gravity and large amount of urea and uric acid present.

(3) Another predisposing cause is slight wounds of the bladder occasioned by the unskilful use of the catheter or other instrument; and we must class here a portion of the cases of cystitis following operations, the bladder being wounded by the catheter.

(4) The congestion of the bladder following inflammation of any of the pelvic organs is a predisposing cause, as is seen in the number of cases of cystitis following inflammatory conditions of the tubes, ovaries, or uterus.

(5) Foreign bodies are also a cause, probably acting by wounding the bladder-walls, and so allowing entrance to the organisms.

(6) New growths are also apt to be accompanied by cystitis.

That no special organism causes inflammation of the urinary tract has been decided from the bacteriological study of a large number of cases, which prove that any pathogenic organism under the proper conditions may give rise to inflammation of the bladder.

The organisms generally found are the staphylococcus pyogenes albus and aureus, the streptococcus pyogenes, the bacillus coli communis, several varieties of the proteus, the typhoid bacillus, the tubercle bacillus, and the gonococcus of Neisser. Besides these, many other of the less common pathogenic organisms have been isolated once or twice.

The infection may be due either to the presence of a single variety of bacteria or, as is often the case, there may be several varieties present—in other words, a mixed infection.

*Forms.*—Formerly all cases of cystitis were grouped under the head of acute and chronic, and we may still retain this division, subdividing again, however, to suit the pathological or clinical conditions present.



The mildest grade of cystitis, and the one most commonly seen, is confined chiefly to the trigonal area and manifests itself by a hyperemic condition at this point. We may find a severer grade where the inflammation is distributed in localized patches over the various portions of the bladder-wall, and a still more severe grade is found where the whole surface of the bladder is involved.

*Diphtheritic Cystitis.*—In this form, in addition to the local or general inflammation, there is a whitish or blood-stained membrane formed in various places.

*Exfoliative Cystitis.*—This is quite a rare form, the severe inflammation being accompanied by exfoliation of a part or the whole of the mucous membrane, and in some cases portions of the muscular coat are also included.

**PATHOLOGICAL ANATOMY.**—As the mild grades of cystitis never cause death, we are not familiar with the microscopical changes of this form. The macroscopic appearance as viewed through the cystoscope is, however, very suggestive.

In the early stage of an acute cystitis the mucous membrane is red and congested, but is otherwise normal; later the changes are marked, the walls of the bladder becoming thickened and the mucous surface covered with pus, fibrin, and exfoliated epithelium. Small bleeding areas where the epithelium has become detached are often seen.

In the chronic process the pathological changes are still more extensive. The muscular and fibrous coats are greatly hypertrophied, and the actual cavity of the bladder is much decreased by the thickening and contraction of its walls. The rugæ stand out as prominent ridges and may assume a polypoid form.

Hemorrhage occurs into the mucous membrane, and appears as dark <sup>extravasated</sup> ecchymotic patches, which later change to slate-color as the extravasated blood is absorbed, leaving only the coloring matter in the tissues as a more or less permanent stain.

In the severe cases of diphtheritic cystitis the membrane is composed not only of necrotic mucous membrane, but at times the muscular coat is also included. It has been stated that portions of the peritoneal covering of the bladder have been included in these casts. Where there is such extensive inflammation of the bladder the surrounding organs are more or less involved through extension by continuity, and are closely adherent to one another.

In some cases the diphtheritic process becomes localized, and



deep erosions or ragged ulcers result. These ulcerated areas may only involve the mucous coat, or may extend deeper and attack the muscular coat, and in rare instances perforate the bladder-wall.

The urine is usually intensely alkaline and heavily laden with mucus and with urinary salts, especially the phosphatic. These salts are often deposited as fine incrustations on the ulcerated areas.

When voided the urine may be of a reddish, brownish, or milky color, and if allowed to stand for a few hours in a conical glass, a thick yellowish or reddish sediment settles to the bottom, while the top is clear, or if bacteria be present it is turbid. On examining such a specimen microscopically there will be found a large number of leucocytes and red blood-corpuscles, pavement epithelium, isolated or in clumps, and often large numbers of crystals of triple phosphates. If the urine has undergone fermentation either within or outside the bladder, myriads of actively motile bacteria will be seen.

The worst forms of diphtheritic cystitis may merge into gangrene and the whole bladder be involved in a putrid sloughing mass. Rokitansky has described a peculiar ulcer of the bladder which he thinks is analogous to the round ulcer of the stomach.

As a result of the hypertrophic thickening of the bladder-walls the vesical orifices of the urethra may partially be occluded, and dilatation of the ureters, pyonephrosis, or hydronephrosis may occur.

SYMPTOMS.—In no condition is the pain more agonizing than in an acute or ulcerative cystitis. The pain is usually most severe above and behind the pubes, radiating into the groin and down the thighs. If able to be about, the patient walks very slowly and the body is slightly inclined forward; if in bed, the legs are usually flexed upon the abdomen, as the slightest jar or tension of the abdominal muscles increases the pain. The desire to void the urine is constant, and the act is attended with sharp lancinating pains, which decrease after the urine is voided. A few drops of blood may be ejected with the urine. There is usually over the pubes constant dull pain, which increases as the bladder is distended with urine.

Pressure over the pubes causes great pain, and at times the tenderness in the region is so marked that even the weight of the bed-clothing cannot be borne. Following urination there is usually a sensation as though a few drops of urine yet remained, which gives rise to constant bearing-down pains. These pains may be so urgent as to cause the patient to remain for hours on the chamber, and may

*Fast  
sterile blank  
dist*



cause her to scream out with agony. There is often dull pain in the perineum, and occasionally a patient describes peculiar sensations about the umbilicus.

Increased frequency of micturition is an invariable symptom in cystitis, in acute cases the desire being constant; in milder cases less frequent, but always urgent.

Hematuria is frequent in the early stage of the inflammation, and at times there may be little else than pure blood voided. As the process becomes older the blood in the urine diminishes, and may entirely disappear. The appearance of the urine, which has been described above, is also characteristic. In acute or ulcerative cystitis defecation may be painful and menstruation is often deranged. In acute cases the attack is ushered in by a rigor, followed by a slight increase in temperature and sharp pain in the region of the bladder. If of the milder type of cystitis, a few days suffice to free the patient from all discomfort.

In the more severe septic or diphtheritic cases the symptoms from the onset indicate a very grave condition. The temperature ranges between 101° and 103° F.; the rigors are severe and occur at intervals for days; the tongue becomes dry, glazed, and coated, and may be fissured; there are headache and vomiting, and occasionally delirium. Micturition is difficult and excessively painful, and may be impossible on account of the occlusion of the ureteral orifice with false membrane. If the bladder is catheterized, only a small amount of urine can be drawn without cleansing the catheter of shreds of membrane.

The bladder may become greatly distended on account of retention. The urine has an excessively fetid odor and is of a brownish or reddish color. Large pieces of membrane, and at times a complete cast of the interior of the bladder, may be expelled through the urethra.

The patient sinks into a typhoid state; the pulse becomes rapid, running, and feeble; the temperature gradually rises during the day, reaching its highest point in the evening; there may be *carphologia* and *subsultus*, and she finally goes into profound collapse and dies.

As the kidneys are often much hindered in their action because of the vesical disorder, there may be total suppression of urine, followed by uremia, from which she dies.

DIAGNOSIS.—The dull heavy pain over the pubes, the sharp lancinating pain during micturition, and the frequent desire to void the

+ *carphologia* = delirious picking at the bedding

+ x *subsultus* = twitching & trembling



urine, are all subjective symptoms strongly suggestive of cystitis. An examination of the urine is also of help, the recently voided specimen appearing turbid or blood-tinged, and on standing a thick whitish-yellow sediment forms at the bottom of the vessel, which may be pinkish in color if blood is present.

The reaction is sometimes acid and sometimes alkaline, so nothing can be based on this point. If alkaline, the urine is apt to have a very strong fetid odor.

The microscopical examination shows the field filled with pus-corpuscles singly and in clumps, red blood-cells, and pavement epithelium.

The diagnosis can in every case be made certain by the use of the cystoscope. In acute cases where there is much pain and tenesmus an anesthetic will be necessary.

**PROGNOSIS.**—The prognosis in the milder grades of cystitis, as in the cases following pregnancy or a serious operation, is usually good, the cystitis disappearing under appropriate treatment in a short time. In the severer grades the prognosis becomes more serious, though many of these cases are finally cured.

Chronic cystitis is always intractable, and may last for years even under the most skilful treatment.

**TREATMENT.**—With our present knowledge of the causes of cystitis the prophylactic treatment is of importance, and this is especially the case in hospital practice, where patients often require catheterization.

A rule should be made that every patient have a separate catheter, which is kept in an antiseptic solution and disinfected after each using.

Before each catheterization the external genitals are carefully washed with a solution of boric acid, especial attention being paid to the urethral orifice. The labia are then separated with the thumb and fore finger of one hand, taking care not to touch the parts near the urethra, and the sterile catheter inserted, not allowing it to touch any portion of the vulva before introduction.

The first requisite in the curative treatment of cystitis is rest, and to accomplish this the patient must at once go to bed and lie in the recumbent position. All stimulating foods, such as meats, highly-seasoned dishes, alcoholic beverages, especially those containing a large percentage of alcohol, should be avoided. It is best to restrict the diet to milk or light broths. Saline cathartics should be admin-

*Treatment in*

*Acute cystitis: Put the patient to bed, give no food for several days, Citr. of Potass. through purging, high rectal enema. Sater keeps rectum open, but high enema not needed. Bat vaginal douches several times pr. day. Ice bag over pubes. Boracic acid washes of bladder 50% to 1% Sol. (Fraspar to pint) Pass catheter, do not let labia close on catheter.*



Irrigate until the water returns clear

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istered, and later care must be used to keep the lower bowel free from fecal accumulation. Warm enemata are useful, not only as a means of evacuating the bowel, but also as a soothing agent. Hot sitz-baths usually relieve the tenesmus and vesical fullness. If the pain is severe, an enema of 30 drops of tincture of opium in 2 ounces of starch-water may be employed, or opium may be given in suppository. Sometimes an iodoform or belladonna suppository will relieve the pain. Hot compresses should be applied over the bladder. Cups applied to the sacrum are often useful in relieving tenesmus and the sensation of fullness.

To allay the fever and keep the urine bland and unirritating the following prescription will prove of value:

R. Tinct. aconiti, f3j;  
Spirit. æther. nitrosi, f3ij;  
Liquor potassii citratis, q. s. ad f3vj.—M.  
Sig. A dessertspoonful every four hours.

For alkalinity  
Sod. benzoate  
Acid. boric.  
āā gr V (to X)  
tw in die

Benzoate of ammonia, in the dose of gr. x every two hours, has been highly recommended.

In acute cases which are of septic origin irrigations of the bladder should at once be instituted, as the removal of the infecting agent is of prime importance.

The solutions used in washing out the bladder are numerous, but those which have been of greatest value are boracic acid (50 per cent. to saturated solution), weak solutions of permanganate of potash, bichloride of mercury (1:100,000, gradually increasing in strength), and silver nitrate (1:4 gr. to the ounce).

The following is the best manner for irrigating the bladder: A glass catheter should be attached to an ordinary or fountain syringe by means of a rubber tubing or small soft-rubber catheter. The temperature of the water should be 100° to 105° F. The same precautions in cleansing the external genitals should be observed in irrigations as in catheterization. The patient lies in a recumbent position with the hips slightly elevated, resting on a bed-pan. The solution is allowed to flow before introduction of the catheter, when the rubber tube is pinched up, thus preventing the introduction of air into the bladder. A sufficient quantity of the solution is permitted to flow into the bladder until slight distension is produced or the patient complains of pain. The fluid is allowed to remain for a few seconds, when it is withdrawn by detaching the rubber

Acute cystitis: Put the patient to bed, give citrate of potassium to open bowels & no food for several days, high rectal enemas; hot vaginal douche. Wash bladder



tubing from the catheter. The irrigations should be repeated until the fluid flows away clear. At first the patient will probably not be able to stand more than one irrigation daily, but after one or two days she becomes accustomed to the treatment, and if the case is badly infected, the bladder can be washed out thrice daily. Boracic acid is always the best solution to commence with, as it is free from danger and is less irritating than bichloride of mercury or silver nitrate. Repeated hot vaginal douches are very beneficial.

Where the cystitis is localized in patches the improvement will often be hastened by applications once in five days or once a week of a 3, 5, or even 10 per cent. solution of nitrate of silver, this application being made through the cystoscope directly upon the affected area.

The treatment of chronic cystitis differs in many respects from that of the acute inflammation. The mucous membrane of the bladder, instead of being functionally over-active as in the acute form, is depraved and its function largely destroyed by the chronic inflammation. For this reason stimulating injections and internal remedies must be employed with the hope of bringing into activity the depraved mucous membrane. It is in these cases that the solutions of bichloride of mercury and silver nitrate will be of greatest service. More than two irrigations daily with these solutions should never be given. If the pain after the employment of silver nitrate is excessive, a 5 per cent. salt solution may be injected, which precipitates the silver nitrate in the form of an unirritating chloride of silver.

If, as in many cases, the treatment fails and the pathological process grows worse, it may be necessary to secure constant drainage of the bladder by means of dilatation of the urethra, by vesico-vaginal fistula, or by the use of a self-retaining catheter.

Dilatation of the urethra may relieve the tenesmus and secure drainage for a short time, but at best is but a temporary measure, and must be repeated a number of times if it is to be of value; for this reason it is not, as a rule, practicable. It may be accomplished either gradually by the use of a hard-rubber graduated bougie or rapidly by the aid of Goodell's small uterine dilator. The danger of urinary incontinence must always be borne in mind, as over-dilatation may result in permanent incontinence. The use of a self-retaining catheter is only to be employed when operative measures are refused.



The best plan is drainage through a vesico-vaginal fistula. Emmet advises the opening to be made as follows: "The patient is etherized and placed in the Sims position, and the perineum well retracted; a sharply-curved sound is passed into the bladder and its beak pressed against the septum, so as to protrude in the median line a short distance behind the vesical orifice: it is then cut down upon by the aid of tenaculum and scissors. The blunt blade of the latter is inserted through the opening into the bladder, and the incision prolonged 3 or 4 cm. in the direction of the cervix uteri. Care must be taken that the blade of the scissors really enters the bladder, since it is apt to penetrate the loose cellular tissue between the vesical and vaginal membranes, and thus the latter only is incised. The edges of the vesical and vaginal membranes should then be united by a continuous suture to prevent the fistula from closing. Any troublesome hemorrhage at the time of operation may at once be arrested by passing a deep transverse ligature through the upper or lower angle of the incision, according to the direction from which the blood comes; any such measure will, however, rarely be demanded."

The actual cautery may be used in making the fistula. After the opening is established the vagina should be douched at least twice daily with boracic-acid solution, and all parts with which the urine may come in contact must be anointed with cold cream or vaseline.

The bladder may be irrigated as before, allowing the fluid to flow through the fistula into a bed-pan. As the fistula must be kept patulous until the cystitis is cured, which may require months, it will be necessary to have the patient wear some form of ambulatory urinal, which can be obtained at any instrument-maker's. After all symptoms have disappeared the fistula can be closed in the manner described in the article on that subject.

*Tubercular Cystitis.*—Tuberculosis of the bladder is usually secondary to renal tuberculosis, though sometimes a primary tuberculosis in this organ is seen, being in such a case evidently a blood-infection from a primary focus in another part of the body.

**PATHOLOGICAL ANATOMY.**—As in tuberculosis elsewhere, at first there is the formation of minute tubercles in the mucous membrane; these tend to coalesce, and then, as in other parts of the body, they break down and form ulcers, which may be of small size or which may cover a large portion of the bladder-wall.



**SYMPTOMS.**—In the early stages the symptoms are those of a rather mild cystitis, but as the condition gets worse the symptoms increase markedly in severity, and will soon break the patient down from the constant pain and loss of rest.

**DIAGNOSIS.**—As the symptoms of tuberculosis closely simulate those of chronic cystitis, it is often difficult or impossible to differentiate the two conditions. In all cases of cystitis coming on insidiously and without apparent cause tuberculosis may be suspected, and a careful examination of the lungs should be made to discover if they are the seat of primary infection. Having excluded the lungs, the kidneys should be examined carefully. It is in these cases that the ureteral catheters are of great value. The method of catheterization of the ureters, as described in the article on that subject, should be followed. The specimens of urine obtained by this means should be examined for tubercle bacilli.

*The Demonstration of Tubercle Bacilli in the Urine.*—The sediment from the suspected urine is obtained from the bottom of a conical glass after the urine has stood for some time, or better still, by centrifugalization. Drops of this are spread out in a thin layer on several cover-slips, as in the examination of sputum, or, as the bacilli are often few in number and it is desirable to examine a large surface, some of the sediment may be spread out on an ordinary microscope slide; after being spread the film is allowed to dry in the air, and the cover-glass or glass slide afterward passed quickly three times through the flame of a Bunsen burner or an alcohol lamp. Care must be taken not to overheat the specimen; this may be avoided, as a rule, by holding the cover-slip between the fingers while passing it through the flame.

The best method of staining for general use is that of Gabbett, a modification of the Ziehl-Neelson method. A few drops of the following solution—

Fuchsin, pure,	1,
Acid. carbolic.,	5,
Alcohol, absolute,	10,
Aquæ destillat.,	100,

are poured on the cover-glass, which is then held in fine forceps over the flame, and heated to boiling for from one-half to one minute; the excess of stain is washed off with water, and the



cover-slip immersed for a moment or two in a combined decolorizing fluid and counter-stain (sulphuric acid pure 1, distilled water 3, methylene blue to saturation).

The specimen is immediately washed off in water, and if insufficiently decolorized, again immersed in the decolorizing fluid. After washing in water, the cover-glass is placed between two folds of good filter-paper to remove the excess of water; the glass is thoroughly dried high above the flame, and finally mounted in a drop of xylol balsam.

A good oil-immersion lens ( $\frac{1}{12}$  or  $\frac{1}{14}$ ) is required for the examination. Sometimes the bacilli are numerous, but in many cases there are very few, and it may be necessary to look carefully through many preparations before finding them.

It is also necessary to warn against the possibility of confusing the tubercle bacillus with the smegma bacillus, which has the same staining qualities, and which is found in the urethra and external genitals. The urine to be examined should therefore always be a catheterized specimen, as by using the catheter the urine does not touch the area in which the smegma bacillus is found.

In the early stage the cystoscope may reveal the miliary nodules or the localized caseous area, or later the tuberculous ulcers may be seen, and thus the extent of the process determined. If tubercle bacilli be found in the urine, and other organs are not the seat of primary infection, the diagnosis is definite; but frequently a cystitis which seems to be the result of a localized tuberculosis will prove upon catheterization of the ureters to be an extension from the kidneys.

**TREATMENT.**—If the infection of the bladder be primary, the tuberculous areas should be treated by the injection of medicated solutions, or the application locally of medicinal substances, as nitrate of silver or lactic acid. Cystotomy and curettement may sometimes be used with good results. The bladder should be opened in the manner described in the article on Cystitis, and it is best to allow the vesical fistula to remain open, as free drainage is afforded by this means. Besides these local measures, the condition should be combated by attention to the general health, and good results often follow the use of creasote, and cod-liver oil, with a generous diet and, if possible, an open-air life.



## TUMORS OF THE BLADDER.

Tumors of the bladder are either primary, taking origin from one of the layers in the bladder-wall, or secondary, the vesical growth being either a direct extension by contiguity from a neoplasm in any of the neighboring organs, as the uterus, urethra, etc., or in rare instances metastasis may occur here.

As primary tumors are the ones of importance to the surgeon, we will only attempt to describe this variety.

In studying the primary tumors of the bladder, Kuester's classification, depending on the point of origin from the various layers composing the bladder-wall, will be followed. According to Kuester, the various tumors which are found in the bladder arise—

(1) From the mucosa or submucosa; (2) from the muscular coat; (3) from the epithelium.

Tumors arising from the mucosa and submucosa are the most frequent, and are usually benign in character.

Unfortunately, the difficulty of obtaining a clear idea of the neoplasms of the bladder is much enhanced by the various names which have been given to the same variety of tumor.

This is well illustrated in the number of names which have been bestowed upon the benign papillary growth, which is the most common tumor seen; for instance, Virchow spoke of the growth as a "fibroma papillare," Kraemer as a "papilloma," Thompson as a "fibro-papilloma," and Kuester as a "zotten polyp."

This tumor histologically is made up of a branched connective-tissue foundation, which arises immediately from the connective tissue of the submucosa, and through which course a network of blood-vessels, each prolongation of the connective tissue having its accompanying artery. The surface is covered by several layers of regularly arranged epithelial cells which are continuous with the epithelial covering of the bladder-wall.

These growths usually have a pedicle which may be very short and broad, or may be long and rather thin; in form they may be either rounded, with something the appearance of a raspberry, or, on the other hand, they may be of a very soft consistence, with long feathery prolongations.

There is another variety of benign growth taking origin from the submucosa, and appearing as a rounded, rather hard growth, always arising by a pedicle and never showing any tendency to papillary excrescences.

*Fibro-papilloma*

*Fibroma*



*Epithelioma = from the epithelial element*  
*Sarcoma = " " connective tissue element*  
*Carcinoma = " both these types*

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Histologically, this approaches more the type of a pure fibroma, the connective tissue being more or less concentrically arranged, and without the prolongations which are seen in the papillary form.

The surface is covered by several layers of epithelial cells arranged in order and continuous with the bladder epithelium. These tumors may be the seat of myxomatous degeneration, and they are then known as fibro-myxomas.

Sarcoma of the bladder is one of the rarest forms of tumor seen here. It usually appears as a flat, fleshy growth extending over the bladder and infiltrating its walls, or, again, it may be found growing from a pedicle, which is in some cases small and narrow, allowing the tumor to appear through the urethral opening. Histologically, the tumor takes either the form of a round-celled or spindle-celled sarcoma, and is very rapid in its growth.

*Fibro-myoma*  
Tumors arising from the Muscularis.—These tumors are always made up of bands of involuntary muscle-fibres, and of a framework of connective tissue, in which the blood-vessels run. They are usually firm in consistence, and are either pedunculated or arise from a flat base. They may also be multiple, though more commonly only one large tumor is found. Rarely, too, instead of growing into the bladder-cavity, they project externally beneath the peritoneum, forming extra-vesical tumors.

*II* Tumors taking Origin from the Epithelium.—Carcinoma is the most common form of malignant tumor that we see, and it may appear either as the hard scirrhus form, extending over the surface of the bladder as slightly raised nodular growths, which infiltrate slowly and are of the epitheliomatous type, or of the softer alveolar type, these tumors projecting more into the lumen of the bladder and infiltrating more quickly the bladder-walls, and having a more marked tendency to ulceration, than the scirrhus form. Both of these forms may also show a tendency to the formation of papillary excrescences, and undoubtedly in a certain number of cases there is a tendency to secondary carcinoma-tous degeneration in the formerly benign growth.

Adenomata have also been described, but are of very rare occurrence.

Paget has also described a case of dermoid cyst of the bladder, but in most of the so-called dermoid cysts the diagnosis has been made by the passage of hair or teeth from the bladder, these prob-



ably coming originally from a dermoid of some other organ which had ruptured secondarily into the bladder.

ETIOLOGY.—The causes of both the benign and malignant tumors are unknown, save that the irritation of a prolonged or severe cystitis is thought by some to be a cause of proliferative changes and the formation of papillary outgrowths.

The sex of the patient has some influence, women being less apt to be affected by new growths of the bladder than men.

The age also exerts influence, carcinoma being usually a disease of late adult life, and papillary growths are also apt to occur late in life, while sarcoma, on the other hand, is present at any age.

SYMPTOMS.—There is in every case of bladder tumor a certain period called the first stage, during which time there are no symptoms complained of, and this has been aptly named the "latent period," the onset symptom marking really the beginning of the second stage, and not the "birth" of the tumor.

The latent period is usually terminated abruptly by hemorrhage, which is most commonly the onset symptom of the second stage; and there seems some difference to be noted in the character of this hemorrhage, that accompanying the benign neoplasms usually starting without any known cause, and appearing as a few drops of blood at the end of micturition, or the appearance of rose-colored urine occasionally, while the hemorrhage from a surface epithelioma is apt to follow for the first time severe exertion or a rough ride, and is apt to be more profuse. The hematuria in both cases is painless and unaccompanied by vesical irritability, and in both cases is apt to be intermittent.

Another symptom is the sudden blocking of the urethra during micturition by the new growth and the stopping of the flow of urine, with straining and some vesical tenesmus.

The onset in the rapidly infiltrating cases differs from the benign and the surface epitheliomata as beginning with vesical irritability, which is soon complicated by the presence of blood and pus in the urine and the symptoms of a severe cystitis.

The later stages in both the benign and malignant cases begins by the appearance of cystitis, which in the benign tumors may be delayed for years, but when it has once begun the patient begins to go down hill rapidly, and, because of the liability to renal complications, the operation for the removal of the growth has a much less hopeful outlook.

benign  
surface epithelioma

malignant

2nd stage



Another symptom which when present is almost pathognomonic is the presence in the urine of pieces of the new growth, though from these pieces, unless large and retaining all of their characteristics, it is almost impossible to determine the variety of the growth.

Pain in the vesical region is a very uncertain symptom, and if present is usually the result of cystitis. Pain has, however, been described as located at the external urethral orifice and in perineum and rectum, and not dependent on the presence of cystitis.

DIAGNOSIS.—The presence of intermittent painless hematuria, especially if complicated by the sudden stoppage of the flow of urine, should always excite suspicion in patients over thirty years of age, and a careful examination should be made to determine the seat and cause of the hemorrhage.

A careful examination of the urine should be made to exclude renal disease, and the fresh color of the blood and its appearance at the end of micturition will be of help in the diagnosis.

The direct examination by palpation is also of value, especially where the growth is somewhat hard and resisting.

The bladder should be emptied, better by the patient herself than by the use of the catheter. Two fingers are introduced into the vagina, and then, with the other hand pressing directly over the bladder behind the symphysis, the walls of the bladder may be easily palpated throughout almost their whole extent by the vaginal fingers, which should touch carefully and slowly the whole of the bladder within reach.

The use of the sound seems rather a dangerous means of examination, and should only be attempted where other means have failed.

Our most important method of diagnosis is, however, the cystoscope, as by its use the whole of the bladder-wall may be visually examined, the character of the new growth made out, and the possibility of operative help determined. The cystoscope should in these cases be used very carefully, as hemorrhage may follow any rough movement, obscuring the field and preventing accurate examination.

TREATMENT.—There is only one method of treating new growths of the bladder, and that is by operation; but there are several points to be decided before an operation is attempted—namely, the extent and character of the growth, the presence of cystitis, as this will lessen greatly the chances of a favorable issue, and also the general



condition of the patient and whether she will be able to stand a serious operation.

An operation having been decided on, there are three avenues by which the bladder may be reached: through the urethra, through the vagina, and through a suprapubic opening.

The female urethra may be dilated enough to allow of the introduction of a No. 15 or 16 mm. speculum, and through this a papillary growth, if arising from a pedicle, may be removed by the snare or by a curette, but beyond this the urethra gives too little room to allow of the careful removal which is so necessary in a malignant growth.

Removal through an opening made into the bladder through the vaginal wall is open to the same objection—want of room and inability to control perfectly the field of operation.

The route which gives us the best chance of success, then, is the suprapubic, as here, if we cannot obtain all the room we want, the field of operation is at least directly under our eyes, and we can control the steps of the operation much more easily.

The patient, after having had the pubes and mons veneris carefully shaved and cleaned, is placed in the Trendelenburg position. The incision may be either a transverse one, just above the symphysis, or an incision perpendicular to the symphysis in the median line.

A male catheter is introduced into the bladder, and after the incision has passed through the thick subcutaneous fat, the muscular layers, and the prevesical fat, the bladder may be recognized by raising it up on the end of the catheter. The bladder is then caught and opened, and the two free edges held by forceps or silk sutures which are passed through them. The neoplasm is searched for, being careful that no rough movements are made, as, if the growth is wounded before the relations are carefully studied, blood will so obscure the field as to make the examination and the subsequent operation much more difficult. If the tumor has a pedicle, this is divided with the scissors or a fine-pointed thermo-cautery, the hemorrhage being stopped, if possible, by the use of the cautery; or fine catgut ligatures may be passed under the stump. Great care must be exercised that in passing ligatures the ureter is not included, and, in fact, the relations of the ureters must be borne in mind during the whole operation. To bring the field of operation better into view, an assistant may introduce a finger or two into the vagina and press the bladder forward.



The treatment of hemorrhage is an important question, and is apt to give trouble. To control it the thermo-cautery may first be used; if this does not do, fine catgut sutures may be passed through the mucosa and deeper tissues. If, however, the hemorrhage is severe, we cannot waste time, and it is most easily and quickly controlled by tamponing the bladder, a firm tampon being also introduced into the vagina.

Fenwick advises operating through a "caisson" introduced through the suprapubic incision and pressed down over the diseased area. A Fergusson tubular speculum may be used in the same way.

The bladder-wound is to be closed by a layer of fine sutures so introduced as not to pierce the mucous membrane. The remainder of the wound had best be left open, merely packing it loosely with gauze and allowing it to heal by granulation. If the bladder has been tamponed, the ends of the tampons are brought out through a portion of the bladder-wound left unclosed, and this tampon must be removed in from twenty-four to thirty-six hours, another one being inserted if the hemorrhage still continues. A catheter must be left in the bladder for the first few days. No irrigation is necessary unless there is a marked cystitis or an infection following the operation; in either case the sutures in the bladder-wall will probably break down, and the bladder must then be irrigated two or three times during the twenty-four hours.

The operation which is done must be controlled by the circumstances of the case—whether a beginning new growth may be cutted away or whether a piece of the bladder-wall must be excised. Also the removal of the whole bladder has been practised, with fairly good results, but every surgeon will realize what it means to undertake such an operation, and that unless it is carried through successfully the condition of the patient will be worse afterward than before.

The palliative treatment of non-operative cases also offers the chance of relieving our patients of much at least of their suffering, and should always be carefully attended to. The vesical tenesmus and constant desire to void the urine may be relieved by making a vesico-vaginal fistula, and daily irrigations of the bladder are useful unless they cause increased hemorrhage. The hemorrhage is a hard symptom to control, and in many cases all attempts are useless. Injections of ice-water into the bladder or the use of ice-bags over the pubes may be tried, as also the use of astringent injections or the internal administration of ergot.



The pain can be relieved by the use of narcotics, opium usually acting well in these cases in the form of suppositories.

#### DISEASES OF THE URETERS.

Diseases of the ureters are becoming daily of more importance to the surgeon as the means of diagnosis and the methods of treatment are improved.

*Anomalies of the Ureter.*—As the ureter is formed by a diverticulum from the Wolffian duct, which, dividing at its free end, forms the calyces of the kidney, it is easy to see how, by a division taking place too soon, an anomalous ureter might be formed.

The commonest anomaly seen is a partial duplication of the ureter near the renal hilus, the two tubes coalescing below to form the single ureter, and above at the kidney, either forming two distinct pelves or opening into one pelvis. A higher grade of duplication is seen where the two ureters, arising by separate pelves, run separately through, side by side, nearly to the bladder before uniting. A complete duplication is also seen where the ureters run their entire course separately, one portion either entering by a blind sac in the bladder-wall, and thus causing a partial hydronephrosis of one kidney, or opening into the urethra or rectum; rarely both ureters opening directly into the bladder by normal orifices.

Most of these conditions are not recognized until seen at the autopsy table or in the dissecting-room, and therefore give rise to no symptoms and require no treatment.

The cases of abnormal opening of one ureter into the vagina or urethra or somewhere on the vestibule give rise to annoying symptoms from the constant flow from them of urine.

**TREATMENT.**—A urinal may be worn to collect the urine and prevent the constant wetting of the genitals and linen, and the unpleasant odor which always clings to these patients; or an operation may be attempted, the ureter being dissected loose and turned into the bladder; or a fistula may be formed between the ureter on one side and the bladder on the other, the edges of the two being sewed together with a fine needle and silk sutures.

*Trauma of the Ureter.*—This subject until of recent date was of comparatively little importance, as so few cases occurred. Since, however, the recent advances in abdominal surgery the ureter is often wounded in removing long pelvic tumors or inflammatory masses, and the methods of treatment are therefore of importance.



The wounds of the ureter may be divided into two classes: the accidental wounds and the wounds occurring during the course of a surgical operation.

The first are of rare occurrence, and may either be occasioned by crushes or other violence, without implication of the skin and external coverings of the body, or they may be occasioned by a stab or a gunshot wound.

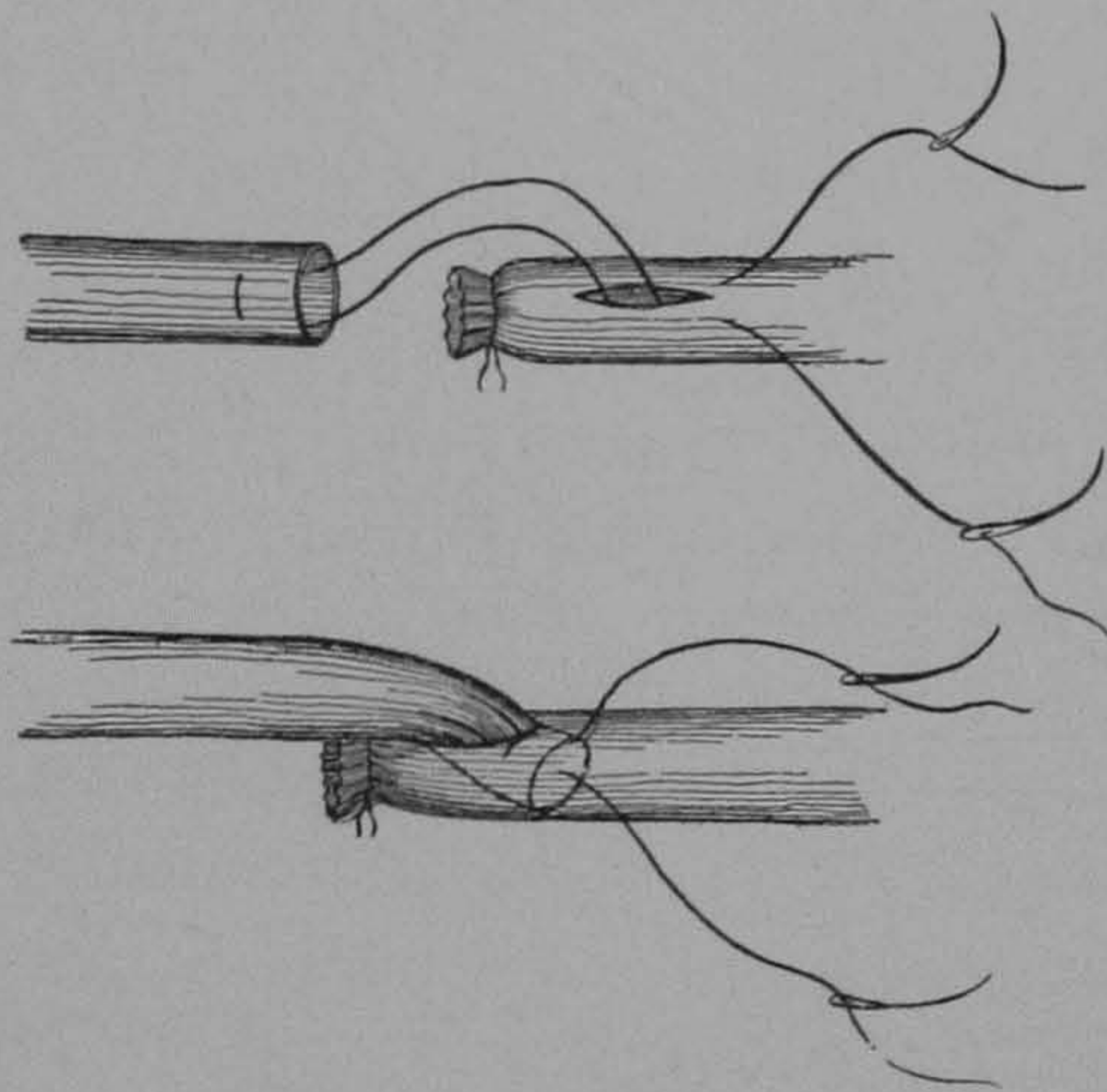
**SYMPTOMS.**—The subcutaneous wounds are difficult to diagnose, as the symptoms are very much like those of a kidney-wound, except there is usually no hematuria, and there is an extravasation of the urine into the tissues and the formation of an indistinct tumor.

Wounds occasioned by stabbing or shooting are diagnosed by the direction of the wound and the effusion of urine.

**TREATMENT.**—Where the diagnosis is made the treatment is anastomosis of the severed ends.

Wounds of the ureter occurring during surgical operations are frequent, and are especially apt to be seen by the gynecological surgeon, occurring during removal of large fibroid tumors of the uterus, carcinoma of the uterus, intra-ligamentary tumors, or pelvic inflammatory disease.

FIG. 338.



Uretero-ureteral Anastomosis: bladder end of the ureter ligated. Stitches in place, ready for tying.

The diagnosis is usually made by seeing the clear urine welling from the cut ureter.

The wounds which may occur are divided into—(1) a simple wound, without complete solution of the continuity; (2) a complete division of the ureter, but without displacement of the extremities; (3) a complete division of the ureter, with wounding of the ends.



TREATMENT.—This is divided into the methods which have for their object a restitution of the ureter, and those by which a complete extinction of the urinary function of the affected side is intended.

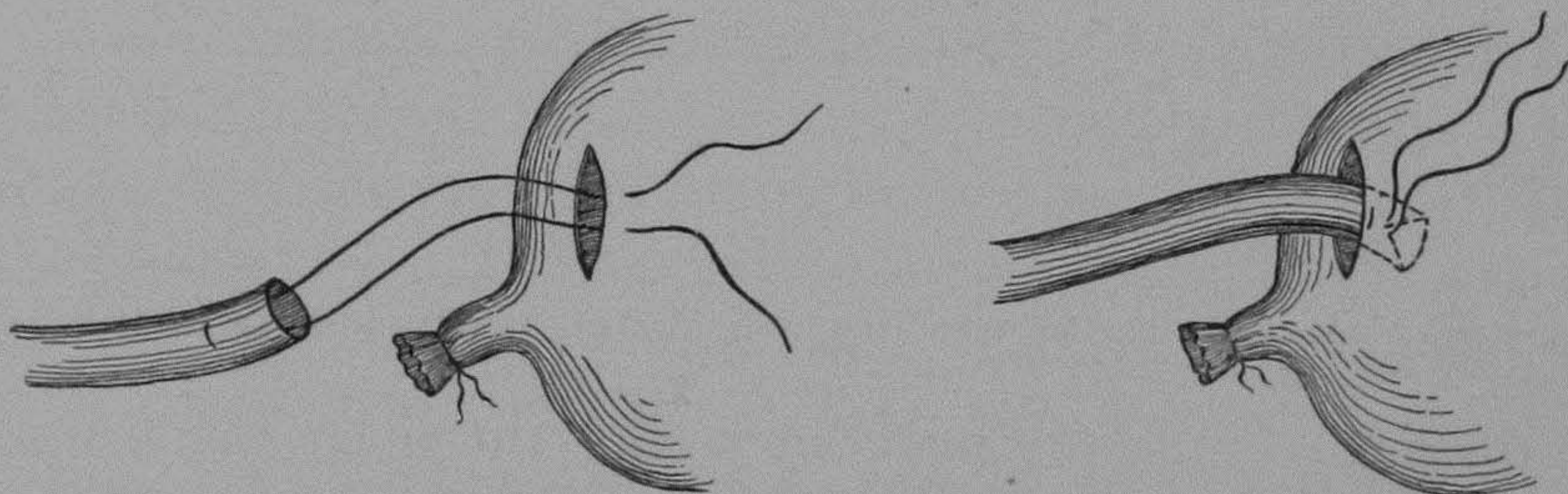
The methods of effecting the restitution of the function are different, depending on the character of the wound, its position, and the amount of ureteral tissue which is lost.

For instance, where the ureter is only partly cut through the wound may be closed by fine silk sutures, care being taken that the sutures do not enter the lumen.

In cases where the ureter is cut entirely across, some method of anastomosis of the two ends is used. By Van Hook's method the lower end is closed and an incision is made in the wall of this portion of the ureter just below the closed end; into this the upper end of the ureter is introduced and kept in place, partly by a catgut suture, which is first introduced through the upper end, and then both ends of the suture threaded on separate needles are carried through the wall of the lower end of the ureter, the needles being passed from within outward, and the ends tied outside. Several fine sutures can also be passed through the edge of the incision in the lower end and through a corresponding portion of the wall of the invaginated upper end, thus holding it more firmly in position.

An end-to-end anastomosis has been attempted, and has been followed by good results, though there is a tendency to contraction of the scar and stricture-formation. This anastomosis may either be made with the two ends cut squarely across, or the two ends may be cut obliquely, thus giving a larger scar and lessening the danger of subsequent stricture.

FIG. 339.



Bladder Implantation. Bladder end of ureter ligated: incision in bladder: stitches in place ready for tying.

The sutures in these cases had best be of very fine silk and so introduced as not to encroach on the lumen. The method is unsafe in view of the certainty of success by lateral anastomosis or bladder



implantation. A direct implantation of the ureter into the bladder has been done a number of times with success where the anastomosis method was impossible, though the uretero-ureteral anastomosis is the better method if it can be carried out.

By the bladder-implantation method the bladder end of the ureter is ligated and dropped. The bladder is then opened at the point nearest to which the end of the ureter is most easily approximated.

After freeing the ureter and opening the bladder, both ends of a suture (each end threaded with a separate needle) are passed through the wall of the ureter and brought out of the end of the vessel. The needles are immediately passed into the bladder through the opening, are made to penetrate its walls about a quarter of an inch from the cut margin, and are brought out upon its peritoneal surface, where the two ends are securely tied, thus drawing the end of the ureter into the bladder and there fixing it. If thought desirable, two such sutures may be passed. Catgut must be used for this purpose, for the reason that by its swelling it obviates any danger which might exist as to leakage of urine from the puncture points (which is exceedingly remote), and for the reason that silk might and probably would act subsequently as a predisposing factor for the formation of vesical calculus.

It is probable that the sutures may draw the free end of the ureter so close to the bladder-wall as to interfere with the free flow of the urine; therefore it is well to always split the ureter for a short distance on the side opposite to that on which the stitch is placed.

It now remains to close the opening into the bladder. A small catgut suture will securely unite the cut edges of the mucous membrane of the bladder, care being taken that it be brought snugly about the ureter. In fact, to the more surely secure this result a stitch may be carried through the wall of the ureter itself, care being taken not to penetrate its lumen. The connective tissue, alone or together with the peritoneum, is now to be approximated by a similar suture, the same precaution as to the ureter being again taken. If desired, silk may be used safely for this and subsequent parts of the procedure.

A ureteral fistula has also been made by implanting the cut end into the abdominal wound or into the vagina or rectum, but this is a dangerous method, and besides the annoyance of the fistula, there is great danger of pyonephrosis from an ascending infection.

Complete extinction of the urinary function of the affected side



may be effected either by ligation of the ureter or by a nephrectomy, but with the present advances in the surgery of the ureter the necessity for this method of dealing with a wounded ureter will rarely or never occur.

### INFLAMMATION OF THE URETER; URETERITIS AND PERIURETERITIS.

Inflammation of the ureter is almost always consecutive to inflammation either of the bladder or of the kidney, and may be distinguished as ascending ureteritis or descending ureteritis as the infection comes from above or below.

Another division may be made between the cases with dilatation and those without dilatation of the lumen of the ureteral canal.

ETIOLOGY.—The most common variety of ureteritis is caused by an ascending infection from an acute or chronic cystitis. The predisposing cause, or, in other words, the reason why in some cases of cystitis ureteritis appears, while in others, apparently of equal severity, ureteritis is not present, cannot be easily explained.

I Retention and stagnation of the urine in the bladder is apparently one cause, as are also the violent vesical contractions which accompany so many cases of cystitis, the contractions forcing the urine backward into the ureter. II Inflammatory disease of any of the pelvic organs, causing pelvic congestion, is also probably a cause. Ferment

The descending ureteritis is merely a direct extension of the inflammation of the pelvis from the kidney, and is rarer than the ascending variety.

PATHOLOGICAL ANATOMY.—We must differentiate between the acute and the chronic forms, though clinically this is hard to do. The acute form shows swelling and reddening of the mucous membrane, and with the microscope there is seen to be some loss of the surface epithelium, infiltration of the mucosa and submucosa with leucocytes, and congestion of the vessels.

The chronic ureteritis takes two forms, according to whether there is dilatation or whether the tube is thickened and not dilated, and fixed in position by periureteral inflammation.

The ureter in the dilated form is lengthened, tortuous, with thin transparent walls, looking at times like the small intestine. Under the microscope the walls in most places are found thin, the mucosa represented by either a thin line of flattened epithelium, or the epi-

Ascending

Cause

Swelling & desquamation



thelium is entirely wanting, the muscular coat being represented by a few fibres and the principal thickness of the wall formed by connective tissue.

In places there are found thickenings in the wall representing the strictured places, the thickened spots being formed of connective tissue.

In ureteritis without dilatation the ureter forms a thickened cord retained in place by a periureteral inflammation. The lumen in these cases is lessened by increase of connective tissue in the walls, and the elasticity has almost entirely disappeared, and in places there will be found strictures almost entirely destroying the lumen.

**SYMPTOMS.**—The symptoms of ureteritis are usually so overshadowed by the symptoms of the accompanying disease elsewhere that they are not noticed.

Pain along the course of the ureter is common, and there is usually tenderness on pressure in the region on each side of the umbilicus, and on making a vaginal examination the ureter may be felt as a rounded, thickened cord in the broad ligament, where it has been mistaken for an ovary.

Pyuria is also present, as is troublesome bladder tenesmus, and frequent desire to pass urine, though these symptoms cannot be spoken of as belonging to the ureteritis, they being also present in pyelitis or cystitis.

**DIAGNOSIS.**—The onset of a ureteritis is usually insidious, and the symptoms for a time are not noticeable. The diagnosis depends on the character of the pain along the course of the ureter, the tenderness elicited by palpation through the abdominal walls, and the finding of the ureter enlarged or thickened in its pelvic course by a vaginal examination.

The introduction of a renal catheter will also give notice of the presence of strictures, both by the difficulty in passing and by the sudden flow of the dammed-back pus or urine after the stricture is passed.

**TREATMENT.**—The most important thing in the treatment is to relieve the immediate cause; thus, if the patient is suffering with a pyelitis, the proper treatment would be drainage of the pus sac. If the cause is a cystitis, the cure or relief of this must be attempted; the constant contractions of the irritated bladder must be lessened, either by using frequent irrigations or by the formation of a vesico-vaginal fistula.



The local application of astringent or antiseptic fluids may be made immediately to the diseased mucous membrane by the use of the renal catheter. The ureter is catheterized in the usual way, and with a funnel connected to the outer end of the catheter by rubber tubing the various medicinal agents, in solution, may be made to run into the ureter, and then, by merely lowering the funnel below the level of the kidney, may be siphoned out again. This is to be continued until the urine comes away clear.

The most useful remedies to use in this way are weak solutions of bichloride of mercury or nitrate of silver, the strength being gradually increased as the organ becomes more accustomed to the treatment.

Drugs such as salol, sodium biborate, sodium salicylate, and the various stimulating oleo-resins may be given by mouth for their effect on the urinary tract during elimination, and will often be found useful, especially in the milder cases.

*Tuberculosis of the Ureter.*—This condition, as in the ureteritis following infection with other pathogenic organisms, is, almost without exception, a secondary condition, though primary tubercular ureteritis has been described.

The SYMPTOMS are pain along the course of the ureter, which is much thickened and very tender, greatly increased frequency of micturition, and in some cases the passage of blood mixed with the purulent discharge.

The DIAGNOSIS from ureteritis following other infections can only be definitely decided by the examination of the purulent urine for tubercle bacilli, which, if found, will settle the diagnosis.

TREATMENT.—As tuberculosis of the ureter is most frequently a secondary result of tuberculosis of the kidney, the probability that in most cases of tubercular kidney the ureter and pelvis of the kidney are also tubercular should be an indication in every nephrectomy for the removal of as much as possible of the ureter.

#### OBSTRUCTION OF THE URETER.

The obstruction may be (1) by a foreign body lodged in the canal; (2) by changes in the wall of the ureter; (3) by pressure exerted on the ureter from the outside.

(1) *Foreign Bodies Blocking the Ureteral Canal.*—The most important and the most common bodies are renal calculi, which during their passage from the kidney become blocked somewhere along

is 100,000 grains  
any increasing  
1 to 4 gr. to the oz.



the course of the ureter. Blood-clots or clots of inspissated pus may act in the same way, as may small daughter cysts in echinococcus disease of the kidney.

*Ureteral Calculi.*—Under this head can be classed only the stones which remain for some time in the ureter, leaving out all cases in which the stone passes through the ureter, even though slowly. These stones are usually about the size of a cherry-pit or larger, and with rough, uneven edges. Stones which have been in the ureter for a longer time usually have a characteristic ovoid form from the additional deposit of the urinary salts on the ends; they are also apt to show on one side a depression or groove through which the urine flows. The most common sites of impaction are just below the pelvis of the kidney and in the lower portion of the ureter just before its entrance into the bladder. More rarely they are found somewhere in the middle third.

The SYMPTOMS may come on acutely, and are then described as occurring in the following order, namely: at first a period during which the patient suffers from agonizing attacks of colicky pain due to the passage of the stone through a portion of the ureter. This ends sooner or later, and the second stage comes on, the pain lessening to a dull ache, and there is almost complete or a complete absence of the urinary flow. This absence of the urine may occur as a sympathetic condition where the other kidney, though healthy, does not secrete; or a more dangerous condition is present where the other kidney is badly diseased or absent, or where there are stones lodged in both ureters. A fluctuating tumor may be discovered in the renal region when there is complete stoppage of one ureter, this being one of the causes of acute hydronephrosis.

The symptoms may also run a chronic course, with attacks of dull pain somewhere along the course of the ureter, the patient often being able to locate exactly the seat of the pain. The urinary symptoms in these cases are usually absent, as, if there is complete cessation of the flow from one side, the other kidney will take up the work of both. There may, however, be seen a condition of "intermittent hydronephrosis" on the affected side, the stone being capable of some motion and acting as a ball valve.

DIAGNOSIS.—In the more acute cases the diagnosis is usually not difficult, as the history of an acute attack of pain, the dull pain located somewhere along the course of the ureter, and the partial or complete cessation of the urinary flow, all point to the condition



present. More important, however, is the condition of the other kidney, this only being determined by careful study of the individual case. The use of the renal catheter will be of great help in these cases, and by coating the tip lightly with dental wax the scratch-marks occasioned by contact with the stone can be seen.

In the cases where the onset is more insidious and the course chronic the diagnosis is difficult, especially if there is complete obstruction and no urine can pass the stone.

Here the diagnosis must rest on the previous history of renal colic, the dull aching pain localized usually in one spot, and the intermittent hydronephrosis which is present in some cases. The use of the renal catheter in these cases will give valuable results.

**TREATMENT.**—A stone having been diagnosed, the only method of treatment is the removal by operation, though diuretics and abdominal massage, with the hope of pushing the stone into the bladder, have been advised.

Two methods of reaching the ureter are open to us—namely, the transperitoneal and the extraperitoneal routes, and a third method, if the stone lies near the bladder, is through a vaginal opening.

The transperitoneal route allows the ureter to be examined more fully through a shorter incision, and the other kidney and ureter can be examined and the condition noted at the same time; but this method is more dangerous, unless the urine above the stone is perfectly aseptic, from the septic urine entering the peritoneal cavity.

If the transperitoneal route is chosen, the incision can be made either in the median line or external to this along the external border of the rectus.

In opening the ureter a longitudinal incision should be made, and after the stone is removed the incision is closed tightly with fine silk or catgut, the sutures being so introduced as not to enter the lumen of the canal.

The extraperitoneal route is safer, though it involves a longer incision, and it is sometimes difficult to find the ureter. The incision begins in the lumbar region just below the twelfth rib and about at the edge of the quadratus muscle, and from here a line is followed curving around the side of the abdomen, just above the iliac crest, to the anterior superior spine. The hilus of the kidney is first located, then the ureter, and by putting this slightly on the stretch it can be traced to where it enters the pelvis, and with the



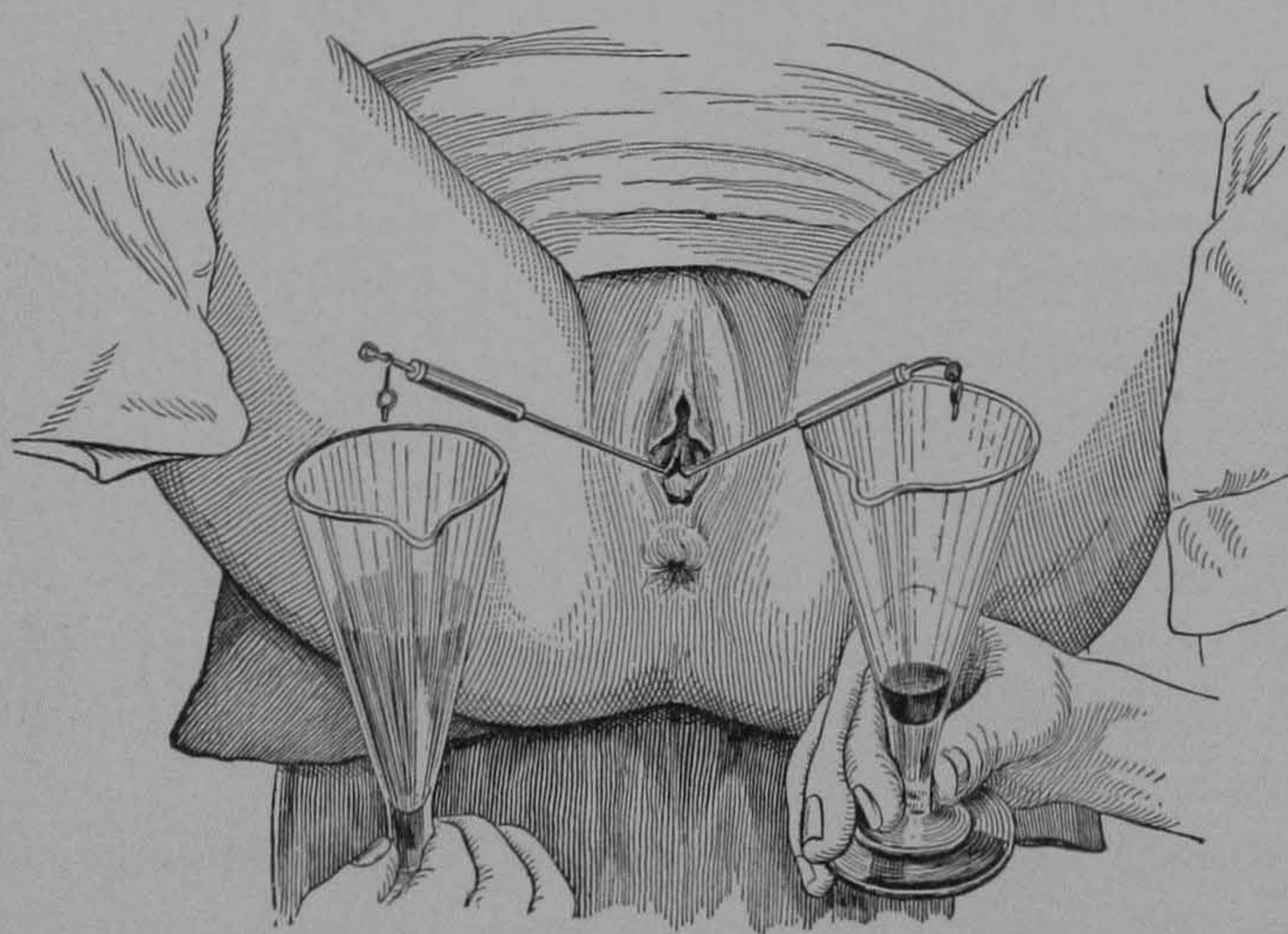
hand in the wound can be followed in its course until the broad ligament is reached. The method of opening and the closing of the ureter are the same here as in the transperitoneal method.

(2) *Changes in the Wall of the Ureter causing Obstruction.*—The most common changes seen here are the strictures of the ureter following inflammatory changes in its walls. These strictures may be single or multiple, and may be situated in any portion of the ureter.

The most common site is, however, near the ureteral opening into the bladder, and next to this the most common site for the stricture is near the junction of the ureter and pelvis of the kidney. The small cysts and the polypoid tumors are uncommon causes of obstruction.

**SYMPTOMS.**—In many of the cases the obstruction will give rise to no symptoms, this being especially true for the non-infected cases, though the symptoms of hydronephrosis from the slow accumulation

FIG. 340.



Catheterization of both Ureters: Left-hand glass showing greatest quantity of urine secreted during a given interval; urine clear. Right-hand glass showing a much smaller quantity of urine secreted; urine bloody, indicating the diseased kidney and the character of the disease.

of urine may be present. If the case is a septic one and the pus is prevented by the obstruction from emptying itself, there will be a history of pain, rise of temperature, and all the symptoms of purulent retention, with the presence in the flank of a tumor tender on pressure and slowly increasing in size.

**DIAGNOSIS.**—In the slow, insidious non-infected cases the only means of diagnosis is the renal catheter, by the use of which we can



locate the stricture, introducing it slowly and noting when there is a sudden outflow of urine, indicating that the stricture is passed. The amount of urine which is then collected should be saved, as indicating the amount of retention. In the infected cases the diagnosis will not be so difficult, the history of the patient, the presence of the tumor, and the pus withdrawn by the catheter, all showing the nature of the lesion.

**TREATMENT.**—A stricture low down near the ureteral orifice can be dilated by the use of a metal catheter, the size of the one used being slowly increased, or metal bougies may be used in the same way.

A stricture in the middle portion of the ureter may be dilated in the same manner by using the flexible-silk renal catheters. Strictures or kinks in the ureter near the pelvis of the kidney have been relieved by operation, either excising the strictured portion and performing a uretero-ureteral anastomosis or by a plastic operation. In the purulent cases the accumulation of pus must be removed and the inflammation combated in addition to the dilatation of the stricture.

(3) *Obstruction of the Ureter by Pressure from the Outside.*—In women the most common cause of obstruction is from new growths or inflammation of the genital tract, there being, for example, in carcinoma of the uterus with extension laterally a large percentage of cases where there is almost complete obstruction to the outflow of urine, many of the patients suffering with carcinoma of the uterus dying from uremia. The ureter may also be blocked by pressure from a band of adhesion crossing it, and there are cases described where a congenitally misplaced vessel crosses and obstructs the ureter.

**SYMPTOMS.**—These cases, unless there is infection and very marked symptoms, are usually entirely obscured by the accompanying disease, not being discovered until either an operation is attempted for the pelvic disease or the patient dies and comes to the autopsy table.

**TREATMENT.**—As the cause is external to the ureter, the only method of treatment is by removal of this cause. Carcinoma which has developed enough to exert pressure is usually hopeless, and the only method of treatment is either by an operation to implant the ureters into the vagina or rectum or bring them out of the abdomen through an abdominal wound. As this will prolong life but a few



months, and is attended by all the discomforts of urinary fistula, in most cases at least it would seem to be contraindicated. Where the pressure is exerted by a pelvic abscess, severe pelvic adhesions, or by a large myoma, operation and the removal of the cause will relieve the ureteral condition.

#### NEW GROWTHS OF THE URETER.

Primary growths of the ureter are very rare, with the exception of the small polypoid tumors which are occasionally found in the pelvis of the kidney and upper portion of the ureter, and which usually give rise to no symptoms, though if they are large there may be hemorrhage from them, simulating a malignant growth of the kidney.

One case of sarcoma of the ureter has been reported which was operated on for a renal tumor.

Small cysts of the ureter are not uncommon, and are supposed by some to be the result of a folding in and adhesion of the mucous membrane following inflammation; by others they are considered to be due to the presence here of a sporozoa. They give rise to no symptoms, and are only of pathological interest.

Secondary new growths of the ureter are not so uncommon, they either extending from a renal tumor, or in the lower portion the ureter may be affected from a primary growth in the bladder or the genital organs.