CHAPTER IX.

DISEASES OF THE EXTERNAL GENITALS.

1. Advantages of superficial position for operation: *a.* Hemorrhage easily controlled. *b.* Defects easily covered. *c.* Asepsis. *d.* Sutures.
2. Diseases of labia majora: *a.* Lipoma. *b.* Hydrocele. *c.* Inguino-labial abscess. *d.* Pseudo-myxoma of the canal of Nuck. *e.* Hernia. *f.* Myoma of round ligament. *g.* Condyloma. *h.* Carcinoma.
3. Diseases of labia minora: Cysts.
4. Diseases of clitoris: *a.* Adhesions and concretions. *b.* Elephantiasis. *c.* Sarcoma. *d.* Carcinoma.
5. Diseases of vulvo-vaginal glands: *a.* Cyst; *b.* Abscess; *c.* Adeno-carcinoma; *d.* Myxo-fibro-sarcoma.
6. Affections of the vulvar mucosa: *a.* Cohesion. *b.* Pruritus.

In considering the surgical diseases of the external genitals, we take up the affections of some five different structures—namely, the labia majora, the labia minora, the clitoris, the mucous membrane about the vaginal outlet, and the vulvo-vaginal glands.

There is no common principle other than contiguity uniting these diverse organs in their pathological affections, the list of which is but short, including neoplasms, elephantiasis, cysts, abscesses, and pruritus.

In spite of the situation of these organs upon the exterior of the body, they are so well protected by the thighs that they are but rarely subjected to violence. I have seen a case in which a hematoma has been produced by the kick of a brutal husband; a girl of twelve was brought into the ward of the Johns Hopkins Hospital suffering from a severe hemorrhage, with a large hematoma of the perineum and left labium, the result of a fall astride a fence rail on which she had been standing. I know of instances in which the external genitals have been injured in young girls by sliding down balusters and striking a low newel post. In one case, in the care of Dr. Jacob Price, of West Chester, Pa., a vulvar laceration was produced by the horn thrust of an angry cow.

Operations upon the external genitals are among the simplest and least dangerous gynecological procedures, on account of the superficial accessible position of the organs.

Hemorrhage, although often free, particularly in operations involving the clitoris, is always readily controlled. Deep sutures uniting the edges of the wound are usually sufficient to control the bleeding without the aid of buried ligatures. The free anastomosis of numerous smaller vessels is the means of effecting a rapid union of wound surfaces. It is also easy to cover up large defects created by the extirpation of tumors and neoplasms with the lax movable adjacent skin. Situated on the surface of the body, the wound is readily pro-

tected, and its aseptic condition easily preserved after operation; for this reason suppuration does not often occur.

For suture material I prefer silkworm gut as a tension suture, and fine silk or catgut for accurate approximation. The need for an absorbable material is not so great where the sutures can be so readily removed, but for greater convenience the subcuticular catgut suture is perhaps the best.

LABIA MAJORA.

Lipoma.—Lipoma, or fatty tumor, is one of the rarest gynecological affections; no writer has as yet recorded more than a single instance in his own practice. In the Johns Hopkins Hospital Reports, vol. iii, page 321, I collected all the cases I could find in the scattered literature, numbering only twenty.

Lipomatous tumors are usually easily recognizable, as they possess the same characteristics as lipomata elsewhere. The labium itself is enlarged when the tumor is attached to it by a broad base, or the tumor may hang by a pedicle more or less attenuated. In a case which I saw in the Episcopal Hospital, Philadelphia, an ovoid tumor, 8 centimeters (3 inches) long, hung from the middle of the right labium majus by a slender pedicle 5 centimeters (2 inches) in length and not more than 3 millimeters in thickness. The pedicle of a large lipoma, on the other hand, may extend up into the inguinal canal, in which case the tumor simulates a hernia. The base of the growth has also been found extending back on to the perineum, or even up into the vagina. The length of the pendulous growth in one case was 55 centimeters (22 inches).

FIG. 106.—HEMATOMA OF THE VULVA OCCUPYING THE LEFT LABIUM MAJUS AND EXTENDING DOWNWARD ONTO THE PERINEUM.

The vaginal outlet is discolored and all of the surrounding parts distorted and infiltrated with blood. Below is an abrasion of the skin. The patient fell astraddle a chair.

Dr. William Goodell, of Philadelphia, observed a case attached by a broad pedicle hanging down to the knees. Balls-Headley, of Melbourne, removed a tumor which weighed 24 pounds.

The lipoma feels hard or soft, according as the fibrous septa or the fat predominates. When there is an excess of fat, the sense of fluctuation is so distinct that the inference that the tumor is cystic is almost irresistible. Under this impression Goodell inserted an exploring needle into his case.

It is easy to mistake such a mass for a hernia, where the pedicle is broad and extends up into the inguinal canal, and where there is impulse on coughing, together with some apparent reduction on manipulation and upon lying down, as has been recorded.

Age is not an important factor; the youngest patient I have found noted was eighteen, and the oldest, operated upon by Dr. A. H. Deekens, in Philadelphia, sixty-one.

The larger growths take years to develop. One woman carried her burden seventeen years.

A large tumor hanging between the thighs is apt to become ulcerated from attrition, and an extensive hemorrhage may arise from such an area.

The chief distress comes from interference with walking, with the sexual function, and in one case, obstruction of the vaginal outlet during labor. Both of these difficulties existed in one of my own cases, in which a large globular fatty tumor hung from the left groin close to the labium majus; nevertheless, the patient carried the growth thirteen years until it alarmed her by becoming ulcerated.

The diagnosis rests upon the following factors: The tumor is a well defined ovoid or round, softish, fluctuating or hard, generally pediculated, often covered with wrinkled or lobulated skin, not reducible, is slightly hardened by the application of cold, and the septa may be faintly outlined on the surface, and is painless unless ulcerated.

The treatment is extirpation; if the pedicle is long and thin, it may be simply constricted firmly or slightly abraded and surrounded for ten minutes by a pledget of cotton wet with a saturated solution of cocaine, and then cut off at a distance of 1 or 2 centimeters ($\frac{2}{5}$ to $\frac{4}{5}$ inch) from its attachment. The growth is often supplied by a single artery in the center, which should be tied with catgut. The wound is closed by catgut sutures, and the dressing applied. Where the pedicle is not so well defined, one may often be formed by grasping the tumor and drawing it out from the body. The incision must here be made well out from the body on the under side of the tumor, otherwise there will be a large defect in the skin when the tumor is taken away. There is no objection to utilizing a part of the skin covering of the growth in this way, as it is in all respects normal, and there is no danger of the tumor recurring.

Large sessile growths extending up into the inguinal canal, or into the vagina, or out on to the perineum, must be removed by making an oval incision through the skin over the growth, and shelling out the fatty mass, ligating bleeding vessels, and then approximating the skin with sutures. Injections with alcohol or

removal by burning through the pedicle with the cautery, or ligation of the pedicle, leaving it to slough off, as practised in the past, ought to be abandoned.

Hydrocele is an affection of the persistent canal of Nuck, characterized by an accumulation of fluid within it; it is exceedingly rare, owing to the fact that the canal is normally completely obliterated in the adult.

The hydrocele presents the appearance of a rounded elongate or moniliform cord extending like a string of beans from the region of the external inguinal ring down into the labium majus.

When the distended sac shows the constrictions, they appear in a succession of little swellings; at other times there is only a single elastic enlargement at the upper and outer angle of the vulva.

The diagnosis is established by noting the location of the affection, its direction upward toward the inguinal canal, and the fact that it does not give rise to any characteristic symptoms.

If the canal is patulous above, the fluid may be forced back into the abdomen.

The absence of any intestine from the canal may be ascertained both by percussion and by placing a finger over the ring and partially closing it, while the fluid is forced back into the abdomen by pressure made upon the tumor with the other hand; the sensation communicated is that peculiar to fluids alone.

When a hydrocele can not be differentiated from a small solid tumor in the canal, the use of the aspirator will determine the diagnosis in a simple and safe way.

Encysted hydrocele should first be treated by aspiration, after cleansing and shaving the part immediately over the swelling; if the tumor returns, the sac should be exposed and dissected out of the labium, all hemorrhage stopped, and the wound closed with catgut.

A sort of false hydrocele of the upper part of the canal is often associated with the presence of a large amount of ascitic fluid in the abdomen, and depends upon the increased intra-abdominal pressure as its cause. The treatment then is that of the intra-abdominal condition producing the ascites, after which an operation may be called for to close the neck of the sac at the inguinal ring to prevent the occurrence of an inguino-labial hernia.

Inguino-labial Abscess.—I have found this condition in the left inguinal canal of a mulatto; it occupied the upper outer part of the labium, and was about 3 centimeters in length by 2·5 centimeters in width. The abscess was hard but slightly irregular, movable, very painful on pressure, and associated with a rise of temperature.

After due preparation an oval incision was made over the enlargement and the entire honeycombed abscess was enucleated from the inguinal canal down to the pubic ramus, which was laid bare. The chief difficulty in the extirpation arose from the extreme vascularity of all the surrounding adherent tissues. Hemorrhage was controlled by numerous ligatures passed deeply under the tissues and tied tight. A thin strip of iodoform gauze made an efficient drain for such oozing as could not be checked immediately. This was removed in

two days, and the wound healed throughout; the skin sutures were removed in a week.

Pseudo-myxoma of the Canal of Nuck.—I have observed this condition in a case of pseudo-myxoma of the peritoneum due to a ruptured ovarian cyst, in which

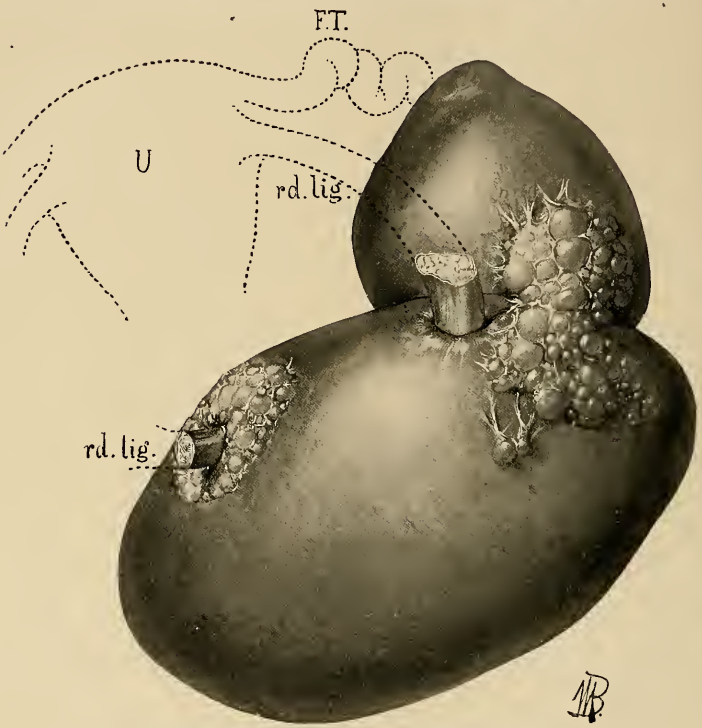

Fig. 107.—Myoma of the Round Ligament within the Inguinal Canal.

The tumor consists of two masses, of which the upper has pushed its way down into the pelvis behind the peritoneum, while the large mass filled the canal. The diagram shows its relations to the left round ligament; the little lobulated masses at each end are fat. Oct. 12, 1893. Natural size.

the encysted mass below the inguinal canal was about 3 by 2 centimeters, and shut off from the peritoneal cavity. The vermiform appendix was glassy and distended with the myxomatous material to three to four times its normal diameter.

Hernia appears in the form of hernia inguino-labialis. The hernial sac forms a pouchlike prolongation of the abdominal parietal peritoneum, and extends down into the labium majus, which may be greatly enlarged, displacing the vulvar orifice to the opposite side.

The sac presents a distinct swelling from its exit at the inguinal ring above down to its lower margin beside the vaginal outlet, and contains either omentum, or omentum and serum, or omentum and intestines.

The diagnosis is readily made upon observing that the tumor extends up into the abdomen, and that it is tympanitic, gurgles on pressure, and can be replaced by putting the patient on her back with elevated chest and flexed thighs in a position of relaxation; on standing and straining it descends again into the labium.

Tumors dull on percussion and irreplaceable are formed by a part of the omentum adhering to the neck of the sac, together with serous fluid transuded and incarcerated in the sac. The use of the fine needle of the aspirator will here settle the doubt. For description of the operation see Chapter XXXV.

Fibroma and Myoma of the Round Ligament.—The most common new growths of the round ligament are fibroma and myoma. Both of these tumors appear as small unilateral growths which gradually enlarge, giving, however, little or no pain.

The differential diagnosis between fibrous tumors of the round ligament and other affections of the inguinal canal is not difficult, depending upon the location, fixation, hardness, and painless character of the growth.

The following case of fibroma of the round ligament presented a typical history (C. H., October 13, 1893, Path. No. 65). The patient first noticed a small mass the size of a pea in the inguinal canal above the spine of the pubes, which grew gradually and never gave rise to any pain. On entering the hospital the tumor was about the size of an egg, slightly movable, painless on pressure, and irreducible.

The operation consisted in an incision along the course of the canal, exposure and ligation of the round ligament at the points of entrance and exit from the tumor, removal of the tumor, and closure of the canal.

Pathological Report.—Tumor, 8 by 6 by 5 centimeters, ovoid in shape, with a smaller mass springing from one side. The surface of the tumor is shaggy and in places masses of adipose tissue are seen. At the junction of the larger and the smaller mass is a cord, 5 millimeters in diameter, which runs directly into the mass. On section its fibers merge into those of the tumor. The tumor is dense, elastic on section, and of a uniform grayish color.

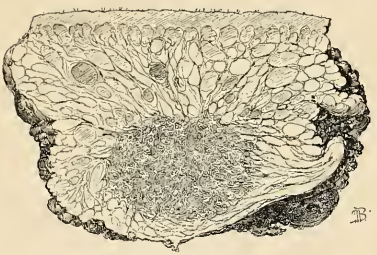

FIG. 108.—ADENO-MYOMA OF THE ROUND LIGAMENT.

Natural size in longitudinal section. The skin is above, beneath the skin is a coarsely reticulated fat with septa radiating from the adeno-myoma in the lower half of the specimen, and surrounding it. Several dark areas of hemorrhagic infarct seen in the fat.

Microscopical examination: Tumor consists of fibrous tissues rich in nuclei; the fibers are more or less concentrically arranged around a central portion,

which consists of non-striated muscle fibers with bands of fibrous tissue running between the striæ. This center is definitely outlined from the surrounding fibrous tissues and is evidently the round ligament. The specimen shows everywhere groups of small canals lined by one layer of cells; these are probably lymph spaces. The specimen is poor in blood vessels.

Fig. 109.—A Portion of the Adeno-myoma, 12 times magnified.

The specimen consists chiefly of non-striped muscle fibers. In the right lower corner are masses of fat cells. In the vicinity of the left upper corner is a pseudo-glomerulus, composed of stroma, scattered throughout which are cross sections of several glands. The surface of the glomerulus is covered by one layer of cylindrical epithelium, and its capsule is composed of one layer of cells which in places are cuboidal or almost flat. The cells of the capsule have practically no underlying stroma, but lie directly on the muscle fibers. The space between the pseudo-glomerulus and the capsule, on tracing it to the right, is seen to be continuous with a gland cavity, and is nothing more than a dilated portion of the gland. Above and to the right of the pseudo-glomerulus are cross sections of two glands; below it are several longitudinal sections, one showing dichotomous branching. All of the glands are surrounded by stroma, which separates them from the muscle.

Diagnosis: Fibroma of round ligament.

I have operated upon one case of adeno-myoma of the round ligament, one of the rarest of the tumors of this region. The growth is benign, and its clinical features in no way differ from fibroma. The tumor possesses considerable pathological interest conforming to the type described in Chapter XXXI, under the title of adeno-myoma of the uterus.

Condyloma.—Small condylomata are common in connection with gonorrhœa. I have seen but one case of extensive condylomata situated upon the lower left labium majus as large as a man's fist, in the practice of Dr. B. F. Baer, of Philadelphia. The patient was pregnant at the time, and the tumor hung from the vulva attached by a broad base to the sound skin, presenting a typical vegetating warty appearance, and was continually moistened with secretions.

The operation was by excision with the cautery knife. The better plan, according to present methods, is by excision with the scalpel and suture.

Carcinoma.—Carcinoma of the external genitals is commonest between the ages of forty-five and sixty. The disease is recognized in its earlier stages as a well-defined, hard, nodular mass, with everted margins, infiltrating the skin, and broken down and ulcerating in the flattened central portion. In the more advanced stages the numerous secondary nodules with the brawny skin and enlarged inguinal lymphatics can not be mistaken.

The tendency of the disease is to extend continuously up to the vaginal outlet, but not beyond it, and then across to the opposite side, or down over the perineum; if not checked, the growth always extends up into the groin. When the inguinal glands are infected, the labium also presents a choked, irregular, knotted appearance, with ulceration in the older portions of the disease. There is, in spite of these changes, always a marked tendency to preserve the general

contour of the labium, giving the cancerous mass a pyramidal form, with its base above. Its wet fissured surface secretes a fetid, watery fluid, and foci of suppuration are not uncommon.

In one case, in which the disease lay partly on the mucous surface, the corre-

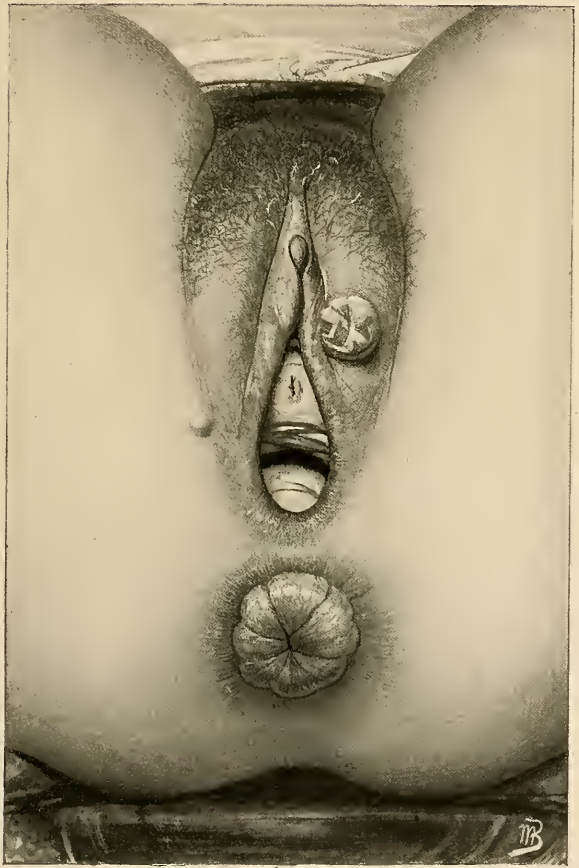

Fig. 110.—Early Epithelioma of the Left Labium Majus, forming a Hard Projecting Nodule, Flat on Top, covered with a Thin Epithelium and eroded in Spots.

No return two years after removal. The vaginal outlet is relaxed, there is a fibroma on the right side at the lower angle of the labium, and there are extensive external hemorrhoids. Path. No. 442.

sponding surface on the opposite side had a thick, white, macerated appearance, but did not appear to be affected with the disease. After a thorough extirpa-

tion of the right labium, the woman returned fifteen months later for operation upon an extensive involvement of the left labium. There was a brawny induration of the labium above the disease with deep pigmentation of the surrounding

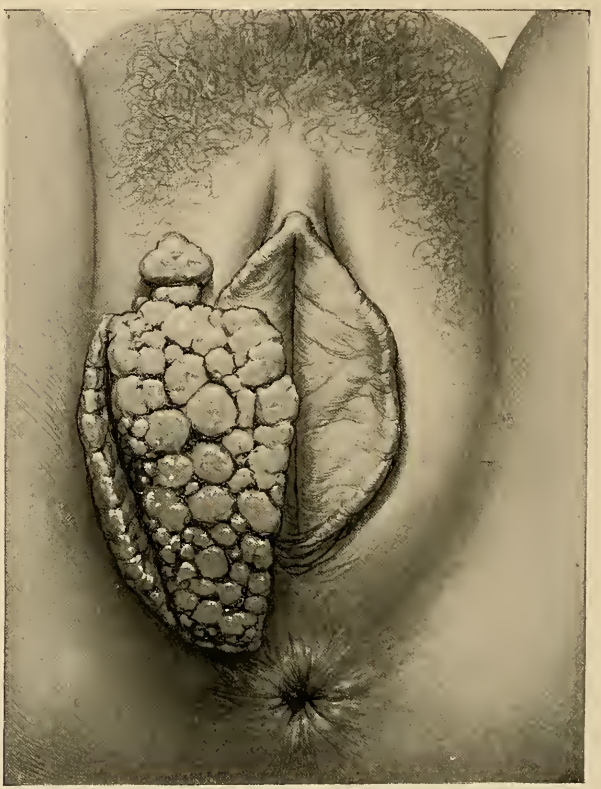

Fig. 111.—Advanced Epithelioma of the Right Labium Majus.

skin; the infiltrated skin bordering on the tumor was of a dark-violet color, separated from the more prominent ulcerating mass by a sulcus.

The earliest case I have seen (Mrs. J. B. R., No. 3013, September 8, 1894), if I except the contact inoculation above mentioned, was a diseased area 2·5 centimeters (1 inch) in diameter, smooth, hard, white and bright red in places, circular, slightly elevated, painless, and situated on the lower part of the left labium (see Fig. 110). This was removed by a wide, deep excision, and in three

years there has been no evidence of a recurrence. The microscopic examination showed that it was an epithelioma.

The patient with carcinoma complains of itching, burning, shooting, and stabbing pains. Bleeding is not a prominent symptom.

Excision is the proper treatment. The use of the cautery or destruction with caustic is no longer admissible. The operation should be performed under continuous irrigation. It is important to give the disease a wide berth by making the incision around it at least 2 centimeters (1 inch) distant on all sides, except the vaginal. It is not necessary to carry the incision inside the vagina, unless the disease extends up to the hymen. The whole labium is usually excised with as much of the surrounding skin as is necessary. In all cases the inguinal glands of the side on which the disease occurs must also be dissected out unless there is an extensive infiltration of these glands, which forms a contraindication to any operative interference.

To remove the cancerous growth the oval incision around it is carried through the skin, and the mass covered with iodoform gauze, grasped, and drawn out from the body, while the scalpel cuts beneath it and rapidly dissects off the entire labium with its underlying fat down to the deep fascia. Two or three arteries, large enough to be troublesome, may need clamping, and afterward a fine ligature. It is best to free the inner side first by dissecting from within outward, to avoid buttonholing the mucous surface, which one is liable to do in dissecting in the opposite direction.

The large defect left by the removal is covered by drawing the outer margin to the inner with deep interrupted catgut sutures, making the line of union in the long axis of the labium removed; the skin is united with subcuticular catgut sutures, or interrupted silkworm gut with catgut between.

Where much tissue has been removed, the tension of bringing the edges of the wound together will distort the neighboring soft parts and drag the urethra toward the affected side. This distortion will necessitate careful attention in keeping the parts clean and dry during the convalescence, because the patient will not be able to urinate without wetting the wound. In such a case I leave a soft catheter in the bladder for the first forty-eight hours, and after that require the patient to be catheterized three times a day by a careful nurse who has had pointed out to her the new position of the orifice and the altered direction of the urethral canal.

LABIA MINORA.

Diseases affecting the labia minora alone are rare. These structures are more liable to be involved in processes starting in and implicating the neighboring organs at the same time; thus they are affected in carcinoma of the external genitals, in elephantiasis, and in pruritus. Under these circumstances and in inflammation the labia do not appear as distinct organs, but merely as coarse reduplications on the mucous surfaces of the labia majora.

In my private practice I have had one case of multiple cysts of the labia minora from a half to two centimeters in diameter (Fig. 112).

Small sebaceous cysts are sometimes met with, occasioning a slight irritation and necessitating an incision to evacuate the contents.

I have had occasion once to remove a small lenticular inflammatory mass from the upper part of the right nympha, brought about by the contusion of a bicycle seat (see Fig. 113). The little flat nodule, which occasioned the patient much discomfort, was excised under cocain. The microscopic examination showed (Gyn. Path. No. 1776) that it consisted of a small firm nodule 1·6 by 0·8 centimeters, covered on its free surface by smooth skin. The center of the nodule was occupied by an inflammatory focus consisting of a dense mass of polymorphonuclear leukocytes, toward the periphery giving place to strands of

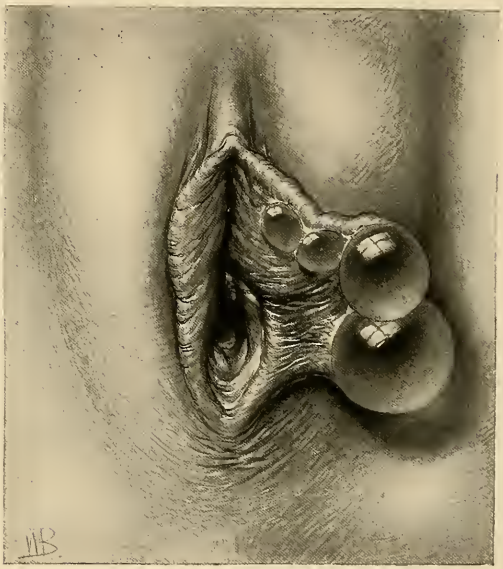

Fig. 112.—Cysts of Left Labium Minus. Oct. 17, 1893.

swollen connective-tissue cells and young blood vessels. The skin covering beyond a moderate leukocytic invasion was unaltered.

I also removed on one occasion a small fibroma of the labium minus (Path. No. 1470) which occasioned no symptoms at all. The tumor, a round hard nodule, 8 millemeters in diameter, was excised from the right labium minus, nearly in the median line, where it joins its fellow.

Histologically the surface was found to consist of several layers of stratified epithelium; the stroma was made up of a loose fibrillated tissue consisting of

spindle cells with spindle-shaped and oval nuclei. The protoplasm took but a faint nuclear stain. The superficial portion of the nodule was infiltrated with small round cells and a few polymorphonuclear leukocytes.

The treatment of growths of the labia minora is simple, consisting in the

Fig. 113.—Section through Small Abscess of the Labium Minus following a Bicycle Trauma.

excision of the affected labium or such portion of it as is involved in the disease, followed by interrupted or continuous subcutaneous catgut sutures.

CLITORIS.

With a single exception, diseases affecting the clitoris alone are exceedingly rare. In elephantiasis of the external genitals the clitoris is prone to be the organ most extensively involved.

Adhesions and Concretions.—The commonest affection of the clitoris is adhesions between the glans and the hood covering it. These adhesions are almost universally found, and never give rise to trouble unless an accumulation of retained smegma causes increased vascularity and irritation. In children these changes are apt to be followed by constant handling and friction.

In any irritation or ill-defined discomfort, or tendency to handle or rub the genitals, the clitoris should always be carefully inspected. This rule is the more stringent in the case of little girls, who can not locate the source of the discomfort (see Fig. 114).

An inspection of the glans of the clitoris should form a part of every gynecological examination which proceeds in a routine manner to investigate the condition of the sexual organs.

The glans is exposed by grasping the fold of mucous membrane covering it between the thumb and forefinger and drawing it upward, at the same time pushing in toward the symphysis and causing the glans to become extruded.

The adhesions will usually at once be seen in semicircular form on the convex surface of the glans back in advance of the corona.

The largest concretion I have seen I removed from the dorsal surface of the clitoris of an unmarried woman of twenty-five, who was hysterical and showed

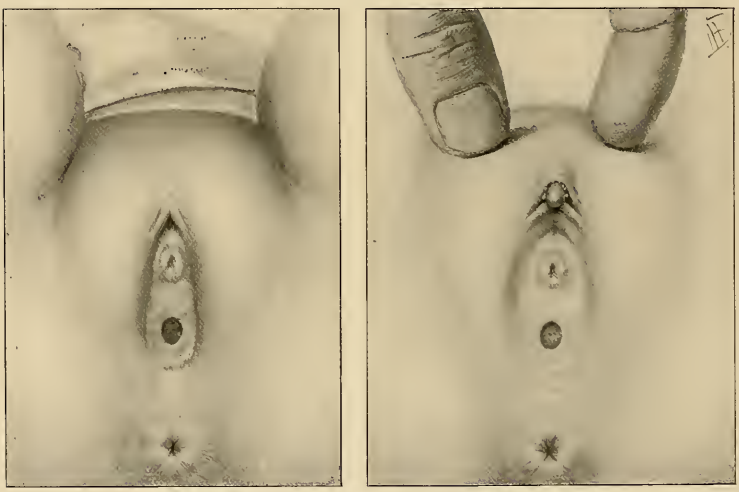

Fig. 114.—Preputial Adhesions in a Child One Year Old.

In the first picture the glans is completely covered in by the adherent prepuce and the diminutive labia minora. In the second picture the adhesions have been severed and the glans is exposed encircled by little accumulations of smegma.

signs of mental aberration (see Fig. 115). The mass was 1·2 by 1 centimeter, and beveled off at its discolored anterior extremity, which could be seen projecting from under the prepuce over the glans. The concealed portion was perfectly white. After releasing a few adhesions at the sides below it was easily lifted out of its bed.

The adhesions exposed by drawing back the prepuce should be freed with a small, blunt probe. If the patient is not too nervous the anesthetic action of a

strong solution of cocain (20 per cent) applied for ten minutes will be sufficient to benumb the sensibility. The exposed adherent surface, although denuded of its epithelium, bleeds but slightly. Here and there little white concretions of smegma, varying in size from a mere point to a mass a centimeter in diameter, come into view, as the adhesions yield to the strokes of the probe point.

The corona as well as the whole convex surface must be freed. The separation is completed when the sulcus back of the corona is exposed. The raw surfaces are now covered with vaseline. The patient should lie abed as long as walking produces discomfort.

The prepuce should be fully drawn back every day for two weeks and vaseline applied to prevent the adhesions from forming again.

This is best done with a little narrow spoon which I have devised for this purpose. The bowl of the spoon is filled with vaseline, and then placed under the prepuce, pushed gently up and turned from side to side, keeping the concavity over the glans which fits in it.

Fig. 115.—Concretion removed from beneath the Prepuce of the Clitoris.

The shaded part was exposed and stained dark. Natural size. Path. No. 183.

Elephantiasis.—Elephantiasis is a name given to an affection which must not be confounded with the elephantiasis of tropical countries, a parasitic disease affecting principally the lower extremities; this affection is rarely seen in this latitude, while elephantiasis of the genitals is by no means rare.

The resemblance between the two diseases is superficial only; in both, the organs affected exhibit a coarse hypertrophy with brawny indurations.

The negro race seems to be peculiarly susceptible; all but one of the cases I have seen have been negresses.

The organs affected in order of susceptibility are first the clitoris and labia minora, and then the labia majora. The perineum may be involved, but beyond this the disease does not invade surrounding tissues.

My own observations lead me to conclude that it owes its origin to a chronic inflammation, associated with an obstruction of the lymph channels draining the external genitals. Syphilis is one of the commonest exciting causes.

I have seen eight well-defined cases, and in most of them areas of ulceration were to be found about the vulva with cicatrices in the inguinal region.

The enlargement may be more or less symmetrical when the clitoris is the chief organ involved, but when a labium majus is greatly enlarged, its fellow is usually but slightly or not at all affected. One or both labia minora may be affected.

The disease is of rapid growth, enlarging to a mass the size of the fist in the course of one or two years. It is usually attended with severe pain in the genitals, often worse at night. Cramps are also felt in the legs. One patient was bedridden on account of her sufferings. One under observation desires the removal of hypertrophied right nympha on account of the pain. Syphilis as a rule will account for cases associated with headache and nocturnal pain.

Painful micturition and even incontinence are common symptoms, due to areas of ulceration and the involvement of the urethra. Leucorrhea almost always exists, and is often profuse.

The diagnosis is not difficult. Elephantiasis is separated from the other tumors by not possessing such sharply defined limits of growth. Close inves-

Fig. 116.—Elephantiasis of Labia Minora; Great Hypertrophy of the Left Side.

tigation always shows it to be a more or less grotesque hypertrophy of normal structures. The brawny feeling and the lobulated fissured surfaces are also important clinical characteristics.

Elephantiasis of the Clitoris.—A good illustration of the disease was afforded by the following case. She was a poorly nourished negress, thirty-one years old. Her menstruation, at first regular and moderate, had be-

come irregular and profuse, and she had a constant free leucorrheal discharge. She complained of pains in the small of the back and in the abdomen and of cramps in the legs, together with frequent painful urination, worse at night.

Upon examining her I found the vulvar cleft occupied by a large, pendulous, irregular tumor mass, attached at the anterior commissure and hanging down over the vaginal outlet. The vaginal outlet beneath this was found relaxed, the cervix stellately torn, and the uterus reclining in the sacral hollow. The tumor was shown by its relations to be an enormous clitoris, 10 centimeters long, 5 centimeters broad, and 4·5 centimeters (4 by 2 by 1¾ inches) in antero-posterior thickness. Its lower rounded end was free and slightly notched beneath, having exactly the form of a large penis with a retracted prepuce. Back of the corona was a well-defined sulcus. Thickened preputial folds encircled the glans. At the sides lay the enlarged nymphæ. It had a broad base of attachment at the symphysis. The urethra lay intact beneath the clitoris, but the vaginal outlet was thickened and corrugated, and showed several superficial areas of ulceration from ½ to 1 centimeter in breadth. A fetid leucorrheal discharge issued from the vagina. On the dorsal surface of the tumor was an irregular white patch 2 by 1 centimeters (⅘ by ⅖ inch), probably representing an old area of ulceration in marked contrast to the surrounding deeply pigmented structures. Two little pediculated tumors, the size of a pea and a hazelnut respectively, hung from the junction of the right nympha with the clitoris. Scars in the left groin and in the supraclavicular region were evidences of old syphilitic disease.

The following case presents a picture of the disease when limited to the labia minora: The patient was twenty-eight years old, and had passed through three childbirths, all instrumental, the last premature at six and a half months, four years before. She had lived a loose life, separated from her husband, and had contracted an ulcer upon the external genitals two years before, where I found upon examination a cicatrix 1 by 1 centimeter, just within the posterior commissure. The urethral orifice was ulcerated and an ulcer lay on the anterior vaginal wall. The labia minora appeared as a lobulated tumor 9 centimeters long by 3 centimeters (3½ by 1¼ inches), projecting 4 centimeters (1½ inch) beyond the normal labia majora, and below the clitoris. There was a deep sulcus between each labium and the frenulum of the clitoris. The outer surfaces of the labia were divided by shallow sulci, the inner surface being smooth and glistening (see Fig. 116).

The treatment of elephantiasis is by excision. Where syphilis is evident and still active, antisyphilitic treatment should be started at once, and by frequent bathing and enveloping the parts in boric acid solution, vaginal douches, and touching ulcerated patches with a five per cent nitrate of silver solution, the parts are brought into a suitable condition for operation.

After placing the patient under anesthesia and suitably exposing the genitals, the hypertrophied mass is enveloped in iodoform gauze, or gauze saturated with a bichloride solution, grasped with the left hand and drawn out from the body, to form a distinct pedicle when none exists naturally.

An incision is now made into the pedicle just above its base, leaving enough tissue to make flaps which can be easily brought together to cover the wound area. There is no danger of a recurrence of the disease from leaving a portion of the pedicle behind in this way.

The better plan is to amputate from above downward. If the bleeding is excessive, vessels may be clamped, or, better still, the wound surfaces may be immediately drawn together by deep silkworm-gut sutures, closing the upper portion of the wound and stopping the flow. The amputation is then continued on down, more sutures are applied, and so on until the whole mass is removed, and the wound completely closed.

Where the clitoris is removed it will usually be necessary to ligate a few large blood vessels, particularly those on the dorsum, with fine catgut. When clitoris and labia minora are removed together, the wound presents the appearance of an inverted Y (⅄); an inverted V-shaped wound (Λ) is left after removing both labia minora.

In the case figured (page 182) I adopted a slightly different procedure by pulling out the mass to form a pedicle, whose upper part was transfixed by three stout silk sutures, one below the other, and the corresponding part of the tumor severed from above downward, leaving a slightly cupped raw surface. The three sutures were then tied, firmly enough to serve the double purpose of approximating the opposite edges of the incision, and controlling the hemorrhage. By a succession of similar steps, first introducing the sutures, then severing that part of the pedicle overlying them and then tying the sutures at once, the large tumor was quickly removed with trifling hemorrhage.

Sarcoma.—One instance of this rare disease has come under my notice. The patient, a Pole, twenty-six years old, came to my service in the dispensary of the Johns Hopkins Hospital, complaining of constant pain in the genitals, increased by coitus.

A tumor, 4¾ by 2½ centimeters (2 by 1 inches) in size, was found overlying the descending pubic ramus in the position of the left crus of the clitoris. It was pointed at both ends, above and below, hard, movable on its base, and slightly lobulated.

A wide incision should always be made; in this case the mass was removed by Dr. H. Robb, under cocain anesthesia, by an incision in its long axis, splitting a fibrous capsule in which it lay. Excessive venous oozing followed the enucleation, and was controlled with difficulty by pressure and the application of tannin.

She was discharged from the hospital in a week with a small linear, non-suppurating wound, and has not been heard of since.

After hardening in Müller's fluid, sections were made showing two kinds of tissues, cells in groups or long rows, with a homogeneous substance between them. In some portions instead of cell groups there were single cells with long, irregular processes, communicating with each other, imbedded in the homogeneous material filling the interspaces. The cells in groups and rows were generally spindle-shaped, with long nuclei, some of which resembled closely non-

striated muscular fibers. All the cell groups and bands communicated so as to make the homogeneous material appear as islets between them.

In some portions of the tumor the cell groups made up the greater parts of the tissue; but every gradation existed between the groups and the single cells. In other places the intercellular substance predominated, and there were only scattered nuclei in the homogeneous material, with but little cell substance around them. In sections made after freezing, the homogeneous material swelled up and became transparent on the addition of acetic acid; in the hardened sections, it was in places slightly granular, and stained faintly with eosin.

Blood vessels were few, and were always found in the homogeneous material into which their walls gradually passed.

In sections stained with picro-carmine, the long bundles of cells where the nuclei were longest stained bright yellow, like muscle fibers. Nothing like this could be discovered in other parts.

The examination thus showed that the tumor was a sarcoma whose homogeneous intercellular substance was formed by a myxoid degeneration of the tissue; it was therefore a myxosarcoma.

Carcinoma.—Cancerous disease of the clitoris is rare. Two cases only have come into my hands for treatment. The first was a married woman, E. McD., No. 179, fifty years old, who had had three children, the last twenty-three years back.

She had ceased to menstruate four years previously, and since that time had suffered from severe itching of the external genitals, for which she had received local treatment without relief.

Two months before, she had noticed a spot of what she took to be proud flesh in the cleft of the vulva anteriorly; this grew rapidly until it reached the size of the end of the thumb. It was not painful.

I found on the dorsum of the clitoris an enlarged hard area, 1 by 8 centimeters in diameter, and its surface pouting, sharply defined, granular, warty, hard, and yellowish, and slightly reddened, not adherent to structures beneath. To the right of the glans was a small patch similar to the first, 3 millimeters in diameter. The labia minora were contracted down to short, thick rudimentary folds. These, together with the white patches, bore evidence to the changes induced by pruritus and scratching.

She was operated upon April 22, 1890. The whole body of the clitoris down to the crura, with both labia minora, were excised, making a wound the shape of an arrow head, whose edges were approximated by sutures passed transversely.

Twelve days later a recurrent nodule was found in the left labium majus, about 1 centimeter from the scar. The whole upper portion of the scar and the adjacent tissue were excised down to the symphysis pubis and closed with six silkworm-gut sutures. The wound healed, and there was no recurrence at a later date.

The second case (C. L., No. 2465, December 23, 1893) was thirty-eight years old, the mother of four children, the youngest seven years old; her mother died of cancer of the lip.

For eight years she had noticed a reddened area gradually extending between the labia anteriorly, and for six months past growing rapidly. She had no pain

FIG. 117.—CARCINOMA OF THE GLANS OF THE CLITORIS, WITH AN AREA OF IMPLANTATION BY CONTACT ON THE LEFT LABIUM MAJUS.

The dotted line indicates the area excised. Dec. 23, 1893.

in it until within a few days; there was a mucoid discharge from the surface of the tumor.

I found upon examination a large rose-red glans clitoris, protruding anteriorly between the labia majora, 3 centimeters (1¼ inch) long by 3·3 centimeters (1½ inch) in breadth, ovoid in form, slightly indented on its under surface. On the convex surface to the right there was a pit 1·2 centimeter deep by 1·8 centimeter long, and on the right dorsum of the corona an irregular tongue of unaffected tissue 1·2 centimeter by 0·3 to 0·8 centimeter broad. There was an area of infiltration of the mucous surface of the left labium majus, 1 by 8 centimeters, where it lay in contact with the diseased glans (see Fig. 117).

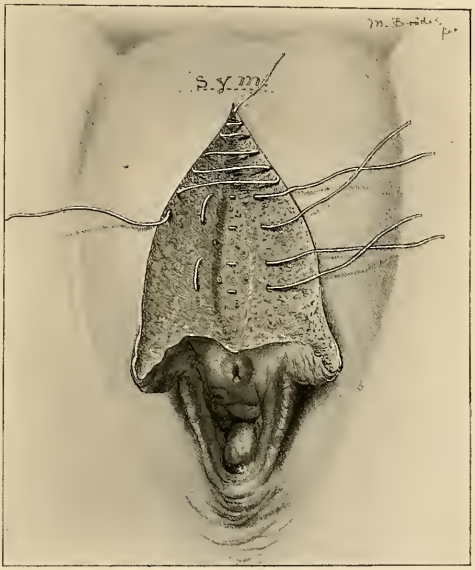

Fig. 118.—Closure of the Wound made by Excision of the Clitoris, by Mattrass Sutures of Buried Catgut and Subcuticular Continuous Suture.

The vascular area in the deeper part of the wound is controlled by the mattrass sutures.

Both labia majora were deeply pigmented from scratching, and the labia minora were withered, insignificant structures from old-standing pruritus.

The disease was extirpated by an oval excision 12 by 8 centimeters (5 by 3½ inches), extending from the mons veneris to the urethra.

Numerous actively bleeding vessels were clamped, and six of them were ligated. The wound was closed by bringing the edges of the incision together from side to side by interrupted sutures. Primary union was secured, and the stitches removed on the seventh day.

The pathological examination showed that the specimen consisted of the clitoris with the surrounding skin and mucous membrane. The clitoris was converted into a mass 2½ by 2 centimeters, in whose center was an ulcerated cavity 1 centimeter deep, with necrotic grayish edges; the remainder of the mass was firm, of a grayish-pink color, and circumscribed in its growth.

Microscopically the tumor was made up principally of squamous epithelial cells, in part arranged in nests, some of them forming the typical pearly bodies, and in part growing free in tissue. The stroma was fibrous tissue and existed only in small quantities. Everywhere there were numbers of lymphoid cells.

The edges of the ulcerated cavity were necrotic, showing little inflammatory reaction. Great numbers of nerve fibers were found everywhere. The epithelial growth was completely circumscribed by fibroid tissue and seemed to have no tendency to invade the surrounding tissues. Beyond the growth was the

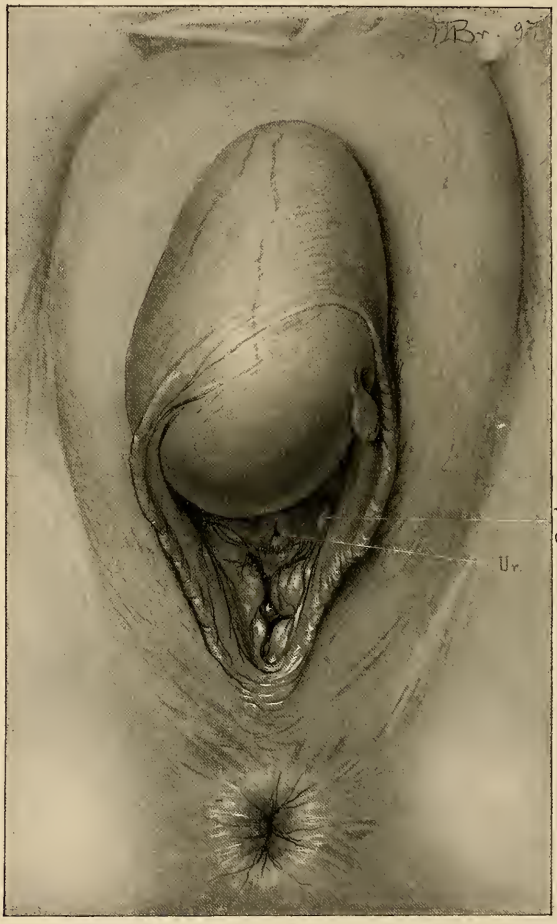

Fig. 119.—Ovoid Fluctuating Cyst of the Clitoris.

The prepuce encircles the convexity of the tumor, extending from one labium minus to the other, forming a shallow sickle-shaped fold. The dorsal veins are shown above. A little lenticular vaginal cyst lies at the base of the left labium minus. Oper. June 21, 1897.

normal mucous membrane, and beneath it the fat and fibrous tissue. The examination showed that the tumor was an epithelioma of the clitoris.

Cyst of the Clitoris.—I had occasion to remove (June 21, 1897) a large cystic clitoris, shown in Fig. 119. The following is the report of the pathological examination:

Mrs. S. C. (Path. No. 1795). The fluid is thick, sebaceous-like, and of a light brownish-yellow color. Microscopically it is found to contain numerous cholesterin and other irregular crystals. It also contains granular epithelial cells. On histological examination the outer surface of the cyst is seen to be covered by squamous epithelium; the walls are composed of wavy connective-tissue cells running mostly parallel to the surface. Near both the outer and inner surfaces are localized areas of small round-cell and polymorphonuclear infiltration. In one or two sections sebaceous glands can be seen. The inner surface of the cyst shows considerable variation in its epithelial lining, some portions being covered by three or four layers of squamous epithelium, the deepest layer of which is cuboidal, and others by one layer of cuboidal cells. In some portions where the epithelium is one layer in thickness the cells are columnar. The cyst has evidently arisen from the clitoris.

VULVO-VAGINAL GLANDS.

Cyst of the Vulvo-vaginal Gland.—Two kinds of cysts of the vulvo-vaginal gland are met with—simple and suppurating. Both forms are among the commonest of the vulvar diseases, while other affections of these glands are extremely rare.

The simple cyst is the result of an inflammatory occlusion of the duct of the glands, followed by a retention of the secretions and the formation of a tumor varying in size from that of a bean to that of a hen's egg. Inflammatory cysts are oftenest due to gonorrheal infection, and the tendency just now is to attribute all of these cases to this source.

I have known instances, however, of small cystic accumulations in which gonorrhea was probably not present. One of my patients for some time complained of a pruritus for which she had had much treatment without benefit, after which the cyst developed.

I have seen but one case in which both sides were involved.

The enlarged gland forms a projection more or less marked, according to its size, to the right or left of the outlet, in a position corresponding to that of the gland. The observer inspecting the tumor from the front is most struck by the marked deviation of the cleft of the vulva forming a curved line directed toward the sound side. The small cysts are located low down in the labium, in the position of the gland; but as they become larger they extend upward in the direction of least resistance, and more especially inward toward the mucous surface of the labium, where they become quite superficial; their mucous surface appears smooth and shining, and sometimes almost transparent. The fluid contained in the cysts is clear, yellowish or turbid, and generally of a gelatinous

consistence. The symptoms in the smaller cysts are negative, and for this reason they are frequently overlooked even by a specialist.

Not infrequently the contents of the cyst can be squeezed out of the orifice of the gland by steady pressure. It oozes out on the reddened surface about its orifice in crystal-clear droplets. In such cases the formation of the cyst has been simply due to an impediment to the outflow of the secretions.

The diagnosis of such a cyst is easy from its location, its ovoid form, and the manifest fluctuation.

The symptoms created by the larger cysts are tension, dragging, soreness, and obstruction to coitus.

The treatment is either by free incision into the lower portion, evacuating its contents, followed by an application of nitrate of silver solution and a pack in the cavity, or by total extirpation.

Incision and pack are simpler, but do not invariably effect a cure. For this purpose an anæsthetic need not be given as a rule. The vulva is shaved, and both vulva and vagina cleansed, and the tumor grasped and pressed forward from behind with the thumb and second finger reaching down from above and making it tense. A 10 per cent solution of cocain is applied for ten minutes.

A narrow, sharp-pointed knife is then quickly plunged through the skin surfaces into the cyst, which is slit up for 3 or 4 centimetres (an inch or more), as it is in the act of collapsing. The bleeding is never more than moderate. The inner surface of the collapsed cyst is now painted with a 10 or 20 per cent solution of nitrate of silver, and packed with a long, thin strip of iodoform gauze. It is well to leave the gauze in until it is bathed in abundant suppuration, when it may be drawn out and a fresh piece laid within to keep the opening from closing until it is filled with granulations.

In making a complete extirpation of the gland three important difficulties must be overcome: First, to sever the close attachments to the deep cellular tissue under the pubic ramus; second, to control the free hemorrhage in the deeper parts; and third, to avoid perforating the thin septum on the mucous surface.

The enucleation is best conducted under a continuous irrigation. An incision is made through the skin surface of the labium over the whole length of the cyst down to its wall; with pressure on each side the incision is retracted, exposing the cyst, which is rapidly dissected free on all sides. The dissection must be slowly and carefully made on its inner side, to avoid cutting through the thin mucous surface.

It is best not to rupture the cyst in enucleation, so as to prevent the escape of its contents over the wound, as well as to avoid the difficulty of finding and removing all parts of the collapsed cyst walls. After the more exposed part has been freed, the cyst must be gently drawn to one side and then to the other with the fingers, while the posterior surface is freed. The cyst must not be grasped with forceps for fear of rupturing it.

The hemorrhage from numerous small vessels is controlled by the stream of

water constantly running over the field. When the vulvo-vaginal duct is cut the contents of the tumor often begin to exude by the fine orifice.

The removal of the cyst leaves a deep bleeding cavity in the labium. All persistently bleeding vessels are caught and tied with fine catgut. Neglect of this precaution will result in the formation of a blood tumor of considerable

FIG. 120.—LEFT VULVO-VAGINAL GLAND EXCISED AND THE WOUND CLOSED WITH FIVE INTERRUPTED CATGUT SUTURES.

size; I have seen one such hematoma containing 90 cubic centimeters (3 ounces) of blood, and the overflow into the patient's bed was estimated at a liter more. The pulse, which was normal, went up to 150. A profound anemia resulted.

After checking the bleeding, interrupted silkworm-gut or silk sutures are passed on the skin surface, the loop of each suture reaching to the bottom of the wound and bringing the surfaces together, leaving no pockets for the accumulation of blood. The usual dry dressing is placed on the surface, and the sutures removed in a week.

Abscess of the Vulvo-vaginal Gland.—The vulvo-vaginal glands are especially liable to become the seat of abscesses forming distinct tumors, in the lower part of one or the other labium, encroaching upon the vaginal outlet. These abscesses have the same topographical relations as the simple cysts just described. The overlying skin may appear normal or dark red, and injected in color.

They generally occur early, in the period of sexual activity, and are found most frequently as a result of gonorrheal vulvitis or vaginitis, and hence among the class of women most liable to impure contacts. Huguier, Velpeau, and Guérin thought that the abscess was often the result of the supervention of an inflammation in a cyst.

The youngest patient I have treated was sixteen years old, and the oldest thirty-eight; it is uncommon to find one over thirty. Velpeau cites a case of forty-five. I do not believe that sexual trauma is a provocative cause, although

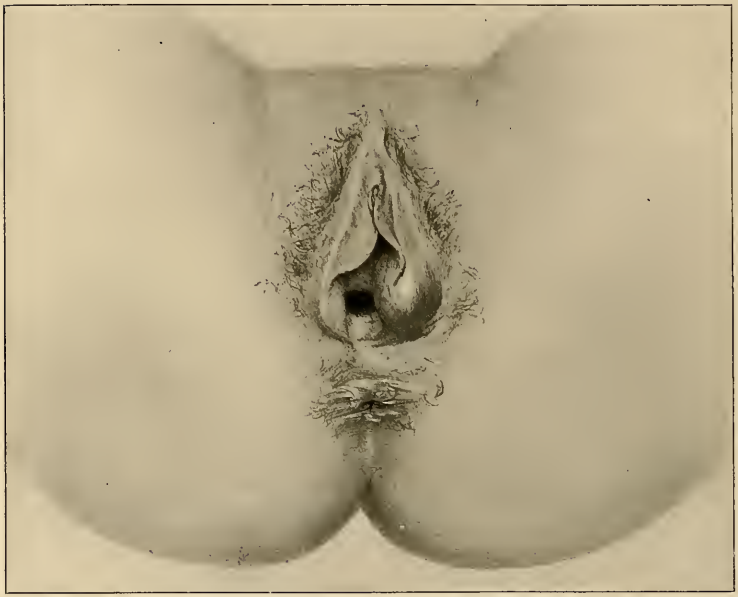

Fig. 121.—Abscess of Left Vulvo-vaginal Gland.

The distention is in the direction of least resistance, out from the left pubic ramus, partly covering the vaginal outlet.

numerous cases in the newly married have been cited to bear out this theory. The facts to my mind rather tend to show how many men enter into the married state with an uncured gonorrhea. Only about seven per cent of these cases have been noted in parous women. My own cases show a much larger percentage. One woman had borne four children, the last one only four months before the disease had developed.

The onset of the disease is acute, accompanied with throbbing pain, great local discomfort, and an irritated feeling about the genitals, swelling, and often edema, and a sense of weight in standing. Locomotion is painful. The pain radi-

ates down the thigh, and there is often inability to sit down without increasing the pain, together with a sense of pressure in the rectum. The gait is slow and straddling and the body bent forward. There are often chills and fever.

The general condition of the patient is one of extreme malaise. Oftentimes there is a history of leucorrhea, offensive or irritating, with painful micturition.

One of my cases had an ulcer 1 centimeter in diameter at the fourchette and another in the inferior wall of the urethra, near its internal orifice, 6 millimeters by 10 millimeters in diameter. In this case the pus removed from the left vulvo-vaginal gland contained numerous typical colonies of gonococci within the cells. In most cases, however, the microscopic examination of cover slips has proved entirely negative.

The affection usually reaches its height in a few days; it may, however, be several weeks in developing; it tends toward spontaneous recovery by rupture on the mucous surface of the labium, discharging from 15 to 100 cubic centimeters ($\frac{1}{2}$ to 3 ounces) of blood, grumous pus, or pure yellow pus. The exit may be by one or several small openings, which tend to close rapidly. But the disease is prone to relapse ("relapsing abscess") in such cases. I have had a patient who presented a history of repeated suppurations extending over many months. Other rare cases give a history of alternation (alternating abscesses) of the affection from one side to the other. Abscesses of the vulvo-vaginal gland is especially liable to recur, because the ultimate ducts become infected, and so the suppurative process may go on indefinitely, until the entire gland is either destroyed or removed by operation.

Occasionally there is no enlargement of the gland visible on inspection. In spite of the fact that there is no evident tumor, there may be a more or less constant escape of pus, serving to keep up an infection of the rest of the genital tract.

The diagnosis, as a rule, is easily made upon associating the symptoms described with the discovery of a painful fluctuating tumor in the lower part of one of the labia. The cases most liable to cause a mistake in diagnosis are those in which the pus sac has thick walls and feels like a small, hard body, the size of a bean, deep in the labium, without fluctuation. I have seen several of these cases in which no diagnosis was made until the pus was let out. In one case even the little nodule was thought to be malignant.

A simple abscess must not be confounded with stercoro-vulvar abscess, due to a rectal fistula extending forward and discharging through a labium. I had one such case treated by one of my assistants in which the rectal communication was not recognized until the abscess was opened. This disease ought to be diagnosed beforehand by the brawny induration, extending back on to the perineum, and by the fistulous orifice which can be felt just inside the sphincter. The history also often shows that the distress was first felt in the rectum.

The proper treatment of abscess of the vulvo-vaginal gland is by free incision and packing. After suitably closing, shaving, and cleansing the parts, the abscess is made tense by pressure from behind on both sides, when it

is freely opened from below up. The incision is begun low down to give good drainage in the most dependent position.

After evacuation the lips of the incision are separated, the sac wiped clean, and its whole inner surface touched with pure carbolic acid on absorbent cotton. The incision must be kept from closing until the cavity is obliterated; to do this, the cavity is loosely packed with a thin strip of iodoform gauze, which should be replaced every two or three days. It will be noticed that it shrinks with surprising rapidity, holding less gauze each time the pack is removed. After healing, the fine linear cicatrix will be found with difficulty. Sutures and ligatures need not be used.

I object to making an incision on the mucous surface, unless the abscess is at the point of rupturing there, on account of the possibility of a tender cicatrix at this point. When the incision is made here, the anesthetic action of a twenty per cent solution of cocain or ethyl chloride will suffice to blunt the sensibility.

In more than one instance I have known an abscess to rupture spontaneously on the night before the time fixed for operation. The opening thus made by nature in each of these cases was badly placed for the drainage, and too small to allow a pack to be inserted. It was therefore necessary to make it larger by incising it downward.

Where the abscess consists of a small indurated mass with a little pus in the center, the better mode of treatment is by complete extirpation of the gland, if possible without opening it. In one of these cases in my clinic it could only be extirpated piecemeal, on account of the hard, infiltrated surrounding tissue. The treatment of the cavity thus made is to close it completely, as described in the case of cyst.

After the incision, evacuation, and packing, the woman must lie abed for several days or a week or more. She may go about as soon as she has recovered sufficient strength, and the act of walking is not painful.

Adeno-carcinoma.—I report here in full a case of adeno-carcinoma of the vulvo-vaginal gland upon which I operated in December, 1891. (R. S., No. 1136, December 18, 1891.)

The writings of Gottschalk, of Berlin, Werth, of Kiel, and Koppe, of Moscow, have thrown a new light upon cysts of the upper portion of the labia majora, which can no longer be looked upon as connected with the vulvo-vaginal gland. It has been shown that adenoid elements can occur in this region probably due to the misplacement of epithelial elements in early embryonic life; it is possible that the following case belongs to this group:

My patient was an American, fifty-five years old. She had had ten children and one miscarriage. The family history was negative. The menses had ceased seven months before she entered the hospital.

At Christmas time, 1890, she noticed a swelling in the left labium majus, which grew slowly for six months, and then for two months it grew rapidly. She had no pain, other than a dragging sensation.

Dr. H. Robb examined her upon entering the Johns Hopkins Hospital during my absence in the summer of 1891, and found a hemispherical enlargement

in the left labium majus, irregular and lobulated, as big as an orange, dark red on its surface, and fluctuating. It appeared to have bands of tissue running around it, and in two places the wall was thickened. There was well-marked venous congestion of its surface.

Under the impression that the contents were purulent, it was incised, and a large quantity of whitish and pinkish cheesy blood-stained *débris* escaped with clots. The cyst wall was lined with similar *débris* and shreds of connective tissue. It was evident that the sac could not be enucleated without great difficulty, and it was therefore cauterized and packed with iodoform gauze, and an

FIG. 122.—ADENO-CARCINOMA OF THE LEFT VULVO-VAGINAL GLAND.

The skin is thin, the pores coarse and widely separated, and a few hairs are seen scattered over the surface. A large vein courses over the right under surface of the tumor, which contains a bloody fluid.

external dressing applied. After eighteen days pure carbolic acid was applied to the cavity, which showed no tendency to close. After twenty-four days infiltration and thickening were still noticeable, but not so marked as at first. A little whitish exudate was squeezed out.

She went home to return in four months, when I found a prominent tumor

4 centimeters (1½ inch) in diameter occupying the left labium. It was encircled by an injected edematous area with two openings in it having dusky blue margins and discharging sanious fluid. From a third opening corresponding to the incision made in August projected a necrotic mass as big as the end of the thumb, which discharged about 60 cubic centimeters (2 ounces) of necrotic and bloody material upon being squeezed.

A microscopical examination of this material showed it to be made up of abundant epithelial cells and small blood vessels. A mucous follicle was found with marked granular fatty degeneration.

The whole left labium was excised, the incision, 14 centimeters (5½ inches) long, beginning 2 centimeters (1 inch) above the symphysis and extending down to the posterior commissure. The wound thus made was at its widest above, 4 centimeters (1½ inch), and narrowest below, 2 to 3 centimeters (⅘ to 1⅕ inch). The edges of the wound were brought together from side to side by thirteen interrupted silkworm-gut sutures and thirteen catgut sutures between.

The tumor was hardened and examined in the pathological laboratory and found to be a typical adeno-carcinoma.

The following case (M. T., No. 3896, operation October 12, 1895), a tumor of the left labium majus, is interesting because, as there was no evidence of involvement of adjacent glands or tissues, the clinical history pointed strongly to ulceration of a cystic Bartholin's gland.

The ulcerated area suggested a malignant tumor, but was not diagnostic; the gland and a wide area of tissue were excised.

Patient first noticed a slight, hard, nodular, painless swelling in the left labium in the spring of 1894. This gradually enlarged until, about six months before she was seen, it took on a more rapid growth reaching the size of a small lemon, and for three months it was ulcerated slightly. She had a sharp pain and a burning sensation throughout the enlargement, and the whole mass at times became sore, the tenderness extending to her thighs. The ulcerated surface bled considerably at times, causing some relief from pain.

Examination.—The vaginal outlet is occluded by a large tumor of the left labium majus. The tumor is reddened, fluctuating, and on its vaginal surface presents an ulcerated area from which blood oozes. The tumor is well circumscribed in the area occupied by the vulvo-vaginal gland and does not infiltrate the surrounding tissues. No enlargement of the inguinal glands on either side.

The cystic gland was excised with a wide area of skin around it; the tumor was lifted well out of its bed and an abundance of underlying tissue removed with it. All bleeding points were caught separately and ligated with catgut, and the wound closed with interrupted catgut sutures.

Pathological Report.—Myxo-fibro-sarcoma of the Labium Majus.—The tumor is globular, 5·5 centimeters in diameter, and for the most part smooth; the skin surface is an irregular elevation 3 by 2·5 by 1 centimeters, presenting a rough, eaten-out appearance, with a deep excavation in the center. With the exception of this nodule, the tumor is surrounded by a capsule; its central portion consists of a fibrillated, semi-gelatinous tissue, having bands of

denser tissue extending across it and partly around the periphery. The nodule on the surface consists of tumor substance which has broken through the capsule. Microscopically the tumor consists of loose fibrillated mesh-work, whose interspaces contain a substance which, with hematoxylin and eosin, is tinged blue. The cells, also tinged faintly blue, are long and spindle-shaped or branched, with elongated vesicular nuclei. Many hyperchromatic and irregular budding nuclei are also present, several times larger than the average. In the denser bands the cells are more abundant and occasionally arranged in whorls. Cells of the lymphoid variety in considerable numbers are evenly distributed throughout the tissue. The tumor is vascular throughout. Where it penetrates the capsule it is more vascular and especially rich in cell elements. The surface of the elevation closely resembles granulation tissue. From this description it will be seen that the growth is a sarcoma and that it has to a great extent been localized by a dense fibrous capsule; at one point, however, it has penetrated this and extended to the surface.

AFFECTIONS OF THE VULVAR MUCOSA.

Congenital Cohesion.—Abnormal adhesions between the mucous surfaces of the right and left sides, inside the labia majora below and the labia minora above, are not rare, although but seldom described.

They have been described by Saenger, of Leipzig, under the name "congluti-natio labiorum" (*Centralb. f. Gyn.*, 1891, No. 50), and by Bokai as "epithelial union of the labia." They are usually found in small children and appear to be either congenital or to result from inflammation, with destruction of the epithelium, followed by adhesion. Four cases of the affection have come under my notice, the youngest a little girl twenty months old, and the oldest one of six years; the difficulty was first discovered by the mother in each instance.

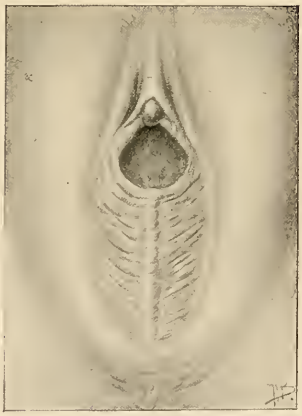

Fig. 123.—Agglutination of the Labia in a Little Girl.

There is a distinct rhaphe in the middle, with a translucent slightly furrowed membrane in both sides, which conceals the urethra and the hymen.

In the little girl twenty months old, seen in 1890, figured in the text, the labia majora were well formed; the hymen and vaginal surfaces were completely hidden by a thin, dark membrane with fine lines upon it, radiating upward and outward from a well-defined central vertical raphe. The only traces of the labia minora were the rudimentary folds covering the clitoris. The glans of the clitoris was well developed. Just under the glans was the genito-urinary opening, 3 millimeters

in diameter, the sole outlet for urine and vaginal secretions. A probe introduced through the opening and behind this membrane showed the depth of the anomalous interlabial septum to be 15 millimeters. On pushing the septum forward the raphe appeared white. The vagina was 5·5 centimeters (2¼ inches) deep.

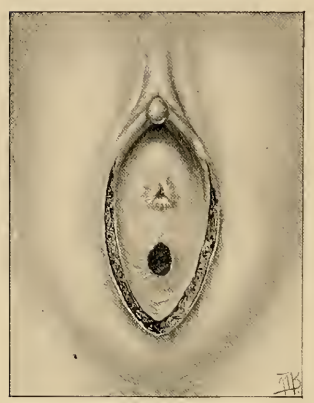

Fig. 124.—Agglutination of the Labia.

The same case after division of the membrane; urethra and hymen exposed.

I look upon this case as simply an abnormally long fourchette, as there was no history of any inflammatory affection, and especially because of the well-formed raphe, which would not have been found on any adventitious membrane. In two other cases the membrane was similarly developed and appeared to be congenital.

Treatment.—The membrane was cut down to its base, exposing a normal urethra and hymen. The incision left a linear V-shaped wound on the mucosa. One suture was required to control bleeding.

Inflammatory Cohesion of the Mucous Surfaces.—A little girl of six presented herself at the clinic with an occlusion of the outlet, first detected when she was a year old. On inspection, a line of granular erosion was found in the middle of the vulva posteriorly, and the labia were extensively united on their mucous surfaces, concealing the site of the hymen and urethra and the whole clitoris, but leaving a minute orifice just over the site of the clitoris. The vulvar mucous surface throughout its entire length was adherent. Under the influence of chloroform the adherent surfaces were stripped apart with a probe, exposing a vaginal orifice 10 by 5 millimeters, the urethra, and the clitoris. Lateral adhesions of the hood to the glans of the clitoris were also freed. Sometimes the adherent surfaces may be separated by using cocain instead of a general anesthetic.

Pruritus, or Vulvitis Pruriginosa.—Pruritus is especially a disease of the old, and is one of the most distressing of all the gynecological affections not endangering life. It consists in a subacute inflammation of some portion or of all the external genitals, involving the deeper layers of the skin and the nerve endings; it is therefore a dermato-neuritis. I have adopted the term vulvitis pruriginosa, suggested by Sänger, of Leipzig (v. *Ges. f. Geburtsh.*, Leipzig, Oct. 16, 1893), as more correctly describing the morbid process. The common name "pruritus" means simply "itching" and nothing more, and merely describes a symptom common to many affections.

While the whole vulva may be involved, the disease is oftenest localized in the free portion of the clitoris with its coverings, the neighboring surfaces, and the labia minora. With these structures, the whole inner surface of the vulva may be involved, the hymen forming the limit of its extension in-

DESCRIPTION OF PLATE III.

Fig. 1.—Pruritus vulvæ. The excoriated spots following scratching are seen as yellowish areas. The whitish areas represent the fibrous thickening of the labia.

Fig. 2.—The dotted line represents the area of excision in the operative treatment of pruritus.

Fig. 3.—Operation completed—sutures in place.

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FIG. 3.—Operation completed—sutures in place.

Fig 1.

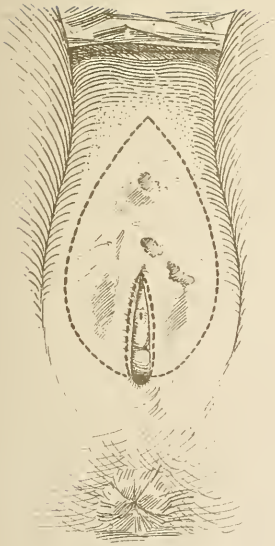

Fig 2.

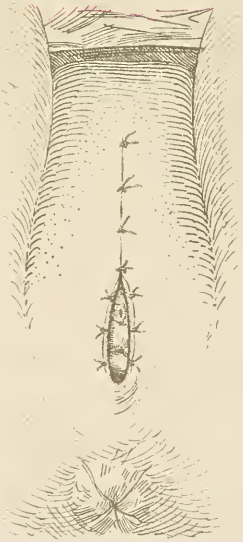

Fig 3

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ward. The skin surfaces of the labia majora also become involved in aggravated cases.

I have seen the disease localized to small areas about the clitoris and fourchette; in another case the most marked alterations were in the labio-femoral folds.

The changes induced are a thickening due to an inflammation of the connective tissue in the corium. The mucous surfaces have a thick, dead-white, withered appearance. The glans clitoris often completely disappears, leaving in its place beneath the thick white preputial folds a little pit. These white surfaces, as well as the labia on their outer surfaces, are streaked with fissures which are due to scratching; these are pink at the bottom and generally arranged vertically.

The real causes of pruritus are not known, although a number of provocative causes and conditions are well recognized.

In every case of intractable pruritus the urine should be examined for sugar, as some of these cases are diabetic in origin; this is due to the fermentation of the urine, which then acts as an irritant upon all the tissues with which it comes in contact.

A sero-purulent discharge from a myomatous uterus proved to be the exciting cause in one instance; all attempts to relieve the pruritus failed, until finally the patient was so harassed that she consented to operation. The uterus was extirpated for the myoma and the pruritus ceased.

Fissure in ano may be accompanied by pruritus of the vulva, which will be cured by the healing of the fissure.

An attempt has been made, without success, to demonstrate a bacterial origin. The initial stages may often be attributed to irritative vulvar and vaginal secretions, after which the more aggravated form of the disease develops from the repeated mechanical insults in rubbing and scratching the parts.

The proper treatment of the severer cases of chronic pruritus with the changes described is, as advised by Sänger, by excision of the diseased area. The free mobility of the external genitals and adjacent parts allows almost any defect created by an excision to be readily covered.

The following case will serve as an illustration of the operation where the disease involves all the external genitals except the skin surfaces of the labia majora:

The patient was a married woman, fifty-seven years old, and a nullipara; she had had one miscarriage twenty-five years ago; menopause sixteen months before operation. When younger she had had a milky leucorrhea, but this had ceased for several years. She had suffered from itching in the genitals for twenty years, at first always connected with the menstrual period, beginning a day before and lasting twelve days; for three years past there had been a constant intolerable itching and burning, with burning micturition, keeping her awake almost every night, and nearly driving her insane. During this period she had noticed the formation of little blisters between the labia, which would break, leaving raw surfaces, discharging pus. These surfaces rarely appeared to heal.

I found the inner surfaces of the labia majora covered with irregular white patches of thickened epidermis, more abundant above, extending from the upper commissure down to the lower part of the vaginal outlet; below this the surface

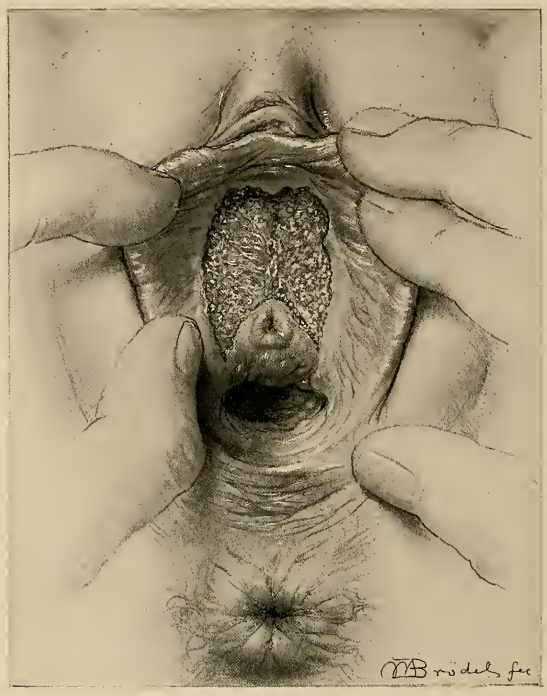


Fig. 125.—Tuberculosis of the Vestibule.

The flat pinkish mammillated diseased area occupies the entire vestibule, encroaching on the upper margin of the urethra and extending slightly into the anterior vaginal sulci. There is no thickening or infiltration of the edges, which are raised about two millimeters above the level of the diseased area. The clitoris and the adjacent parts red and swollen.

was covered with a reddish glaze. At the angle between the inner mucous and external skin surfaces of the labia—that is, on the margin of the disease—was a line of whitish scales with slightly elevated edges. A few small superficial ulcers were scattered over the white area. The labia minora were withered down to insignificant rudimentary folds. The clitoris was completely concealed beneath the thickened diseased tissue, and a little hole only showed where the glans is usually found. The hymen was entirely absent; the disease was limited by a line encircling the vaginal outlet and including the urethra, which was not involved.

The whole of this diseased surface was excised under anesthesia by an operation lasting thirteen minutes. After a prolonged painstaking scrubbing an incision was made, outlining the area to be removed, beginning at the commissure above and extending down on either side along the angle between the outer and inner surfaces of the labia, to the level of the vaginal floor. From

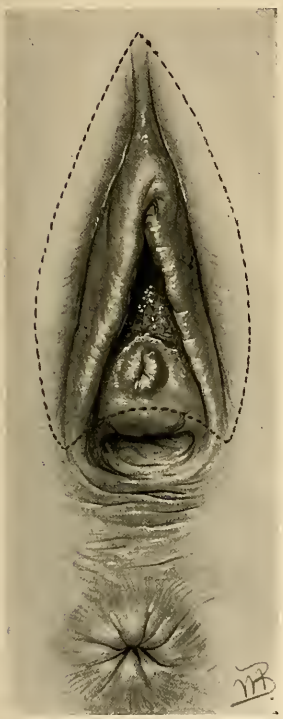


Fig. 126.—Area of Excision of Tubercular Disease shown by the Dotted Line: this included the Clitoris, both Labia Minora, and the Entire Vestibule, with the Anterior Part of the Urethra.

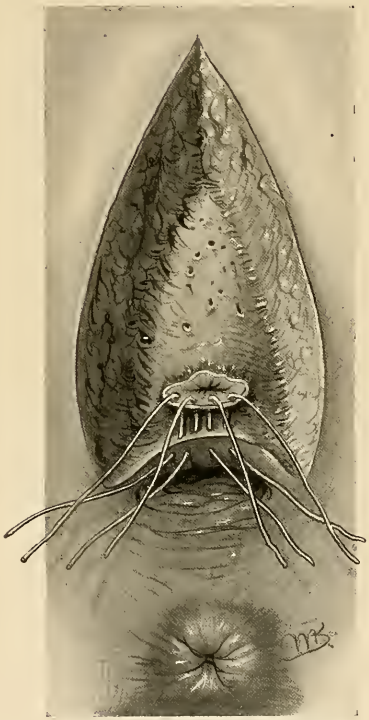


Fig. 127.—Raw Surface created by the Removal of the Diseased Area, showing Four Catgut Sutures uniting the Posterior Margin of the Urethra to the Vaginal Mucosa.

this point the incisions were carried up to the vaginal outlet and around it, meeting over the urethra.

The area excised, roughly described, resembled a spearhead pointing upward with a deep notch at its base. The whole thickness of the skin thus outlined was rapidly dissected away, removing with it the labia minora and the body of the clitoris. The dissection was made from above downward by catch-

ing the apex above with forceps and drawing it down, detaching the flap with rapid strokes of the knife. Six artery forceps had to be applied to bleeding vessels. The bleeding from the cut crura of the clitoris was surprisingly small. No vessels were tied; all the hemorrhage was controlled by so placing the sutures approximating the edges of the wound as to catch the bleeding vessels in the loop and then tying the sutures tight.

The outer surfaces of the labia were now drawn together above, and in as far as the vaginal outlet on each side below, with silkworm-gut sutures about 1 centimeter apart. The line of union formed resembled an inverted Y (⅄), the point of divergence being 1 centimeter above the urethra. There was no difficulty in covering the defect, and there was no tension on the sutures.

The patient was at once entirely relieved of her distressing disease.

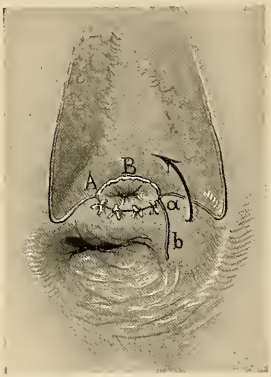


Fig. 128.—Showing the Flap *a b* taken from the Left Vaginal Wall, and drawn in the Direction of the Arrow and Attached to the Upper Margin of the Urethra, A B.

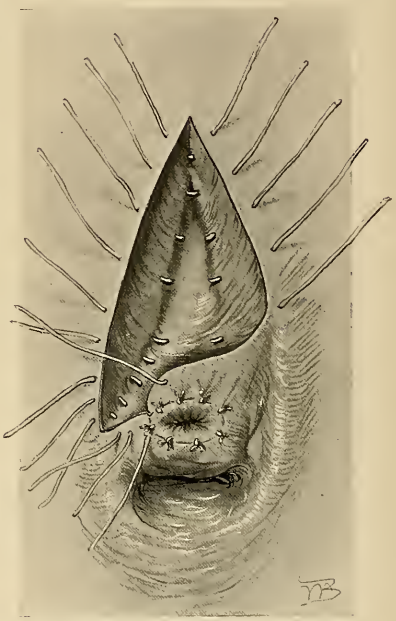


Fig. 129.—Showing the Restoration of the External Urethral Orifice completed; Catgut Sutures introduced for the Closure of the Rest of the Wound.

The sutures were removed on the tenth day, and the wound found to have healed by primary union throughout.

The removal of the whole vulva in the more extensive cases is performed in the following manner:

An oval incision is made in the middle line in the mons veneris, starting at the upper limit of the disease and continuing down on either side, so as to include the whole of one or both labia majora, meeting below at the posterior commissure, or on the perineum or even at the anus, according to the extent of

the disease downward. Another incision encircles the vaginal outlet in the position of the hymen, beginning above the urethra. The whole area between these two incisions is rapidly excised from above downward, and bleeding vessels caught with forceps. The edges of the upper part of the wound are brought together from side to side with silkworm-gut sutures, down as far as the level of the urethra. Below this point they are drawn in on either side and attached to the vaginal outlet, covering the whole defect.

Fig. 130.—Showing the Union of the Rest of the Wound above the Urethra in the Form of an Inverted Y.

Tuberculosis of the Vestibule.—Tubercular disease of the external genitals is extremely rare, not more than three or four cases having been recorded. This disease is usually associated with pulmonary phthisis.

I have seen one case of tuberculosis of the vestibule. The patient, Mrs. S., a widow, aged fifty-five, complained chiefly of stinging pain on urination, caused by the urine flowing over the ulcerated area. A small ulcer first appeared one year before coming to me; this increased steadily in size until it occupied an area as seen in Fig. 125, Mrs. S. (Gyn. Path. No. 1756). The specimen removed consists of a triangular piece of tissue, the margins of which are covered by mucous membrane. The central portion presents an eaten-out appearance, and the deeper tissues are infiltrated, though not markedly indurated. Situated in this ulcerated area is the urethral orifice surrounded by a narrow band of smooth mucous membrane. Histologically, the surface of the ulcer is made up of the characteristic tubercular granulations, while typical tubercles are scattered throughout the deeper tissues, some being found immediately beneath the urethral mucous membrane. Tubercle bacilli are demonstrable in small numbers.

Diagnosis.—Tuberculosis of clitoris and vestibule.

The description of the operation is given in Figs. 126–130.

CHAPTER X.

RUPTURE OF THE RECTO-VAGINAL SEPTUM AND RELAXED VAGINAL OUTLET.

1. Physiological support of the vaginal outlet.
2. Operations for recent injuries to the vaginal outlet: External tear; internal, and combined external and internal tear; complete tear of recto-vaginal septum.
3. The intermediate operation for injuries to the outlet.
4. Old complete rupture of recto-vaginal septum: Operation for the same.
5. Relaxed outlet: Operation for the same.

The Physiological Support of the Vaginal Outlet.—The "vaginal outlet," called "outlet" with reference to its parturient function, or "introitus," "inlet," or "vaginal entrance," from its sexual function, forms the inferior extremity of the vaginal canal communicating with the external genitalia beneath the pubic arch. While the vaginal canal above and within the pelvis is broader and more capacious, inferiorly it suddenly narrows down to an outlet which is a canal 4 to 5 centimeters (2 inches) long.

The posterior wall of the vagina in sagittal section of the body forms a flattened sigmoid with the convexity of its lower curve directed forward behind the pubic arch. The peculiar funnel shape of the vagina—broad above and contracted below—appears most distinctly upon placing a woman who has never borne children in the knee-breast position and letting in air, when the intrapelvic portion of the vagina will balloon out, while the outlet or introitus remains tightly contracted, closely hugging the pubic arch.

The mechanical theory advocated by some writers, that the closure of the outlet and its snug position beneath the pubic arch are dependent upon a thick wedge of tissue, a so-called "perineal body," acting like a cork plugging a bottle, is erroneous. In consequence of this false conception absurd and unnecessary operations have been devised and extensively employed for injuries in this situation.

The error of this prevalent notion is evident upon examining the virginal outlet, where the vaginal outlet and anus are both seen lifted well up under the pubic arch, and upon introducing the index finger into the vagina the pubic arch is felt in front, while posteriorly a broad, rounded, resilient band of muscular tissue, the levator ani, stretches behind the outlet from the right to left pubic ramus.

This examination readily demonstrates the important fact that the vaginal introitus is but a narrow chink between this posterior muscular band and the pubic arch. By making backward pressure upon the posterior wall of the

vagina within the introitus the band yields, to return to its former position as soon as the pressure is withdrawn.

The fourchette and the supposed "perineal body," lying between the fourchette and rectum, should now be closely examined by placing the index finger of one hand just within the vagina and the other in the rectum and palpating so as to measure the size and thickness of these structures. It will be found that they are but slight tissues incapable of giving any support to the superjacent organs.

The real supporting mechanism of the outlet is not the perineal body, but the anterior portion of the levator ani muscle. This broad, rounded muscle arises on either side of the inner surface of the pubic ramus and passes back around the lateral vaginal wall to unite with its fellow behind the rectum, its fibers being intimately interwoven with the lateral walls of the rectum. These

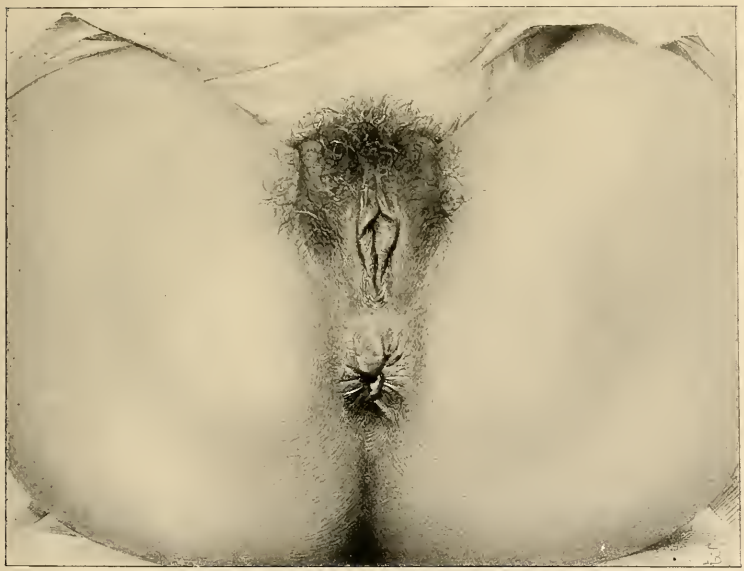


Fig. 131.—Normal Vaginal Outlet in a Nullipara.

The vagina is completely hidden and there is no flattening across the anus and the gluteal furrow as in the case of a relaxed outlet. The little concentric furrows surrounding the fourchette below are not found in the virgin.

important anatomical relations may readily be detected in the living subject by making pressure in each lateral sulcus of the vagina while one finger lies within the rectum.

From what has just been said, it is apparent that the vaginal outlet has no

direct means of closure such as would be afforded by a powerful sphincter muscle, but depends for its support upon the indirect action of the levator muscle. For by the contraction of this muscle the lower end of the rectum is tightly lifted up under the pubic arch and the vagina flattened out and held up between the two. It is further important to notice that the position of the plane of the pubic arch, in front of the plane of the levator fibers, renders the closure more efficient, like a "cut off." It is this arrangement which gives the sigmoid curve to the lower extremity of the virginal vagina.

With rare exceptions, the important injuries to the vaginal outlet affect its caliber alone, and arise during parturition. It is not difficult to appreciate the rationale of this when we recall the fact that during the passage of the child's head the outlet, normally from 2 to 3 centimeters ($\frac{1}{2}$ to 1 inch) in diameter, is dilated until it forms a ring 28 centimeters (10 or 12 inches) in circumference. In numerous instances, instead of the gradual and all-round dilatation of the outlet produced by repeated impacts of the advancing and retiring fetal head, the yielding is sudden and in one place, with rupture of the muscular fibers in consequence. The parturient canal represents a funnel within a funnel, the uterus and cervix representing the upper funnel, set within the upper vagina and outlet as the lower funnel. In consideration of this fact it is surprising that both the contracted outlets, cervical and lower vaginal, are not more frequently damaged during the passage of the large fetal ovoid. Injuries to the outlet similar in character often result from the removal of large submucous myomata lying within the vagina. The vaginal outlet may be injured from without by a variety of accidental causes, such as falling upon a chair post, or being gored by cattle, or in a child from sliding down a haymow on to a pitchfork handle, or sliding down a balustrade on to a low newel post.

The operation in all cases of injured outlet should be performed as soon as possible after the injury; all other operations at a later date act only as more or less efficient substitutes.

Recent obstetrical injuries at the vaginal outlet may, for practical purposes, be classified under three heads:

1. External superficial tear.
2. Internal, and combined external and internal tear.
3. Complete tear of the recto-vaginal septum.

Recent External Superficial Tear.—The simplest form of tear begins at the fourchette, extends backward through the skin in the median line, and involves the superficial wedge of lax tissue between the fourchette and the rectum; it may extend up into the vagina as far as the posterior column. This form of injury is the commonest and relatively the least important, and does not in any case affect the supporting structures at the vaginal outlet.

The only purpose of an operation for its relief is to avoid healing by granulation and the possible formation of a tender scar.

Operation.—In its slightest forms the external tear needs no further attention than strict cleanliness throughout the convalescence.

A deeper injury, with a base 2 to 3 centimeters ($\frac{3}{4}$ to $1\frac{1}{4}$ inch) in length,

may be sutured immediately after delivery, or on the following day, when the patient should be brought across the bed under a good light, with the legs flexed on the abdomen and held by an assistant or by a legholder.

The necessary instruments are a needle holder, medium-sized curved needles, and catgut and silkworm-gut sutures. These instruments should be close at hand on a sterilized towel. The hands of the operator should be carefully washed immediately before operating. The labia are now held apart with the first and second fingers of the left hand, exposing a torn triangular surface on either side posteriorly. A needle provided with a carrier threaded with a catgut suture is introduced in the sound tissue near the upper angle of the tear from a half to three quarters of a centimeter from its margin, brought out at the base of the wound, and re-entered, to emerge on the mucous surface opposite the point of entrance. A similar suture is placed about a centimeter below this. When both these sutures are tied the wound is closed down to a shallow pit on the skin surface, where two or three superficial sutures may be needed to complete the approximation.

The wound should be protected afterward with iodoform and boric-acid powder.

Recent Internal Tear and Combined External and Internal Tear.—Another common form of injury sustained in parturition is a slit in the mucosa, which may extend from the fourchette or from the hymen for 4 or 5 centimeters up into the vagina into one of its sulci. In another form the tear is forked and extends into both sulci. This injury is often caused by the head of the child starting within the vagina a tear, which is enlarged by the shoulder following, plowing its way down between the levator fibers and their rectal attachments on one or both sides. If this tear happens to be continued forward, it becomes associated with the external tear and forms a combined external and internal tear.

Neglect of this injury results at a later date in the serious disability which I describe as a relaxed vaginal outlet. The fact that this lesion within the vagina was not looked for by our older practitioners has induced many of them to assert that lacerations never occurred in their obstetrical practice. Teachers of obstetrics can not lay too much stress upon the necessity of a proper examination after labor and proper attention to this neglected form of primary injury.

Immediately after the birth, if the labia are separated and the posterior vaginal wall inspected under a good light, the ragged, bleeding surface of the tear stands out in marked contrast with the smooth vaginal wall, although both alike are uniformly deeply congested.

The Operation.—The lacerated surfaces must be repaired at once or on the day following delivery, for a few sutures skillfully applied at this time will accomplish the work of many more at a later date.

The patient should be placed as described in the operation for superficial external tear, resting upon a perineal drainage cushion. The use of an anesthetic advisable if she is nervous, can usually be dispensed with if the operator is deft and can work quickly.

The following instruments are required: Needle holder, medium-sized curved needles threaded with carriers, 6 strands of silkworm gut, catgut sutures, a dozen intermediate silk sutures, a pair of scissors, and a Sims speculum or flat retractor.

It is important to secure the utmost approximation of wound surfaces by sutures placed within the vagina.

The upper angle of the wound is exposed by elevating the anterior wall of the vagina with the speculum or retractor. If the field of operation is obscured by blood, a temporary pack should be placed within the vagina above the wound. The first suture is introduced close to the upper angle of the tear, the next about a centimeter below this, and so on down to the skin surface. The needle enters from 5 to 10 millimeters ($\frac{1}{5}$ to $\frac{2}{5}$ of an inch) from the margin of the wound, according to the character of the tissue, and farther if there is much contusion; it emerges at the bottom of the wound, toward the operator, and, re-entering close by, is brought out again at a point on the vaginal mucosa corresponding to the point of entrance. A second suture is introduced a centimeter below this, with its loop directed toward the operator, and so on until the wound is closed. If an external tear is associated with the internal, as is usually the case, the opening remaining on the skin surface is now reduced to a shallow pit, and so readily approximated by a few additional superficial sutures. Each suture is best tied as introduced. Silkworm gut softened in warm water is the best suture material for the operation. These sutures may be left in the vagina for several weeks.

I mention but to condemn the practice of closing this form of tear by sutures passed altogether on the skin surface in a wide sweeping curve beneath the lacerated tissues, leaving the important portion within the vagina ununited, for by this means a pocket is left in the posterior vaginal wall which accumulates secretions, defeating the union, or even burrowing through the perineum, leaving a fistula. I have often found good broad union of the skin surface accompanied by a relaxed outlet or even prolapse.

After-treatment.—It is unnecessary to keep the knees bound after the patient has returned to consciousness, if an anesthetic has been used, and there is no objection to her making gentle movements, turning carefully from side to side in bed, elevating the knees, etc.

The use of the catheter should be avoided if possible, and, if necessary at all, should be continued for a few days only after the operation. The bowels should be opened within two days afterward; straining efforts during defecation must be avoided.

The sutures may be removed in from eight to ten days after the operation, when the union will be found to be firm.

The patient should stay in bed from twelve days to two weeks after an operation, and for four weeks more she should go about with care, and do no work or lifting.

Recent Complete Rupture of the Recto-vaginal Septum.—This laceration begins at the fourchette and extends through the skin perineum in the median line, and

through the sphincter ani for a variable distance up the recto-vaginal septum. The tear into the rectum forms a serious complication, destroying the function of the sphincter muscle and causing incontinence of feces and flatus. By this accident a sensitive patient is cut off from the company of her nearest friends, and compelled to live in a state of isolation. Strange, however, as it may seem, if the operation is not performed at once, the patient may carry her malady for years without seeking the relief so readily afforded.

Operation.—An immediate operation is imperative. The parts should be suitably exposed, as described for the last operation, and under anesthesia, if the patient can not be perfectly controlled without it. The instruments required are a needle holder, scissors, curved needles, and catgut and silkworm-gut sutures. The first step in the restoration is the closure of the rent in the bowel, which is effected by interrupted catgut sutures on the rectal surface at the upper end of the tear. Each suture pierces the margin of the mucosa and appears on the septum 4 or 5 millimeters ($\frac{1}{6}$ to $\frac{1}{4}$ inch) from the edge, to enter the septum on the opposite side, coming out again on the mucosa. The remaining sutures are passed in like manner, radiating out on to the skin surface and embracing the ruptured ends. Great care must be taken in bringing the sphincter ends into accurate approximation. The lower sutures alone are not sufficient to insure the sphincter union without the addition of a silkworm-gut suture entering on the skin surface and emerging well behind the ends of the ruptured muscle and traversing the septum. The tear now presents the appearance of the simpler form just described, which is closed by interrupted silkworm-gut sutures, for the most part placed within the vagina. Each suture is tied as passed, and a few superficial catgut sutures are passed between them, to insure perfect approximation. This operation skillfully performed is always successful if a puerperal sepsis does not interfere.

The bowels should be moved on the third day, and opened every second day afterward. Under no circumstances should they be allowed to become constipated.

It is important that the patient should remain at least two weeks in bed. The external sutures should be removed on the eighth day, and the internal a week or two later.

The Intermediate Operation for Injuries to the Outlet.—The intermediate period begins from five or six days and extends to two or three weeks after labor, while the unrepaired perineal wound is undergoing granulation and cicatrization. The parts at the bottom of the wound, naturally in close juxtaposition, often unite by first intention, while the remaining area is engaged in throwing off sloughing particles, granulating, and cicatrizing. In a few days small pink granulations are visible over the wound area, while the marginal epithelium as a fine white line invades it on all sides, contracting the wound from day to day. The granulating surface and the adjacent area is rigid and flushed by the new vascularization. The intermediate period, although not often selected as a time for operative interference, on account of prolonging the detention in bed, is not altogether

unsatisfactory, for a well-performed operation will be almost surely followed by a good result.

The wound is best exposed on a table, with flexed thighs, under a good light. Local anesthesia by means of cocain will, as a rule, be sufficient. This is secured either by saturating a pledget of absorbent cotton with a 4 per cent solution, applying it for ten minutes to the wound and surrounding tissue, or by injecting a few minims around the margin of the wound. With a sharp scalpel or spoon curette, the operator vigorously scrapes off the granulations, using also scissors

Fig. 132.—Complete Tear of the Recto-vaginal Septum, showing the Characteristic Pentagonal Form.

The opening is filled up with the anterior vaginal wall. At each end of the horizontal bar of the pentagon below slight depressions, indicating the sphincter pits, are seen.

and forceps as needed to effect the denudation. The peculiarity of the tissue will be found to be its friability, which makes it difficult to denude evenly in the usual way with scissors and forceps. The denudation must everywhere extend down into the sound tissue below. If some time has elapsed since the injury, it will be necessary in denuding to allow for considerable contraction of the wound. In this case strips of adjacent mucous membrane must also be removed.

The sutures should then be passed as described in the repair of recent injuries, according to the character of the tear, whether external superficial, internal,

or combined internal and external. It is important to avoid introducing the sutures too close to the edge of the wound to guard against the danger of their working through and becoming loose. The after-treatment is the same as has been described in the previous section.

If the injury to the vaginal outlet has not been repaired during the puerperal period, one of the two following conditions will be found at a later date: complete rupture of the recto-vaginal septum, or relaxed vaginal outlet.

Old Complete Rupture of the Recto-vaginal Septum.—In from four to six weeks after labor the extensive lacerated surfaces of a ruptured recto-vaginal septum contract down to a branching scar, forming a sharp ridge across the bowel, below which a few red folds of everted rectal mucosa project (looking like hemorrhoids and sometimes mistaken for them). In the absence of the perineum, rectum and vagina have a common outlet, or cloaca, characteristically pentagonal or triangular in outline. Notwithstanding the absence of the perineum, prolapse of the vagina and uterus but rarely occurs. This fact is irreconcilable with the view commonly held that the function of the perineum is to plug the pelvic outlet like a cork. The correct explanation is to be sought in the different locations of the tear; in most cases it extends up the median line, and only branches superficially into the sulci, leaving the lower fibers of the levator ani mus-

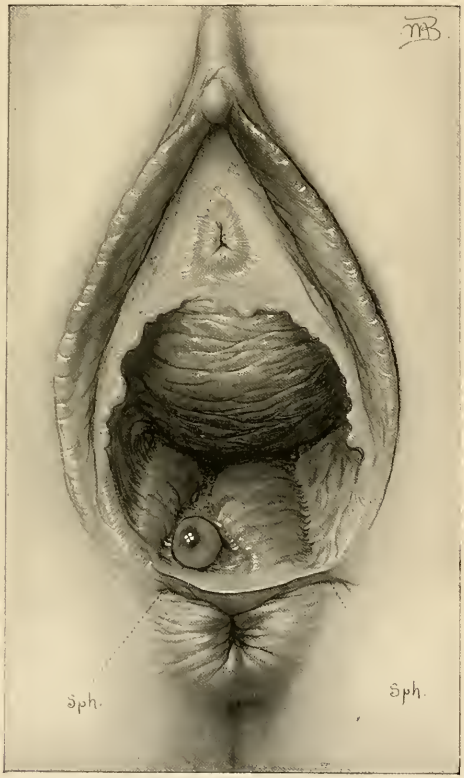


Fig. 133.—Complete Tear of the Perineum, with Well-defined Sphincter Pits and Retraction and Thickening of the Muscle, with a Deep Dimple Behind it.

A vaginal cyst due to inclusion of the vaginal mucosa in the healing process is seen in the right sulcus in the scar area. Oper. Feb. 6, 1896.

cle uninjured. When, in rare instances, the rupture both passes through the perineum centrally and extends deeply into one or both sulci, prolapse may occur.

The sphincter ani muscle in cases of complete tear will vary in form, in different cases, from a simple broken circle, with its ends still bound together, all

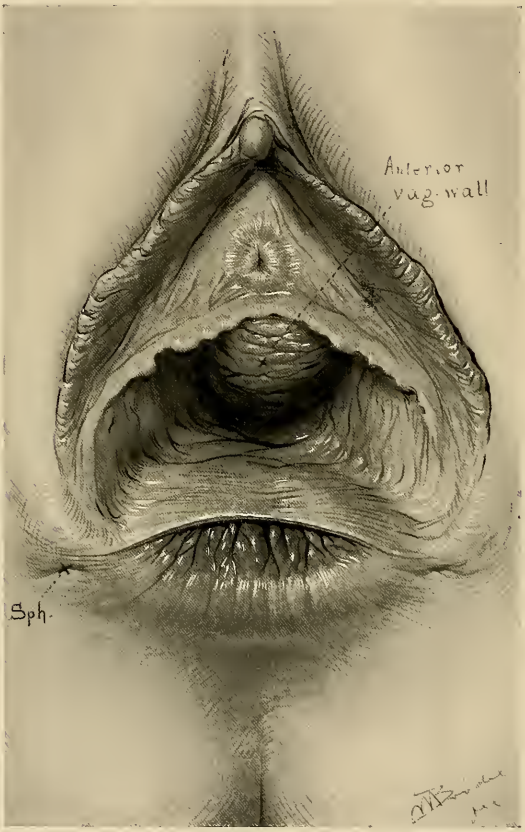


FIG. 134.—RUPTURE OF THE RECTO-VAGINAL SEPTUM, ORIGINALLY EXTENDING HIGH UP ALONG THE POSTERIOR VAGINAL WALL, BUT NOW PULLED DOWN BY THE CONTRACTIONS OF THE SPHINCTER INTO A SHALLOW ARC WITH EXTREME SEPARATION OF THE SPHINCTER ENDS. JUNE 21, 1897.

the way to a shallow arc, in which case the muscle is short and thick with a deep dimple in the skin behind it. A smooth glazed depression, at times puckered or pitted, at the lower angle of the perineal scar, frequently serves as the sphincter

landmark. A straight sphincter is the result of frequent contractions pulling down the angle of the tear so that ultimately a deep tear comes to look like a superficial one. Thus the extent of separation of the ends of the muscle becomes a measure of the depth of the original tear. It is sometimes difficult to identify the sphincter ends upon simple inspection, but by pulling on or pinching the

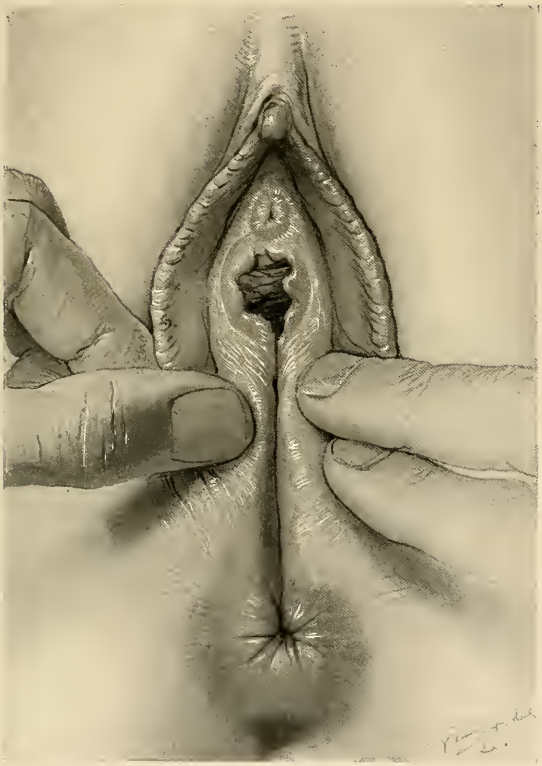


FIG. 135.—SAME CASE SEEN IN FIG. 134.

On bringing the two sides together the hymen is found to be intact except posteriorly. The yielding of the vaginal orifice in labor has therefore been sudden, and all in one place posteriorly, instead of a slow, equable distention producing multiple tears in the hymen. June 21, 1897.

muscle so as to stimulate a contraction, the position of the ends may always be discovered. It is important not to be misled, by the ability of the patient to retain feces, into the error of thinking the tear can not be complete, for where the original rent is shallow and the cicatrix in the angle binds the

ends firmly together, the sphincter will often contract efficiently up to this point. A similar result is, in fact, all we can hope to attain by the best plastic operation.

Operation.—Women with complete rupture of the septum sometimes have a chronic diarrhea. Here the only preparation necessary is an injection high into the bowel a few hours before the operation, clearing out all fecal matter. In other cases a free purgation must be secured the night before operation, followed by an enema in the morning. Carbolized and mercurial solutions, if used at all in other cases, must never be used here for irrigation, on account of the danger of fatal poisoning from absorption through the bowel. To prevent discharges from contaminating the field, one or two pledgets of iodoform gauze wrung out in warm water are pushed up into the lower bowel, to be removed when the operation is completed. The instruments necessary are scalpel, dissecting forceps, Emmet's left-curved scissors, needle holder, curved needles, and catgut and silkworm-gut sutures. The area to be denuded must be outlined with the scalpel,

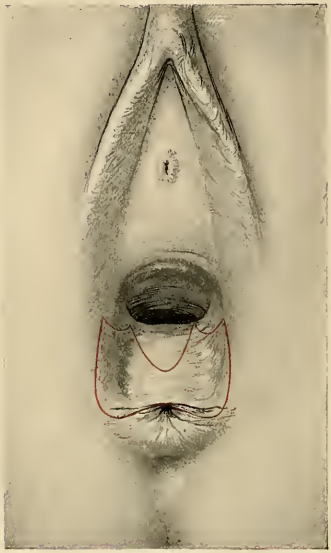


Fig. 136.—Complete Tear of the Recto-vaginal Septum.

The sphincter pits are seen below on both sides of the rectal orifice, the shortened sphincter muscle is much thickened, and there is a characteristic pit just below it. The red line encloses the area to be denuded; it must not be forgotten that the triangles seen extending up into the vagina are greatly fore-shortened.

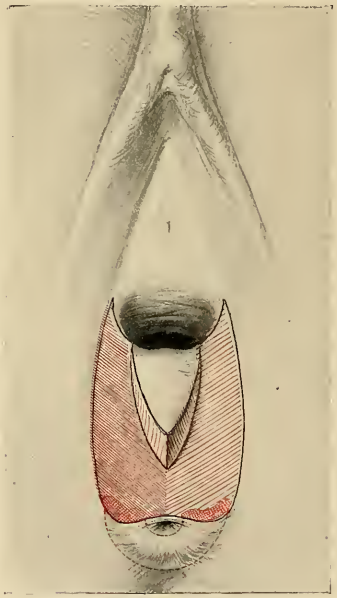


Fig. 137.—Complete Tear of the Recto-vaginal Septum. Denudation completed.

which follows the direction of the scar tissue in a general way, greatly exaggerating its outlines; the cardinal principle in the denudation is to reproduce as nearly as possible the original injury.

The first incision splits the septum and includes the sphincter ends, from which a line is continued up under the pubic arch on either side; thence it goes down into each vaginal sulcus and back again, meeting in front of the posterior column, 1 to 2 centimeters ($\frac{2}{5}$ to $\frac{1}{2}$ inch) above the first incision in the septum. All of the tissue included within the outline is now removed. Begin at one of the sphincter ends, catching it up with tissue forceps and cutting it free with curved scissors. Continue the denudation around the sharp edge of the septum to the opposite end of the sphincter, which is denuded in the same way, taking care to remove all scar tissue. A second strip above and parallel to this is next cut off, a third, and so on, continuing the denudation up into the vagina until the whole area within the outline has been removed. It is important to bear in mind that the denudation within the vagina must extend a centimeter or more ($\frac{1}{2}$ inch or so) above the angle of the tear in order to avoid the tendency to form a recto-vaginal fistula at this point. Silkworm-gut and catgut sutures are best adapted to the approximation of the denuded surfaces. Half-deep sutures of catgut are preferable for closing the rectal side of the tear, and for securing accurate approximation between the silkworm-gut sutures, which are used at wider intervals. The complication of the torn bowel is first disposed of by a series of interrupted rectal sutures, commencing at the upper angle of the tear, entering each suture at the margin of the rectal mucosa, and emerging on the wound surface 4 to 5 millimeters ($\frac{1}{10}$ to $\frac{2}{5}$ inch) distant, re-entering on the opposite side and coming out again on the margin of the mucosa at a point corresponding to that of entrance. This suture may be tied at once and dropped into the rectum, and a little less than a half centimeter ($\frac{1}{5}$ inch) below this another suture passed in like manner, tied, and dropped, and so on until the whole of the rectal rent has been obliterated down to the sphincter. One of the most important points in the operation now is to secure an accurate approximation of the

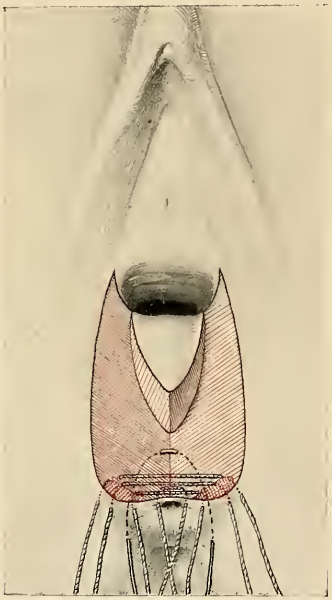


FIG. 138.—COMPLETE TEAR OF THE RECTO-VAGINAL SEPTUM.

Rectal sutures introduced, but not tied. Note the position of the silkworm-gut tension suture introduced well behind the sphincter ends and passing up through the septum.

sphincter ends by two or three sutures radiating from the rectal out on to the skin surface. The contractions of the sphincter render it necessary to assist these sutures with one of silkworm gut introduced well behind to the denuded ends and passing up through the septum. When this has been done the rectal

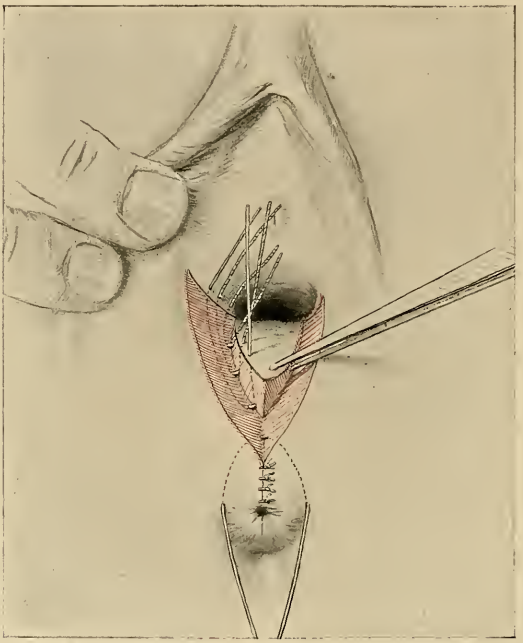


FIG. 139.—COMPLETE TEAR OF THE RECTO-VAGINAL SEPTUM.

The rectal sutures all tied except the silkworm-gut tension suture. The sutures are introduced but not tied in the right vaginal sulcus, one of silkworm gut and two of catgut above it.

rent is repaired, the wound is reduced from a complicated one involving three surfaces—rectum, skin, and vagina—to a simpler wound involving vagina and skin perineum.

The next step is the repair of the vaginal wound by a silkworm-gut suture in either sulcus, reaching down to the series of rectal sutures, at the bottom of the wound. The loop of the suture should lie in a plane nearer to the operator than its points of exit and entrance, so as to lift up the tissues at the bottom of the wound when it is tied. Superficial and half-deep catgut sutures complete the union within.

There still remains an opening on the skin surface, which is readily brought

together by a silkworm-gut suture, aided by a few superficial or half-deep catgut sutures.

The Relaxed Vaginal Outlet.—The name "relaxed outlet" describes a loose, gaping introitus, a condition which is more frequently observed after multiple childbirth, each successive delivery distending the orifice, until it appears like the mouth of a bag without its draw string, as Dr. T. A. Emmet has long been in the habit of describing it. Although a frequent ailment, it is rarely recognized except under the title of some one of its attendant and accidental fea-

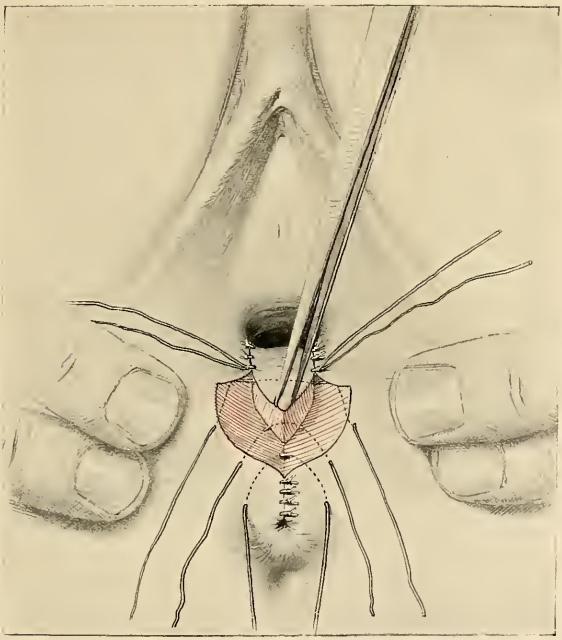


Fig. 140.—Complete Tear of the Recto-vaginal Septum.
Rectal and vaginal sutures all introduced and tied, and the perineal sutures in place, but not yet tied.

tures, such as "rectocele," "cystocele," or "rectocele and cystocele," or "laceration of the perineum" in varying degrees.

Clinical Appearance.—Upon inspection of such a patient on the back, with the legs flexed, the cleft of the buttocks appears flattened and broad; the anus is often wide, somewhat everted, and displaced backward; the sphincter ring is clearly seen. The skin perineum is often preternaturally deep and the fourchette intact. In other cases the skin surface of the perineum is torn as

far back as the sphincter ani. The intact deep perineum has long been a gynecological stumbling block, on account of the inveterate habit of physicians of estimating the functional activity and efficiency of the vaginal outlet by its depth on the skin surface; a "good perineum," signifying that the distance from fourchette to anus measures 2½ centimeters (1 inch) or more, whence the faulty conclusion is drawn that the support at the vaginal outlet must likewise

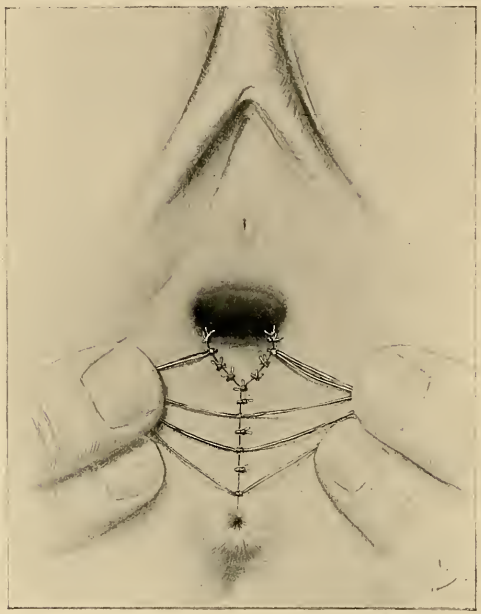


FIG. 141.—COMPLETE TEAR OF THE RECTO-VAGINAL SEPTUM.

All three sets of sutures introduced and tied, the catgut suture cut off and the silkworm gut left long. The outlet is pulled open a little in order to show the inside suture.

be "good." The fact is that in many of the worst forms of relaxation the perineum is deeper on the skin surface than before childbirth, a condition due to the overstretching of the external skin at the time the outlet was broken down.

On separating the labia in a case of relaxed outlet the vaginal walls appear more or less pouting, and either the anterior or posterior walls may protrude to a marked degree. In rarer cases lateral, anterior, and posterior walls all protrude.

The relaxed condition of the vaginal outlet may be demonstrated in a variety of ways. Upon instructing the patient to bear down, both anterior and posterior

walls roll out, bringing into view a considerable portion of the lower vagina. We are thus enabled to estimate the effects of lifting, walking, or straining at stool upon such a patient. If a finger is placed upon the cervix uteri, during the act of straining it will be felt descending in the axis of the vagina toward the outlet. The descent is especially marked if the patient is examined in the erect posture, when the surgeon will also be still better able to judge the effect of exercise upon her pelvic organs.

Upon placing the patient in the left lateral position and elevating the upper right buttock, air rushes audibly into the vagina and the posterior vaginal wall drops away from the anterior, leaving the gaping outlet as a large hole in the pelvic floor (*vide.* Fig. 144).

Palpation in the dorsal position reveals other important deviations from the normal outlet. The perineum is often but a lax, thin partition which may easily

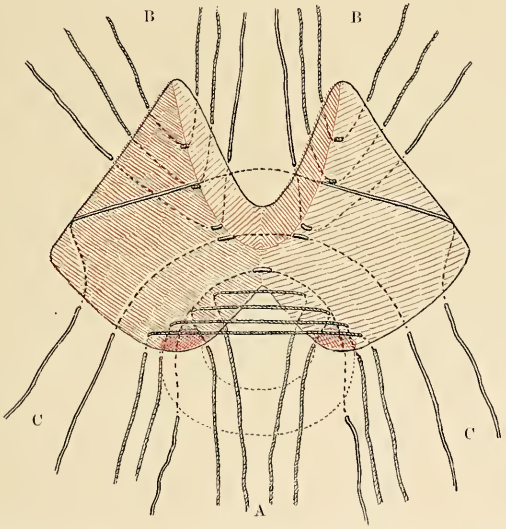


Fig. 142.—Scheme of the Operation for Complete Tear of the Recto-vaginal Septum laid on a Flat Surface.

The torn sphincter muscle is indicated by dotted red lines cross-hatched at each end. The deep indentation on the under side of the figure represents the rectal side of the tear, and the two red triangles above, one on each side, represent the denudations extending up into the vaginal sulcis. The sutures are passed first on the rectal side, A, radiating out into the perineum, then in the vaginal sulci, B, and finally on the perineal side, C. The cross-marked sutures are of catgut and the plain ones of silkworm gut. Note especially the silkworm-gut sutures passed in behind the sphincter ends and up into the septum.

be gathered up between thumb and forefingers of both hands and lifted up over the urethra and the clitoris. Many physicians are misled by the fact that, when the patient is lying in the dorsal position, the lax anterior and posterior vaginal walls apparently fill out the deficieney. Touch, however, ought to

demonstrate at once that the protrusions are loose, baggy tissue, incapable of affording any support. They are, on the contrary, danger signals, indicating a progressive descent of the vaginal walls and the uterus.

Further palpation shows that the strong lower levator fibers stretching from one pubic ramus to the other, and supporting the outlet, have disappeared; in

FIG. 143.—METHOD OF DEMONSTRATING A RELAXED VAGINAL OUTLET BY HOOKING THE FINGERS IN THE VAGINA ON BOTH SIDES AND PULLING OUTWARD AND BACKWARD.

The entire vagina and the cervix of the uterus are exposed by the fingers as by a speculum.

their place, the levator fibers are found more or less parallel to the lateral walls of the vagina. In the relaxed outlet, therefore, there is both a change in the direction of the lower levator fibers and a difference in the size of the levator loop surrounding the posterior vaginal wall. The broad, powerful transverse band, from pubic ramus to pubic ramus, has been replaced by a long, sharp-edged, lax loop, whose lumen is filled up by such soft, weakly resisting structures as vaginal walls and rectum.

The lesion is not always the same; the levator ani on one side sometimes remains intact, while its fellow of the opposite side is severed from its rectal and vaginal attachments. The difference in the direction of the fibers of the two sides is then marked, for while the intact side preserves a more or less horizontal direction its broken-down fellow hangs parallel to the lateral vaginal wall, at which point the finger may be buried in the deep sulcus between the rectum and the levator. Again, the attachment of the fibers on one side may be

nearer the outlet than the fibers of the opposite side, which lie in a different plane.

While the eversion of the relaxed outlet is often evident upon simple inspection, it may be most characteristically demonstrated by placing the thumbs on either side of the outlet behind and pushing outward and upward.

In many cases of reflex disturbances a relaxed outlet can only be detected

FIG. 144.—TEST FOR THE RELAXED VAGINAL OUTLET, SHOWING HOW THE POSTERIOR VAGINAL WALL DROPS WELL AWAY FROM THE ANTERIOR WALL BY SIMPLY PLACING THE PATIENT IN SIMS'S POSTURE.

The external skin perineum is well preserved, but in spite of this there is a large lax, gaping orifice.

by examination under an anesthetic, for during a conscious examination the weakened levator is under tonic contraction and more or less efficiently closes the outlet, and the examiner may be so far deceived as to estimate a marked

relaxation as one of minor degree, or even to overlook the condition. I call these cases "concealed relaxations."

It is a curious anatomical fact that the hymen is often better preserved in a relaxed than in a normal parous outlet. The explanation lies in the mechanism of parturition. In the lax outlet the distention has not been equal on all sides; rupture has occurred and the hymen has given away in one or two directions. Thus the sequence of precipitate labor may be the curious anomaly of a greatly overstretched outlet with an overstretched hymen torn in but one or two places.

Operation.—The rational treatment for the relaxed outlet is resection. There are in general two modes of operating—the posterior median, and the posterior bilateral exsection of the superfluous tissue, followed by suture. Since the

FIG. 145.—TEST OF AN EXTREME RELAXATION OF THE VAGINAL OUTLET.

Four fingers are easily introduced into the vagina and the thin pelvic floor pushed out, everting the rectum, and showing the entire absence of support.

natural outline of the vagina is H-shaped, the obvious inference is that the vaginal tissues will unite to best advantage in the limbs of the H that is in the sulci. This I believe is a correct inference, and I prefer, therefore, a bilaterally symmetrical operation extending up both sulci, based on the procedure of Dr. T. A. Emmet, of New York.

It is necessary to exaggerate slightly the effect of the operation in narrowing the vagina in order to counterbalance a slight relaxation which always follows.

The first step is to determine the limits of the denudation; this is done by

means of two tenacula shaped like a shepherd's crook, fixed on either side at the junction of the hymenal ring, or its remains, leaving sufficient tissue across the anterior vaginal wall between the tenacula to make a small outlet when the tenacula are brought together. These points mark the upper lateral limits of

Fig. 146.—Relaxed Vaginal Outlet.

The fingers are demonstrating the position and the direction of the lower fibers of the levator-ani muscle, which is grasped between them. The almost vertical direction of the levator loop is especially noteworthy as the most characteristic feature.

the resection. If they are fixed too near the urethra too much tissue will be removed and the new outlet will be too contracted ; on the other hand, if they are fixed too low down the new outlet will continue to be too large, notwithstanding the operation. The correct pattern to have in mind in resecting is the nulliparous outlet.

A third tenaculum is now fixed in the vagina in the median line posteriorly, on the crest of the vaulted prominence of the rectocele, or posterior column (*vide* Fig. 150).

With these three points fixed, the area of denudation must now be outlined with a sharp scalpel. The bloody outline obviates the liability to error in a free-hand denudation. No one pattern will fit all cases; as an excessive relaxation requires a more extensive resection than one of moderate degree.

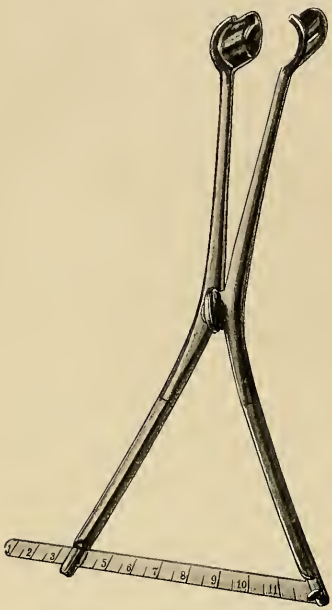


FIG. 147.—CALIBRATOR FOR MEASURING THE DEGREE OF RELAXATION OF THE VAGINAL OUTLET; GRADUATION IN CENTIMETERS.

The blades are closed and introduced just within the outlet and then opened as far as they will separate easily. The figures on the scale measure the degree of the relaxation.

FIG. 148.—RELAXED VAGINAL OUTLET IN A VII-PARA, WITH PERFECT PRESERVATION OF THE HYMEN, EXCEPT IN THE MEDIAN LINE POSTERIORLY.

Forceps were not used in any of the labors. Operation, June 1, 1897.

The surface to be denuded is irregular in outline and occupies several planes, making it difficult to represent it adequately in a picture. In making the outline the central tenaculum and one of the lateral tenacula are drawn widely apart, downward, and outward, exposing one of the vaginal sulci. If there be a moderate degree of relax ation the apex of the triangle outlined in each sulcus is situated 3 centimeters ($1\frac{1}{3}$ inch) within the outlet. By depressing the convex posterior vaginal wall a distinct line will be seen at the juncture of the anterior and lateral walls. An

incision should be made down to the lateral tenaculum through the vagina, parallel to and just below the anterior wall. From the same point within, the second side of the triangle is made by an incision down to the tenaculum at the crest of the rectocele. A narrow triangular undenuded area remains between the two triangles thus formed in the sulci (*vide* Fig. 151). The outline is now completed by a semicircular incision extending around the posterior wall, keeping within the hymen above, but embracing any scar tissue seen below. The center of this line falls 3 to 4 centimeters (1 to 1½ inch) below the tenaculum fixed in the posterior column. The area thus outlined is rapidly denuded with Emmet's right curved scissors, removing the whole thickness of the vaginal walls in long strips 3 to 4 millimeters ($\frac{1}{10}$ to $\frac{1}{5}$ inch) broad. At first the strip of tissue follows the line of the incision down

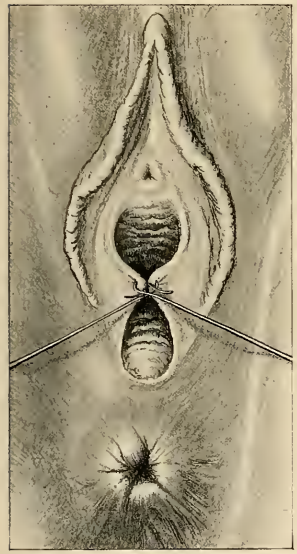


Fig. 149.—Relaxed Vaginal Outlet.

Shepherd's-crook tenacula fixed in both sides just within the hymen, mark the limits of the denudation. The tenacula are crossed to show the size to which it is proposed to reduce the reconstructed outlet.

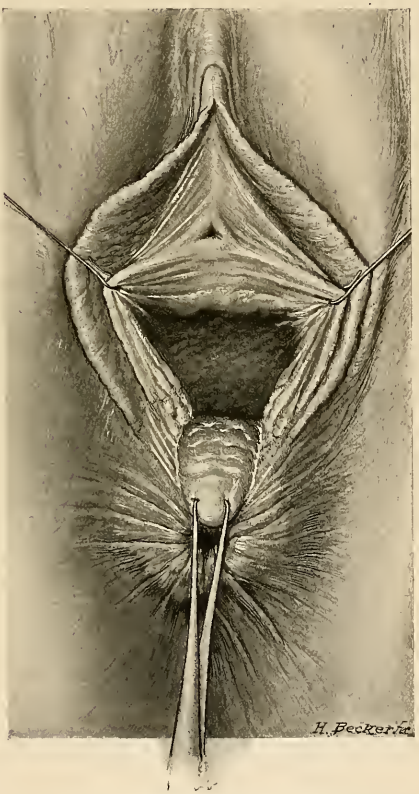


Fig. 150.—Relaxed Vaginal Outlet.

Showing the shepherd's-crook tenacula fixed at the sides, below the urethra, and the tenaculum forceps drawing the posterior columna downward, so as to expose the lateral vaginal walls where the triangular denudations are made.

to the apex of one of the triangles; then it continues back, and is carried to and fro across the front and up into the other triangle; frequently the whole outlined area can be removed in a single strip. The dissection is often facili-

FIG. 151.—RELAXED VAGINAL OUTLET.

The silkworm-gut tension suture is placed in the triangle on the right side. The dotted lines represent the part of the suture which lies concealed under the surface. The short piece of the suture visible as a white line at the bottom of the denudation is the part which is exposed by bringing the needle out at the bottom of the wound and re-entering it close by.

tated by running the ends of the scissors beneath the lax tissue on the floor of the vagina. Arterial and venous hemorrhage from cut vessels is sometimes free, but the venous flow lasts only a short time and ceases spontaneously. An actively spouting artery should first be clamped for a time in the artery forceps, and if it persists in bleeding after a few moments it may be tied with catgut. By judicious application of the deep tension and the approximation sutures, much hemorrhage can be checked without the use of buried sutures at all.

The large wound area is now accurately approximated by means of from three to four silkworm-gut sutures, and from eight to twelve half-deep and superficial catgut sutures. But one silkworm-gut suture is placed within the vagina, in either sulcus. An assistant exposes one of the triangular areas by drawing the tenacula at its base downward and outward; a carrier is entered upon the

mucosa on the lateral vaginal wall near the incision, a little below the middle of the triangle, and carried under the tissue toward the operator, appearing at the bottom of the sulcus, considerably below the point of entrance; it is re-entered close by and carried in the reverse direction, finally emerging on the mucosa of the opposite side of the triangle (and opposite the point of entrance). A stout silkworm-gut suture sharply bent upon itself, 2 centimeters ($\frac{3}{4}$ inch) from the end, is hooked into the loop of the carrier and drawn through, then pulled up and tied in a square knot, care being taken to adjust accurately the edges of the wound before tying. The suture thus placed draws together a large area of tissue. To close the wound accurately above the suture its ends are grasped between the third and fourth fingers, and by traction the upper part of the triangle is exposed, as a narrow ellipse, with loosely approximated sides. Perfect

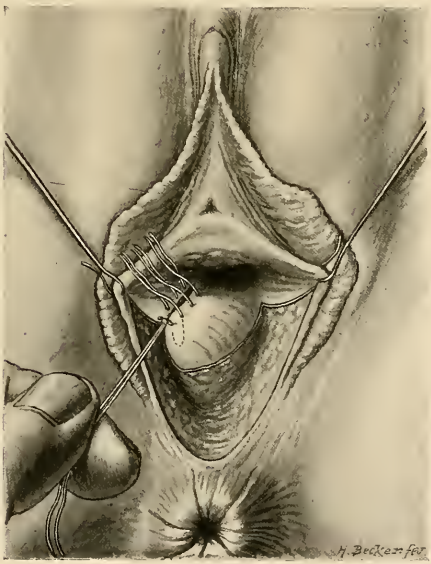


FIG. 152.

The silkworm-gut suture is tied and pulled down, exposing the catgut sutures in place and ready to be tied, closing accurately the upper part of the denudation, already brought loosely together by the silkworm gut. These catgut sutures must pass deep into the tissues so as not to leave a pocket in the wound below them.

union is secured here by fine catgut sutures, carried deeply from side to side. The first is placed but a short distance above the one of silkworm gut, tied here, and used in its turn as a tractor, exposing the wound immediately beyond; then the next suture is passed and tied and so on, until the upper part of the triangle is closed and all bleeding has stopped. The opposite sulcus is closed in the same

way with a single suture of silkworm gut and several of fine catgut. These sutures should check all hemorrhage, but if there is persistent oozing it must be controlled by additional sutures tied tightly at the bleeding point. In this way a large par tof the resected area within the vagina has been approximated, and the vaginal canal markedly narrowed within the pelvis. When the triangular areas in the sulci are large, a half-deep catgut suture should be added below the one of silkworm gut.

Most of the remaining area may be brought together by a single gathering suture of silkworm gut, embracing the upper angles on the sides and transfixing the rectocele (*vide* Fig. 153).

An additional silkworm-gut suture may sometimes be necessary on the skin

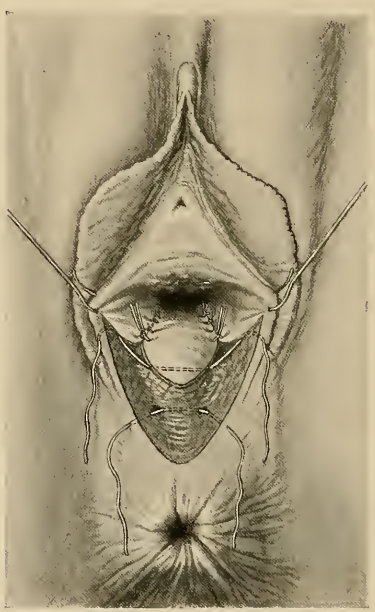


FIG. 153.—RELAXED VAGINAL OUTLET.

The inside sutures are now introduced and tied in both sulci. The gathering suture of silkworm gut is introduced above across the angles, but is not tied. An auxiliary suture introduced to close the wound below this is also left untied.

surface extending through to the bottom of the wound. Half-deep and superficial sutures will complete the union.

The duration of the operation is from fifteen to thirty minutes. The outlining takes about one minute and a half, the denudation three or four minutes, and passing the sutures ten minutes longer; various minor matters may lengthen the time to half an hour.

The result of the operation is now evident in the change in the position, size, and direction of the vaginal outlet. It has been lifted and restored to its position well beneath the pubic arch. Its size has been reduced from 5 or 6 to $1\frac{1}{2}$ or 2 centimeters ($2\frac{1}{4}$ to $\frac{3}{4}$ inches) in diameter. The examining finger no longer enters in the direction of the promontory of the sacrum, but goes backward

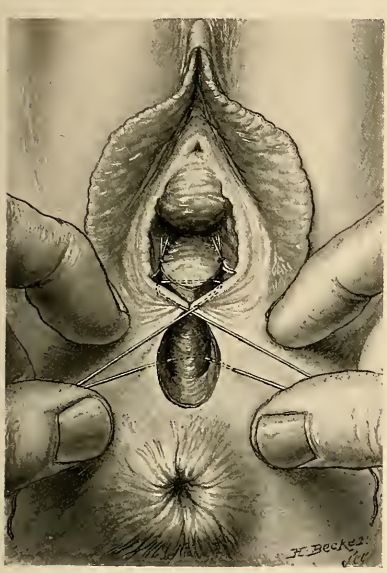


FIG. 154.—RELAXED VAGINAL OUTLET.

Showing how the gathering suture above draws together the tissues.

FIG. 155.—RELAXED VAGINAL OUTLET.

Operation completed. The sutures with longer ends, two inside and two outside, are of silkworm gut; the others are all of catgut.

toward the coccyx. This change in direction and position of the outlet removes it from the line of intra-abdominal pressure in which it has lain. Instead, therefore, of the constant tendency to eversion of the vaginal wall through a wide opening, the pressure is spent in forcing the anterior vaginal wall down upon the posterior one, and both upon the restored pelvic floor.

The external sutures should be removed from the eighth to the tenth day. Those in the inside may remain several weeks.

The immediate result of this operation is a complete restoration, and even the hymen is often restored. Subsequent labors will not destroy the effects of the operation, unless unskillfully conducted or attended by complications.

CHAPTER XI.

OPERATIONS ON THE VAGINA.

1. Introductory: *a.* Anatomy. *b.* Intrinsic affections, few. *c.* Traumatic affections, largest group. *d.* Diseases from extension.
2. General surgical principles.
3. Congenital affections: *a.* Absence of the vagina. *b.* Imperforate hymen. *c.* Atresia of one side of the uterus. *d.* Vaginal septa. *e.* Double vagina associated with uterus bicornis duplex.
4. Foreign bodies.
5. Vaginitis.
6. Vaginal cysts.
7. Abscess of Gartner's canal.
8. Neoplasms: *a.* Benign. *b.* Sarcoma and carcinoma.
9. Traumatic affections: of the vault; of the orifice; of the canal. Strictures—falciform and annular. Atresia.
10. Recto-vaginal fistula.

The vagina is a simple musculo-membranous canal, lined by stratified epithelium. It is distinctly funnel-shaped, its lower extremity being contracted and lying beneath the pubic arch, while its expanded upper end, flattened antero-posteriorly, rests upon the pelvic floor and receives the cervix of the uterus.

The list of its surgical affections is a short one. The most frequent and important are the ruptures at either extremity occurring during parturition; those above are produced by the extension of a tear beginning in the cervix and continuing out into the vaginal vault on one or both sides, while those below are oftenest found in association with a lacerated outlet. Other vaginal affections, such as malformations, cysts, and neoplasms, are rare.

Uterine tumors, such as a polypus or an inverted uterus filling the lumen of the vagina, are not reckoned among vaginal diseases.

The vagina being in the form of a sac, all of its surgical diseases, except fistulæ, in one way or another affect the size of the canal; foreign bodies, cysts, abscesses, neoplasms, cicatrices, and atresiæ encroach upon the lumen and diminish the caliber to a varying degree. The injury at the outlet alone has the effect of enlarging the canal at this point. Destructive diseases, such as sloughs, ulcers, and carcinoma, perforate the walls, establishing fistulous communication with the bladder in front, the rectum behind, or even the small intestines above.

GENERAL SURGICAL PRINCIPLES.

The surgical principles involved in the treatment of vaginal diseases relate to:

1. The thorough cleansing of the field.
2. The proper exposure for operation.

3. The careful removal of existing disease, avoiding injury to important neighboring viscera.

4. The control of hemorrhage.

5. The closure of the wound by suture.

The vagina must be thoroughly cleansed before every operation. After bringing the buttocks to the edge of the table on a drainage pad, as in all plastic operations, the assistant retracts the posterior commissure with two fingers, or in a virgin with a narrow speculum, and introduces into the vagina a ball of cotton about 3 centimeters (1·2 inch) in diameter, coated with soft soap, grasped in a pair of forceps; warm water is then poured in from a vessel above, and the upper vaginal tract thoroughly cleansed by vigorously scrubbing for several minutes in all directions, taking care to distend and cleanse between the folds. All parts of the vault will be better reached if two fingers are introduced, the middle finger pushing the vaginal tissue down or to one side, while the index finger pushes the cervix in the opposite direction. By repeated washings with fresh pledgets of cotton and soap, followed by douching with warm water, all *débris* and loose epithelium are gradually softened and removed. The lower vaginal tract is cleansed in like manner. Where discharges are escaping out of the cervix there is a constant liability to reinfection. It is best in such a case to dilate and curette the uterus, and then to pack the vault of the vagina with iodoform gauze during the performance of an operation.

Exposure of the field.—In women who have borne children there is usually no difficulty in opening the vaginal outlet wide enough to expose and permit easy access to all parts of the canal by means of retractors in front and behind. The upper retractor fitting under the symphysis pubis should be narrow, with its blade spreading outside to keep the labia minora from dropping over the outlet and so obstructing the view; the posterior retractor must be broad enough and long enough to stretch the vagina and afford a good view of its walls, including the cervix. I found it necessary in one case, in order to reach a malignant disease of the vault of the vagina, to split the pelvic floor from the fourchette around the anus to the sacro-coccygeal joint, and dissect down beside the rectum, turning it to one side.

In the removal of diseased tissue it is important to bear in mind the topographical relations of the parts. In the first place, there are no organs except the ureters in the vicinity whose integrity is essential to life; thus, if uterus, bladder, or rectum are involved together with the vagina, portions of these structures may be sacrificed in removing the diseased tissue.

Even a considerable segment of the rectum may be removed and the upper and lower ends brought together. The exsection of portions of the bladder requires careful attention to avoid injuring the ureters, whose location is indicated by the ureteral folds in the anterior vaginal wall.

The hemorrhage encountered in vaginal operations is never alarming, and is readily controlled by forceps and ligatures. Bleeding from the vaginal walls may always be controlled by the sutures approximating the edges of the wound.

Silkworm gut is the best suture material where there is tension, but silk and catgut may both be used.

Cleanliness is maintained after the operation by keeping the vaginal outlet dry and well protected. As soon as there is any discharge from the vagina the pack should be removed, and if the discharge is sweet-smelling the further care should consist in applying iodoform and boric acid powder (1 to 7) and absorbent cotton over the outlet. If the discharge is ill-smelling at any time, the vaginal douches must be given once or twice daily. I find the pleasantest and most efficient douche to be two drops of menthol and bicarbonate of soda and borax, a teaspoonful each, dissolved in half a liter of hot water and used warm.

The various surgical affections of the vagina may be considered under the following heads:

1. Congenital affections.
2. Foreign bodies.
3. Cysts.
4. Neoplasms.
5. Traumatic affections and atresiæ.
6. Recto-vaginal fistulæ.

CONGENITAL AFFECTIONS.

Congenital affections are imperforate hymen, absence of the vagina, atresia of the upper part of the vagina with bicornute uterus, double vagina, and vaginal septa.

Absence of the Vagina.—When the vagina is absent, the uterus, ovaries, and tubes are also usually either absent or rudimentary. The exact condition of the organs higher up must be determined by a bimanual examination under anesthesia through the emptied rectum and the abdomen; the examination may also sometimes be made by a finger in the rectum and a sound or a finger in the bladder. An operation attempting to establish a connection between rudimentary organs and the vulva can not be serviceable, and is therefore unjustifiable. It is also useless to attempt to form a deep pocket between the rectum and bladder simply for sexual purposes, as such an opening can not be maintained.

Transplantation for Atresia of the Vagina.—An absent vagina may be replaced by the transplantation of new vaginal tissue from a case of prolapse, when the uterus, tubes, and ovaries are present, or when there is a unicorn uterus with hematometra and hematosalpinx. As W. Nagel has pointed out, in many apparently congenital cases the atresia of the vagina is really due to an unnoticed local inflammation in early childhood.

The formation of a new vagina has been twice successfully done by A. Mackenrodt (*Centralb. f. Gyn.*, 1896, No. 21, p. 546) as follows: A transverse incision is made in the septum between the urethra and the rectum, and the vesical and the rectal sides of the septum are separated from each other by a blunt dissection, with finger and instruments; on reaching the cervix both index

fingers are inserted and the future vagina widened. The wound surface is now packed firmly with an iodoform-gauze tampon, which is changed every few days, until the whole surface becomes covered with healthy granulations. At this juncture the transplantation is done either at one or at several sittings, according to the amount of the tissue available to make the new vagina. Unusual care must be taken in preparing the flaps which must be carefully cleansed first, and then cut out without crushing or bruising, and with as little as possible of the underlying connective tissue. The flaps are then put aside, wound surface to wound surface, and kept warm and covered in a sterile dish until the prolapse operation has been completed, when they are laid with great care on the dried aseptic wound surface and pressed down, until they adhere as if by suction; they are then fixed in place by an iodoform-gauze tampon, which remains undisturbed for about ten days, while the patient is kept absolutely quiet in bed. The replacement of the whole vagina at one sitting is more difficult; the flaps formed as described are spread out lengthwise on a Cusco's speculum, with the epithelial surfaces turned inward; they are then sewed loosely together so as to allow any secretions to escape between them. At the inner end of the speculum they are connected by a few threads which form a loose pocket; then the upper end of the speculum is filled with iodoform gauze and inserted into the wound, and as the speculum is withdrawn more gauze is packed in, all in one piece, until the tamponade is completed. Especial care must be given to keeping the tampon from being wet with urine. In two weeks the parts appear normal.

When both the vagina and the uterus are absent and the ovaries are present and functionally active, the recurring monthly paroxysms of pain, associated at times with a vicarious menstruation, may necessitate celiotomy for the removal of the ovaries, as in the following case:

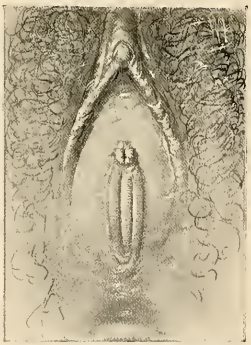


Fig. 156.—Entire Absence of the Vagina, with Indication of Double Hymen. The External Genitals Normal. Sept. 9, 1893.

B. M. (No. 2190, Sept. 9, 1893), an anemic woman twenty-eight years old; at the age of twelve began to have periodical monthly severe headaches, accompanied by dizziness and flushes of heat over the entire body; her face flushed readily, and she was annoyed by frequent blushing; she also had sharp, cutting pains in the region of the left ovary; between the attacks she felt well. In her twentieth year she began to have convulsions, as many as four and five in a day. The first hemorrhagic discharge from the rectum took place in her fourteenth year at one of the periods. The flow was dark brown in color, clotted, and not offensive, and continued one day; after this there was no discharge for three years, but the feeling of fullness and pain in the abdomen still recurred every month. In her seventeenth year she had a second hemorrhage, which continued for six weeks.

During the convulsive attacks, which persisted at variable intervals, she became weak and nervous, and the abdomen was swollen and tender. Six months before entering the hospital the rectal flow began, and continued up to the day of operation with the exception of a few days, accompanied by much pelvic pain.

Examination.—Scanty growth of pubic and vulvar hair. Escutcheon of the female type. External genitalia perfectly formed, rudimentary hymen, and the vagina is entirely absent, being represented by a narrow fibrous column which can be palpated by the rectum.

Both ovaries and tubes are apparently normal, but seem to fuse into two nodular masses corresponding to the cornua of a uterus, but no uterine body can be felt.

Diagnosis.—Total absence of vagina and uterine cervix; two rudimentary uterine bodies; ovaries and tubes normal. Menstrual molimina with rectal discharge.

Operation.—Celiotomy for the removal of undeveloped uterus, ovaries, and tubes. The bladder lay transversely across anterior part of the pelvis, and the small intestine and the rectum filled the posterior two thirds. On the pelvic floor a fleshy nodule, 1·8 centimeter in diameter, was found in the median line,

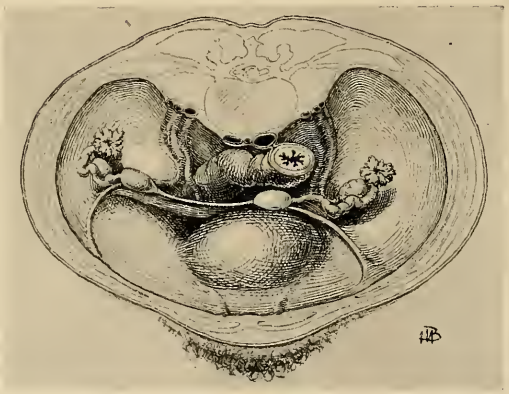


Fig. 157.—Relations of the Rudimentary Uteri, the Tubes, and the Ovaries in the Case of Absence of the Vagina.

The left uterine nodule lies upon the bladder near the median line, the right nodule is close to the pelvic brim, and the two are connected by a thin fleshy band. Note the large oval made by the round ligaments. Operation for vicarious rectal menstruation with extreme nervous discomforts.

from which a well-formed uterine tube extended out and up to the brim of the superior strait on the left side, terminating in a fimbriated extremity beneath which lay a small ovary.

This central nodule was connected by a fold of peritoneum with a second similar but smaller nodule on the right side. From this nodule also a uterine

tube extended out to an ovary. Both tubes were patulous down to the fleshy nodules, from which well-formed, round ligaments extended out to each inguinal canal.

A fibrous band about 4 centimeters long, about 5 millimeters broad, and 2 to 3 millimeters thick, extended down under the bladder, representing the va-

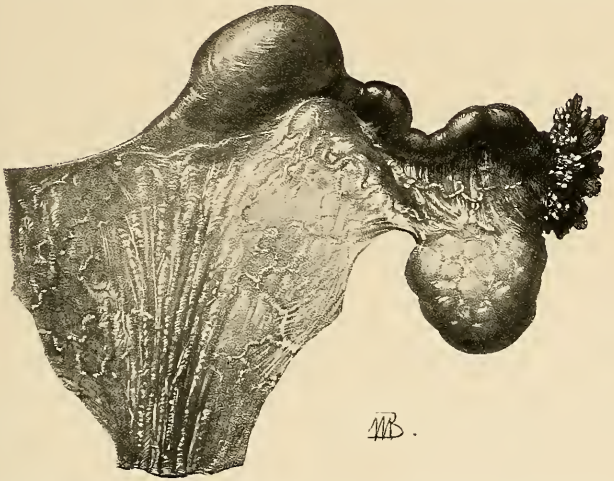


FIG. 158.—LEFT TUBE AND OVARY AND UTERINE NODULE, THE TUBE AND OVARY NORMAL IN SIZE.

The membrane below, with parallel folds, occupies the position of the uterine body and the upper vagina. Sept. 9, 1893, No. 54. Natural size.

gina. The rudimentary uterine cornua tubes and ovaries were removed and the patient made a good recovery.

Microscopical Examination.—Tubes normal, well developed, nothing atypical in their histology. They end in two *culs-de-sac* in fleshy nodules slightly larger than the tubes and containing some normal uterine mucosa and glands.

The ovaries contain Graafian follicles in various stages of development. Corpora lutea and corpora fibrosa are present.

Diagnosis.—Rudimentary bicornute uterus, absence of cervix and fundus of uterus, normal ovaries and tubes.

Imperforate Hymen.—The simplest form of vaginal atresia is that of its lower extremity at the hymen. The closure here affects the vaginal mucous membrane alone and does not consist, as in atresiæ above, of an absence of the entire wall with a replacement by fibrous tissue, forming the septum. The hymen in these cases usually forms a thick, tough, resisting membrane.

The upper vagina, uterus, ovaries, and tubes are, as a rule, well formed and functionally active in such cases.

This condition of the hymen is rarely recognized until puberty, when the failure of the appearance of the menstrual secretions is the occasion of an examination, which at once reveals the anomaly. It may, however, be discovered in quite young children by the accumulation of mucus within, causing the hymen to pout out, forming a whitish sac between the labia beneath the urethra, which becomes more prominent when the child cries. If this sac is cut open with a pair of scissors a little mucus is discharged and no further difficulty is experienced.

After puberty, as each menstrual period pours its secretions into the uterus and vagina, the more fluid parts are absorbed and leave behind a thick tarry substance. In the course of time, between the ages of seventeen and twenty, the vagina may become distended into a sac big enough to fill the pelvis. The upper end of the sac is formed by the expanded uterus, often with dilated tubes at

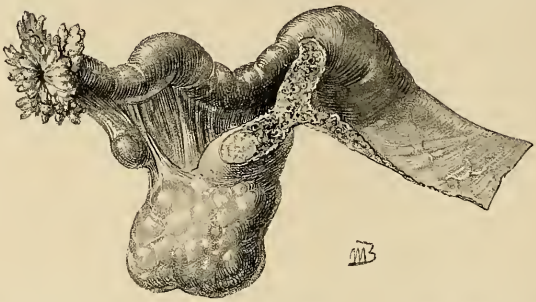


Fig. 159.—Right Tube, Ovary, and Uterine Nodule, showing the Normal Size of the Tube and Ovary.

either horn, and a greatly distended cervix. The distinction between uterine cavity proper and cervical canal is marked by the internal os uteri, which preserves its identity although much dilated. The lower uterine segment opens up so as to appear like a continuation of the vagina; indeed, the external os is often difficult to find. One of the most important complications is the distention of the uterine tubes by the backing up of the retained menstrual secretions.

The changes at the lower end of the vagina are quite characteristic and afford valuable diagnostic points, as they are readily accessible to inspection and touch. There is a marked bulging convex tumor protruding between the labia, which fluctuates distinctly upon touch; posteriorly it is limited by the perineum, laterally by the inner surfaces of the labia, and anteriorly it reaches the posterior margin of the urethra. If the tumor is large enough to fill the lower abdomen, rising as it may as high as the umbilicus, the wave of fluctuation is readily transmitted from above downward as far as the tumor at the vulva. The rectal examination reveals an elongate sac filled with fluid occupying the position of the uterus and conforming in its general direction to the axis of the pelvis.

Treatment.—Lives have been repeatedly lost from sepsis coming on rap-

idly after opening these accumulations, especially where the tubes have been dilated. The blood adhering to the sac and the thin walls, together with the sudden change in the pressure upon the blood vessels, affords nutrient material for sepsis and a ready avenue for its entrance into the neighboring peritoneal cavity through necrosis of the thin walls. This danger will be avoided by a thorough cleansing of the field, by taking care not to infect the tract while operating, and by a careful packing with iodoform gauze so as to protect the field for some days after operation.

After cleansing the external genitals the bulging membrane is opened by a crucial incision, dividing it into four triangular flaps. The thick tarry fluid is allowed to escape slowly; the canal above it is washed out from five to ten minutes with a saturated boric acid solution introduced through a long curved glass douche nozzle. Pains must be taken to empty the whole vaginal and uterine cavities of all the blood. An abundance of iodoform and boric acid powder is dusted into the vagina and iodoform gauze loosely packed in from the vaginal vault to the outlet. The urine is drawn, the powder sprinkled over the outside, and a pad of sterilized cotton laid on, held in place by a T-bandage. These dressings may be left in four or five days or even longer, provided all is going well and they do not become saturated earlier. At any time as soon as they are wet with secretions the dressings must be changed by bringing the patient conveniently to the edge of the table or bed under a good light and withdrawing the pack with forceps and reinserting it with a packer, using every care to avoid contact of the gauze with fingers, buttocks, etc. By this mode of treatment sepsis will be kept out and the one great danger eliminated.

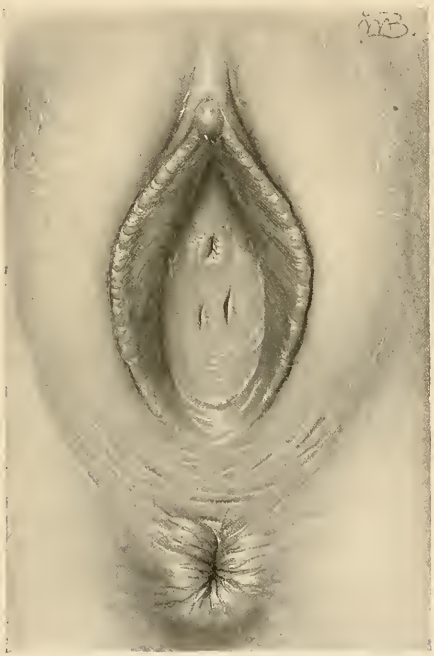


FIG. 160.—HYMEN INTACT AFTER NINE YEARS OF MARRIED LIFE.

The membrane was thick and tough and perforated by two small orifices. Oper. June 5, 1897.

In some rare cases a thick, tough hymen, almost imperforate, forms an insuperable barrier in married life. Such a malformation is generally soon discov-

ered and easily relieved by a simple incision with the surgeon's knife. In the figure (160) I show a case, however, in which this barrier still existed after nine years of married life.

Atresia of One Side of the Uterus.—Another form of congenital atresia affects but one horn of a bicornute uterus. The menstrual secretions are here retained in the one side, and as the accumulation increases a pelvic tumor is formed, bulging into the vault of the vagina on the defective side, where there is a distinct ovoid swelling, more or less tense and fluctuating to touch, displacing the uterus toward the opposite side.

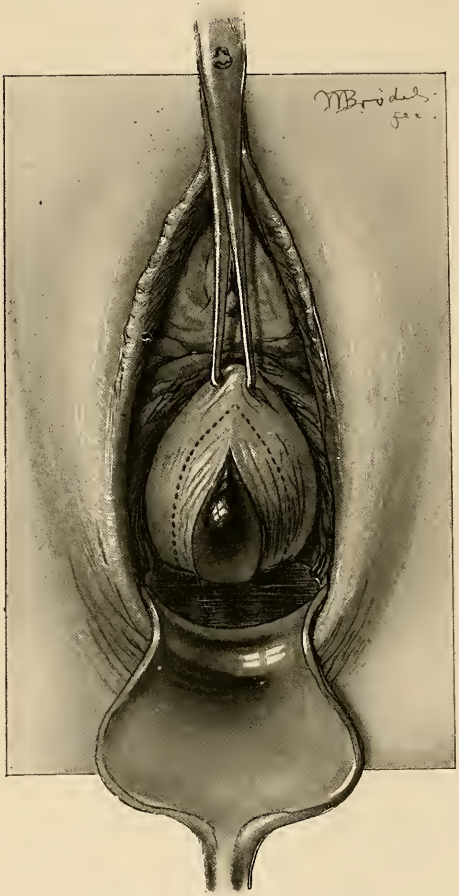


FIG 161.—TRAUMATIC ATRESIA OF THE VAGINA WITH ACCUMULATION OF THE MENSTRUAL SECRETIONS ABOVE.

A median incision allowed the thick, tarry blood to escape and accumulate in the speculum as shown. The membrane was then excised along the dotted line. Dec. 5, 1896.

The treatment of this form of gynatresia is by making a cruciform incision and evacuation and thorough irrigation, followed by the most rigid aseptic precautions during the convalescence.

Vaginal Septa.—Septa when congenital are usually found in the upper part of the vagina. They appear as falciform processes, involving only the mucous membrane and encroaching upon the lumen of the canal. The cervix may be entirely hidden and the avenue of communication from the vagina below to the vault above may be but a small orifice placed at one side.

Sometimes the septum extends transverse-

ly across the entire vagina, forming an atresia, as in the case shown in Fig. 161.

Such septa may mechanically cause sterility. They may also act as pockets in which irritating secretions are retained. The treatment is simply to divide the septum with a scalpel in one or two directions down to its base without an anesthetic. If the septum is thin and membranous no sutures will be needed; if fleshy and bleeding at the base, two or three fine silk sutures at this point will draw the upper and lower surfaces together and stop the flow. These septa must not be confused with the acquired cicatricial septa, which need a different treatment.

Double Vagina associated with a Septate Uterus.—When there is a fusion of the Müllerian ducts without the absorption of the septum, uterus septus and double vagina are formed. These cases are not rare, and often present a history like the following: M. C. (No. 4887, December 28, 1896), aged forty-one, married twenty-six years; iii-para; labors difficult, but not instrumental; three miscarriages.

Menstruation began at fifteen, regular, moderate, lasting two to three days, always with much pain.

Examination.—External genitals normal; hymen beginning on left side below urethra around to posterior margin is intact, beyond this on the right side broken in three places, leaving caruncnlæ between.

A prominent bridge of tissue extends from a point 1 centimetre below the everted urethra to the posterior margin of the hymen, where it curves upward and joins the hymen on the left side. This bridge between the anterior and the posterior walls is thick and fleshy, looking like normal vaginal tissue. It begins on the anterior wall 1·5 centimeter broad, is about 5 millimeters broad in the middle, and 2 to 3 millimeters in width where it joins the left side of hymen. Two vaginal orifices are formed in this way, the left crescentic with the lower sharp horn of crescent encroaching on the left side; the right opening is oval, 3 by 2 centimeters in size when held slightly apart. The redundant vaginal walls pout into both of these orifices.

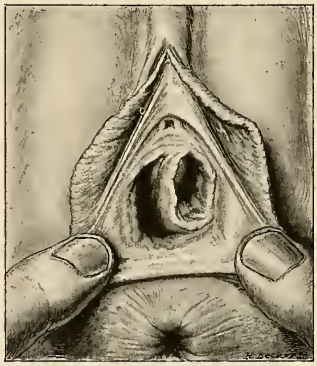


Fig. 162.—Double Vagina with a Thick Fleshy Septum. The Left Orifice is Oval, while the Right is Crescentic. Dec. 28, 1896.

The vaginal introitus looks as if the right side had been broken down and its folds smoothed out by labor, while the left side remained intact. This doubling of the vagina, apparent at the orifice, is continued all the way up to the flattened double uterine cervix, and upon introducing a bivalve speculum, two little cervices appear at the vaginal vault, one in each half of the vagina, with both

openings turned toward the septum. The septum is not quite so thick above as below, and it measures about 3 centimeters from anterior to posterior wall.

A diagnosis of pelvic abscess was made in this case, and in order to evacuate it by the vagina and to secure good drainage in a dependent position it was necessary to excise the entire septum, and so unite the right and left vaginæ into one. This was done by cutting it away with scissors at a little distance from the vaginal walls. The bleeding was moderate and easily controlled by a continuous catgut suture along the anterior and posterior vaginal walls.

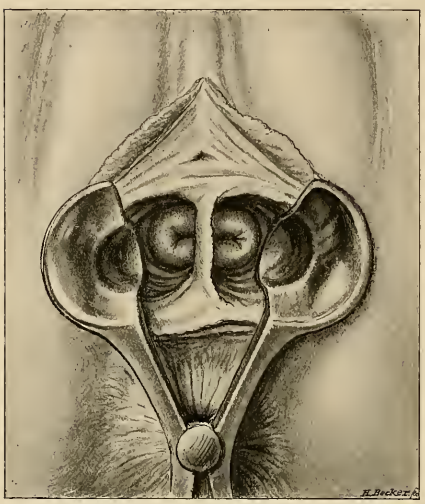


Fig. 163.—Double Vagina and Double Cervix, with a Blade of a Bivalve Speculum introduced into each Side so as to show both Cervices and the Septum in the Middle.

An exploratory abdominal incision was then made and the vagina opened and drained in the vault behind the cervices under guidance of the fingers in the abdomen, and the patient recovered.

Foreign Bodies.—The one foreign body found in the vagina with any degree of frequency is a pessary, introduced for therapeutic purposes. The pessary becomes injurious when it is too large, or when, owing to its composition, it gives rise to foul secretions, or when left in too long. It was more a fault of our predecessors than of present-day practitioners that they tried to effect by the size of the pessary what they could not attain by its skillful adjustment. I once removed a Hodge pessary large enough for a mare, which had been thrust into the vagina years before to relieve a simple flexion. In another case I found an old woman in a low typhoid condition which was inexplicable, until a fetid leucorrheal discharge was discovered; then on vaginal examination a large, thick ring pessary was felt choking the vagina. On removal, it was found to be made of cloth covered with an impermeable paint and stuffed with fiber. It had been introduced in Germany fifteen years previously, and had produced such extensive ulceration of the vagina with absorption from the raw surfaces as to bring on the typhoid condition in which the patient died, in spite of the removal of the cause and repeated careful cleansing of the wound surfaces.

In another instance a stem pessary, which had been introduced by the family physician, was thought to have been lost, as examination failed to reveal its presence in the vagina. Later, the patient began to suffer intensely, and

came to the hospital in a septic condition, and on examination, the pessary was found lying transversely across the vagina, one end having buried itself in the perineum, where it was felt as a hard body, while the cup had ulcerated its way into the bladder, producing a vesico-vaginal fistula. It was removed by breaking it to pieces with the bone forceps. The patient did not rally from the septic condition, and died in a few days.

Soft-rubber ring pessaries commonly produce a free leucorrhea, often with intense itching of the external genitals, and for this reason I have abandoned them. The effect of a hard-rubber pessary, which is too large, is to imbed itself in the posterior vaginal wall. On removing such a pessary a deep semicircular sulcus may be seen back of the cervix and extending out on the lateral walls. When the granulations meet over the posterior bar, this part of the pessary is completely buried, and must be cut out to be removed.

In more extreme cases the ulceration extends through into the rectum behind, and the anterior bar pushes through the vesico-vaginal wall into the bladder in front, forming recto-vaginal and vesico-vaginal fistulæ. Instances of ulceration even into the peritoneum are also recorded.

The treatment is the removal of the foreign body and keeping the wound clean by repeated irrigations until it is healed, and then closing the fistula. Careful note must be taken of the fact that where the foreign body has been in place for years the vaginal orifice often becomes so contracted as to prevent its withdrawal by simple traction through the outlet without laceration. The effort may be first made to remove it by traction in the direction of least resistance, after cleansing the vagina thoroughly and injecting into it a large quantity of vaseline. If the pessary can not be extracted in this way without injury, either on account of its size or because of the incrustations covering it, the operator must remove it in pieces. To do this he will have better command of the field and be less liable to injure the vagina with the patient in the knee-breast position and the posterior vaginal wall well retracted by a broad Sims speculum. The pessary is then easily seen and caught with a pair of stout forceps, which fix it firmly, while with bone forceps it is cut into pieces small enough to be readily removed. If the forceps can not break it, a metacarpal saw may be used.

Fig. 164.—Atresia of the Vagina due to a Cup and Stem Pessary.

Above the atretic area the vagina is filled with pus. The stem of the pessary is outlined where it lay buried in the tissues to the right.

Ulcerated areas should be freely penciled with a 5 per cent nitrate of silver solution every four or five days, and warm boric acid douches used twice daily until the wound has healed.

Vaginitis.—Vaginitis, or, more correctly, colpitis, is an inflammatory affection of the vaginal mucosa usually due to a bacterial infection.

Vaginitis may also be the result of the application of an irritant to the vagina, but the disease does not persist unless the inflammation is kept alive by the invasion of one or another of the pathogenic organisms. A vaginitis is also often produced by the irritant effect of a foreign body in the vagina, such as a pessary, particularly if the pessary has been transferred from another person without being sterilized.

Although a variety of micro-organisms form the real basis of the different forms of inflammation of the vagina, but few of these have as yet been identified, and it is often impossible in a given case to name the true cause. The best known forms of bacteria liable to produce a vaginitis are the gonococcus, the tubercle bacillus, an organism resembling the oïdium albicans, and a gas bacillus.

Gonorrheal vaginitis is rare, and so experienced an observer as Bumm (Veit's *Handb.*, Bd. i, p. 474) declares that he has only seen five cases all told.

Too great care, therefore, can not be taken in establishing such a diagnosis. Bumm considers that the cases commonly considered as gonorrheal vaginitis are merely the result of the secondary irritation proceeding from the stagnation of purulent discharges from an infected cervix. He quotes further experiments made in v. Rinecker's clinic in Würzburg, in 1880, where the vagina was allowed to remain for twelve hours in contact with a gonorrheal secretion without any manifest result.

Veit, on the other hand, is inclined to lay much stress on the gonococcus as an etiological factor.

The exemption of adult women is apparently due to the thick impervious vaginal epithelium; in young children, on the other hand, and even in young women, where the vaginal epithelium is tender and succulent, an infection of this sort is far more liable to occur.

Pregnancy, by the increased blood supply to the genital organs, with the attendant softening of the tissues, increased moisture, and loss of the superficial layers of the vaginal epithelium, predisposes to inflammatory processes, and a slight trauma may suffice to bring about an acute colpitis. At this time we observe the two following forms, which are almost unknown at any other period.

The aphthous vaginitis is due to the presence of a vegetable parasite, resembling closely the oïdium albicans, which appears in white raised patches on the reddened vaginal wall, and in the shape of small white flakes in the vaginal discharges.

The other form of vaginitis is known as colpo-hyperplasia cystica, and is characterized by the presence of gas cysts in the vaginal mucosa, the formation of gas being due to a bacillus which has been isolated by several observers. The gas is found in cavities in the interstices of the connective tissues.

A vaginitis may also be due to contact with the irritating discharges of a carcinomatous cervix.

Senile vaginitis is peculiar to old age, when the vagina is atrophic and has a poor blood supply; if at this time an inflammation is set up by an irritating uterine or cervical discharge, or if a trauma occurs from coitus or other cause, the result is an ulcerated area which is slow to heal, or adhesions may form chiefly at the vaginal vault, giving rise to the adhesive vaginitis of old age.

Finally, there is found at times, accompanying febrile or exanthematous diseases, a severe form of vaginitis, which may present the picture of diphtheritic vaginitis, so called from the false membrane formed, either in localized areas or almost entirely covering the vagina. The inflammation may even be severe enough to terminate in gangrene and sloughing of the vagina.

These cases are usually masked by the acute general symptoms of the disease, and in the worst forms are almost always fatal. The results of the less severe forms are seen afterward in atresia or stenosis of the vagina.

A chronic form of vaginitis is also seen, characterized by thickening and prominence of the papillæ of the mucous membrane, by a thin purulent discharge, and sometimes by ulcerated areas in various parts of the vaginal wall.

The symptoms of a vaginitis vary greatly from the acute form, where the patient is unable to move on account of the severe pain, with its attendant vesical and rectal tenesmus, to those cases where the only complaint is of irritation of the external genitals, with some vaginal discharge.

On examination in an acute case, the labia and surrounding skin show signs of inflammation, being reddened, thickened, and smeared with a whitish purulent discharge. On separating the labia the discharge will be seen issuing from the vaginal orifice, which may be pouting and of a deep red color. On introducing the finger the vagina will be found hot and swollen and sensitive, the tissues feel softer than normal, and on withdrawing the finger it may show a little streak of blood. Under the speculum the vagina is of a deep red color, the mucosa looks thicker than normal, and in places a velvety appearance, from the prominent papillæ, is noted. Small blood-red areas may also be seen which bleed on touch; these are points where the mucosa is thinned out and the blood vessels show more distinctly. This latter appearance was the origin of the name of "colpitis granulosa" for one variety of vaginitis.

The symptoms in the senile vaginitis are usually but slightly marked, and the condition is often discovered accidentally. There is usually a little purulent discharge, the vagina is smooth, injected uniformly or spotted with red, diminished in caliber and length and coitus is interfered with.

In vaginitis accompanying pregnancy the principal complaint is the almost unbearable itching, which at times prevents the patient from sleeping.

The diagnosis of vaginitis can only be made by a thorough examination of the parts. The presence of a profuse curdy secretion covering the walls

should not suffice, but this must be wiped off and the color and amount of swelling or thickening noted. The aphthous vaginitis may be distinguished by the small white flecks on the surface, which can not easily be wiped off, and by a microscopical examination of the discharge. The colpo-hyperplasia cystica is recognized by the presence of the cysts, which, on opening, are found filled with gas.

The diagnosis of gonorrheal vaginitis must always be carefully made, and if there is any doubt a gonorrheal source should not be suggested to the patient. The acute history, with the onset following six or eight hours after coitus, the profuse yellowish discharge with a slight pungent odor, the involvement of the urethra, cervix, and perhaps one of the vulvo-vaginal glands, will all help in the diagnosis, which must also be strengthened by a microscopical examination of slides, stained by the Gram and other methods.

The treatment of vaginitis depends to a large extent on the cause of the inflammation. The proper plan is to discover the cause when possible and to remove it, and then to treat the remaining disease.

For example, a foreign body must be immediately removed, and in many cases this will be the only treatment necessary. The irritating discharges from a carcinomatous cervix or from a sloughing uterine myoma must first be checked by the removal of the growth and by vaginal douches.

The local treatment may be carried out by using medicinal substances in a watery solution, introduced through a syringe into the vagina, or by medicinal substances applied directly in viscous solutions or as dry powders.

Irrigation of the vagina is best practiced with a fountain syringe with a glass nozzle, which can be easily and thoroughly cleansed by boiling. The reservoir of the syringe should only be raised a foot or eighteen inches above the patient, and the injection should always be taken in the reclining position, allowing the fluid to enter the vagina slowly, the nozzle not being introduced over two inches. The patient should also lie quietly for a time, allowing the last of the irrigation to remain in contact with the vaginal mucosa for a short time.

Various substances are used in this way, either for their antiseptic or astringent action, and combinations may be made in which both actions may be taken advantage of. The watery solutions which are most frequently used are bichloride of mercury, in strengths of from 1–40,000 to 1–10,000; carbolic acid, 20 or 30–1,000; potassium permanganate, 5–1,000; boric acid, 30 or 40–1,000; also, as astringents, tannin from 10 to 30–1,000; acetate of lead, 1 to 5–1,000; alum, 10 to 25–1,000.

When the discharge is acid, it will often prove of distinct advantage to use alkaline douches, such as lime water, soda water, etc.

The use of cotton tampons soaked in viscous solutions of various agents is also a good method of treating vaginitis, with, however, the drawback that the patient must see her physician every time it is necessary to renew the tampon, for it is usually impossible for her to introduce it herself. The tampons may either be introduced in the knee-breast or in the left lateral

position, or they may be introduced in the dorsal position, using a bivalve speculum. The tampon should either be soaked in the fluid or the fibers can be separated enough to form a cavity in the center, in which the fluid may be poured. Each one must also have a cord attached firmly to it to facilitate the removal.

The substance generally used for the vehicle is glycerin, as this has itself a

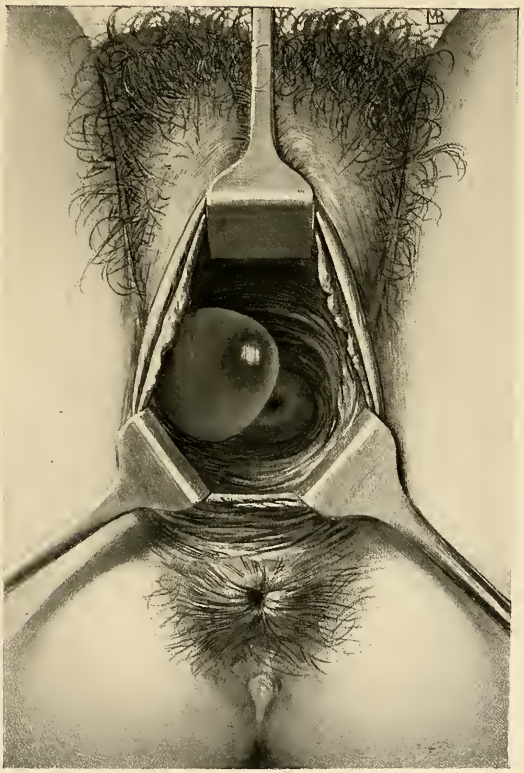


FIG. 165.—THIN-WALLED CYST OF THE RIGHT VAGINAL WALL.

The cyst is somewhat acuminate and the base is much smaller than the greatest circumference. Path. No. 428.

certain amount of action on the vagina. In this may be dissolved alum, 5–100, boric acid, 10 to 20–100, or ichthyol of 5 or 10 per cent strength.

Dry powders may be applied to the vaginal surface through a powder blower

or by means of a brush, or they may be inclosed in a wad of wide-meshed gauze and introduced.

Nitrate of silver, in 5 or 10 per cent solutions, may be applied locally to ulcerated areas by an applicator wound with cotton.

The prognosis of most cases of acute vaginitis is good if the cause can be removed. Gonorrheal vaginitis usually heals quickly, though there is always a chance of reinfection from the cervix or urethra, unless these also receive careful and prolonged treatment. The chronic and senile forms are hard to heal on account of the marked changes which the tissues have undergone, rendering rejuvenation impossible; the prognosis as to complete cure in these cases must therefore be guarded.

FIG. 166.—CYST OF THE ANTERIOR VAGINAL WALL IN PREGNANCY.

The entire cyst is translucent, with whitish bands interlacing over the surface. Note the well-defined blood vessels. Natural size. Dec. 9, 1895.

Vaginal Cysts.—Cysts in the vaginal wall are not so rare as is commonly supposed, for if all cases were examined carefully enough small cysts would be frequently found which are ordinarily overlooked; cysts, however, as big as a hen's egg or even larger, are uncommon. Cysts may spring from any portion of the vaginal walls, and are usually hemispherical or ovoid, rounded or flattened on top, shining and translucent when the vaginal mucosa is thinned out over them, and projecting into the vaginal lumen, which may be seriously encroached upon. I saw one clear thin-walled cyst lying behind the cervix, reniform, concave anteriorly, extending transversely across the vaginal vault, about 3 centimeters (1·2 inch) long by 1 centimeter in breadth. Several small cysts are occasionally found in a group.

The cyst contents are thin and watery, gluey, opalescent, or even purulent. I have seen purulent vaginal cysts five times, three of the anterior wall and two of the posterior, all of them extremely painful and sensitive to the slightest touch and associated with fever. Two of those on the anterior wall, however, were not true vaginal cysts, but were suburethral abscesses, discharging into the urethra; another, a true vaginal cyst with a thin wall, was seen with Dr. A. K. Minich, of Philadelphia, and was situated within the vagina on its anterior wall, ovoid, and as big as a hen's egg; it was cured by a simple incision, evacuating the pus. The fourth was 4 centimeters (1·6 inch) in diameter and

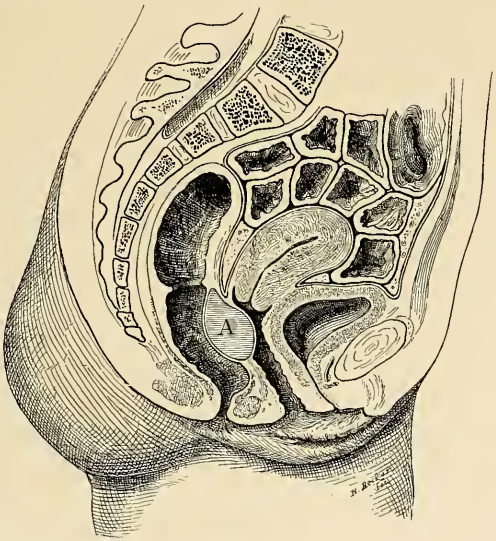


Fig. 167.—Abscess of the Recto-vaginal Septum (A) in the Upper Part of the Vagina.

3 centimeters (1·2 inch) thick, situated in the posterior vaginal wall, high up, just below the vault and seemed fixed to a firm base. It caused paroxysms of agonizing rectal pain, during which the patient would stand grasping a chair and screaming. On incising it, thick, yellow, odorless pus escaped; the walls of the cavity were smooth, rigid, and irregular above. There was no communication with the rectum in this case, as noted in an abscess of the recto-vaginal septum reported by Heydrich (*Centralb. f. Gyn.*, 1891, No. 21). The remaining case involved the posterior vaginal wall, low down, and was caused by a rectal fistula, so that out of the five four were pseudo- and but one was a true vaginal cyst.

Etiology.—The current belief that the true vaginal cysts are commonly formed in Gartner's ducts is erroneous, for two reasons—the superficial site of

these cysts, and their indifferent positions on the anterior, lateral, or posterior walls. The case mentioned above is also quite conclusive evidence against this theory, inasmuch as the cyst lay quite superficial, and crossed the vaginal vault from side to side with its long axis horizontally. Another objection is the fact that a group of small cysts may be found irregularly distributed on one side of the vagina, and not arranged in a curved or in a straight line, as would be the case if they originated in Gartner's duct. The same objections can not be urged against the cases cited by Kiwisch and Veit, in which a row of cysts were distributed in line along the anterior vaginal wall on either side. Nor can any objection be urged against the supposition that cysts at the vaginal vault, lateral to the cervix and extending up into the parametrium above the vault, have developed in the remains of the duct.

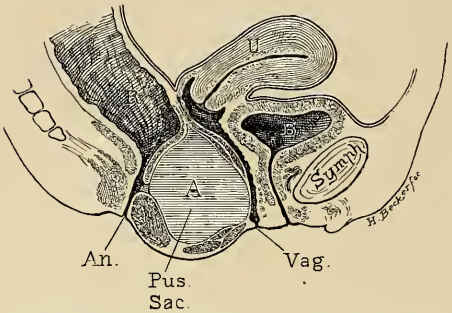


Fig. 168.—Abscess of the Recto-vaginal Septum from a Rectal Fistula, distending the Perineum and the Posterior Vaginal Wall.

I would divide vaginal cysts, according to their origin, into those arising—

1. From the vaginal glands.

2. From epithelial nests included in the scar tissue following a trauma.

3. From Gartner's ducts.

The vaginal glands are sparse and are lined with cylindrical epithelium; when the duct becomes choked the accumulating secretion within pushes out into the vagina in the direction of least resistance and a cyst is formed. The evidence we have of this mode of origin of some vaginal cysts depends upon the researches of F. von

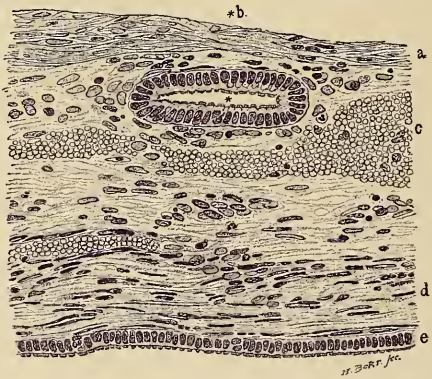


Fig. 169.—Section of the Wall of a Cyst from the Anterior Wall of the Vagina, just to the Right and Posterior to the Urethral Orifice.

The cyst walls were smooth, thin, and transparent; the cavity was empty, except for a few clumps of round cells here and there. *a*, Stratified epithelium; *b*, a vaginal gland lined with ciliated cylindrical epithelium situated in the connective tissue in the wall of the cyst; *c*, blood lying free in the stroma; *d*, large spindle-shaped connective-tissue cells; *e*, cylindrical ciliated epithelium lining the cyst cavity. Path. No. 1502. Magnified 360 times.

Preuschen and the discovery by C. Ruge of a gland in one of his sections of a vaginal cyst.

I am prepared to strengthen Ruge's position by showing a similar case in which a vaginal cyst 1 by 1·5 centimeter in size was removed and found lined with columnar ciliated epithelium; between the cyst and the typical vaginal epithelium lay a flattened vaginal gland lined with columnar epithelium similar to that of the cyst, and radically different from the vaginal epithelium.

The cysts due to epithelial inclusion (see Fig. 171) are entirely different in their microscopic characters; they are usually small and located in the posterior vaginal wall at the outlet or near it. I have seen one case in which

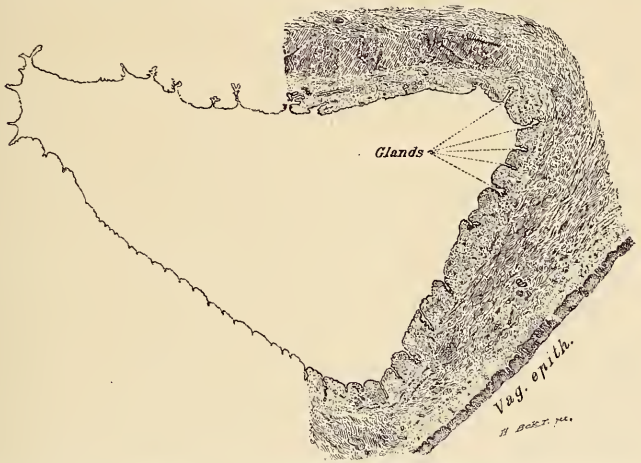


FIG. 170.—CYST 8 BY 5 CENTIMETERS IN DIAMETER PROTRUDING FROM THE VAGINA AND COVERED ON ITS EXTERNAL SURFACE BY SMOOTH VAGINAL MUCOSA; EGG-SHAPED AND DENSELY ADHERENT TO THE STRUCTURES ABOVE THE VAGINAL VAULT.

The walls, 3 millimeters in thickness, are of a dark-grayish opaque color, and the cavity contains a semifluid, greenish substance. The cyst is lined with a single layer of high cylindrical epithelium, a true prototype of that found in the cervix. In places there are islets lined with epithelium like that lining the surface of the cyst; these islets sometimes dip down into the wall of the cyst a centimeter or more, and closely resemble true glands in their structure. Just beneath the lining epithelium of the cyst cavity there is a layer of connective tissue, and next to this came a broad layer of non-striped muscle fibers cut longitudinally, transversely, and obliquely. A layer of normal stratified squamous epithelium lies over one portion of the outer surface. Case of Dr. C. P. Noble. Path. No. 1775. Magnified four times.

a cyst almost 2 centimeters in diameter lay on the left side, situated in a complete tear of the septum; in two other cases the formation of the cysts followed operations on the posterior wall in which islets of undenuded tissue were undoubtedly left behind; in one of them three or four cysts followed the line of the scar, in the other the cyst was in the sulcus and was 2 by 1·5 centimeters in diameter. In all cysts of this group the epithelium is squamous, and usually in two or three layers; in one instance piles of desquamated epithelium were found in the cyst cavity.

Cysts developing from Gartner's ducts are found in rare instances at the vaginal vault extending up between the folds of the broad ligament.

FIG. 171.—SECTION FROM THE WALL OF A CYST, 2 BY 2·5 CENTIMETERS IN DIAMETER, TAKEN FROM THE POSTERIOR WALL OF THE VAGINA.

The walls are thin and transparent, and the cyst cavity is nearly filled with large cells. *a*, normal stratified squamous epithelium of the vaginal mucosa; *b*, connective tissue showing a number of small blood vessels; *c*, a layer of muscle fibers cut longitudinally and transversely; *d*, two, and in places three, layers of rather flat epithelial cells lining the cyst cavity. Other portions of the cyst are lined with several layers of typical squamous epithelium. *e*, large cells lying free in the cyst cavity, probably desquamated epithelium. Path. No. 1411. Magnified 50 times.

Cysts of the vaginal vault must be distinguished from the atresia of a rudimentary horn of the uterus, which forms a prominent fluctuating tumor at the vault or extending from the vault down the lateral wall. In these cases there is a history of pain associated with the retention, and a bimanual examination through rectum and abdomen will show that the tumor extends well up into the pelvis. A suburethral abscess is peculiar in its position beneath the urethra, the thick vaginal wall covering it, its extreme tenderness, and in that it discharges its contents through the urethra on pressure.

A cystic dilatation of a blind ureter beneath the urethra may easily be confused with a simple vaginal cyst. Such was the case of E. G. Orthmann (*Centralb. f. Gyn.*, 1893, No. 7). The cyst occupied the lower two thirds of the vagina and grew year by year. The diagnosis of a vaginal cyst was made, but in dissecting it out it was found that the contents had disappeared, and on reaching its long pedicle above, a correct diagnosis of a forked ureter with a blind end dilated into a cyst was made.

The small cysts occasion no symptoms whatever. The chief clinical symptoms of the larger ones are obstructions to marital intercourse and to labor; often the patient's first intimation that there is anything wrong is when a part of the cyst protrudes at the vulva. The suppurating cyst alone is painful.

The treatment is simple and free from risk. Small cysts may be excised without opening them and the wound closed with catgut sutures; larger cysts may be freely opened, the lining membrane dissected out, and the wound then closed by suture. In suppurating cases after proper cleansing, a large segment of the whole thickness of the cyst wall is

excised from end to end, its contents removed, and the vagina and remaining portion of the cyst packed with gauze. This is renewed from time to time until the raw surface has healed.

Abscess of Gartner's Canal.—I have seen a single instance of this rare affection. A young Jewish girl of about fifteen years, a patient of Dr. G. W. Guthrie, of Wilkesbarre, Pa., developed severe pain in the genitals with high fever, which continued for several days. A fluctuating sac was found extending from the vault of the vagina on the left side close to the cervix, down along the antero-

FIG. 172.—CROSS SECTION THROUGH THE WALL OF A CYST 1 CENTIMETER IN DIAMETER; THE CYST WAS FOUND SO NEAR THE EDGE OF THE VAGINA THAT ITS OUTER WALL IS SKIN.

At *a* the epidermis is normal, and scattered throughout the tissue are sebaceous glands, as seen at *b* and other points. *c* indicates spindle-shaped connective-tissue cells running parallel to the cyst wall. *d* shows the inner surface of the cyst lined by one layer of cuboidal epithelium. Path. No. 1390. Magnified 36 times.

lateral wall to the vestibule, to the left of and on a level with the posterior urethral wall, where it shortly opened spontaneously, discharging pus. I saw her afterward in consultation with Dr. Guthrie, and was able to pass a probe through the external orifice clear up to the vault of the vagina, but not beyond.

The quickest way to effect a radical cure of such a case would be to pass in a probe and to lay the sac open throughout its whole length in the vagina so as to get good drainage.

NEOPLASMS.

Benign neoplasms originating in the vagina are extremely rare, and the only forms found are the myomata.

The etiology of these tumors, as in those occurring in the uterus, is still unknown, though Veit, following Recklinghausen (*Hand. d. Gynäkol.*, Bd. i, p. 348), speaks of the possibility of their originating in Gartner's ducts.

Myomata appear in the vagina either as polypoid growths with long pedi-

Fig. 173.—Large, Thick-walled Cyst of the Posterior Vaginal Wall projecting from the Vulva. Sept. 14, 1894.

cles or as more diffuse rounded tumors with wide bases extending out into the connective tissue surrounding the vagina.

The symptoms depend upon the size of the growth and the obstruction of

the vagina and pelvis. The patient may complain of a sense of weight in the pelvis, tenesmus of the bladder, and even partial retention may occur, as direct effects of the pressure. There may also be constipation and rectal tenesmus. Pain in coitus has been noted, and the tumor may at times attain a sufficient size to interfere with delivery.

With necrosis and gangrene of the tumor we find the added symptoms of profuse ill-smelling vaginal discharge, with an accompanying irritation of the surrounding parts.

The treatment is removal of the growth. Pediculated tumors are easily amputated, the vessels controlled, and the base sutured, bringing the tissues evenly together. In the case of a larger tumor with a wide base it may be necessary to enlarge the vaginal opening by making lateral incisions before the growth can be satisfactorily reached and removed. The way to remove sessile tumors is to make a linear incision through the overlying vaginal wall and then to enucleate the growth. The cavity remaining after such an enucleation may be closed completely by suturing the vagina after checking all hemorrhage. The opposed sides are kept together by packing the vagina with gauze, which is allowed to remain undisturbed for from four to seven days.

Malignant neoplasms are represented by sarcomata and by carcinomata.

Sarcoma appearing in the vagina, according to Steinthal (*Virch. Arch.*, Bd. cxl, p. 449) and Kolisko (*Wien. klin. Wochenschr.*, 1889), may be sharply divided into two classes. In young children they are usually polypoid in form and situated on the anterior vaginal wall, while in adults the sarcoma is usually a diffuse growth found in any portion of the vaginal canal.

When secondary to sarcoma of the uterus it appears first in the vaginal vault as a dark bluish knobbed or polypoid outgrowth.

In children the first symptom noticed is a rounded or irregular berrylike tumor appearing in the vulvar cleft and accompanied by pain. Pain on micturition and constipation may be present. In adult patients a vaginal discharge usually makes its appearance early in the course of the disease, and there are at times slight hemorrhages from the surface of the growth.

There is a great tendency in all of these tumors to undergo necrosis, and this, together with the foul discharges, opens up an avenue for the entrance of an infection, which in the end often causes death. Cystitis and pyelonephrosis also often accompany the growth, as well as pyometra and purulent peritonitis.

The diagnosis in all of these cases must be made by a microscopical examination of the tumor, but in case of sarcoma it must be remembered that delay makes the prognosis more serious.

The treatment is by early and radical removal of the growth.

Four cases have been reported—two in children and two in adults—in which permanent recovery has followed removal.

The various methods of operating are similar to those described under the treatment of carcinoma.

Carcinoma of the Vagina.—Primary cancer of the vagina is rarely seen. Hecht (*Inaug. Dis. München*, 1891) found that a little over one per cent of

cases of cancer in women were vaginal. In the majority of these cases the posterior wall is affected first. Ont of eighteen cases cited by Olshausen of Berlin, thirteen involved the posterior wall. The disease usually appears in the form of a fungating mass of tissue, easily breaking down and bleeding. Another form appears as a granular ulcerated area with hard infiltrated margins. In a still rarer form of carcinomatous infiltration the vaginal walls simply become rigid and contracted.

While primary cancer is rare, a secondary involvement from extension to the vaginal vault from a cancerous cervix is quite common—so common, indeed, that it is often necessary to remove a considerable part of the upper vagina with the uterus in hysterectomy for uterine cancer.

Nothing is known as to the cause of this affection. Heredity and trauma during childbirth have not been shown to be active, as in the case of cancer of the cervix. The tendency of the disease located in the upper part of the vagina is to extend over onto the posterior cervical lip, rendering it impossible at times to determine whether the cervix or the vagina was the original starting point. Where there is a large cancerous area at the vault of the vagina with an involvement of the outer surface of the cervix, which is continuous with it, the disease may without hesitation be stated to be vaginal in its origin instead of cervical.

Hemorrhages, vaginal discharge, dull aching pain, and difficulty in defecation and micturition are common symptoms. As the disease extends rapidly into the neighboring lymph channels cachexia becomes more and more marked, until the patient dies of exhaustion.

The treatment is extirpation in all cases in which there is no involvement of the connective tissue laterally. Such an implication must be discovered by estimating the mobility of the diseased area by pressing directly upon it, and by palpating around its margins through the rectum.

There are in general four ways of operating upon a cancerous vagina:

First, a simple excision of the cancerous area through the vaginal outlet.

Second, a circular incision of the vagina below the diseased area, followed by a stripping off of the whole circumference of that portion which is to be extirpated; after this an abdominal incision, freeing the uterus and removing it with the upper part of the vagina.

Third, a transverse incision through the perineum and extending on up through the recto-vaginal septum to the diseased area, which is then removed through the incision.

Fourth, a posterior incision from sacrum to fourchette beside the rectum, splitting the vagina up to the diseased area.

First, if the disease is discovered when it is still quite superficial and limited in its area, it may be extirpated with knife, or scissors and forceps, operating through the vaginal orifice, cutting around it on all sides at a distance of 1·5 or 2 centimeters and loosening it up from its base with the fingers and removing it, and finally bringing the margins of the wound together by catgut sutures.

The second method consists in a circular incision of the vagina well below the disease; afterward it is stripped up to the vault with the fingers and detached on all sides. The abdomen is then opened from above and the uterus and detached portion of the vagina removed. It is especially important here to determine that the vaginal infiltration does not extend into the surrounding tissues; careful examination must also be made by the rectum to discover any infiltration of the broad ligaments; should this be found a radical operation is contra-indicated. The operation may sometimes be concluded after stripping the vagina loose posteriorly and at the sides, and in front as far as the vault, by catching and drawing down the cervix and applying ligatures to the broad ligaments, and removing the uterus, as in vaginal hysterectomy. Sometimes the whole upper third of the vagina may be removed in this way.

The third method, proposed and used by Prof. Olshausen (*Centralbl. f. Gyn.*, 1895, No. 1), consists in the removal of the cancerous vagina through a transverse incision in the perineum, and a separation of rectum and vagina up to Douglas's *cul-de-sac*. If the uterus is to be removed, the peritoneum is opened and the uterus inverted and freed by tying off the broad ligaments from above downward toward the cervix. When this separation is partly effected, the loosened vagina is cut through with scissors and the carcinoma detached, and finally, after releasing the bladder, the cervix uteri is tied off. If the uterus is not to be removed, the separation of vagina and rectum is carried up to the cervix uteri, and the vagina in the neighborhood of the disease is freed on all sides from the subjacent tissue. An incision is then made into the vagina at a suitable point and the diseased portion excised with scissors. In a contracted vagina the last part of the excision is facilitated by splitting its posterior wall from the frenulum up, giving a broad view of the field.

I prefer the fourth plan to this, as less awkward and as enabling me to reach the parts more directly, the extirpation by an incision beside the rectum, adopted in the following case.

The cancerous patch was situated at the vault of the vagina posteriorly, and was 3 by 4 centimeters (1·2 by 1·4 inch) in diameter, and involved as well the outer surface of the cervix. It could not be drawn down, so as to attack it from below, so the patient was placed upon her left side and an incision made from the end of the sacrum, beside the coccyx, and continued in a slightly curved line down beside the rectum and around the right margin of the anus, through the perineum to the fourchette. By carrying the incision deep enough the rectum was exposed and easily drawn toward the left with retractors, in this way exposing the vagina.

The posterior vaginal wall was then split from the fourchette to the cervix and the diseased portion freed at the sides with the fingers and removed. It included the posterior two thirds of the upper portion of the vagina and the posterior lip of the cervix above the vault. I now brought the uterus down in retroposition, and united its posterior surface to the vaginal wall, where it was cut off, filling in the gap left, leaving a shortened but entire vaginal canal. The posterior wound was closed with interrupted sutures. The patient recovered

and the uterus united in its new position, but the disease, which had extended beyond the limits of the field of operation, continued to advance, and she died at her home some months later.

If the uterus is to be removed as well, the peritoneum may be opened at Douglas's *cul-de-sac* and the uterus drawn through the incision and its broad

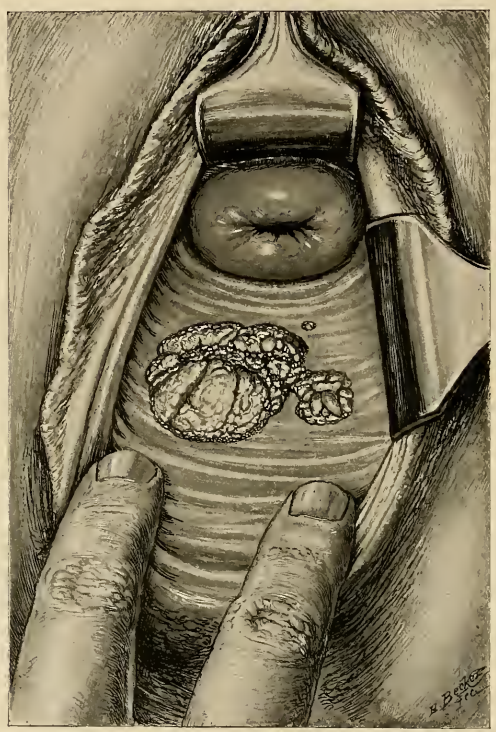


Fig. 174.—A Case of Adeno-carcinoma of the Posterior Vaginal Wall by Implantation from an unsuspected Adeno-carcinoma of the Body of the Uterus.

ligaments tied off; then, using it as a tractor by pulling it well out of the wound, the vagina is made tense and easily outlined while the finger is engaged in freeing it from the tissues at the sides and from the bladder in front. As much of the vagina as is necessary may be removed with the uterus. Care must be taken not to wound the ureters by placing bougies in them before beginning the operation. If the uterus is not to be removed the peritoneum must be pushed up without opening it, and the vagina freed on all sides in the neigh-

borhood of the diseased portion, and then opened and the diseased area excised.

Traumatic Affections.—Traumatic affections are frequently found in the vagina, the result of injuries incurred in labor. They are usually located either in the vault or near the outlet, and involve one or both sides, extending down or up in the axis of the vagina. Any marked narrowing of the vaginal canal due to cicatricial contraction between the vault or the outlet is unusual.

Extensive sloughing in the middle of the vagina may produce a concentric contraction, narrowing the caliber even down to complete closure (atresia vaginæ), and followed by retention of the menses (hematocolpos and hematometra). The cicatricial bands radiating out from the sides of a vesico-vaginal fistula and narrowing the lumen of the vagina serve to illustrate another mode of the production of a vaginal stenosis.

The vaginal cicatrices may be classified under two general heads, corresponding also to the difference in etiology, viz., cicatrices whose direction is in the axis of the vagina, and cicatrices whose direction is transverse to the axis of the vagina.

Cicatrices of the first class in the axis are usually found at either extremity of the canal, and are associated, as stated, with a lacerated cervix or a ruptured outlet.

Cicatrices of the second class crossing the axis are the result of pressure and sloughs during parturition or of syphilitic sores.

At the vaginal outlet the principal scars extend from the posterior median line up the right or left sulcus on one or both sides of the posterior column. The scar tissue at this point must be regarded as a conservative effort of Nature in her endeavor to fill out and draw together the rents produced in childbirth. The symptoms produced by such scars vary from the slightest all the way to a severe neurosis. Rarely a scar is so tender as to require excision. A scar at the vault may be the cause of a lateral displacement of the uterus. Cicatricial contraction of the canal will interfere with all its functions, even rendering the escape of the menses impossible or endangering life in case of pregnancy. Too much stress, however, must not be laid on this last point, as labor has progressed normally in such cases in which the outlook seemed almost hopeless at the start.

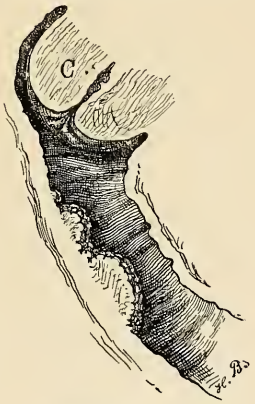


Fig. 175.—Secondary Vaginal Carcinoma.

Sagittal section of the cervix (*C*) and vagina, showing the isolated carcinomatous nodules on the posterior wall. Case same as Fig. 174. J. S., Nov. 14, 1895.

The treatment differs according to the form and extent of the disease. The best method, in general, is a complete excision of the scar extending well into the subjacent tissue, supplying the defect created by sliding over it the sound tissue from above and below.

Small falciform cicatrices at the vault of the vagina on the right or left side may be treated by drawing the cervix in the opposite direction with a tenaculum, making the scar tense, and cutting across it in several places down to its base. This may be done under cocain, and if the cutting is repeated several times, the cervix will finally be freed. If the cervix is torn deeply, as is usually the case, the cervical tear may be repaired and the scar excised at the same time. Care must be taken to avoid the mistake of simply removing that portion of the scar which projects into the vagina. The dissection must be carried well below the vault, removing all of the scar tissue. The chief dangers are of injury to a ureter which has been drawn out of its normal position, and perhaps caught in the scar tissue, and of cutting a uterine artery, which is also brought nearer the vault than normal.

To avoid injuring the ureter, a bougie should be placed in it before beginning any extensive operation at the vault. The ureter can then be readily felt from time to time, and if involved will be easily dissected out and restored to its proper place without injury.

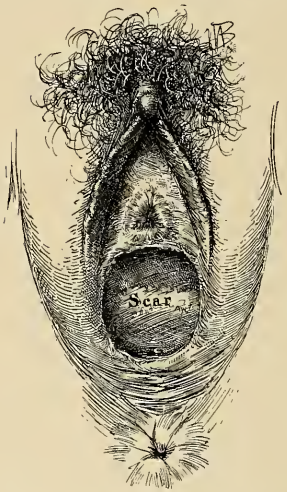


Fig. 176.—Atresia of the Vagina, showing the Scar at the Point at which the Anterior and Posterior Vaginal Walls come together. A. M., Jan. 18, 1896.

The artery will be avoided by a slow, careful dissection, palpating the structures often as it progresses. The wound thus created is closed by interrupted sutures, and a dry dressing applied. Cicatrices in the lower part of the vagina are always removed in the course of the operation for relaxed vaginal outlet.

Atresia of the vagina following labor may involve any portion of the canal. The closure is due to sloughing from pressure during labor, followed by a cicatricial contraction. The area cut off may be from one to several centimeters in diameter. Oftentimes the atresia is incomplete, when a superficial examination would lead the observer to assert that it was complete. One or two minute orifices may be detected in the transverse scar at the bottom of the vaginal *cul-de-sac*, and pressure made above may cause a little dark fluid to exude.

The severest symptoms arise in atresia from the apparent amenorrhea, which might be called an amenorrhea parodoxica, as the menstrual function continues normally, while the secretions accumulate above the stricture. The pain at the menstrual period is often agonizing. With the increasing accumulation the vagina expands, and the cervix and uterus, and sometimes the uterine tubes, dilate, until the pelvis is choked, and a large mass may be felt projecting into the abdomen.

Atresia may arise from extensive ulceration in the vagina, but the one com-

mon cause is the traumatism of a delayed labor in a contracted pelvis. From this cause one of my patients recovered, not only with an atresia, but with a vesico-vaginal fistula, and a recto-vaginal fistula as well.

The diagnosis is made by the history of a severe labor, by the subsequent amenorrhea with severe menstrual colic, and by the impediment to sexual intercourse. An examination reveals the nature of the affection, as the finger enters a short sac, or if the urethra is dilated, as is often the case, the finger may enter the bladder without difficulty, greatly puzzling the physician for a time.

An examination *per rectum* shows the presence of a fluctuating sac above the atresia, and above this, it may be, one or two other sacs, separated by one or two well-defined transverse constrictions.

The treatment is to remove the scar tissue which closes the vagina and establish a permanent free communication between the separated parts of the vagina by a plastic operation; this is completed in three steps: first, opening up the channel and allowing the accumulated fluids to escape; second, removing the scar tissue; third, uniting the sound upper and lower portions of the vagina over the defect.

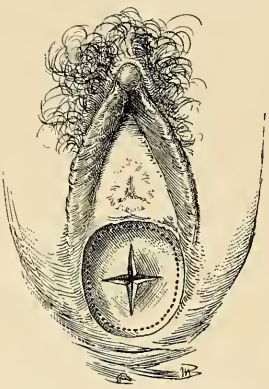


FIG. 177.—OPERATION FOR ATRESIA OF THE VAGINA CAUSED BY AN ADHESION OF THE ANTERIOR AND POSTERIOR WALLS IN THE FORM OF A SEPTUM JUST ABOVE THE HYMEN.

The cruciform incision is made first to permit the thorough washing out of the sac; the dotted line indicates the area excised in restoring the caliber of the vagina.

Before, throughout, and after the operation the most painstaking antiseptic precautions must be taken, as the accumulated fluid is peculiarly liable to undergo rapid decomposition, and the walls of vagina, uterus, and tubes are in a state of extraordinary susceptibility to infective processes. Death from infection has so often followed the simple evacuation of the fluid that many surgeons dread the operation.

I can not illustrate the further steps of the operation better than by describing one of my cases (*Johns Hopk. Hosp. Rep.*, vol. iii, p. 429).

The patient was a negress about twenty-two years old. She had had a still-born child after a prolonged instrumental labor eight years before I saw her, and had suffered ever since the birth. Her periods had always been regular before, but she had never menstruated since, although suffering greatly with the monthly molimina and from backache and pains in the lower abdomen. Six months before I saw her she had been kept in bed eight weeks by an attack of peritonitis.

On making a vaginal examination under a bed cover, the finger entered a large, smooth-walled cavity in which none of the expected landmarks could be recognized. This was found to be the bladder, with the urethra so widely dilated that two fingers could be introduced without pain; the external urethral

orifice hung patulous and everted under the pubic arch. All that was left of the vagina on the vulvar side was a little pit of firm scar tissue 1 centimeter in depth just behind the urethra.

Upon making a bimanual examination a chain of tumors was found filling the pelvis, lying one above another; at first they felt like a group of myomata, but

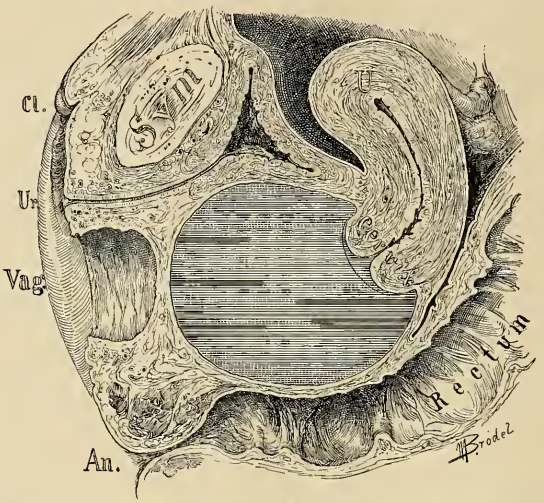


Fig. 178.—Atresia of the Vagina seen in Sagittal Section; the Vagina above the Atresia is distended with the Accumulated Menstrual Fluid. There is no Distention of the Uterus.

a closer examination showed that they fluctuated and formed a continuous cavity, with two shallow sulci between. The obliterated portion of the vagina was 4 centimeters long.

The operation was performed in this way: The left index finger was introduced into the bladder and the thumb into the rectum until they touched the sac of fluid and held the atresic area between their palmar surfaces. Guided by these fingers to avoid injuring the rectum or the bladder, a large trocar was entered in the pit beneath the urethra and pushed up through the obliterated septum until it penetrated the sac. Upon withdrawing the trocar 500 cubic centimeters (about 16 ounces) of tarry blood escaped and the three sacs collapsed. By means of a uterine dilator the trocar puncture track was now enlarged until it reached from one pubic ramus to the other. Abundant room was thus secured to catch the margin of the vagina just above the stricture and dissect it loose on all sides for a distance of a centimeter. This loosened collar was then pulled down over the dilated atresia and attached by a series of interrupted sutures to the margin of the vagina just below it. By this means, by sliding the normal vaginal tissue down over the cicatricial area, the canal was restored without leav-

ing an exposed raw area to undergo subsequent contraction. The caliber of the new vagina was now normal, and a month later, when the patient was discharged, it even appeared normal in length.

If resisting scar tissue is felt after opening up the canal, it must be dissected out. Where the urethra is not dilated, the finger in the rectum alone will serve as a guide for the trocar.

Recto-vaginal Fistula.—Recto-vaginal fistulæ are abnormal channels of communication between the rectum and the vagina, generally situated at one end or the other of the vaginal canal.

The cause of the fistula in the upper vagina is commonly an extension of a cancerous disease from the cervix on to the vagina and through the recto-vaginal septum; in the lower vagina the commonest cause is a failure in the attempt to restore a complete rupture of the recto-vaginal septum. After this operation, if the suturing is imperfect, fecal matter is apt to be forced into the upper part of the wound upon the denuded surfaces, producing suppuration and failure of union, and leaving a fistulous orifice opening either on to the vulva or into the vagina.

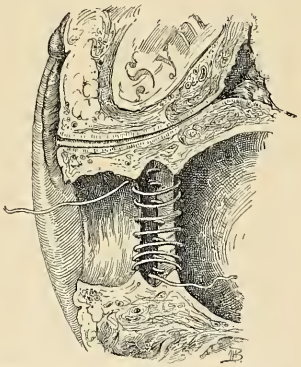


Fig. 179.—Operation for Atresia of the Vagina seen in Sagittal Section, showing the Continuous Suture applied in the Right Half of the Vagina, bringing the Vaginal Mucosa above down to the Vaginal Mucosa below the Atresia, in this way bridging it over with Mucous Membrane.

Other causes, such as syphilis and stricture of the rectum, produce fistula in some cases. I have seen but one case where it was due to labor. I have also seen one case where it followed the excision of hemorrhoids, and another where a necrosis had been produced by the pressure of a badly fitting pessary.

The symptoms arise from the escape of fecal material into the vagina, or, if the orifice is minute, from the escape of gases by this avenue.

The cancerous fistulæ are particularly distressing from the disgusting condition in which the patient is apt to be kept by the constant emission of feces from the vulva.

Fistulæ low down in the vagina are often so small that they are detected with difficulty, and yet the inability to control the gases, which escape audibly, keep the patient in a constant state of nervous apprehension.

The diagnosis is made either by simple inspection, or by passing a probe into any suspicious pits and thus tracing the connection with the bowel, or by introducing the finger into the rectum and palpating its anterior surface from the sphincter up. The rectal end of the fistula is marked by a distinct depression easily felt; this can be pushed forward and the vaginal opening made visible.

A further demonstration may be made by injecting milk into the rectum

and watching for its avenue of escape by the vagina. The patient herself often calls attention to her inability to retain rectal enemata, which escape by the vagina.

The proper treatment of a recto-vaginal fistula depends upon various associated conditions.

FIG. 180.—ATRESIA OF THE VAGINA IN A NEGRESS.

The index finger is introduced through the dilated urethra into the bladder, and with the thumb in the rectum clearly defines the position and thickness of the recto-vesical septum. Only a shallow vaginal pocket is visible between the thumb and the finger.

Fistula from the extension of cervical cancer is not, as a rule, amenable to treatment. The utmost that can be done is to keep the parts as clean as possible by securing a daily free evacuation of the bowel, avoiding the constant leakage, and by the frequent use of vaginal douches.

In event of a slow progressing cancer at the vault, it would be quite right to try to give some relief by making the fistulous opening large enough to establish a free communication with the bowel, and then to denude a circular strip on the vaginal wall below this and to close the vagina with interrupted silkworm-gut sutures (partial colpocleisis).

There are three ways of closing a recto-vaginal fistula by suture:

First, by a funnel-shaped denudation of the edges on the vaginal side followed by suture, after the pattern of the vesico-vaginal fistula operation.

Second, by splitting the perineum and recto-vaginal septum and completely separating the rectal from the vaginal portion of the fistula, followed by a separate suture of the rectum.

Third, by splitting the recto-vaginal septum vertically as far as the fistula, which is then denuded and the recto-vaginal septum closed as in a case of complete tear.

Before operation the intestinal tract must be thoroughly emptied, the parts cleansed, the sphincter ani stretched so as to paralyze it, and a loose iodoform-gauze pack put well up in the rectum to keep its discharges out of the vagina and off from the wound during the suturing.

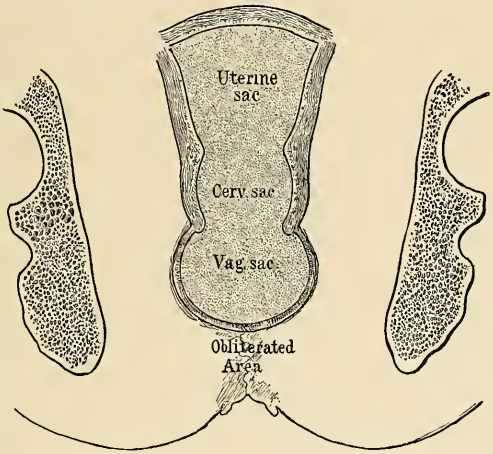


Fig. 181.—Coronal Section of an Old Atresia of the Vagina with Distention of the Vagina, Cervix, and Uterine Cavity with Menstrual Fluid. The Atresia occupies the Lower Third of the Vagina.

In determining what form of operation will be best in a given case, the position of the fistula, the condition of the surrounding parts, and the presence or absence of scar tissue must be considered. Any complication on the rectal side, such as a deep pit or an ulcer or granulation tissue, must also be taken into consideration, as these conditions almost necessarily defeat union.

First. The simplest form of operation, a funnel-shaped denudation and suture, will be selected when the opening lies above the sphincter and levator ani area, and when it is free from bands of scar tissue, and the rectal surface is healthy and does not present a deep pit. After suitable exposure the parts are benumbed with cocain applied for ten minutes. The area to be excised is then outlined with the point of a sharp knife about 1 centimeter away from the edge of the opening on all sides. This is now denuded by catching the edge with forceps or a tenaculum, cutting away strip after strip with a pair of delicate scissors until the whole is bared and bleeding down to the rectal mucosa, which now lies at the bottom of a wide-mouthed funnel opening on the vaginal surface. The wound is now closed by a series of interrupted silkworm-gut sutures,

three to the centimeter, passed in the direction of least resistance, generally from side to side, and tied firmly. Superficial catgut sutures are used between the silkworm gut if the line of approximation is not perfectly accurate. The gauze pack is now taken out of the rectum and the vagina washed out and a piece of iodoform gauze inserted loosely. The after-treatment consists in a restricted

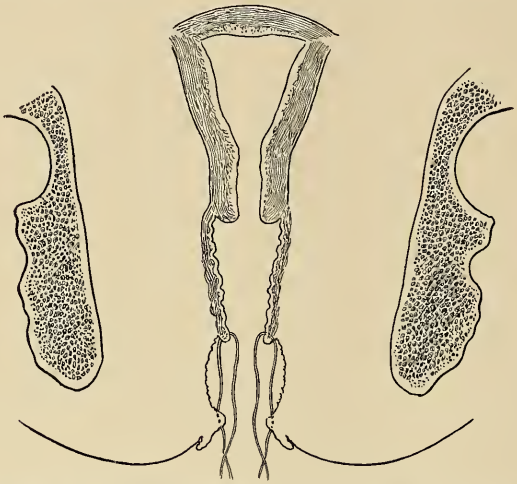


FIG. 182.—OLD ATRESIA OF THE VAGINA OPENED AND EVACUATED; INTERRUPTED SUTURES IN PLACE TO DRAW THE VAGINAL MUCOSA DOWN TO THE MUCOSA AT THE VAGINAL OUTLET, BRIDGING OVER THE DENUDED AREA IN THE CONNECTIVE TISSUE.

diet and regular daily movements of the bowels, preferably secured by medicine taken by the mouth. In eight days the stitches are removed, and the patient may go about.

In one of my cases there was a small opening 3 millimeters in diameter just beyond the internal sphincters, and the surrounding tissue was soft and natural and free from scars. I applied cocain, and denuded and closed it on the vaginal surface, as described, and allowed the patient to rise at once from the table and go home to continue her usual occupations without interruption. In eight days she returned, and I removed the silk sutures and found that perfect union had taken place. Such treatment as this will only succeed in the most favorable cases, and ought rarely to be tried. The proper after-treatment of a simple fistula is to keep the patient quiet in bed for a week.

Second. When the fistula is up above the sphincter area and is surrounded by scar tissue, the best plan is to dissect the rectum free from the vagina, either by splitting the perineum from side to side and working up to the fistula between rectum and vagina, or by raising a flap of vaginal tissue below the opening and dissecting it up to the fistula, which is then freed from its vag-

inal attachments on all sides. Interrupted sutures are now passed through the muscular coats of the denuded bowel, avoiding the mucosa and closing the rectal opening. They are left long and brought out through the fistulous vaginal opening, which need not be closed. The incision in the recto-vaginal septum, through which the separation was made and the sutures passed, is finally closed, and a dry dressing placed in the vagina.

The success of this procedure depends upon the invariable soft, yielding condition of the bowel, which is well adapted for plastic union when detached from the rigid cicatricial vaginal tissue, which prevents the sides of the wound from coming together without undue traction.

I succeeded in one case (K. S., No. 2916, Sept. 5, 1894) in doing this where the rectal fistula was 2 centimeters long at the top of an obliterated upper vagina, with a vesico-vaginal fistula directly opposite. There was a large amount of scar tissue on all sides, rendering union by suture after denudation a hopeless undertaking. I therefore made a transverse perineal incision 4 centimeters long and dissected between the vagina and rectum up to the fistula, which was then split, making two fistulous orifices out of one, the posterior opening leading into the rectum and the anterior into the vagina. The rectal opening was then closed separately by interrupted fine silk sutures brought out through the vaginal opening. The perineal wound was closed, and the result was immediate union throughout.

Third. When the fistula is low down, close to the vaginal outlet in the sphincter area, the better plan is to cut entirely through the septum, reproducing the complete rupture, and then to denude the margins of the fistula and for some distance above it, and close the whole as in a case of complete tear. This is better than an attempt to effect closure by a denudation on the vaginal side alone, for three reasons: In the first place, the position of the opening on the rectal side is unfavorably situated, as in any bowel movement unusual pressure is brought to bear on the anterior wall of the rectum at this point by the fecal masses, and is so great that some particles of fecal matter are inevitably forced into the wound, preventing union. In the second place, there is always a pit on the rectal side in these sphincter fistulæ which catches fecal matter. In the third place, the bridge of tissue below the fistula which the operator endeavors to save by simple denudation and approximation is often insignificant; this is especially apparent after it has been cut through.

I would repeat the caution not to forget to carry the denudation on the vaginal surface well above the fistula. The further denudation and suture must be made as fully described in the treatment of complete rupture of the recto-vaginal septum in Chapter X.

CHAPTER XII.

AFFECTIONS OF THE URETHRA AND BLADDER.

1. Brief historical sketch. Celsus: calculus. Fatio: vesico-vaginal fistula. Simon: dilatation of the urethra. Grünfeld: introduction of light into bladder. Rutenberg's air-pumping speculum. Nitze's cystoscope for examining the male bladder modified for the female. Pawlik's method of catheterizing the ureter free-handed. Sänger: palpation of the ureters. Kelly: examination under atmospheric distention induced by posture. Bibliography.
2. Topography of the bladder in women. Natural landmarks within the bladder. The relations of the bladder to surrounding structures. Artificial division into hemispheres and quadrants.
3. Examination of the urethra and bladder: Urinalysis and examination of discharges; percussion; palpation; inspection without instruments; urethroscopy; cystoscopy: Its fundamental principles; instruments used—the light, the reflector, vesical specula with obturators, dilator, evacuator, ureteral searcher. The cystoscopic examination: asepsis; preparation of patient; anesthesia; postures, dorsal and knee-breast; calibrating and dilating the urethral orifice; the lubricant; introducing the speculum; inspection.
4. Diseases of the urethra. 1. Malformations: hypospadias; epispadias; atresia of the urethra; totally deficient urethra. 2. Displacements: prolapse of the mucosa. 3. Dilatation. 4. Stricture. 5. Ischuria. 6. Fistula. 7. Foreign bodies. 8. Urethritis: acute; chronic: (1) diffuse chronic urethritis; (2) circumscribed chronic urethritis. 9. Suburethral abscess. 10. New growths: caruncle; fibroma; cancer; sarcoma.
5. Diseases of the bladder. 1. Introductory. 2. Diagnosis: by history and symptoms; by urinalysis; by palpation; by inspection under illumination. 3. Methods of treatment in general. 4. Classification of diseases: Congenital defects: (1) double bladder; (2) loculate bladder; (3) exstrophy. Displacements: (1) lateral; (2) upward; (3) downward; (4) eversion. Foreign bodies in the bladder: (1) calculi, pessaries, catheters, etc.; (2) removal—through urethra; through vaginal incision; through suprapubic incision. Vesical fistulæ: (1) historical sketch: Luiz de Mercado, Felix Plater, Hendrick Roonhuyzen, J. Fatio, A. J. Jobert, G. Simon, J. Marion Sims, T. A. Emmet, Nathan Bozeman, A. Martin, L. von Dittel, A. Mackenrodt, W. A. Freund, E. C. Dudley, H. A. Kelly; (2) causes; (3) symptoms; (4) diagnosis. 5. Treatment, (*a*) general, (*b*) of fistula of large size: A. Martin—closure by turning up vaginal flaps to form the new base of the bladder; F. Trendelenberg—closure by transplanting a flap from the posterior vaginal wall; E. C. Dudley—closure by suturing the denuded vesical mucosa to its anterior margin; A. Mackenrodt—closure by detaching the bladder from the vagina and suturing it independently; H. A. Kelly—closure by detaching the bladder posteriorly and suturing it to the denuded vaginal wall anteriorly; W. A. Freund—closure by suturing the body of the uterus into the defect. Of vesico-utero-vaginal fistula: H. C. Coe, Otto v. Herff, H. A. Kelly, F. Trendelenberg. Of vesico-uterine fistula: F. H. Champneys, H. A. Kelly. Of other vesical fistulæ: G. C. Blackman. Hemorrhoids. Hyperemia. Cystitis: (1) bacteriology; (2) acute; (3) chronic; (4) treatment of chronic cystitis—medication, irrigation or instillation, direct topical treatment, surgical treatment; (5) tubercular cystitis; (6) exfoliative cystitis.
6. Tumors of the bladder: 1. Classification. 2. Benign tumors: papilloma; fibroma; adenoma; myoma; cystic follicles; dermoid cysts. 3. Malignant tumors: epithelioma; myxoma; sarcoma. 4. Clinical history of vesical tumors. 5. Diagnosis. 6. Operative treatment: by a dilated urethra; by vaginal incision; by suprapubic incision; by symphyseotomy; cystectomy; K. Pawlik's case.

Previous to the latter half of the century just closing but little was known about diseases of the urinary apparatus in women.

And while the relatively more urgent and dangerous diseases of the male organs had exacted the closest attention, the modesty of women, as well as the inaccessible nature of the affections, all conspired to hinder an earlier scientific investigation of the female organs.

The shortness of the female urethra was known and special suitable metal catheters devised and used before the Christian era, and Celsus in the first half of the first century carefully describes an operation for stone in the bladder in women—cutting for the stone from the outside through the vestibule into the neck of the bladder, cautioning the operator to insert the finger, as a control, into the vagina in a married woman, but into the rectum in a virgin. Calculus in the female therefore attracted attention at an early date, on account of the surprising observation that enormous stones could safely pass through the short and more easily relaxed female urethra (*quæ et brevior quam in maribus et laxior est.*—Celsus).

Johannes Fatio, of Basel, late in the seventeenth century recognized, treated, and cured cases of vesico-vaginal fistula by denuding the margins with scissors and drawing the edges together with a sharpened quill wrapped with thread.

A new interest was aroused in diseases of the bladder by the labors of G. Simon, of Rostock, who carefully determined the extreme degree of safe dilatability of the urethra for digital palpation of the bladder, using a series of conical dilating specula with obturators, with diameters increasing up to 20 millimeters.

Simon was also able in some cases to feel a ureteral orifice, and, under the guidance of touch, to slip in a ureteral catheter; he did this seventeen times in eleven cases, but never made any practical use of it. Indifferent as was Simon's success, this was the starting point of all recent important work in connection with the diagnosis of affections of the female urinary organs.

Josef Grünfeld, of Vienna, in 1874, filled the bladder with water and then examined it through a short, straight speculum, with a piece of glass set obliquely in its tube, so as to prevent the escape of the fluid and at the same time to permit the direct passage of light without reflection.

Rutenberg devised a speculum, about 20 millimeters in diameter, with a glass partition and a tube attached for injecting air into the bladder, while a mirror placed inside the bladder reflected various parts of its walls. It was necessary to anesthetize the patient to relieve the pain produced by this examination, and Rutenberg never succeeded in finding the ureteral orifices.

Max Nitze, of Dresden, with real genius, constructed a cystoscopic apparatus for the male bladder, consisting of a long tubelike catheter with a short beak carrying a small electric lamp at the tip and a prism at the eye through which the light, reflected from the walls of the bladder distended with water, is directed into the tube, which further contains a telescopic arrangement of lenses so as to give a wide field of vision to the observer at the outer end. A larger, shorter and straighter tube has been made after the same plan for use in women.

Through this elaborate and delicate but most useful instrument Nitze and his followers, who are now to be found among the genito-urinary specialists in all the larger cities, are able not only to examine the bladder but also the ureteral orifices, and even to catheterize the ureters with a flexible catheter, introduced in a small tube beside the speculum. Nitze himself is also able even to operate successfully upon small tumors within the bladder.

K. Pawlik, of Prague, made one of the most important additions to this

subject when he improved Simon's ureteral catheter for women, and demonstrated the feasibility of introducing it free-hand into the ureter through the urethra and bladder. This is done by retracting the posterior vaginal wall while the bladder is moderately distended with water (150 to 200 cubic centimeters), when the two "ureteral" folds come into view on the anterior vaginal wall, sweeping backward from the neck of the bladder toward the cervix and marking the site of the ureters just above them. These folds determine the direction of the tip of the catheter in the bladder as it is made to glide along its base while seeking the ureteral orifices. The finger at once recognizes the fact that the catheter has become engaged in the ureter by its assuming a certain fixed direction.

M. Sänger, of Leipzig, added another fact of the highest importance when he pointed out the ease with which the lower ends of the normal ureters could be felt through the vaginal walls, and the increased distinctness of enlarged diseased ureters.

My own method was first published in the *Johns Hopkins Hospital Bulletin* for November, 1893, and in a longer and more fully illustrated article in the *American Journal of Obstetrics* for January, 1894. Its essential features are:

1. An atmospheric dilatation of the bladder induced by posture.

2. The introduction of a simple straight speculum as a rule of small size and without fenestra.

3. The examination of the mucous surface of the bladder and urethra by means of a reflected light or an electric headlight.

I have further demonstrated the ease with which flexible catheters can be introduced into the ureters in this position, and by their use I have been able to reach the pelvis of the kidney, and to diagnose accurately such renal diseases as hydronephrosis, pyelitis, calculus, etc.

The whole field of investigation of bladder, ureteral, and renal affections is in this way thrown open to easy investigation.

Since the publication of my method K. Pawlik has described a modification of it consisting in a dilatation of the urethra under anesthesia sufficient to admit a large open speculum, the atmospheric distention of the bladder, and its examination by means of a little electric light introduced into the bladder through the speculum (*Central. f. Gyn.*, May 5, 1894).

But few treatises devoted to urinary diseases in women have as yet appeared. Scanzoni's, in 1854, was the first. A. J. C. Skene's book on *Diseases of the Bladder and Urethra in Women* was published in New York in 1882; F. Winckel's elaborate and valuable contribution appeared in Billroth and Luecke's *Handbuch*, Stuttgart, second edition, 1886; H. A. Kelly's *Diseases of the Female Bladder and Urethra, Twentieth Century Practice*, William Wood & Co., was issued in January, 1895; and finally we have *Die Krankheiten der weiblichen Blase*, by H. Fritsch in Veit's *Handbuch der Gynäkologie*, 1897.

TOPOGRAPHY OF THE BLADDER.

The fact that we are now in possession of a simple means of observing all sorts of bladder affections characterized by changes of form or color, bringing under observation and within the reach of local treatment even minute lesions, emphasizes the need for other and more accurate ways of describing the location, form, and extent of such diseases in their relationship to the bladder wall, as well as of registering such changes as may be found from examination to examination. It is also important, if we would convey any accurate impression of our observations to others, to use a more precise phraseology than such vague generic anatomical terms as "vertex" and "base," and to substitute in their place an accurate schema of the interior of the bladder with suitable divisions and subdivisions.

I will therefore consider the topography of the bladder from three standpoints, each of which will be useful to the specialist in describing what he sees through the speculum:

1. The natural landmarks within the bladder.
2. The relations of the bladder to surrounding structures.
3. An artificial division into hemispheres and quadrants.

1. **The Natural Landmarks in the Bladder Itself.**—The internal orifice of the urethra, which begins as a narrow margin to shut in over the end of the speculum, and continues to increase in breadth as the speculum is slowly withdrawn from the bladder, forms one of the most important points of departure in the description of lesions which may extend from the bladder into the urethra, or vice versa, or in the location of lesions limited to the area adjacent to the urethra; we have in this way a periurethral area circumscribed by a circle of say about 4 centimeters in diameter around the internal urethral orifice.

"Opposite the urethral orifice" is also sometimes a convenient expression to designate the location of an affection involving the small area of the posterior vesical wall, the part first seen on withdrawing the obturator.

The ureteral orifices are the most important of all the natural landmarks in the bladder, and any account of a lesion in their immediate neighborhood is readily described as located either between them (interureteric) or posterior, anterior, or lateral, to one or the other.

In the knee-breast posture the ends of the ureters often stand out prominently, forming a truncate cone from 5 to 8 millimeters in diameter at the base, and from 3 to 4 millimeters high, with the orifices at the top or a little to the anterior inner side; I have named this eminence the mons ureteris; it is a valuable landmark in accurately locating minuter lesions directly about the orifices.

I have given the name "ureteral folds" to marked rounded elevations in the vesical mucosa, about 2 centimeters ($\frac{3}{4}$ inch) long, sometimes seen in the knee-breast position, stretching from each ureteral orifice backward and outward toward the pelvic walls. These folds manifestly correspond to the terminal

portions of the ureters which pass through the bladder wall. When the rest of the bladder expands with air the resistance of the firmer tissue of the ureters causes the elevation.

The vesical triangle, or trigonum, with its three apices at the ureters and the internal urethral orifice, defines an area about 2½ centimeters (1 inch) wide at the base and 2 centimeters (¾ inch) long on the sides, easily distinguished by its deeper injection from the rest of the bladder mucosa. This is one of the most important landmarks, and as an area it is peculiarly susceptible to certain affections rarely found elsewhere.

The interureteric ligament, connecting the ureteral orifices, is sometimes seen as a distinct fold elevated above the the level of the bladder behind it; it is usually marked as a line separating the deeper injection of the trigonum from the paler mucosa of the posterior part of the bladder.

A shallow depression 2 or 3 centimeters (about 1 inch) broad is sometimes seen posterior to the interureteric line, and is formed by the bladder ballooning out in the direction of the vagina, while the less yielding trigonum resists the expansion.

Important points of reference also are those relating to the fixed and the movable portions of the bladder. As the bladder is emptied, the upper, more movable portion, covered with peritoneum, settles down into the lower and relatively more fixed portion, which lies in close relation to the vagina, until it comes to lie within it as one saucer rests in another. During respiration the free upper half may often be seen moving on the lower half, as if hinged, and the line of demarcation between them may be distinctly made out. This difference between mobility and relative immobility seems to determine to some extent the localization of the inflammatory affections.

At the edges where the two saucers meet, three folds are formed which can be most easily seen by examining a patient in the dorsal position, even without any, or with but little, elevation of the pelvis. I call these folds the plicæ vesicales right, left, and posterior. The posterior fold stretches from side to side in front of the uterus; it is gently convex forward, and ends in front of each broad ligament, where each lateral fold begins, and extends horizontally around toward the urethra. These folds represent the physiological hinges on which the bladder moves in expanding and collapsing. I have called the apices where the posterior fold meets the lateral folds in front of the broad ligaments the right and the left vesical cornua.

2. **Relations of the Bladder to Surrounding Structures.**—To the specialist a familiarity with the exact relationships existing between the hips and bladder and its enveloping structures is of the highest importance, on account of the liability of the bladder to be affected by or to participate in the diseases of these structures.

The upper half of the bladder is covered with peritoneum, and may be called the subperitoneal area. This does not include an area above the urethral orifice, in relation to the space of Retzius and the symphysis pubis—the symphyseal area.

The trigonum and a broad strip of tissue extending back from it lies in close relation to the anterior vaginal wall—the vaginal area of the bladder. Just above this vaginal area is a narrow strip in close relation to the anterior portion of the supravaginal cervix uteri, as far up as the internal os, the uterine area. Laterally the two broad ligaments lie in contact with the right and left cornua.

3. **Artificial Division of the Bladder into Hemispheres and Quadrants.**—When the bladder is distended with air it forms a hollow sphere, flattened antero-posteriorly, and the observer, looking through the speculum, simply peeps through a hole in its wall, and by turning the speculum brings all parts, even those nearest the speculum, into view.

From the observer's standpoint it is easy to consider the bladder simply as a mathematical figure, a sphere divided into hemispheres. For example, the sagittal plane of the body which divides the pelvis into right and left halves, also cuts the bladder into right and left hemispheres by an imaginary line easily and accurately followed by simply elevating and depressing the handle of the speculum.

A point opposite the end of the speculum in the fully distended bladder, in the knee-breast position, in the center of the posterior hemisphere, may be taken as a posterior pole, corresponding to the internal urethral orifice, the anterior pole.

The position of the posterior pole determined in this way is not always in the same horizontal meridian, even in the same patient at different examinations; it is, however, always in the same vertical plane, and near enough the same horizontal position for practical purposes, so that, after assuming a certain point, as the posterior pole, and describing any lesions near by in relation to it, the same point is easily located at a later date for further comparison.

With a fixed posterior and an anterior pole, we may then consider the bladder as further divided by a horizontal plane passing through these poles. The sagittal and the horizontal planes, intersecting at the poles, further subdivide the bladder into quadrants.

Lesions at and around the posterior central point we may speak of as polar and circumpolar; lesions above or below the horizontal plane and to the right of the sagittal plane are described as located in the right upper or lower quadrants, and on the left side as in the left upper or lower quadrants.

By using this simple but purely artificial scheme an irregular patch of disease can be accurately mapped out on a diagram, and any alterations in its form easily noted from time to time.

The chief use of this system of division is to locate lesions in the posterior part of the bladder, where there are no natural landmarks which are readily available.

EXAMINATION OF THE URETHRA AND BLADDER.

There are, in general, four ways of making a physical examination of affections of the urethra and bladder, namely, by

1. Urinalysis.
2. Percussion.
3. Palpation.
4. Inspection, urethroscopy, cystoscopy.

1. **Urinalysis.**—The fullest physical, chemical, microscopic, and bacteriologic examination of the urine should be made in every case where any morbid changes are found.

The color, odor, and specific gravity must be noted, together with the degree of the alkalinity or of the acidity, and the presence of albumin, sugar, pus, blood, mucus, or fragments of stone; minute stones may be seen under a weak lens and tested micro-chemically; the microscope may reveal pus corpuscles and blood, even in minute quantities, as well as casts and various crystalline substances. Bacteria must be noted and identified as far as possible by the various staining and culture methods. Bits of tissue and epithelial cells may also be discovered. The bacteriologic examination of an uncontaminated specimen of urine will sometimes reveal at once the true cause of disease, such, for example, as the tubercle bacillus, gonococcus, or colon bacillus.

As a rule, in inflammatory diseases of the urethra, by stroking it from above downward on its vaginal surface, sufficient secretion may be brought to the meatus for a cover-slip examination. After exposing the inner surface of the bladder to view in the manner to be described, secretions clinging to the bladder wall, or issuing out of a sinus, or from a ureteral orifice may be taken up on a platinum loop for further examination.

2. **Percussion** is of use in outlining a bladder full of urine or containing air. If percussion over the lower part of the abdomen above the symphysis yields everywhere a tympanitic note, it is certain that the bladder can not be more than moderately distended with urine. When there is a decided fluctuating swelling just above the symphysis, and extending even as high as the umbilicus, a flat percussion note all over the enlargement, with a corona of resonance above and at the sides and a broad dull base below, almost surely indicates an overdistended bladder.

After examining the bladder under atmospheric distention, upon withdrawing the speculum, the overlying abdominal wall yields a high-pitched, tympanitic note on percussion until the air is discharged.

3. **Palpation.**—Valuable information can often be gained in urethral and vesical diseases by the sense of touch alone. Changes noted in this way relate to sensitiveness and to variations in form or consistency. The urethra is palpated indirectly through the anterior vaginal wall by rolling the index finger over it from side to side, pressing upward, and using the under and the posterior surfaces of the symphysis pubis as a point of counter-pressure. An inflamed

urethra feels tense and swollen and elicits a cry of pain; a suburethral abscess feels like an elastic round lump projecting into the vagina; a cancerous urethra is hard and fixed like a rigid cord, and often nodular.

The external urethral orifice is best felt with the index finger pressing up onto the symphysis just over the vaginal outlet. An inflamed orifice or a sensitive caruncle makes pressure intolerable; a cancerous orifice is hard and ragged. If the urethra is excessively dilated, as from coitus in atresia of the vagina, the finger may go into the bladder so easily as to produce the impression that it has entered a capacious vagina.

By palpating the empty bladder bimanually between two fingers in the vagina and a hand pressing down over the symphysis, the fingers can be brought close together, with only the abdominal wall, vagina, and upper and lower walls of the bladder intervening; by carrying the fingers back in the direction of the cervix, the posterior part of the bladder, where it is reflected on itself, is often distinctly felt as it slips from under the touch. In cystitis pain is felt on making this pressure; in advanced tubercular cystitis the thickening in the bladder walls is easily appreciated. In one of my tubercular cases the bladder was felt firmly contracted down behind the symphysis, and big and hard like a hen's egg.

A stone or a foreign body may be caught between the fingers and outlined, and a diagnosis made in this way.

A still better way to palpate the bladder bimanually is by putting the patient in the knee-chest position and letting air into the vagina, when the fingers of both hands can be brought close together and the whole organ felt with wonderful distinctness. The time has forever gone by for dilating the urethra to admit the index finger for the purpose of palpating the inner surface of the bladder. No useful information can be gained by this crude procedure which can not be better secured, and without pain and risk of incontinence, by the simple method of inspection

4. **Inspection.**—In almost all affections of the urethra and bladder direct inspection yields the most positive results in the diagnosis of disease. An inspection without the use of any instrument may afford much valuable information. Almost all the affections of the urethral orifice may be diagnosed by an inspection, in which nothing more is done than to separate the labia minora wide enough to expose it. By placing a finger close to each side of the urethra and drawing its lips apart, the lower end of the canal is exposed to view, including the orifices of Skene's ducts posteriorly and just within them. By retracting the vaginal outlet, the vaginal surface of the urethra and of the floor of the bladder are seen, and a tumor of the urethra projecting into the vagina, or a displacement of the bladder, or a vesico-vaginal fistula may be diagnosed. Such marked displacements as a cystocele or a prolapse of the vagina and bladder are best observed when the patient stands erect.

When the abdomen is opened the peritoneal surface of the bladder is exposed to view, and anything affecting it, such as adhesions, or tumors pressing on it, or a hypertrophy, are easily seen.

Urethroscopy.—When a urethral or a vesical disease is far enough advanced to call for an investigation, there will almost always be found morbid changes distinct enough to be recognized by a cystoscopic or a urethroscopic examination.

The urethra is examined by introducing into the bladder a speculum 8 or 10 millimeters in diameter and withdrawing it gradually, all the while studying the urethral mucosa as each successive part of the canal passes over the end of the speculum from above downward. At first the end of the speculum coming out of the bladder just clears the rim of the internal urethral orifice, then on continuing the withdrawal the rim approaches the center, forms the central figure, and then disappears from view as the lower walls successively come to occupy the field.

The endoscopic picture resembles a flat funnel, and, as suggested by Grünfeld, is so named; the portion in the middle where the urethral walls meet is called the central figure, and the portion of the urethra exposed to view between the central figure and the rim of the speculum is the funnel wall.

The central figure forms a large free opening only at the internal urethral orifice, where, surrounded by a narrow margin of mucosa, it is at first almost as large as the speculum; it decreases in size as the speculum is withdrawn, until the walls approach on all sides and form a small quadrilateral or oval figure, finally closing altogether; lower down in the urethra the central figure forms a transverse line, which finally assumes a vertical direction at the external urethral orifice.

The funnel walls are made up of numerous folds which radiate out from the central figure to the margin of the speculum. From eight to twelve of these may be seen at once. The posterior fold in the upper part of the urethra is the largest and is a continuation of a triangular elevation on the trigonum in the bladder, named by J. C. L. Barkow colliculus cervicalis. Numerous delicate vessels are plainly visible on the urethral walls, one or two on each fold, running longitudinally with it.

In the lower part of the urethra, near the external orifice, the longitudinal folds are crossed by a transverse fold, which subdivides the urethral mucosa into a kind of lattice work with shallow pits between.

The orifices of the urethral glands, Morgagni's crypts and Littré's acinous glands, appear as fine points, often in groups disposed longitudinally, or as larger yellowish spots; they can be better seen by changing the position of the speculum so as to displace the central figure and bring one side of the urethral wall flat against its end.

Cystoscopy.—The fundamental principles of a cystoscopic examination are:

1. The introduction of a simple cylindrical speculum into the bladder.
2. The atmospheric distention of the bladder induced solely by posture.
3. The illumination and inspection of the vesical mucosa, either by means of a direct light, such as a little electric lamp attached to the forehead or the mouth of the speculum, or by means of a strong light reflected by a head mirror.

The view of the bladder obtained in this way is a direct one; and the open

speculum allows the operator to touch any part of the bladder with a sound, and to introduce various instruments with ease.

The Instruments Used.—The necessary instruments are the following: A strong light, a head mirror, vesical specula with obturators, a urethral calibrator and dilator, an evacuator for removing urine, long mouth-toothed forceps, and a ureteral searcher.

In case of emergency the instruments absolutely necessary for an examination are but few and simple. The light is always easily obtained, and every physician owns a throat mirror. An evacuator can be made by attaching a piece of rubber tubing to the end of a syringe; and the dilator, forceps, and searcher can be dispensed with, so that the vesical speculum is really the only novel indispensable instrument, and even that could be extemporized from a piece of tin or a bit of cardboard.

The Light.—The best illuminant is the strong white electric light. I commonly use a sixteen-candle-power droplight set in a socket on a short wooden handle, with a simple oval tin reflector, evenly coated with white enamel paint on the inside, covering half of it; the current is conveyed from the wall by cords, and the connection with the wall is made by means of a movable socket; it is ready for use at any moment, and can be carried from room to room.

When there is no electric light available, I take with me a small storage battery weighing ten pounds and measuring 10 by $6\frac{1}{2}$ by $4\frac{1}{2}$ inches, which runs a six-volt four-candle-power mignon lamp for fifteen hours. The little light is attached to the head band and inclosed in a short metal cylinder with a reflector behind it. A tube carrying a convex lens fits over the cylinder, covering in the light, and moves on a ratchet, affording an adjustment which concentrates the illumination on a small circle at the desired point. If a direct electric current is available, the battery can be recharged without sending it away, by connecting it with the wires from the street, with a current adapter interposed.

Strong daylight or sunlight gives a good illumination, and although at times invaluable, it is uncertain, and awkward to direct to all parts of the bladder, necessitating moving the patient about instead of the mirror.

A short candle may be used, but its light is too feeble for a minute examination. Lamps and gas burners are the most unsatisfactory light, because they can not be held close enough to the patient, and they give out enough heat to make the examiner uncomfortable.

The head mirror is a simple concave reflector with about 30 centimeters (12 inches) focal length. The large circle of light which is thrown by this mirror around the orifice of the speculum is a necessity, for, if the circle were a small one, the slightest movement of the head would darken the field in the bladder, while the larger circle allows considerable latitude of movement.

I like the mirror attached to a flexible steel band crossing the top of the head better than the elastic bands encircling it; the steel band is more quickly put on and removed without disarranging the hair. A steel segmented band covers and protects the mirror when out of use, and is the safest and most convenient device for transportation.

The Vesical Specula.—The specula are simple cylinders 8 centimeters ($3\frac{1}{6}$ inches) long, and equal in diameter throughout; they are preferably made of German silver and nickel plated. There is a funnel-shaped expansion at the outer end of the speculum 15 millimeters long, inclined at an angle of sixty degrees to the cylinder. The handle, 8 centimeters (3 inches) long and 12 millimeters broad and 5 millimeters thick, is attached to the funnel and is large enough to afford a convenient grasp which does not tire the hand during a prolonged examination.

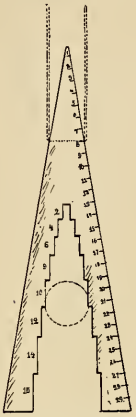


Fig. 183.—Graduated Instrument for measuring Calibers and Diameters of Specula

The caliber is measured by inserting the end into the speculum as far as it will go and reading off the size on the scale. The diameter is measured by dropping the speculum into the graduated opening and reading off the size. By deducting the caliber from the diameter the thickness of the wall is measured.

The vesical end of the speculum must be rounded in toward its lumen, and under no circumstances must a ragged or a knife edge be left to cut the mucosa.

Specula are made in various numbers ranging from 5 to 20, each number representing the diameter of the cylinder in millimeters—5, 6, 7, etc., up to 20; the specialist will also find it convenient to have on hand the following half sizes: $6\frac{1}{2}$, $7\frac{1}{2}$, $8\frac{1}{2}$, $9\frac{1}{2}$, $10\frac{1}{2}$, $11\frac{1}{2}$. The sizes below No. 12 are used for examination, and those above to secure a wide lumen in operations upon the bladder.

Each instrument has its obturator, only used for the purpose of rounding out the end of the speculum during introduction; the obturator consists of a conical end piece connected by a slender shank to a stout handle which fits into the funnel of the speculum.

The shank of the obturator is made stout enough not to bend in withdrawal, and the handle is large, so as to give a good hold for the thumb and index finger.

To facilitate the introduction of the cystoscope there must be no shoulder to injure the urethra between the end of the speculum and its obturator.

The dilator is a conical instrument 7 centimeters (3 inches) long, with a blunt point 3 millimeters in diameter; it is 16 millimeters in diameter at its base. It is graduated from point to base in millimeter diameters from 4 to 16 millimeters. A handle attached to the base is large enough to afford a convenient hold for three fingers, and a flange at the base keeps it from slipping all the way into the urethra.

I have devised the one simple conical dilator representing an infinite series on its sides, to take the place of the interrupted series of the Hegar dilators commonly used, as I have found by careful investigation that the external orifice is the only part of the urethra which needs stretching to admit the specula commonly used. The rest of the urethral canal is so elastic that it yields at once to the obturator and opens up to the full size of the speculum without previous dilatation and without injury.

The evacuator is used to empty the bladder of the residual urine

which the patient often can not expel, and which can not be removed by a catheter, amounting to 4 to 10 cubic centimeters. It must also be used from time to time to remove the urine accumulating during a prolonged examination. The evacuator is a small hollow, perforated metal ball, connected by fine rubber tubing, about 35 centimeters (14 inches) long, with a rubber exhausting bulb. The rubber tube is cut about 5 centimeters (2 inches) from the ball, and a piece of glass tubing inserted which serves both as a telltale to show when the urine is flowing in the tube, as well as to give rigidity to the tube when it is picked up for introduction into the bladder.

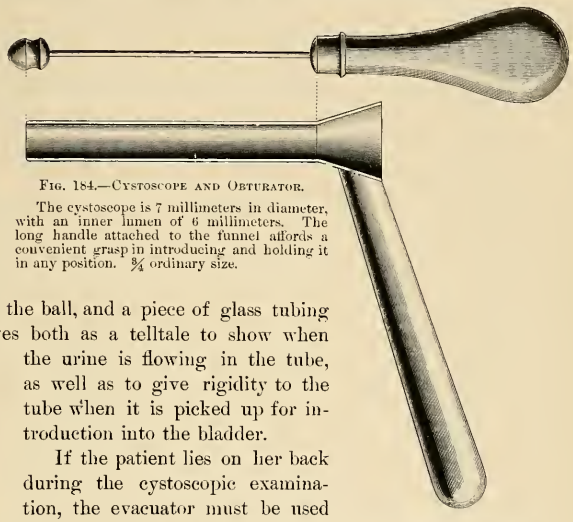


Fig. 184.—Cystoscope and Obturator.

The cystoscope is 7 millimeters in diameter, with an inner lumen of 6 millimeters. The long handle attached to the funnel affords a convenient grasp in introducing and holding it in any position. ¾ ordinary size.

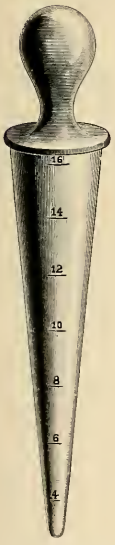


Fig. 185.—Urethral Calibrator and Dilator.

The numbers indicate the diameters in millimeters.

If the patient lies on her back during the cystoscopic examination, the evacuator must be used much oftener, as a small quantity of urine easily obscures the field of view in this posture. In the knee-breast position, on the other hand, a little clear urine in a pool in the inverted vault of the bladder in no way interferes with a thorough inspection of all parts.

The evacuator is used in the following manner: The assistant, grasping the rubber bulb, pushes its base in with his thumb and forces out all the air; while the examiner, holding the other end, drops the little perforated ball through the speculum into the pool of urine, when the assistant removes his thumb, and the bulb slowly expands, sucking up the urine. The evacuation will be more rapid if the suction bulb is held well below the level of the bladder. If there is only a little urine to be taken up, it will escape faster by withdrawing the ball a little occasionally so as to suck up some air with the urine.

Dr. G. E. Shoemaker, of Philadelphia, has devised a simple evacuator consisting in a little tube with perforations and slightly bent at both ends, and connected with an exhaust bottle emptied by a syringe (see *Annals of Surgery*, November,

1895). Dr. W. L. Burrage, of Boston, has also made an attachment for the cystoscope to effect the same end.

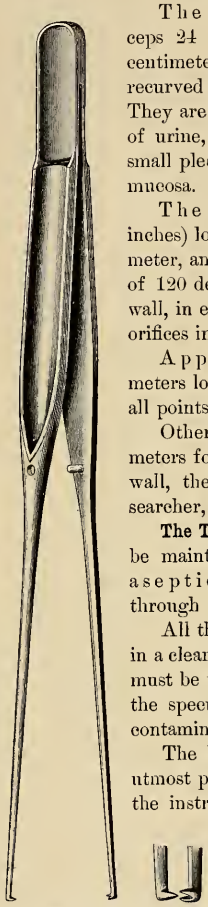


Fig. 186.—Delicate Mouse-toothed Forceps for conveying Pledgets of Cotton into the Bladder.

The teeth should be more recurved.

The long mouse-toothed forceps are a light forceps 24 centimeters (9 inches) long, with long slender arms 10·5 centimeters (about 4 inches) long, and at the ends delicate slightly recurved mouse teeth. The handles are fenestrated for lightness. They are useful in cleansing the lumen of the speculum of drops of urine, or in taking up a little urine out of the bladder with small pledgets of cotton, or in wiping off small areas of the vesical mucosa.

The ureteral searcher is a small rod 18 centimeters (7 inches) long with a little bulbous end 3 millimeters by 1·5 millimeter, and a handle 6 centimeters (2½ inches) long set at an angle of 120 degrees. It is used in touching any part of the bladder wall, in exploring a sinus, and particularly in locating the ureteral orifices in doubtful cases.

Applicator.—Any piece of flexible wire about 15 centimeters long will do as an applicator to carry medicated cotton to all points on the bladder or the urethra.

Other useful instruments are a speculum graduated in centimeters for measuring the distance between points on the bladder wall, the external or internal urethral orifices, and a flattened searcher, likewise graduated in centimeters and half centimeters.

The Technique of the Examination.—Asepsis.—Asepsis must be maintained throughout every examination by handling only aseptic instruments, introduced by clean hands, through a cleansed urethral orifice.

All the instruments used must have been sterilized and be laid in a clean tray on a sterilized towel. The external urethral orifice must be wiped clean with a boric acid solution before introducing the speculum to remove any leucorrheal or other discharges often contaminating its lips.

The hands must be scrubbed clean, and as far as possible the utmost precaution must be taken to avoid touching any part of the instruments but the handles. If this were always done, no infection could occur even with infected hands. Every instrument should be constantly inspected to detect any rough or scaling surface liable to cut the mucous membrane.

Preparation of the Patient.—The patient should come to the examining table with the lower bowel emptied. I find that in many cases it makes a decided difference if she has just eaten a meal, when the bladder does not always expand so well. Immediately before the examination she must empty the bladder in a sitting or standing posture. If the nurse

draws the urine with a catheter, or if she passes it on the table, the evacuation will not be nearly so complete.

Anesthesia.—A general anesthetic is only needed for a nervous woman. Local anesthesia by means of a 10 per cent solution of cocain applied on a pledget of cotton wound on a metal rod and introduced just within the external urethral orifice for five minutes beforehand, is sufficient to benumb the sensations so entirely that any required dilatation may be made and the speculum introduced without much discomfort.

Fig. 187.—Searcher for locating the Ureteral Orifice.

Posture of the Patient.—Two postures are available, an elevated dorsal and a knee-breast. The dorsal position is the most convenient to use and the least tiring to the patient, but it is only of service in thin patients, and the atmospheric expansion is not so good; the bladder of a fat woman will rarely distend at all in this posture. The head and thorax rest on the table, while the pelvis is raised by putting one or two bran cushions under the buttocks, so as to elevate them 20 or 30 centimeters (8 or 12 inches) or more above the table level. This gives a pitch to the pelvic and lower abdominal viscera which makes them gravitate toward the diaphragm, and as soon as a speculum is introduced the bladder sucks in air enough to distend it.

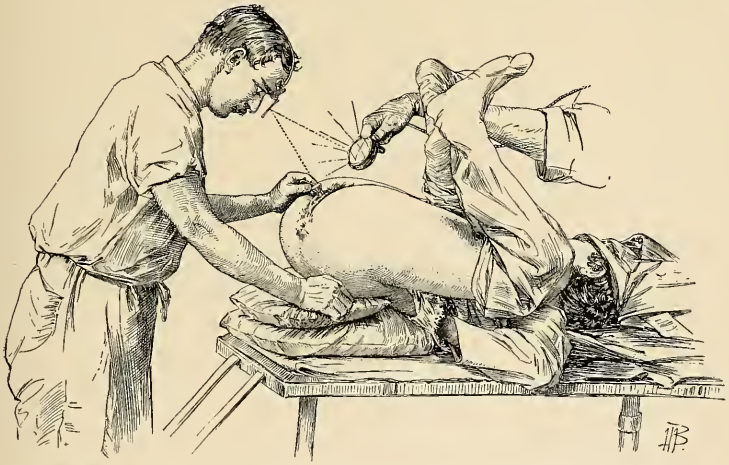


Fig. 188.—Examination of the Bladder in the Dorsal Position, with Elevated Pelvis.

The electric light held close to the symphysis is reflected by the head mirror into the bladder. The angle of reflection must be as small as possible, so as to avoid constantly displacing the pencil of light with slight movements of the head.

When the bladder does not expand, and yet it is particularly desirable to

use the dorsal position on account of the inability of the patient to stand the inconvenience and fatigue of the knee-breast position, the bladder may be distended and the pelvis relieved of the small intestines by first placing her in the knee-breast position for a minute and letting in air with a catheter; she is then turned on her back with hips elevated on the cushions, taking care to keep the pelvis all the time well above the level of the abdomen. The speculum may now be introduced and a satisfactory examination made. A bladder distended in this way will often remain well distended until the hips are let down again to the table level.

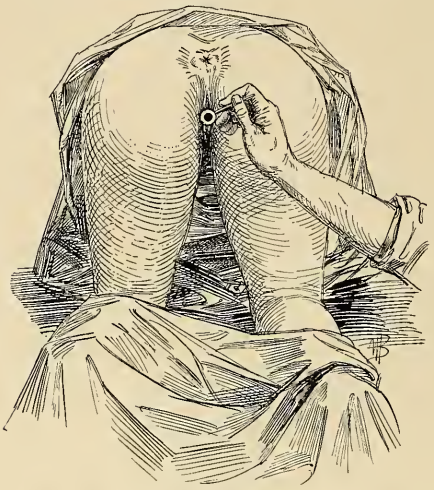


Fig. 189.—Vesical Speculum introduced with the Patient in the Knee-breast Posture.

The knee-breast position is the one position most satisfactory and applicable in all cases. The patient kneels with her knees separated 10 or 12 inches, close to the end of the table, and, keeping the buttocks as high as possible, lets the back curve in, and brings the side of the face down on the table. If she squats a little, drooping the buttocks slightly toward her feet, she will be more conveniently disposed for the examination. Sometimes, to get a good expansion, it is necessary to push the thighs in the opposite direction beyond the vertical. If she is under an anesthetic, the best way to hold her in the knee-breast position is for two assistants to stand, one on each side, close up to the body to prevent it from falling sidewise, each grasping the body with one arm thrown over the back, and holding the leg in the crotch of the knee with the other hand to keep it from slipping up or down.

An apparatus like that shown in the text (Fig. 190) and devised by Dr. G. B. Miller is useful where assistants are scarce, but the thigh bands must not be allowed to cut into the femoral fold.

Calibrating and dilating the Urethral Orifice.—Before dilating the urethra and introducing a speculum it is well to calibrate it, that is, to measure its diameter in millimeters as a guide to the amount of dilatation needed to admit a speculum; for example, if the urethral orifice has a diameter of 6 or 7 millimeters only, it can not be dilated up to 10 or 12 millimeters without a slight rupture of its margins; calibration in this case would induce one to use a speculum a size or two smaller than usual. Again, the calibration often

shows that the orifice is already so large that it needs no preliminary dilatation. A practiced eye will usually be able to gauge the size of the urethral orifice at once, and to select the exact size of speculum suitable for introduction.

To calibrate the orifice, the small end of the conical dilator, Fig. 185, is pushed into the urethra until it fits snugly, when the index finger marks the point in contact with the urethral orifice; the dilator is then withdrawn and the diameter in millimeters read off. If it is 9 or 10, the speculum of the same number is taken up and introduced without dilatation; if the number indicating the diameter is 7 or 8, the urethra must first be dilated up to the size of speculum to be used.

Boroglycerid forms the best lubricant for dilator and speculum because it is colorless. Vaselin sometimes leaves a film behind which looks like pus.

To dilate the orifice, the dilator, which is one and the same instrument with the calibrator, is introduced into the urethra in the direction of its

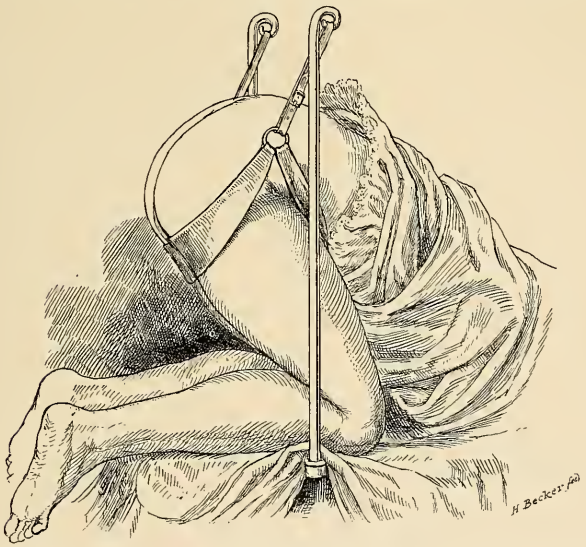


FIG. 190.—PATIENT IN A HARNESS IN THE KNEE-BREAST POSITION FOR CYSTOSCOPIC EXAMINATION. The squatting attitude is a little too much exaggerated for the average case.

axis, with a slight boring motion, until the required distention is reached in a few seconds. Often there is no injury at all from such a dilatation, while at other times one or two shallow ruptures 1 millimeter deep and from 3 to 5 millimeters long are made at the posterior margin. I have never seen any serious bleeding nor have had to treat the ruptures later as fissures; only two or three

times have I had to put in a fine suture to stop the oozing. An unusually small and rigid orifice should be cut posteriorly, as suggested by Simon; then, after the examination, the cut is closed with one or two fine silk sutures.

Introducing the Speculum.—A skillful examiner will select a suitable speculum (Fig. 184), a No. 7, 8, 9, or 10, or one of the half sizes between, according to the case, the age of the patient, and the purpose of the examination; a patient with a sensitive urethra may often be treated with less discomfort and with equal facility through a No. 7½ or 8 speculum. The smaller sizes are better adapted to girls and to young women with small urethræ. Beginners in cystoscopy are apt to select a larger speculum, using always a No. 10 or 11; with experience they will drop a size or two.

To introduce the speculum, it is grasped as shown in Fig. 191, and the obturator is kept from slipping back into the cylinder by a decided pressure with the thumb, continued until the end has entered into the bladder. The urethra, wiped clean with a boric acid solution, is exposed by an assistant holding the buttocks and the labia well apart, while the point of the speculum, coated with the boroglycerid solution, is applied to the urethral orifice, and pushed through the urethra into the bladder with a gentle sweep around the pubic arch. The handle of the speculum is now firmly grasped, while the obturator is withdrawn with a slight rotary motion. If the internal urethral orifice is drawn well into the pelvis by the posture, the urethra is so much curved that there is danger of injuring it by pushing the speculum hard against its posterior wall; this must be avoided by introducing the speculum in a decided curve. The moment the obturator is taken out the air rushes in and the bladder is dilated and ready for the inspection.

If the bladder does not expand in this way the examiner will usually find that the patient has assumed a faulty position, and as soon as this is corrected the expansion occurs.

Viewing the Bladder.—It takes far less time to view the whole interior of the bladder than it does to describe the method of inspection (Fig. 192); indeed, after practice, a few seconds will be sufficient to determine by actual sight whether any portion of the interior is sound or diseased.

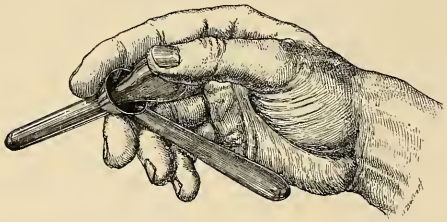


Fig. 191.—Holding the Vesical Speculum ready for Introduction; the Thumb presses the Obturator firmly in.

If the patient is in the knee-breast position the examiner sits on a stool with his eyes a little below the level of the urethra, grasping the handle of the speculum, which is turned upward, and he should wear the head mirror over the same eye he uses at the microscope.

The assistant now holds the electric droplight close to the end of the sacrum,

which is protected from the heat by one or two towels, and the lower margin of the head mirror is drawn away from the face and turned until the reflected light spot falls within the bladder. Men accustomed to throat and eye work will find no difficulty in putting a good illumination at once just where they want it, while to the inexperienced man the apparent waywardness of the light will be his chief trouble throughout. The direct ray of the little electric headlight makes the illumination of the field an easier task.

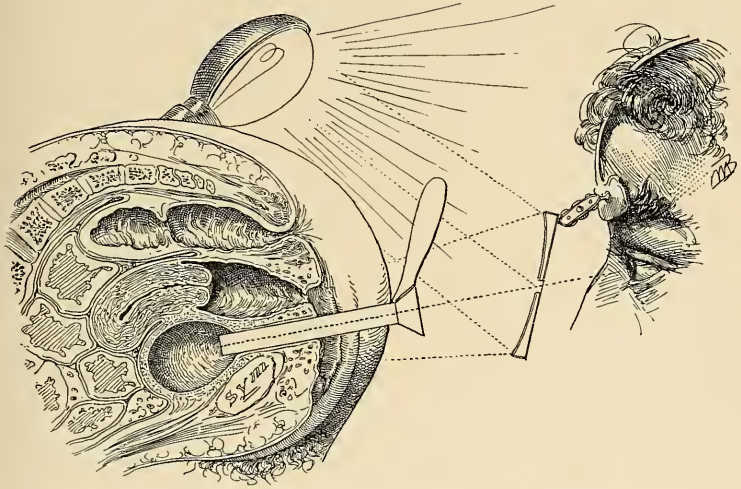


Fig. 192.—Examination of the Bladder with the Patient in the Knee-breast Position.

The inspection of the bladder naturally begins with the posterior hemisphere about the posterior pole, opposite the internal urethral orifice, from 3 to 5 centimeters distant from the anterior wall, but not more than 2 or 3 centimeters from the end of the speculum, which is pushed well into the bladder.

The whole posterior hemisphere is first examined as the end of the instrument is directed to the right and to the left, by alternately raising and dropping the handle so that every part of the mucosa is passed in review at least twice.

The normal background of the inflated bladder seen in this way is a dull white, with here and there large vessels branching and anastomosing over it in an irregular manner. The fine rosy capillary injection seen in a contracted bladder is not visible when it is distended with air, for the minuter vessels are emptied, both by the expansion and by the posture of the patient. At a point 1 or 2 centimeters above the posterior pole a rounded red spot of capillary injection is often seen, which may easily be mistaken for a localized inflammation, but which is merely a suction hyperemia induced at this point by contact with the end of the speculum during the withdrawal of the obturator.

The larger blood-vessels spring out of the submucosa, where they are first seen in a hazy way, becoming clearer and with sharply defined outlines on the surface, where they divide and subdivide into numerous branches. Occasionally an artery is seen pulsating, and a large dark vein may sometimes be seen gradually disappearing from view as it penetrates the walls obliquely. The mucous surface on the right and the left of the posterior hemisphere is often divided up by shallow interlacing ridges, or again a sharp ridge 2 to 3 centimeters long is seen to cross the field obliquely; these ridges are formed by the inner muscular bundles irregularly arranged. Numerous little glistening points are due to moisture on slight inequalities of surface which catch and reflect the light.

By dropping the handle of the speculum decidedly, its inner end is raised and the vault or summit of the bladder is brought into view, and every part of the organ inspected by moving the end from side to side. By elevating the handle decidedly, the floor of the bladder is examined in the same way, and then by moving it to the left and to the right the right and left walls come into view.

The only parts which remain unexamined are those contiguous to the internal urethral orifice, and these are now seen by a still more decided elevation and depression of the handle. With a marked depression of the speculum the vesical triangle comes into view, always a little more injected than the rest of the bladder, due to the fact that the mucosa and the underlying tissues are intimately connected, which prevents this part from expanding and becoming anemic like the rest of the bladder.

Turning the speculum from fifteen to twenty degrees—generally the latter—to the right or to the left a little pinkish prominence is seen—the *mons ureteris* which marks the position of the *ureteral orifice*; this usually looks like a fine transverse line about 2 millimeters long on the side of the mons. It is sometimes a faint streak, like a little water line on paper. At other times the orifice appears as a little pit or a mere point. Immediately around the ureteral orifice is a paler area about 1 millimeter broad, and surrounding this a rosy area 3 or 4 millimeters broad. I have several times seen a blood vessel emerging out of it on to the vesical mucosa. If a V with its angle at thirty degrees is marked on the cylinder of the speculum, near the handle, by bringing one of the arms of the V parallel to the axis of the urethra the other arm will then point toward one of the ureteral orifices, which may now be found at once on looking through the speculum.

If the ureteral orifice is watched for half a minute or so a little clear urine will be seen to spout out from the surface, forming a jet which lasts two or three seconds, to be repeated again in the course of a minute.

Sometimes the urine spurts up free from the surface of the bladder and shoots into the lumen of the speculum and trickles down to the outer edge. By holding the end of the speculum close up under the ureter, or by using the oblique speculum adapted specially to this purpose, Fig. 193, enough urine can be caught up with pledgets of cotton or in a small graduate to answer the purposes of a physical, chemical, and microscopic examination. When the bladder is inflamed

or ulcerated, it is sometimes of great advantage to get a little urine from one or both sides in this way, because it avoids the risk of a possible infection of a ureter by putting in a catheter.

The interureteric line is often distinctly seen, either from its having a little deeper color than the bladder behind it, or from a slight elevation.

In the process of the examination of the entire bladder conducted in this way the field of vision has changed from the posterior wall perpendicular to the plane of vision to the triangular area which lies almost parallel to it; at right angles differences in color are best seen, while in the plane of vision outlines which cross it come out more distinctly.

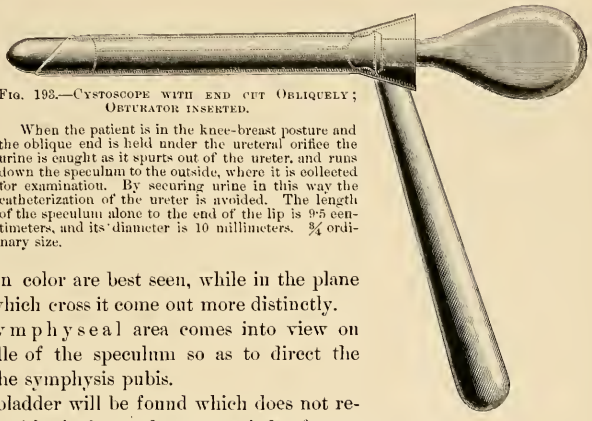


FIG. 193.—CYSTOSCOPE WITH END CUT OBLIQUELY; OBTURATOR INSERTED.

When the patient is in the knee-breast posture and the oblique end is held under the ureteral orifice the urine is caught as it spurts out of the ureter, and runs down the speculum to the outside, where it is collected for examination. By securing urine in this way the catheterization of the ureter is avoided. The length of the speculum alone to the end of the lip is 9·5 centimeters, and its diameter is 10 millimeters. ¾ ordinary size.

The retrosymphyseal area comes into view on elevating the handle of the speculum so as to direct the inner end toward the symphysis pubis.

Occasionally a bladder will be found which does not remain ballooned out with air, but undergoes periods of more or less rhythmic contraction, each of which lasts half a minute or more. With the contraction there is an influx of blood into the capillaries, and the mucous membrane assumes a rosy hue, becoming more intense as the contraction increases, until the whole organ is thrown into small folds like a labyrinth of cerebral convolutions. With the contraction the air is audibly expelled and often

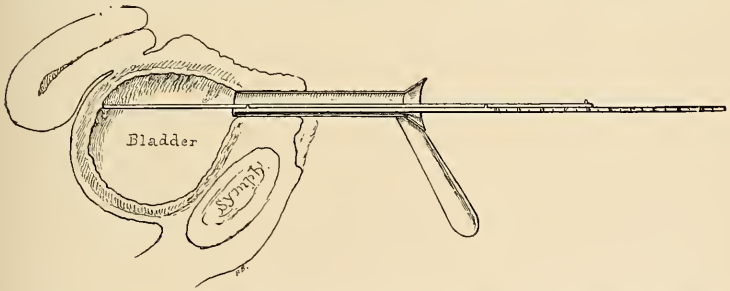


FIG. 194.—INSTRUMENT FOR MEASURING THE DISTANCE BETWEEN THE INTERNAL ORIFICE OF THE URETHRA AND VARIOUS POINTS ON THE VESICAL WALLS.

The distance in millimeters is registered on a graduated arm on the outside. One arm slides along the other and the lower one is provided with a little hook on its inner end to hold it against the inner end of the speculum. Knee-breast posture.

urine comes sputtering out with it. After waiting from half a minute to a minute the contraction relaxes and the bladder expands, and the examination can be continued. The color and appearance of the walls and of the vessels of a normal bladder must be well fixed in the mind by numerous examinations, because the normal conditions are the standards of comparison in determining the presence of areas of congestion, inflammation, or other diseases.

Insufficient expansion of the bladder will be noticed in advanced pregnancy, or in the case of a tumor blocking the pelvis, or in ascites. It may also be due to the fact that the patient in taking the knee-breast posture arches her back, and raises her chest too high from the table, and so interferes with the action of gravity on the intestines. Often, too, a little time must be allowed for the viscera to gravitate slowly toward the diaphragm, and so create the necessary suction for the distention of the bladder.

Too great an expansion of the bladder may also be troublesome. The difficulty is that the trigonum and the ureteral orifices are then lifted up so high that the examiner has to bring his head so far under the patient that his position is extremely awkward and he does not get enough light for the inspection. This may be remedied in several ways:

a. Before introducing the cystoscope a speculum is always put into the vagina, which then balloons out with air and lets its anterior wall with the floor of the bladder drop in the direction of the symphysis; then when the vesical speculum is introduced the available expansion space of the pelvis, already partly occupied by the distended vagina, is so diminished that the floor of the bladder remains more nearly in the plane of vision. In parous women the atmospheric expansion of the vagina is usually spontaneous. Distention of the rectum with air will sometimes produce the same effect.

b. By putting a cotton pack in the vagina or by depressing its anterior wall with a spatula, any particular portion of the base of the bladder can be held down in view.

c. Cases where there is a tendency to an excessive expansion may, as a rule, be easily examined in the dorsal posture, when it is naturally not so great.

The presence of air in the bladder is rarely painful so long as the urethra is open and the air enters and escapes freely with each respiratory movement. But not infrequently as soon as the speculum is taken out the patient feels a cramping pain, which is not relieved until she has been able to seat herself on a vessel to expel the air. To avoid this after-pain, the examiner may leave the speculum in place, or slip a catheter in, and then lower the patient gently from the knee-breast posture on to her side, so as to let the air out gradually.

It is not necessary to take any special precaution after a vesical examination, unless it has been prolonged enough to weary the patient, or unless she is feeble or nervous; under these circumstances rest for an hour or two with a half teaspoonful of aromatic spirits of ammonia may be prescribed.

The field of usefulness of the cystoscopic method just described is a large one, commensurate with the entire field of vesical diseases, and the practitioner

who uses it liberally will be rewarded by constantly discovering that affections hitherto described as merely functional have definite local lesions as their basis, and are often speedily amenable to simple methods of treatment.

I wish further to insist that a cystoscopic examination should be made in every case where a vesical affection is more than transient and the diagnosis is not absolutely clear without it, and that every part of the bladder should then be thoroughly inspected.

AFFECTIONS OF THE URETHRA.

Short as the urethral canal is in women, it is liable to a variety of diseases, some of which are peculiar to the sex. These affections are chiefly those which either interfere with function or affect the caliber of the urethra. As the final avenue of egress of the urine the urethra holds a position analogous to the short anal canal in its relation to the rectal ampulla and the intestines above. Owing to its relation to the external genitals, which are infested with micro-organisms, the urethral orifice is constantly exposed to the risk of infection from without. Its position under the resisting pubic arch renders the urethra liable also to damage from prolonged pressure during labor, or to compression by a tumor which chokes the pelvis. It is protected from external injuries by its concealed position between the thighs and labia.

Affections of the urethra may conveniently be considered under the following heads: Malformations, displacements, dilatation, stricture, ischuria, fistula, foreign body, hyperemia, urethritis, new growths.

Congenital malformations of the urethra are among the rarest gynecological affections. The commonest is a distinct lateral displacement of the external orifice, generally about 2 millimeters, to one or the other side. A shallow vertical fissure corresponding to the urethral orifice may be found on the opposite side with a sharp ridge between the two; this gives the appearance of a double urethral orifice.

Most malformations of practical importance are due to a deficiency of the development of some part of the urethral canal.

These may be classified as: (a) hypospadias, (b) epispadias, (c) imperforate urethra, (d) totally deficient urethra.

Hypospadias.—In hypospadias part of the inferior wall of the urethra is wanting and the external urethral orifice opens at some point in the anterior vaginal wall. One of the best described cases is that of A. Lebedeff (*Arch. f. Gyn.*, vol. xvi, p. 290). The patient was a married woman, twenty-three years old, a nullipara. She had always been well in every respect until five years married, when she began to experience a pressure on the bladder and to suffer from an involuntary escape of urine, at first at night after coitus, but soon becoming constant. An examination showed normal labia, nymphæ, and clitoris. But in the vestibule, instead of a urethral canal, there was a furrow, lined with a delicate mucous membrane, and leading back over the anterior vaginal wall, between vaginal folds so closely applied as to form a distinct ridge; this furrow

ended in a canal 2 centimeters long situated 2 centimeters within the introitus, which admitted two fingers directly into the bladder. The upper wall of this furrow, seen on drawing aside the protecting vaginal folds, was covered throughout with a bright-pink mucous membrane crossed by a fine network of vessels. The fact that the patient had never borne a child, and the straight course of the canal, associated with the entire absence of any cicatricial tissue, showed that the condition was a congenital defect of the inferior wall of the urethra extending as far up as the neck of the bladder. The incontinence had been brought on mechanically by coitus.

A case of my own, more properly classified, as F. Winckel has pointed out, as a persistent urogenital sinus, was a nullipara forty-six years old; the external genitals were normal as far as the introitus of the vagina, where the only opening between clitoris and rectum was found. There was no hymen, and the smooth orifice beneath the pubic arch had the form of a transverse slit. If the finger was pushed in, it invariably entered a short muscular canal, which was the shortened urethra, and so passed directly into the bladder. The urethral orifice was in this way situated about 1 centimeter behind the pubic arch, and the urethral canal was only 1 centimeter long. While the inferior wall of the urethra was absent, the anterior wall continued on out as far as the vestibule, but was not of normal length. The upper wall of the introitus was vascular and of a deep-red color, and presented numerous longitudinal mucous folds. There was a gaping slit in the anterior vaginal wall 1 centimeter long, which shortened the caliber of the urethra by so much. If now the point of the sound introduced into the vagina was turned sharply down over the perineum, it would then enter one or the other of two orifices lying side by side, and separated by a fleshy septum; this was a double vagina about 8 centimeters (5 inches) deep, with a small cervix in the vault of each half. The incontinence and distress the patient had complained of in coitus was relieved, and the channels returned to their normal usage by a plastic operation, freshening and uniting the edges of the flaps, and converting the two vaginæ into one by removing the septum.

Similar to this was the case of a short dilated urethra reported by Dr. W. H. Baker, of Boston (*New York Jour. of Gyn. and Obstet.*, Oct., 1893); here there was no trace of an upper urethral wall, and there was therefore a complete absence of the external part of the urethra, *defectus urethræ externæ*.

Epispadias.—In epispadias there is a defect of the upper wall of the urethra associated with a separation of the labia minora and division of the clitoris. In its extreme form the symphysis gapes, the anterior wall of the bladder is deficient, and the bladder becomes everted (exstrophy).

Atresia.—Congenital atresia of the urethra may be due either to defective intra-uterine development, when it is associated with other anomalies, or it may be acquired late in intra-uterine life by an agglutination of a portion of the urethral canal. The latter condition was clearly the one obtaining in the case of a child two days old (Mandl, *Wien. klin. Wochenschr.*, 1891, p. 515), which vomited and had general convulsions until the atresia was broken down by

a sound, when turbid concentrated urine escaped and the disturbances ceased. There was no marked distention of the bladder or evidence of hydronephrosis.

When the atresia is due to defective development a number of other coexisting defects are usually found, as in the instance reported by F. Schatz (*Archiv f. Gyn.*, i, p. 12), where there was a double uterus, double vagina, and double bladder. As there was no urethra, each of these bladders opened by an orifice in its base into the corresponding vagina.

If the atresia is a complete one, in order that the child so affected shall live, nature must have provided some other channel for the escape of the urine, such as an opening into the bladder through the symphysis, or a patulous urachus, which discharges at the navel. If there is no avenue of escape for the urine, this will, even in the intra-uterine life, accumulate in such quantity as to produce an enormous distention of the bladder, ureters, and kidneys, with ascites. Under these circumstances the distended abdomen forms a serious hindrance to the birth.

Congenital Absence of Urethra.—In these cases all trace of the urethra is wanting, both external and internal orifices, and upper and lower walls, and the base of the bladder opens directly into the vagina, with which it forms one common canal.

The urethra is liable to displacements of two kinds: (1) Those affecting the entire urethra with the adjacent tissues; (2) those affecting the mucous membrane of the urethra alone.

Displacement of the Entire Urethra.—The anatomical and topographical relations of the urethra are such that it is most favorably situated to prevent displacement. Its shortness, its position directly under the pubic arch, and the dense fibrous connection with the adjacent parts all resist any ordinary efforts to force it out of its natural position. The commonest change in position is noticed when the vaginal outlet is relaxed and gaping, and the base of the bladder descends with the anterior vaginal wall to fill up the gap. Careful inspection and the use of a sound then show that the urethra has rotated outward and forward around the symphysis as its axis; the external orifice lies farther forward and its direction more upward than normal, while the internal orifice has sunk with the bladder. In prolapse of the elongated cervix uteri with a vesical diverticulum in the pouch the urethra often undergoes a still more marked change in its direction, gradually yielding to the traction of the prolapsed sac, first at its internal orifice, and then the lower portions, until the whole urethra finally lies outside the body. The canal sometimes assumes a sigmoid curve, which makes it difficult to pass a catheter.

The symptoms of this condition are those referred to the prolapsus and those which arise from difficulty in emptying the bladder. Unless the patient is in the habit of pushing up the sac for this purpose, the evacuation is often incomplete and decomposition of retained urine may set in with all its untoward sequelæ.

Upward displacement of the urethra occurs during labor and when the urethra is drawn up by a full bladder. It also occurs in the case of large

subperitoneal tumors of the uterus, which drag the bladder high up, and with it the urethra, sometimes changing its horizontal direction to a vertical one. The difficulty of emptying the bladder may be great, but it is sometimes also surprisingly easy. In relieving the patient, it is safer to use a soft catheter, which finds its own way into the bladder. If a metal or glass catheter is used it must be done with the gentlest touch, feeling for the channel with each advance of the instrument. I know of a doctor who decided to perform a Cæsarean section on a woman in whom the head of the child was sticking in the pelvis. As a preparatory measure he attempted to empty the bladder, but instead of doing that he forced the catheter through the urethra into the child's head several times, and when the catheter was removed its eye was found full of brain tissue. The operation was abandoned on this account, and in several days a dead child was born spontaneously, with perforations in its head which were the cause of much curious speculation on the part of the friends.

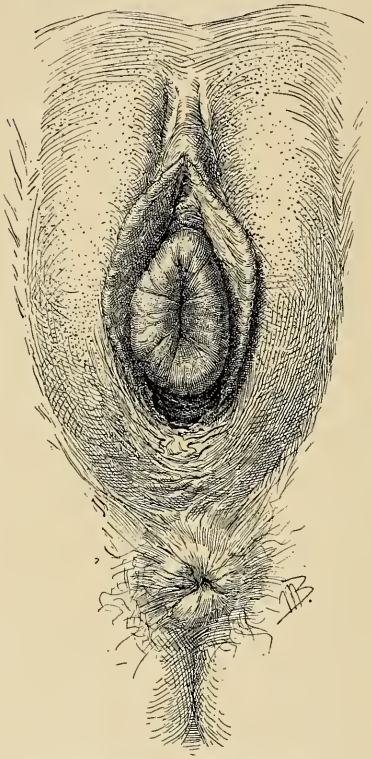


Fig. 195.—Hypertrophy of the Urethral Mucosa at the External Orifice. Apr. 16, 1896.

Prolapse of the Urethral Mucosa.—A more or less complete eversion of the mucous membrane of the urethra is found in rare instances. While the rest of the urethra remains in its normal position the mucosa becomes loosened from its submucous attachments and is gradually extruded at the external orifice, forming a pale, deep-red, or bluish tumor, which swells and becomes edematous and even gangrenous if left to itself. As the anterior, posterior, and lateral walls of the urethra are all involved, the protruding mass is tubular, and is lined within as well as covered without by a sensitive, easily bleeding mucous membrane. No age is exempt from prolapse of the urethral mucosa, but the affection is far commoner in young children; in two cases reported the patients had reached the advanced age of seventy and seventy-two years.

The prime cause of the affection is usually struma, but the immediately ex-

citing cause may be a blow, straining, or coughing, or rape. Inflammation of the mucosa also occasionally produces a prolapse, which is as a rule only partial.

The diagnosis will be made upon separating the labia and observing at the site of the urethra and choking its orifice a vascular tumor with a slit in the center of it opening into the bladder. This condition must be distinguished from caruncle of the orifice or a hemorrhoidal pouting of the mucosa at the orifice, as well as from eversion of the mucosa of the bladder or of the ureter.

The seat of a caruncle is usually on one side of the external urethral orifice. An eversion of the mucosa of the orifice forms but a shallow protrusion not more than 5 or 6 millimeters long.

In everted bladder the base of the tumor is found by a sound to be within and attached to the bladder, instead of at the external orifice of the urethra. The bladder tumor also lacks a canal. An everted ureter is attached to the bladder wall and a fine sound or catheter $1\frac{1}{2}$ millimeter in diameter passes through the tumor on up over the pelvic brim into the kidney.

The treatment will vary with the conditions. The cautery so often used ought to be given up entirely for cleaner surgical methods. It is also unadvisable to transfix and ligate the protruding mass and allow it to slough or to cut it away beyond the ligatures, as has been done.

The first and simplest plan to be tried in a recent case is reposition, after getting rid of the sensitiveness, either by means of a weak solution of cocain or by anesthesia. By compressing the tumor on all sides and at the same time pushing it back into the urethra a replacement may be effected which will prove permanent; the patient should be kept in bed afterward, and a vulvar compress applied, and small doses of belladonna should be given as a sedative by rectal suppository.

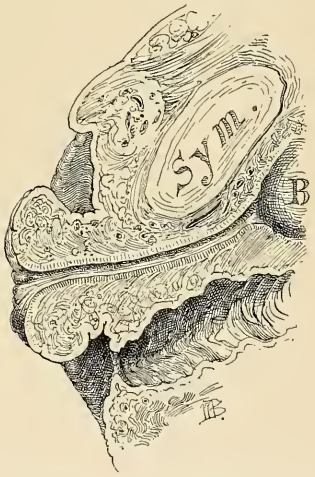


Fig. 196.—Hypertrophied External Orifice of the Urethra shown in Sagittal Section.

Sym. is the symphysis; B, the bladder; the vagina lies below.

If the tumor can not be replaced or if it escapes again directly after replacement, an operation will be necessary, and the best is the excision of the protruding portion with knife or scissors, followed by a carefully applied continuous suture of fine catgut, uniting the cut edges and checking the hemorrhage. It is important to catch both edges as they are cut to prevent an inversion with excessive hemorrhage.

Dilatation of the Urethra.—Variations in the caliber of the urethra, both dilatation and stricture, are of rare occurrence. Dilatation, however, a disease never found in men, is far commoner than stricture, a disease so often found in them.

Dilatation of the urethra is an enlargement of its lumen, the result of any injury to the circular fibers by a trauma from without, or by some object forced through its canal in either direction. All grades of dilatation are found from a slight one which permits an escape of the urine only noticed on coughing, sneezing, or lifting, to the extreme forms where the bladder is incapable of holding even a few drops of urine. The worst forms entail all the miseries of a large vesico-vaginal fistula.

The commonest cause of extreme dilatation is coitus *per urethram* in women with either a congenital or an acquired atresia of the vagina. In these cases the external urethral orifice is gaping and everted, and the examining finger is often carried into the bladder without any apparent resistance. I have seen three cases, in one of which two fingers could be easily introduced into the bladder, where a distinct contraction was felt at the position of a much thickened internal vesical sphincter. The consequences of a dilatation of this character are often less serious than would be anticipated, for, in spite of the extreme distention of the urethra, the patient is often able to retain her urine for several hours, or at most notices a decided incontinence following coitus only.

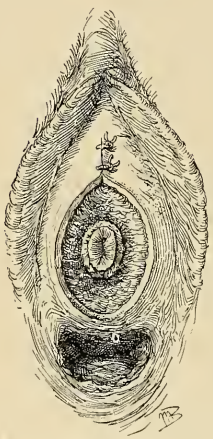


Fig. 197.—Operation for Hypertrophied Urethral Mucosa.

A circular amputation with approximation of the tissues of the vestibule and the anterior vaginal wall to the urethral mucosa. The vagina is seen below.

It is quite otherwise with the cases of dilatation of the urethra where a large finger has been bored in for diagnostic purposes. The extensive rupture of the muscular fibers is then followed by an incontinence which is often permanent. These cases are fortunately becoming rare, as this barbarous way of examining the bladder is being given up. With our present facilities for examination, we are never warranted in introducing a finger through a urethra which is not already dilated so as to admit it without resistance.

Another cause of dilatation is that which acts from within outward, as when a large stone under the spasmodic contractions of the bladder is pushed down into and on out through the urethra, or when a stone is grasped and dragged out by a stone forceps. It is remarkable, however, what the urethra will stand in this way, for a stone even an inch or more in diameter passed spontaneously in this way may not be followed by more than a transient incontinence.

The partial incontinence following repeated births is undoubtedly due to injury to the circular fibers of the urethra by the compression produced by the child's head, and is apt to increase after each fresh insult.

Treatment.—If the dilatation has been but recently and suddenly produced, as by the passage of a stone or by forcing a finger or too large dilators through the urethra, and there is no evident laceration, it will be well to wait a

few days, simply keeping the parts clean and free from contamination by vaginal douches and local application of a boric acid solution; and if there is any definite improvement it will be well to wait as long as it continues. If there is any evident laceration at the external meatus, this should be sutured under eocain, first trimming off all unevenness and then uniting the parts from side to side with fine interrupted silk sutures, using a small fine needle. When the relaxation is due to coitus and the abnormal channel has been created in place of an atresic vagina, nothing can be done until the vagina is restored to its integrity.

The condition of a patient with an incontinent urethra is so pitiable that as eminent an authority as Rutenberg (*Wien. med. Woch.*, 1875, No. 37) proposed to cure it by closing the urethra entirely and making a suprapubic fistula, which was to be controlled by the pressure of a pledget.

In general four plans have been tried with varying success in attempting to overcome incontinence. These are:

(a) A vaginal pessary.

(b) A longitudinal resection of the vaginal wall, with or without a piece of the urethra.

(c) An operation to flatten out and compress the external orifice.

(d) Twisting the urethra spirally so as to narrow its caliber.

It is not possible in the absence of a larger experience to speak with decision as to the comparative merits of the three operative procedures proposed, but I would prefer as a first resort to resect after the plan proposed in (b).

If the incontinent urethra was near the normal caliber I should use Pawlik's plan (c).

If the incontinence is due to the traction or scar tissue in the anterior vaginal wall on the neck of the bladder, this must first be freely incised to do away with the traction. Permanent relief has even been obtained in this way.

(a) F. Schatz (*Arch. f. Gynäkol.*, vol. xi) has been able to give relief by means of his funnel-shaped pessary, which presses directly upon the urethra. Similar results have occasionally been secured by the use of a ball pessary large enough to press the urethra against the symphysis and hold the urine back until the intravesical pressure has increased to a certain degree. An intact levator ani is necessary for the successful use of a pessary, which can not give relief in a relaxed vaginal outlet.

(b) An excision of the superfluous relaxed portions recommends itself as the most rational plan, and it has yielded excellent results in the hands of Frank and Engström.

Frank's procedure (*Centralbl. f. Gynäkol.*, 1882, No. 9) is to lay a small catheter in the urethra and then to excise a wedge-shaped piece from the posterior urethral wall, including the vaginal as well as the urethral mucosa, and extending from the external urethral orifice to within about one centimeter of the internal orifice. The incision is now continued in an elliptical form on the vaginal wall beyond the neck of the bladder. By a transverse row of interrupted

sutures the whole wound surface is now accurately approximated. The lower anterior part of the incision underlying two thirds of the urethra simply resects its relaxed canal, while the width of the elliptical portion of the denudation has been calculated so as to form a sort of buttress behind the neck of the bladder like the third lobe of a prostate in the male.

Engström (*Berl. klin. Woch.*, 1887, p. 744), in an anemic, badly nourished woman, fearing a failure of union on the side of the urethral mucosa, carried his excision on the vaginal septum down to the urethral mucosa, but did not include it. The wound suppurated and healed by granulation with the formation of scar tissue, and as a result the patient was able to hold her urine four hours by day, and all night.

(c) By flattening the outer end of the urethra and bending it at the same time, Pawlik (*Wien. med. Wochenschr.*, 1883, Nos. 25 and 26) relieved several patients of incontinence. His plan is to draw the orifice of the urethra well forward toward the clitoris and sharply to one side; then, marking the point on the side to which it could be drawn without excessive traction, a long, narrow denudation about 2 centimeters long ($\frac{3}{4}$ inch) is made in the sulcus and sutures passed to hold the urethra in that position. After a week, when the sutures are removed, the other side of the urethra is drawn upward and outward in the same manner, and the sulcus on that side denuded and sutured. By this means the urethra receives a sharp bend forward and the posterior wall is strongly flattened against the anterior by traction on both sides.

(d) Torsion of the urethra is a plan proposed by R. Gersuny (*Centralb. f. Chir.*, 1889, p. 433). The whole urethral canal is dissected out from the surrounding structures as far as the neck of the bladder, and the urethra is then twisted on itself, so as to form a series of spiral folds, when it is sutured so as to be held in this position. Gersuny relieved his patient after twisting the urethra one and a quarter times on itself—that is, through an arc of 450 degrees.

Desnos (*Ann. des mal. des org. gen.-urin.*, 1890, p. 344) partially relieved the patient by ligating the urethra. He first introduced a catheter into the bladder, and then cut through the vaginal mucosa so as to expose the upper two thirds of the urethra; this portion was then isolated by a catgut ligature placed 2 or 3 millimeters from the neck of the bladder and tied so tight that the catheter could just be moved. The vaginal incision was then closed with silkworm gut. A small wedge was also taken out of the gaping external orifice. The result was an immediate power of retention for three hours, afterward reduced to one hour and a half.

Stricture of the Urethra.—A stricture of the urethral canal so large as to interfere with the free exit of the urine from the bladder is rare. Strictures of large caliber in which there is no evident impediment to urination or to the passage of an ordinary catheter have been described and their importance insisted upon by Dr. Ely Van de Warker (*Medical News*, Philadelphia, 1887, p. 59). They are to be recognized by using olive-pointed bougies, which catch and trip in the stricture as they are withdrawn. Dr. Van de Warker finds that the evil results of a neglected stricture of large caliber in women

are similar to those in men; but confirmation of these important conclusions are still wanted from other clinicians.

A variety of causes may operate to produce a stricture, some of which are:

1. A localized thickening produced by a chronic gonorrheal urethritis.
2. A cicatricial contraction in the anterior wall of the vagina following a slough produced by labor.
3. The cicatrization of a chancre, whether in the vagina or in the urethra.
4. Carcinoma of the urethra.
5. Extreme contraction of the external meatus without assignable cause.

Gonorrheal stricture is the commonest of all forms, although it has as yet received but little attention in women. Its history is often difficult to obtain, owing to the slightness of the symptoms produced by a chronic gonorrheal urethritis. The slough which follows labor is more apt to result in a urethro-vaginal fistula than in a stricture.

The symptoms of stricture are difficulty and pain in micturition, the urine being expelled in drops or in a fine stream with considerable straining. These difficulties increase as the caliber of the stricture lessens, although occasionally even an extreme contraction of the urethra may elicit no complaint. I remember well my first case, a German woman of about fifty-two, from whom I removed 252 gallstones. After the operation she could not urinate lying on her back, nor could the nurse catheterize her. I found just within the external orifice a cicatricial narrowing of the urethra, which only allowed a fine catheter 2 millimeters in diameter to pass with difficulty. The patient was not conscious of there being anything wrong, nor was I able to get any history or to determine the cause of the stricture.

The diagnosis will be made readily if every case complaining of any urinary disturbances is examined locally. The effort to catheterize or to pass a vesical speculum will at once tell whether an obstruction exists or not, and if so, the urethra may be calibrated with bougies and the stricture studied urethroscopically, determining its exact size, position, extent, appearance, and consistence.

The treatment will depend upon the form of the stricture and its cause. In secondary cancerous disease which can not be eradicated, in the earlier stages the bladder should simply be catheterized regularly; later, when the obstruction increases, a vesico-vaginal fistula may be made, or, if necessary, the ureters may be set free and turned into the vaginal vault. In one of my cases of syphilitic thickening the urethra was reduced to a rigid canal, with extensive ulcerations at the external orifice; the patient had beside this a universal cystitis and hypertrophy of the bladder walls.

In cicatricial contraction of the anterior vaginal wall compressing the urethra, if the cicatrix is narrow, the plan of making multiple incisions into it under cocain, may be tried. If this does not succeed, the cicatrix should be dissected out, even going so far, if necessary, as to resect the lower walls of the urethra with it; then, after an exact closure of the wound with fine interrupted sutures passed close together, a catheter should be left in the bladder for four or five days to relieve the canal of any strain.

When the stricture is narrow and more or less circular, as in the gonorrheal stricture, the lumen should be enlarged by incising or dilating it.

A stricture which allows a bougie 2 or 2½ millimeters in diameter to pass may be dilated by passing the bougies daily, until a No. 4 or 5 is passed. After three or four days a No. 5, 5½, and 6 may be passed, and so on gradually up to No. 10, the maximum. A smaller stricture, admitting only a No. 1 or 1½ bougie, may be exposed through the urethroscope, its edges incised slightly, and then dilated up to No. 3 or 4, gradually followed by the larger dilators until the lumen is restored to the normal size.

Care must be exercised to keep the field free from contamination, and not to transport the germs on the external urethral orifice into the canal every time the dilators are used. If the stricture is limited in its extent, and an examination shows that there will be but little risk of an extensive rupture, a rapid dilatation may be practiced, as recommended by E. Hermann (*Trans. of the Obst. Soc.* of London, for 1887, xxix, p. 27), restoring the urethra to a normal caliber at the first sitting.

All cases treated by dilating must be kept under observation for a long time, as a good percentage show a decided tendency to relapse, when the dilatation must be repeated. I gave one of my patients, who was an intelligent nurse, a glass catheter, with the instruction to use it at intervals to discover whether the stricture was recurring and to keep it open, and she did this with good effect.

A stricture confined to the external meatus is easy to treat by benumbing the part with a strong solution of cocain and using the conical urethral dilator, or, if it is very tight and the scar tissue extends deep, an incision 5 millimeters deep may be made through the posterior margin and the urethral and vaginal mucosæ sewed together.

Ischuria.—Ischuria is an affection in which the patient, often without a demonstrable mechanical cause, is unable to void the urine which is then retained in the bladder. It is sometimes seen in hysterical girls, and often in the puerperal state, where it is probably due to pressure on the neck of the bladder by the head of the child during its descent, benumbing the nerves and so destroying for a time the reflex sensibility. That this is probably the correct explanation is borne out by the fact that it oftenest follows forceps labors.

The diagnosis is usually easy to make by the discovery of a distinct tumor just above the symphysis pubis; on introducing the catheter the urine escapes and the tumor at once disappears. I had one case in a young woman with anorexia nervosa, in whom I palpated and percussed the flat lower abdomen and concluded that there was no urine in the bladder, but on putting in a catheter 500 cubic centimeters of urine escaped; the bladder had distended laterally.

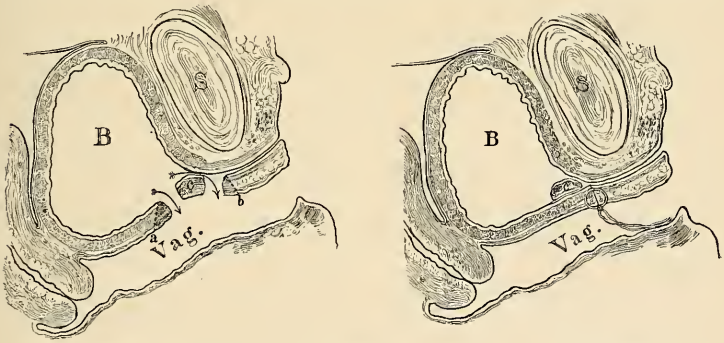
The best way to treat puerperal cases is first to try letting the patient urinate by sitting erect on the vessel, and if this does not succeed to practice a rapid dilatation of the urethra under cocain. The external genitals are carefully cleansed and the caliber of the urethral orifice taken. Cocain (10 per cent solu-

tion) is then applied for five minutes in the canal and the first dilator used, followed immediately by a size a half millimeter larger, and this by the next size, and so on up to No. 12 or 14 millimeters in diameter. Often the patient will be permanently relieved at once, or at most the passage of the same numbers once more after an interval of a day or two will relieve the ischuria.

In an anemic, hysterical patient the condition of the blood, and the nervous symptoms, the bowels, and the digestion should receive especial attention. Strychnin is one of the best systemic remedies given in full doses.

Urethral Fistula.—A urethro-vaginal fistula following labor is a rare occurrence. When the urethra is involved the lesion is located in the upper part, oftenest at the neck of the bladder, and is frequently found in association with an extensive injury to the base of the bladder, forming a vesico-urethro-vaginal fistula. Not so rare, however, is a fistula artificially created to draw out a redundant urethral mucosa and relieve dysuria (Emmet's buttonhole operation).

Urethral fistulæ usually involve the lower wall only, and appear either as elliptical openings from 1 to 1·5 centimeter long or as a fine circular opening not larger than a pin head. If the fistula is close to the neck of the bladder there may be a frequent involuntary escape of urine. If it is farther down in



Figs. 198, 199.—Urethro-vaginal and Vesico-vaginal Fistula in the Same Patient.

A small bridge of tissue (*c*), including the neck of the bladder remained intact. The upper border of the vesico-vaginal fistula (*a*) and the lower border of the urethro-vaginal fistula (*b*) were denuded and united without sacrificing the neck of the bladder (*c*). See also Fig. 200.

the canal there may be no symptoms at all pointing to its existence, and under these circumstances there is no reason why the fistula accidentally discovered should be operated upon.

I have seen but two cases, both resulting from the traumatisms of labor. In one there was an elliptical opening in the floor of the urethra at about the middle, 1·5 centimeter long by 3 millimeters in width, and the other a round opening about 4 millimeters in diameter, just in front of the neck of the

bladder, while just behind the neck there was a vesico-vaginal fistula a little larger in diameter.

The treatment of a simple fistula which does not involve more than one third of the lumen of the urethra is like that of vesico-vaginal fistula, by a funnel-shaped denudation of its margins, broad on the vaginal surface, and reaching up to but not including the urethral mucosa. Fine silkworm-gut sutures are then passed transversely, and tied so as to bring the edges into exact apposition. It is better to leave a catheter in the bladder for five days. The stitches should be removed in from seven to ten days.

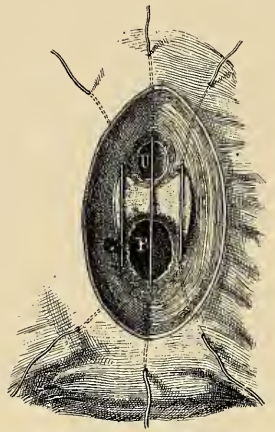


Fig. 200.—The Method of introducing the Sutures in the Case of Vesico-vaginal Fistula (B), and Urethro-vaginal Fistula (U).

The bridge of tissue between U and B is the neck of the bladder.

In a case in which a urethral fistula just below the sphincter was complicated by a vesical fistula just above it, leaving intact the vesical sphincter ring at the internal urethral orifice, the problem was to save this important bridge of tissue with the hope of retaining its sphincter action. The bridge was so narrow that both sides of it could not be denuded and sutures passed, so the plan was adopted of denuding the margins of both vesical and urethral fistulæ, treating them as if they constituted one large fistula instead of two small ones; the urethral sphincter lying between them was not touched. The denudation was made down to the vesical and urethral mucosæ, and extended out broadly on to the vaginal mucosa, and interrupted sutures of silkworm gut were passed in an antero-posterior direction, so as to make the line of union a transverse one. The union was complete and the patient had entire control of her urine, in spite of the fact that a short circuit was made in this way from the bladder under the sphincter portion into the urethra.

Foreign Bodies in the Urethra.—Foreign bodies are but seldom found in the urethra. They arise either from a calculus escaping from the bladder and caught in the urethra, or are introduced from without through the external urethral orifice, or they are formed within the urethra itself.

In case the foreign body forms in the urethra or is lodged there from the bladder, it is quite sure to be a phosphatic calculus.

When the foreign body is introduced from without, if it remains long enough, it becomes incrusted with phosphates, and so forms a calculus. I have the specimen of a peculiar form of urethral calculus in a case in which the bladder was choked with a large ovoid stone, from one end of which a mass about 3 centimeters long and 2 centimeters in diameter projected into the urethra. The outer end is pointed, while a constriction at the upper end indi-

cates the position of the neck of the bladder. These calculi closely resemble the calculi filling the pelvis of the kidney, and projecting into the ureter.

The symptoms of a urethral calculus are frequent and difficult micturition, with alkaline urine containing mucus, pus, or blood.

The examination by the vagina reveals an enlargement in the anterior vaginal wall, somewhat movable and tender on pressure and densely hard, feeling through the thick mucous covering like cartilage. On attempting to introduce a catheter into the bladder, the point strikes against the hard substance and the diagnosis is clear.

Treatment.—The best mode of treatment, when the stone is not too large, is to extract it by the meatus in the manner proposed and practiced by Prof. A. J. C. Skene (*Diseases of the Bladder and Urethra in Women*, New York, 1878, p. 345). In one of Dr. Skene's cases the stone was lodged near the meatus; the forefinger of the left hand was introduced into the vagina and pressed above the calculus to steady it. A wire curette was passed through the meatus beyond the stone, when by traction with the curette and pressure with the finger the stone was extracted. This is not unlike the classical method of treating vesical calculi in women. In another case of a stone higher up in the urethra Prof. Skene was able to fix it firmly by pressure through the vagina so as to grasp and extract it by forceps.

In a case of Prof. F. Schatz (*Verhand. d. deutsch. Gesell. f. Gynäkol.*, II Cong., Leipzig, 1888, p. 115) a urethral stone weighing 100 grains formed around a hairpin which had escaped into the urethra in masturbation three quarters of a year before. The stone was 8 centimeters (3 inches) long, and projected well back into the bladder. The patient passed this stone spontaneously with severe straining and bleeding for two hours; she afterward suffered from incontinence. Similar to this was the case of A. Mazario (*Siebold's Jour., f. Geb. und Frauenzim. und Kinderkrankh.*, No. 7, p. 794). The patient had thrust a long sewing needle into the meatus, which penetrated the urethro-vaginal septum and was lost. A calculus formed in the wall between the vagina and urethra, which was removed by cutting down through the meatus half an inch on both sides of the tumor and pressing it out by a finger in the vagina. After removing the stone, the finger could easily be introduced through the dilated urethra into the bladder. The stone was three inches long and four inches and a quarter in greatest circumference. The patient recovered.

When the calculus is small enough to pass without injury, or when it is lodged behind the contracted external meatus, and is cylindrical or narrow and fusiform, it should be removed by simple traction and pressure, or, if necessary, by dilating and incising the meatus. Soft phosphatic calculi may be broken by crushing with forceps, and so removed piecemeal. A large stone projecting into the urethra from the bladder should be removed from the bladder by a vaginal or a suprapubic incision. In other cases it is better to extract the stone by making a longitudinal incision through the vagina into the urethra or into the urethral sac in which the stone lies.

This was done in a case of Serfioti reported by Piaseski (*Nouv. arch. d'obstet. et de gynécol.*, 1892, p. 236) .The patient, sixty-five years old, began to experience discomfort twenty-five years before, immediately after her last confinement. For three years she had suffered intensely with painful micturition, passing her urine as often as ten times daily and almost as often at night. Upon examination, 1½ centimeter from the meatus a densely hard, incompressible angular mass was felt in the anterior vaginal wall, about as big as a nut, painful on pressure, and movable. The urine contained a muco-purulent sediment. The stone lying in a pocket with a small orifice of communication with the urethra was not touched by the first sounding efforts.

An incision was made through the anterior vaginal wall 2½ centimeters (1 inch) long over the calculus, and it was extracted and the wound closed with a continuous silk suture. The calculus was pipe-shaped, the size of three little hazelnuts superimposed, and was made up of earthy phosphate. A complete recovery followed.

Urethritis.—Urethritis in woman is a disease quite common, but rarely noted, owing to the infrequent use of the endoscope by gynecologists. Moreover, many of the cases of urethritis are diagnosed symptomatically as "cystitis" or "irritation of the bladder." Inflammation of the urethra in the absence of such a local cause as a foreign body is usually due to the gonococcus, which lingers in the urethra as its seat of preference long after all traces of infection have disappeared from every other part of the genito-urinary tract. Sometimes the patient presents a history of an acute inflammation, but oftener there is no definite history of such an attack or some slight disturbance only is recalled.

Vaginitis, endocervicitis, and inflammation of the vulvo-vaginal ducts may be found coexistent with an old urethritis.

B. Tarnovski (*Vorträge über venerische Krankheiten*, Berlin, 1872) in 750 cases of gonorrhea found acute or chronic urethritis in 286, or 38 per cent. Steinschneider (*Berl. klin. Woch.*, 1887, No. 17, p. 301), in a study as to the localization of the gonorrheal infection in 34 fresh cases, found gonococci in the urethra in all of them.

The secretion may be discovered bathing the urethral orifice, or on separating the little urethral labia, or by milking the urethra from above downward, when a little purulent or brownish or bloody fluid will exude from the external orifice. This should be done before urinating, so that the secretion will not have been washed away.

The disease is particularly apt to linger in a chronic form in Skene's glands, which can be milked out by making the pressure from above downward, first on one side of the urethra and then on the other. One or two drops of thick pus will often exude from the orifice of the duct just inside the urethra, giving evidence of its source by adhering more to the side from which it was squeezed. Long after a gonorrhea is apparently well a fresh attack may start up by auto-infection from a chronic gonorrhea which has lingered in these glands.

In acute gonorrheal urethritis the symptoms are a persistent intense burning, frequent urination with pain, and sometimes a discharge of blood. Vulvitis and vaginitis may be associated with them. In the subacute form the discomforts may be transitory and not serious.

It is important in all cases to examine the urethral secretion microscopically for gonococci, and confirmatory evidence will be gained if the presence of gonococci in the cervical secretions can be demonstrated. Should they be found in the cervix and not in the urethra the evidence would still be in favor of a gonorrheal urethritis.

Fig. 201. — Concealed Abscess of Skene's Gland.

A drop of thick pus has been squeezed out of the right gland and lies upon the right labium urethræ. The orifice of the left gland is seen just inside the left labium urethræ.

The urethroscopic examination must be made in every case where the purpose of the examiner is not only to know the nature but its grade and its extent as well. The diseased conditions are found almost exclusively in the mucous and submucous tissues, and are more apt to be localized in the anterior or posterior portions of the urethra than in the middle.

In making a direct examination several precautions must be taken :

1. A small-sized speculum must be used (say a No. 8) in acute cases in order to do as little harm as possible to the mucous membrane.

2. The external meatus must be well cleansed to avoid pushing any pus on the surface up into the urethra and bladder on the end of the obturator.

3. The manipulations must all be conducted with extreme gentleness and delicacy so as to avoid producing lesions which might open up an avenue for septic invasion of the submucosa.

Acute Urethritis.—In florid gonorrhea with a pouting swollen meatus secreting abundant pus the examination may be foregone with advantage to the patient until the swelling of the mucous membrane has somewhat subsided.

If the examination is made, a strong solution of cocain should first be used to diminish the extreme sensitiveness of the mucosa, especially at the external orifice, which is swollen, red, and everted. Often here the little dilated orifices of a few glands can be seen exuding minute drops of pus. This condition is shown by the urethroscope to extend a short distance back, to be less intense about the middle, and often to assume a marked intensity again near the internal orifice. The use of the speculum always does some injury, making small fissures and producing slight hemorrhages.

Linear ulcers from 2 to 4 millimeters long and 1 millimeter broad are not rare on the inferior wall; they are painful and exhibit a yellowish area of necrosis in the center with an injected margin. The whole mucous membrane is deeply injected, and so swollen that it looks edematous, pouting into the lumen of the speculum and obliterating any distinct funnel form. Pus is seen abundantly between the mucous folds (See, v. Janovsky, *Arch. f. Dermat. und Syph.*, 1891, p. 925).

Under the name urethritis externa Guerin has described a localization of the gonorrheal process which Dr. E. Finger (*Die Blenorrhoe des Sexualorgane und ihre Complicationen*, Leipzig and Wien, 1893, p. 300) speaks of as follows: "The gonorrheal inflammation of the follicles at the orifice is either chronic, when there are no symptoms and a small amount of pus, or acute and relapsing. One or the other follicle swells, giving the urethral orifice an asymmetrical appearance, and the mucous membrane over the follicle is reddened. Soon a little point of pus appears. An abscess has formed in the follicle, and speedily opens, the pus escapes, and the follicle closes. In a short time the same thing occurs again in the same or another follicle, and so it continues for a long time.

"The only symptom of this unappreciated condition is some pain on touching the orifice. By a rupture of the abscess into the urethra and vagina simultaneously, a fistula is formed."

Chronic urethritis, the commonest form seen by the gynecologist, presents characteristic lesions easily noted through the urethroscope.

That the chronic form is a common sequel of the acute has been shown by the investigations of Finger and Janovsky (*ut supra*).

It exists in two forms:

1. The diffuse chronic urethritis is especially apt to follow on the acute form when located in the anterior part of the urethra. It is marked by small abscesses, especially involving Skene's glands, and by a diffuse chronic swelling in the anterior urethra. The funnel wall in these cases is thickened and pouts into the speculum, and the central figure may be displaced laterally. The vessels are deeply injected, giving the mucosa a livid color. The mucosa in older cases presents grayish or slate-colored patches, 2 or 3 millimeters in diameter. The disease is commonest in prostitutes.

Janovsky states that diffuse hyperplastic processes extend out on to the submucosa from the diseased Skene's glands.

2. Circumscribed chronic urethritis.—The subjective symptoms of circumscribed urethritis are mostly slight, often amounting to nothing more than an itching or burning sensation. The discharge is thin and contains but few gonococci; when the disease is localized in the glands it is known as glandular urethritis (Oberländer). Patches of deeply reddened mucosa are seen for the most part up near the internal and down near the external orifice. In these, particularly along the posterior wall, groups of yellow spots about half a millimeter in diameter are seen surrounded by a reddened area. In a more advanced stage anemic streaks of scar tissue may be seen and the tissue resists the passage of the speculum, even tearing when more pressure is made.

Treatment.—No active local treatment should be undertaken during an acute urethritis. The patient must rest in bed and receive frequent hot vaginal douches; she must bathe the parts externally with lead water and laudanum and receive a belladonna suppository (0·03 grain), or if the pain is too great an opium suppository. As soon as the acute stage has subsided, an iodoform suppository may be inserted once daily into the urethra with benefit.

The chronic form must be treated by exposing the affected areas and making applications of a 3 to 5 per cent solution of nitrate of silver at intervals of from three to five days. Skene's glands should be emptied daily by pressure from above downward on each side of the urethra. If there is a chronic diffuse inflammation about these tubules they should be laid open in the direction of the vagina, and their lining mucosa burned with a silver stick.

Ichthyol (the ichthyo-sulphate of ammonia), first employed therapeutically by Unna, in 1883, in cutaneous diseases, is now widely used as a gonococcocide, and Jadassohn vaunts its germicidal powers in a 1 per cent solution as more efficient than resorcin or permanganate of potash, already much used. It has no toxic or irritant effect, and is best used in solutions of from 1 to 10 per cent strength. Jullien (*Internat. Cong.*, Rome, 1894) uses ichthyol with remarkable effect in urethritis in the following manner: A delicate piece of metal roughened for about 8 centimeters (3 inches) of its length is wrapped in absorbent cotton, which is then soaked with an ichthyol and glycerin solution (1 to 10, or 1 to 5), and introduced into the urethra; by making pressure in various directions the folds of the urethra are effaced, the glands pressed upon, and the solution squeezed out of the cotton and brought into contact with all parts of the mucous membrane. At the same time the urethritis is under treatment gonorrhea of the vagina and cervix must be actively treated by vaginal tampons.

Suburethral Abscess.—There is a peculiar affection of the urethra about whose etiology we are still in the dark; it has been variously called "suburethral abscess," "abscess of the urethro-vaginal septum," "chronic abscess of the female urethra," "urethral urinary pocket," "urethral diverticulum," and "urethrocele." The essential features of the disease are an abscess cavity in the urethro-vaginal septum communicating with the inferior wall of the urethra. The disease presents itself as a symmetrical rounded swelling of the anterior vaginal wall beneath the urethra, varying in size from two to three centimeters in diameter. It is sometimes ovoid and as big as a hen's egg, with its longest diameter in the axis of the vagina.

The enlargement begins one or two centimeters behind the external urethral orifice, and may extend back to the base of the bladder; it is sharply circumscribed, and can, as a rule, be seen at once, filling the vaginal outlet, on separating the labia. In one case which I have seen it was situated farther back toward the neck of the bladder, and was first detected by the finger recognizing a peculiar cushiony resistance at this point. The surface of the tumor is smooth, sometimes tense, and elastic or yielding to touch. If firm pressure is made upon the tumor it diminishes in volume as the contained pus flows out of the urethra. It is extremely painful to handle. A urethroscopic examination shows a deeply congested mucosa, and on withdrawing the speculum a few drops of pus suddenly gush into its lumen as it passes a certain point, and on moving it to and fro until the exact place is fixed, and elevating the handle a little to bring the floor of the urethra into better view, a small longitudinal fissure may be seen about the middle or a little behind the middle of the urethra. A

probe passed through the speculum into this opening is felt *per vaginam* in the sac.

When the cases come into the gynecologist's hands the patients have, as a rule, been suffering for some years, and have often been treated for a long time

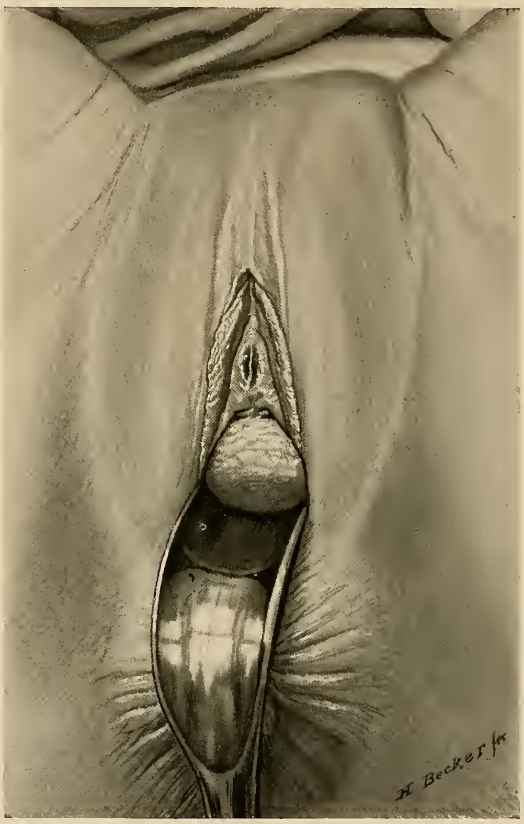


FIG. 202.—LARGE SUBURETHRAL ABSCESS OCCUPYING THE ANTERIOR VAGINAL WALL AND DISCHARGING PUS INTO THE URETHRA THROUGH A NARROW SLIT NEAR THE INTERNAL URETHRAL ORIFICE. OPERATION, JAN. 17, 1894.

for an irritable bladder. They are usually married women in the thirties, and complain of painful micturition, excessive pain in coitus, and a sense of discomfort and bearing down as if a foreign body were in the vagina. The patient herself often notices a discharge of pus from the urethra, sometimes fetid. In

urinating, Hugnier noticed first an escape of pus, then pus and urine, and finally clear urine (*Mém. de la soc. de chir. de Paris*, 1847).

Hugnier is supposed to have been the first to describe this disease, but curiously enough I have found the first real description in William Hey's *Practical Observations in Surgery*, published in Philadelphia in 1805, p. 304. Hey gives a typical history as follows: "In 1786 Anne Miller came under my care as an out patient of the General Infirmary at Leeds for a node on the tibia, which I suspected to have had a venereal origin. When she was about to be discharged cured, she informed me that she had been troubled for fifteen or sixteen years with sudden and irregular discharges of purulent matter from the vagina. These discharges, she said, were frequent, and sometimes considerable, yet she never perceived any matter to be mixed with her urine.

"Upon examination, I found a roundish tumor at the os externum, appearing to be formed by an enlargement of the bulbous part of the urethra. When the tumor was compressed pure pus issued from the urethra, yet her urine, when drawn off with a catheter, did not contain the least mixture of purulent matter. Upon introducing a bent probe into the urethra, I could easily push it to the most depending part of the tumor, and I could feel the probe distinctly by a finger introduced within the vagina.

"I divided the tumor longitudinally at a time when it was distended with matter. That part of the vagina which I cut through was not thinned by the distention, but was rather tough. The cavity of the cyst was smooth. As the opening which I had made was depending, and as the removal of any part of the cyst would have been attended with difficulty, I only filled the cavity with lint. A small artery was opened by dividing the cyst, but the hemorrhage did not continue long. This patient recovered speedily, and got quite free from the complaint."

The microscopical examination of the sac in one of my cases (L. J. P., 3095, i, 17, 1894), a nulliparous colored woman, thirty-one years old, showed on the outer vaginal surface a typical mucous membrane beneath which was connective tissue rich in oval and spindle cells, with numerous dilated blood vessels. The inner lining of the sac consisted in mucous membrane eroded in places, and beneath this were irregular aggregations of polynuclear leucocytes, and the surface was rough, with many elevations and depressions. In some of the depressions irregular oval cells with small oval nuclei were found, either in short rows or scattered without order, appearing identical with urethral epithelium.

The clinical history would appear to indicate that the sac was a urethral diverticulum probably starting in an abscess formed in one of the crypts on the floor of the urethra.

A wide distinction must be drawn between these sacs, with a small orifice of communication with the urethra, and cases of urethrocele, in which there is a bellying out of the entire posterior wall of the urethra, and vaginal cysts occupying the same position, but not sensitive, incompressible, and containing a viscid fluid. The vaginal wall is generally thinned over a vaginal cyst.

They must be distinguished, too, from a small abscess in one of the lacunæ

of Morgagni which is not large enough to produce any swelling in the vagina, or a calculus, arrested or forming in the urethra and carried in a diverticulum, recognized by its density and the sensation of a stone communicated to the probe.

Trauma due to an injury in labor, where there is an abrasion of the mucous membrane, followed by the formation of a little urinary pocket, with decomposition of the urine and inflammation, may also be mistaken for a suburethral abscess. (S. Duplay, *Poches urineuses*, *Archiv. gén. de méd.*, No. 146, 1880, p. 12.)

Treatment.—Four plans have been followed:

a. Dilating the urethra sufficient to introduce the finger and enlarge the fistula by forcing it into the sac, and so giving free exit to the accumulations.

b. A simple longitudinal, vaginal incision into the sac with a knife or cautery.

c. Exsection of an elliptical piece of the urethro-vaginal septum, including part of the sac wall, with or without suture.

d. Exsection of the entire sac and closure of the wound.

Winckel (Billroth and Luecke, *Handb. d. Frauenkrankh.*, Stuttgart, 1886, iii, p. 361) had a case which, he says, took care of itself, the patient emptying the sac frequently and using lead-water applications.

The best and simplest plan to bring immediate relief is the old one of William Hey—a longitudinal incision into the sac. After benumbing the vaginal mucosa with a 10 per cent solution of cocain, the sac is split open from end to end with a knife. The sac wall may then be painted with a strong tincture of iodine and packed with lint. The excision of an elliptical piece prevents the edges coming together and gives freer drainage. In one of my cases I split the vagina and dissected out the urethral sac with great difficulty, on account of its intimate relations with all the surrounding parts and the free bleeding throughout. I then closed the longitudinal wound under the posterior urethral wall with a series of interrupted silkworm-gut sutures. The patient recovered completely. I was not so fortunate in a second case in which union was delayed, leaving a urethro-vaginal fistula, which had to be closed by a subsequent plastic operation.

If the simple incision and drainage is not sufficient, the contracted sac can be just as well dissected out at a later date, removing a small oval piece of the vaginal wall, but taking care to leave enough tissue to close the defect left by cutting out the sac.

NEW GROWTHS FROM THE URETHRA.

The following forms of new growths have been observed in the urethra:

1. Caruncle.
2. Fibroma.
3. Carcinoma.
4. Sarcoma.

PLATE IV.

M Brodel, fec.

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DESCRIPTION OF PLATE IV.

Caruncle of urethra. The caruncle is seen as a bright red growth like a cockscomb attached to the lower margin of the urethral orifice. Note the flattening of the tumor due to the constant lateral pressure between the labia.

All of these affections are rare. Caruncle is the commonest form, cancer comes next, and fibroma and sarcoma are found with extreme rarity.

Caruncle.—Urethral caruncle, or vascular tumor of the meatus, was first described by Samuel Sharp in 1750 (*Critical Enquiry into the Present State of Surgery*, 1750, p. 168). He says: "Small excrescences may occasion violent disorders in so tender an organ as the urethra. I have seen a notable instance in the urethra of a virgin, where they grew in small quantity upon the orifice of the meatus urinarius, and for many months had produced the most excruciating torment, which continued until I had totally extirpated them."

In the same year G. B. Morgagni described a case in a post mortem examination upon a girl fifteen years old. "*Ex urethræ osculo corpusculum prominebat rubellum*" (*De Sed. et Causis Morborum, Lib. iv, de morb. Chir.*, Ep. 50, 51, first edition, Venice, 1751).

Since this time English writers in particular have devoted much attention to this affection.

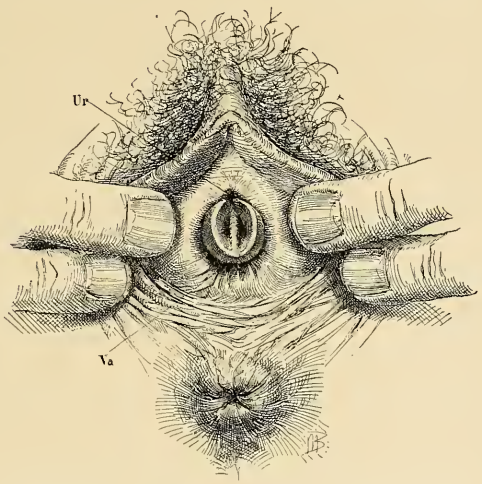


Fig. 203.—Urethral Caruncle occupying the Posterior and Lateral Margins of the Urethra (*Ur*) and lying in Front of the Vaginal Outlet (*Va*).

The growth is crescentic, and concave on its inner surface, and has a broad base with a narrow outer margin. It is smooth and glistening, slightly papillary, pink at its base, and deep red at the outer margin. Path. No. 1356. Oct. 24, 1896.

The growth is usually seated upon the external orifice of the urethra somewhere on the lower half; it is of a florid or a dusky-red color, and is attached to the margin of the urethra by a pedicle or by a broad base, which sometimes extends up into the urethral canal. The appearance varies greatly. Sometimes it is flat and rugose and but slightly elevated, and looks much like a raspberry; at other times nodose, or, as in the accompanying plate, the tumor is narrow, with a pedicle and a sharp, crenated edge, and stands out from the urethra with its long axis vertical, compressed by the labia on the sides.

Histologically the tumor is made up of connective tissue and hypertrophied papillæ, with numerous dilated vessels. It is covered with pavement epithelium. The presence of any unusual number of nerve fibers or any unusual arrangement of the nerve endings has not yet been satisfactorily demonstrated, although this statement of Sir J. Y. Simpson (*Clin. Lect. on Dis. of Women*, Phila., 1863,

p. 137) is still largely quoted: "The late Dr. John Reid once examined for me most carefully with the microscope a very sensitive and painful caruncle which I had removed from a patient, and he came to the conclusion that there was a very rich distribution of nervous filaments in it."

The clinical history of a urethral caruncle is a striking one. While some of them are painless, the majority cause exquisite pain during urination. One of Simpson's patients suffered so that she was in the habit of going some distance from the house to urinate, so that her moans and screaming might not be heard. Another patient, a young girl at puberty, would hold her water for twelve hours at a time to escape the pain of passing it, looking forward with horror to the time when the bladder must be emptied. In married women the sexual relation is often intolerable. From the site of the growth the pains radiate up through the pelvis into the bladder, vagina, and uterus, and down the thighs. The wear and tear of the extreme suffering on the nervous system is so great that the health may be completely wrecked, and the patient does little else than nurse her misery.

William Goodell (*Lessons in Gynecology*, Phila., 1879, p. 26) presents a typical picture of an extreme case—that of "a young married lady who was broken down in mind and body by her sufferings. She was peevish, morose, and melancholic, and had dysmenorrhea and every imaginable ache. Coitus had not been indulged in for months, and she had taken to her bed. Neither her medical attendant nor myself could believe that the presence of a urethral caruncle satisfactorily accounted for pale lips, hollow cheeks, sunken eyes, and for her grave mental and physical manifestations. . . . Yet after we removed the caruncle she became another woman. As if by magic, all her pains and aches, even her dysmenorrhea, left her."

When the growth is unusually vascular and its dilated vessels lie near the surface, hemorrhages are frequent and may become alarming.

The diagnosis is readily made upon separating the labia and inspecting the external genitalia, when the striking red excrescence at the urethral orifice is at once noted. If the patient is examined first by touch, the finger may reveal the seat of the suffering; but as a rule she will shrink so from the examination that the examiner will be unable to bring the finger into contact with the parts, and will be apt to be misled into concluding it is a case of vaginismus. Dysmenorrhea and ovarian disease are among the commonest mistakes made when the diagnosis is based on the patient's description of sufferings which she may be unable to locate precisely. Cystitis is also often erroneously thought to be present after the loose fashion of diagnosing diseases of the bladder in women.

The treatment must look to the complete extirpation of the growth. Anything short of its entire removal will almost certainly be followed by a return after a few months or longer.

Galvano-puncture has been used with eminent success by Dr. L. M. Sweetnam, of Toronto, Ontario. The growth is covered with a 10 per cent solution of cocain for five minutes, and then the red-hot galvanic needle is plunged into

its most prominent part down to the base from five to ten times, according to its size. This has the immediate effect of blanching it and causing it to diminish in size. The treatment is painless, and may be repeated one or more times until the entire mass has disappeared.

The use of caustics, which has been advocated in the past, is to be entirely rejected on account of the subsequent dangerous cicatricial contraction of the urethral orifice.

The removal with the knife, followed by suture, is the usual plan of treatment, but to be successful this must be thoroughly done. For a small or a pediculated tumor anesthesia is not necessary, as the parts can be sufficiently benumbed with cocain; but if the growth has a broad base or extends up into the urethra, the operation must be done more deliberately and anesthesia used. The growth is clasped in a pair of small fenestrated forceps, drawn forward, and an incision made on all sides, one or two millimeters from the base of the pedicle; then the pedicle is cut through, step by step, and the tissues approximated in the direction of least resistance with a fine continuous catgut suture, covering in the raw surface as the growth is cut away. Any large actively bleeding vessels must be tied separately with fine catgut.

Fibroma of the Urethra.—Connective-tissue growths in the urethra are rare. Judging by the few cases described they would appear to occur with greater frequency in little girls.

C. Hennig (*Jahrb. f. Kinderheilk.*, N. F., 1868, Bd. i, p. 101) notes a case in which he was called to remove a growth from the genitals of a recently born girl. It consisted of a fleshy, soft, pendulous tumor about the size and form of a lupine seed, with a pedicle 3 centimeters ($1\frac{1}{4}$ inch) long and 2 to 3 millimeters thick, and was attached to the posterior margin of the urethra; it was visible as soon as the legs were separated. The little growth was removed with scissors, with very slight bleeding.

Another case observed by the same author was that of a prematurely born girl 45 centimeters (18 inches) long. A soft rose-colored mass, 4 millimeters long and 5 by 3 millimeters thick, with a pedicle 3 millimeters in length, hung down from the right inferior margin of the urethra. This little polypoid tumor was tied with a string and cut off on the following day between the child and the ligature; there was considerable bleeding. Microscopic examination showed that the growth consisted of a whitish connective tissue in almost parallel layers frequently running into one another, so as to form numerous meshes, and provided with numerous long nuclei characteristic of connective tissue.

C. Mettenheimer (*Jahrb. f. Kinderheilk.*, N. F., Bd. vi, 1873, p. 323) reports a case similar to that of Hennig in which the little girl was six years old. He found on examination a soft, elongate, red body, compressed by the labia of both sides, secreting mucus and hanging down over the frenulum. The base of this tumor was attached to the inferior margin of the urethra and somewhat crenated. At each side of the base were two little wartlike outgrowths connected with the larger mass. The growth became markedly sensitive during

the use of local applications, and was removed with difficulty on account of the resistance of the child.

Microscopic examination showed on the surfaces several layers of pavement epithelium with markedly granular cells. The stroma of the tumor consisted of a thick connective tissue, whose fibrillæ were densely interwoven. Between the fibers were numerous fine granules. At a later date the remainder of the tumor, which was imperfectly removed at the first operation, was extirpated under chloroform narcosis.

Dr. H. Hoening, of Breslau (*Berl. klin. Wochenschr.*, 1869), reports a case of a large fibroid polyp attached to the inferior margin of the urethra, choking the vagina and projecting out beyond the vulva. I shall refer but briefly to this case, as it belongs to a group of tumors of the urethro-vaginal septum, included under urethral diseases with doubtful propriety.

The patient had noticed a year before a painless elastic swelling projecting out of the vaginal orifice, looking like a bladder, and producing a sensation of tension and occasional retention of urine. This grew rapidly and she was finally obliged to be catheterized regularly. According to her statement, a physician cut off a mass, as large as a child's head and weighing two pounds, fourteen days before she entered the gynecological clinic at Bonn.

Upon examination, a mass was found projecting from the genitals about the size of the fist, ulcerating and breaking down, and extending into and choking the vagina. It was the shape of a dumb-bell with the marked constriction under the pubic arch. At the operation the vaginal tumor was drawn outside by strong traction, when it was found attached to the anterior vaginal wall under the urethra by a short pedicle about as thick as the finger. This was cut through with scissors and the tumor removed. Some free hemorrhage was checked by ligatures. The vagina had been converted by the tumor into a large sac in its highest part, and was extensively ulcerated by pressure. The mass weighed nearly three pounds, and was 20 centimeters (8 inches) long by 9 centimeters (3½ inches) in breadth at the thickest place.

The microscopic examination was made by Prof. E. Rindfleisch, who reported that the tumor was an edematous soft fibroid without any admixture of suspicious elements.

Myoma of the Urethra.—Büttner describes (*Zeitsch. f. Geb. und Gyn.*, vol. xxviii, Part I, p. 136) a case of myoma of the urethra observed at F. Ahlfeld's clinic in Marburg in September, 1893.

The patient, forty years old, had had a sensation of pressure in the region of the urethra for a year back; four weeks before, she noticed a small tumor at the vulva, which apparently grew rapidly. There was no other disturbance produced by its presence than the frequent evacuations of the bladder.

The examination revealed an ulcerated tumor the size of a hen's egg protruding from the genitals, which was separated from the clitoris by a broad area of sound tissue; the orifice of the urethra was converted into a crescentic slit 4 to 5 centimeters wide, encircling the tumor on its under side. The anterior

part of the urethra could not be distinguished, as the tumor was attached at that point. The base of the tumor was apparently covered with a thin connective-tissue layer, and numerous reddish fibers from the sphincter muscle of the urethra. The tumor was only moderately sensitive to touch. The firm circumscribed tumor of considerable size, distinctly attached to one part of the urethra, bleeding but slightly and not breaking down or bleeding under handling, differs in these important characteristics from a carcinoma or a sarcoma of the urethra. The extirpation was made without any difficulty by catching the projecting mass with forceps and pulling it forward, and cutting around it so as to split the capsule, which was then easily pushed back much as a uterine myoma may often be shelled out of its capsule. There was scarcely any hemorrhage. The finger could be introduced into the pit in the anterior wall of the urethra at its external orifice, and back of this the finger could feel the firmly closed normal urethra. The patient made a rapid and complete recovery.

The microscopic examination showed that the tumor was made up almost entirely of the smooth muscle fibers of the urethra, with a minimal admixture of fibrous tissue.

Cancer of the Urethra.—Cancer of the urethra belongs to the rarer diseases and appears in two forms, either as a primary cancer, affecting, as a rule, at the outset the mucous surface of the urethra, or as a peri-urethral cancer.

In two cases of cancer of the epithelial surface of the urethra published by P. Reichel (*Phys.-Med. Ges.*, Würzburg, 1891, p. 48) the patients were both sixty years old, and the extensive carcinomatous affection of the entire urethra seemed to have taken its starting point at the external orifice, where the disease was most advanced.

Dr. T. G. Thomas (*Amer. Jour. of Obstetrics*, 1877, p. 114) exhibited a cancer of the urethra of a patient, twenty-nine years of age, who two months previously had noticed a pinkish discharge from the vagina, increasing until it amounted almost to hemorrhage. Upon finding a growth at the orifice of the vagina she consulted a physician, who discovered a tumor as large as an English walnut projecting from the urethra. The tumor was removed, together with the entire urethra up to the neck of the bladder, and the specimen examined by Dr. Francis Delafield was pronounced to be carcinoma. The patient recovered, and had complete control of her bladder function.

Winckel (Billroth and Luecke's *Handbuch*, 2d ed., Bd. iii, p. 381) describes two cases of primary urethral cancer. In one he was able to extirpate the isolated urethral tumor, which was 3 by 1 centimeters in size. In its center was the urethra with its mucous surface broken down and ulcerated. Close to the external orifice the vaginal mucosa bordered directly upon the whitish-gray crumbling tumor mass filled with yellowish spots. Plugs of pavement epithelium were separated from each other by bundles of muscular tissue. The tumor was separated from the vaginal epithelium by the normal vaginal mucosa containing an unusual number of leukocytes. In his second case, figured in his book (page 382), the patient had a carcinomatous urethro-vaginal fistula and a secondary cancer of the bladder.

In October, 1891, J. Schramm (*Centb. f. Gyn*, 1892, p. 236) exhibited, at the Gynecological Society of Dresden, a primary peri-urethral cancer removed from a patient fifty-six years old. The tumor was larger than a walnut, and caused incontinence. It was removed by scraping, and the surface treated with the Paquelin cautery.

In 1869 Melchiori and Riberi described five cases of peri-urethral cancer (*Schmidt's Jahrb.*, Bd. cxlvi, p. 314). They found that the peri-urethral cancer started in the vestibule close to the urethra and then developed in the cellular tissue inside the urethra, without affecting the urethral walls or mucosa. The nodules were hard and showed no signs of ulcerating at the beginning, but occasioned lancinating pain. In some cases they were ulcerated and bleeding when first discovered at a later stage of the growth.

I have myself seen two cases of secondary peri-urethral cancer. In both the urethra was converted into a small rigid tube, easily bleeding upon introducing a glass catheter into the bladder, and the patient suffered from extreme difficulty in emptying the bladder. In one of these cases the disease extended from a cancer of the labium majus down over the vestibule around the urethra; in the other, a small-celled cancer extended from the vault of the vagina down around the urethra, after an extirpation of the uterus and the upper vagina for cancer of the cervix, with metastases in the vault. The patient came back six months later, with a nodular infiltration of the rest of the vagina and an infiltration underlying the whole urethral tract, converting the urethra into a rigid tube.

Treatment.—The treatment of carcinoma of the urethra is by extirpation in all cases where the disease has not progressed so far as to make a radical procedure absolutely hopeless. The removal of the disease in its earlier stages, when it is confined to the neighborhood of the external orifice, is easy. This should be done with a knife, and the carcinomatous mass should be given a wide berth, cutting as high up in the vagina as it may be necessary. The vaginal mucosa can afterward be approximated, and the vaginal and urethral mucosa sutured together to preserve, as far as possible, the normal caliber and direction of the urethra.

Thomas's case cited above shows that with destruction of the urethra, even down to the neck of the bladder, continence may still remain.

In the case operated upon by A. F. McGill (*Lancet*, 1890, p. 966) the cancer involved two thirds of the urethra and the lower part of the bladder. It was treated as follows: The pelvis was elevated and the abdominal walls opened a half inch above the pubis by a transverse incision three inches long; a transverse incision into the bladder under this was fixed to the skin by sutures to keep the bladder from dropping away. Then putting the patient in the lithotomy position, the entire cancerous mass was removed with knife and scissors, an assistant pressing it down into the vaginal opening from above. A vaginal opening, made in the bladder by this excision large enough to admit two fingers, was closed by five sutures. On putting the patient again in the Trendelenburg position, the suspending sutures were cut and the suprapubic incision closed down to a

small orifice left for drainage. The wound in the vagina broke down, leaving a vesico-vaginal fistula; but this healed spontaneously in thirty-seven days and the patient went home wearing a urinal.

Sarcoma of Urethra.—But four cases of sarcoma of the urethra have been described, affecting the external orifice.

H. Beigel (*Die Krankh. des weiblichen Geschlechtes*, Bd. ii, Stuttgart, 1875, p. 654) cites the case in a patient, fifty years old, who suffered from pain and hemorrhages. The examination revealed a tumor made up of three vertical folds occupying the position of the urethra and projecting out so as to separate the labia majora, the whole mass being about the size of a walnut. On the 29th of Nov., 1873, the tumor was removed with scissors. The operation only occasioned a moderate amount of bleeding, which was checked by the application of chloride of iron. Beigel gives a picture of the tumor *in situ*, together with two pictures of the microscopic sections, showing that the tumor was a sarcoma.

E. Ehrendorfer describes a second case (*Centralb. f. Gyn.*, 1892, No. 17, p. 321) very like Beigel's. The patient was fifty-two years old and past the climacteric. For eighteen months she had noticed an enlargement in the neighborhood of the urethral orifice, but it gave no trouble until shortly before the examination and treatment. Her attention was first directed to the swelling by the discharge of a bloody watery fluid without any bad odor. She also suffered, as in Beigel's case, from bleeding at coitus. An examination showed the tumor projecting out over the vulva, pushing aside the labia majora and minora. The mass was made up of several deep-red, injected, rounded, and cockscomblike protuberances, divided, in general, by three deep sagittal fissures. In places there was a loss of the superficial epithelium, and a discharge of bloody fluid. Several small areas appeared edematous. The length of fold of the right side was 3 centimeters (1¼ inch); of the left and middle folds, 4 centimeters (1½ inch); the thickness varied from ½ to 2 centimeters (⅕ to ⅘ inch); and it projected from 3 to 3½ centimeters (1¼ to 1½ inch). These masses were attached to the inferior lateral margin of the external urethral orifice, and connected with some smaller masses surrounding the upper margin, so that the orifice was completely encircled and formed a distinct pedicle for the tumor. Between the larger masses hanging down from the inferior orifice and the smaller masses above, the urethral opening was easily found. There was no infiltration, and no nodules were found in the surrounding tissue. The growth was moderately resisting and elastic.

The tumor was removed, at the request of the patient without anesthesia, by grasping it and drawing it forward moderately and incising the mucous membrane just behind the pedicle on all sides with a knife. Keeping up the moderate traction, the urethral mucosa was also cut through, and the whole mass completely removed. There was a moderate amount of parenchymatous bleeding, and only one vessel was tied. The urethral and vaginal mucosa were united with catgut sutures, and a dry iodoform dressing applied. The wound did not heal by first intention, but in four weeks the patient was discharged cured.

Microscopic examination showed that the smaller tumors on section appeared like lymphatic glands made of numerous small cells poor in protoplasm. Between the crowded cells in the thin places was a fine reticulated intercellular substance, more fibrous in some places than in others. Toward the periphery appeared scattered or grouped smaller round cells (small-celled infiltration). The tissue was vascular, and a few of the larger veins were choked with blood. The vessel walls were thin without endothelium. The outer covering in the smaller tumors was made up of pavement epithelium, wanting in places, where it was replaced by flat granulations. The larger masses consist in their deep portions of the same crowded round cells found in the small tumors. More superficially, however, there was a firmer, large-meshed stroma poor in round cells. In places the pavement epithelium was made up of many layers, and showed no atypical penetration into the depths of the mass. At no place was there any gland or glandlike outgrowth. With reference to the lymphoid cells poor in protoplasm, disposed partly in a network and partly in bands between intercellular substance without epithelioid character, and without alveolar arrangement, it is evident that the tumor was a small, round-celled sarcoma, closely resembling fresh granulation tissue. Free pigment found in places was evidently due to interstitial hemorrhages or blood-corpuscle columns.

Galabin (*Trans. London Obst. Soc.*, vol. xxxviii) also reports a case of "myxosarcoma of the urethra in a child."

The patient, a little girl three years old, was first admitted to the medical ward of the hospital, but, on account of hematuria, was transferred to the gynecological division. On examination a tumor was found between the labia extending from a dilated urethra. This tumor measured about three inches in both principal diameters, and the surface was bright red and lobulated. The growth was removed with the galvano-cautery, and after removal the urethra was found dilated enough to allow a finger to be introduced. The child died soon after leaving the hospital. Microscopical examination showed the tumor to be a round-celled sarcoma, myxomatous in places.

A case of melano-sarcoma of the urethra occurring in a single woman, aged sixty-four, is reported by Dr. C. A. L. Reed, of Cincinnati (*Amer. Jour. of Obs.*, Dec., 1896, p. 864).

The patient discovered the tumor herself some months previous to the examination upon suffering pain and noticing blood in the urine. After this there was a more or less constant pinkish discharge. At the examination a black, lobulated, eroded mass about 3 centimeters in diameter was found separating the labia, with the urethra in its center.

Almost the entire urethra was removed with the growth, in spite of which the patient was able to retain her urine, and made an excellent recovery as far as the local condition was concerned. She died six months and a half later with a large nodular tumor filling the abdomen above the navel.

Microscopical examination of the urethral tumor showed it to be a typical melano-sarcoma.

AFFECTIONS OF THE BLADDER.

Affections of the bladder may in general be classified as:

1. Those originating in some part of the bladder wall itself.
2. Those connected with its functional activity.
3. Those due to the extension of disease from some other organ.

The bladder is a thin-walled musculo-membranous sac, imbedded in connective tissue, and partly covered by peritoneum, and any disease originating in it must first involve one of the component layers of its walls, either the mucous, the muscular, the fibrous, or the peritoneal coats. The list of such purely local affections is short; we may have, for example, an inflammation of the mucosa, cancer of the mucosa, or myoma and fibroma of the muscular and fibrous layers. No disease limited to the small area of its peritoneal covering has as yet been observed. The physiological activity of the bladder as a recipient of the urine, as a reservoir, and as a d e t r u s o r u r i n æ, render it liable to certain diseases depending upon pathological conditions of the urine.

Stones are formed in the bladder from nuclei which may be either transferred from the kidney or may originate in the bladder *de novo*. The bladder is also often inoculated by bacilli brought down to it from a tuberculous kidney. When there is an obstruction to the outflow of the urine the bladder walls become either abnormally thin or hypertrophied.

The topographical relations of the bladder, its continuity and contiguity with neighboring structures, are a fruitful source of secondary affections. A conspicuous example of this sort is the cystitis following upon a gonorrheal urethritis. The peritoneal covering is also often involved in any extensive pelvic peritonitis, and the bladder then forms adhesions to the uterus, to ovarian and tubal tumors, and even to the rectum. I have often seen these adhesions between the bowel and bladder so extensive as to bury the uterus completely out of sight.

When we come to look over the list of the diseases which are due to contiguity of tissue we find the bladder liable to participate in a variety of vaginal, uterine, tubal, and ovarian affections. As each of these organs exhibits a well-defined tendency toward certain peculiar affections, and only a limited portion of the bladder lies in contact with it, certain areas of the organ are also in this way rendered more susceptible to particular affections, which are distinctly regional in character. A conspicuous example is the fistulous communication between the vagina and the base of the bladder. Again, that portion of the bladder which touches the cervix is apt to be invaded by a cancerous disease extending from the uterus; ovarian and tubal abscesses may break through the broad ligament into the bladder posteriorly in the neighborhood of the vesical cornua.

The d i a g n o s i s of diseases of the bladder is made—

First, by careful study of the history and the symptomatology.

Second, by urinalysis.

Third, by a direct examination, by palpation, and inspection of every part of the illuminated inner surface under simple atmospheric distention in the way described.

With the new and easy methods of diagnosis which at once separate the simpler from the graver cases, and the localized from the diffuse affections, rational plans of treatment may now readily be adopted, superseding the older ways.

First, topical applications can be made over small areas under direct inspection, even using strong caustic solutions, which would be dangerous if applied to the whole interior of the bladder.

Second, irrigation with medicated solutions is valuable in extensive affections involving almost its entire inner surface.

Third, ointments can be applied to the mucosa by inflating a rubber balloon.

Fourth, the snare and other instruments can be used to remove pediculated growths.

Fifth, diseased areas can be excised, and sound tissues brought together by sutures.

Classification of Diseases.—It is important in taking up diseases of the bladder in women to avoid the old error of transferring to this field the clinical observations gathered in the study of the vesical diseases of men, for both the symptomatology and the frequency of the various diseases differ vastly in the two sexes. Many of the vesical diseases of women are entirely different from those in men, and the modes of treatment should be different also, on account of the different anatomical relations.

Diseases of the bladder in women may be classified as—

1. Congenital defects.
2. Displacements, with alterations in form and capacity.
3. Neuroses.
4. Foreign bodies.
5. Traumatic affections.
6. Inflammatory affections.
7. Neoplasms, benign and malignant.

Congenital defects of the bladder are but rarely seen. They are (a) double bladder, (b) loculate bladder, (c) exstrophy.

Double Bladder.—This anomaly is due to the want of fusion between the right and left parts of the allantois in early fetal life. Only a few cases are known to have occurred; the first is the observation of Gerard Blasius (*Observ. Medicæ Rariores*, Amsterdam, 1700, p. 59), in which a complete double bladder was found in an adult; his account of it occurs in his nineteenth observation, entitled "Another Example of Double Bladder." "At the post mortem of a man who died of phthisis in 1657 the outside of the bladder had a longitudinal depression extending throughout its length, and when the bladder was laid open a thick membranous septum was found completely dividing it into two cavities and extending down to the orifice of the single urethra, into which each cavity opened. Each of these cavities had but one ureter."

A similar case occurred in the practice of Dr. Alan P. Smith, of Baltimore, to whom the patient came for a stone in the bladder (see *Trans. Med. and Chir. Faculty, State of Maryland*, 1878, p. 91).

The patient was a middle-aged man with a double penis, separated by a deep sulcus above, below closely united; on the right side there was a normal urethra beginning at the extremity of the glans; on the left side the urethral orifice was found just in advance of the scrotum; in front of this the organ was perfectly solid. On the surface of the organ and midway between the umbilicus and the pubis was an irregular smooth patch with a slightly concave surface not covered by true skin, formed by the wall of a partly extroverted bladder. The scrotum was normal and contained two normal testes. The patient urinated at will from the right or the left ureter, and doing this in presence of the doctor, he first discharged a quantity of clear amber-colored, healthy urine from the right side, and then immediately afterward emptied the left side into a separate vessel, discharging ammoniacal urine, turbid with mucus and pus. The left urethral orifice was dilated and the stone removed from the bladder, after which the patient recovered.

Several similar cases have been observed in young children, respectively fifteen days, two months, and twelve hours old, by I. Cattier. S. T. von Soemmering (v. Winckel, Billroth and Luecke's *Handbuch*, iii, p. 407), and F. Schatz (*Archiv f. Gyn.*, No. 1).

Cattier's case is clearly told (see Petri Borelli, etc., *Centuriæ iv. Accesserunt D. I. Cattier Obs. Med. rarœ, Parisiis*, 1657, Obs. xx, p. 76). "An infant monstrosity with double urinary bladder and misplaced rectum and uterus. The aforesaid D. Rousseau related to me that he was called to open a cadaver of a child fifteen days old, in which he noted many abnormal things; for example, there were two bladders in the hypogastrium, separated by the breadth of a finger, into each of which one ureter passed directly."

Dr. Futh, of Metz, describes a case of double bladder (*Central. f. Gyn.*, 1894, No. 14) in a boy of four months. The bladder was divided by a septum into right and left halves communicating by means of a small opening 5 millimeters in diameter at the apex of the trigonum. A single ureter opened into each half. The urine of the right side was obliged to pass through the opening in the septum in order to escape. There was also a separation of the symphysis, ventral hernia, and adhesions between the bladder and the rectum, as well as a lengthened meso-sigmoid.

Partial division of the bladder by septa extending a short distance into its lumen in the median line are not so rare.

Loculate Bladder.—Congenital loculi or diverticula forming smaller or larger pockets projecting like bosses on the outer surface of the bladder are not so rare. They are undoubtedly due to a defective development of the muscular wall of the bladder, allowing a part of the mucosa to be forced out between the bundles of muscles during the contraction. These anomalies are liable to be confounded with similar pockets which are the result of inflammatory diseases, and which not infrequently lodge calculi. They were also mistaken by the

earlier observers for supernumerary bladders. A. Molinetti, for example, describes a woman with five urinary bladders (*Dissertationes Anatomico-Pathologicæ*).

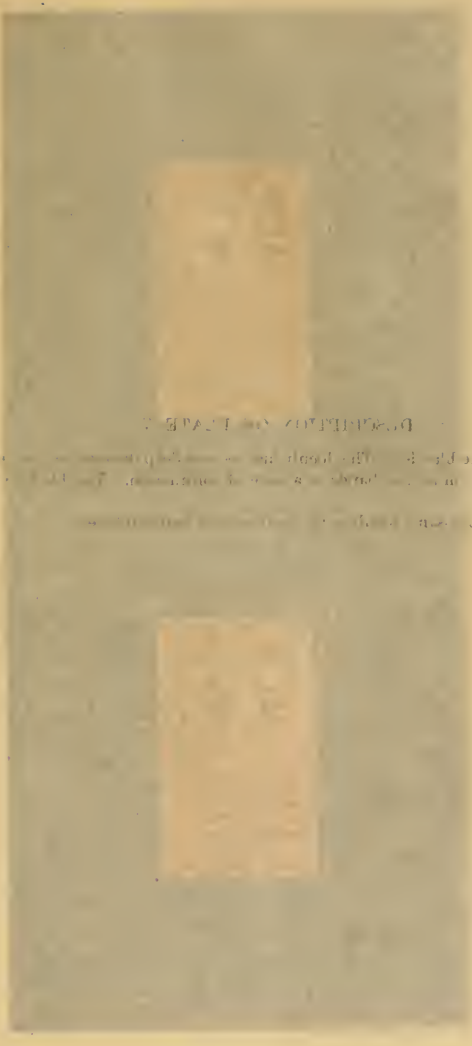
Blasius, too, just quoted, mistook such a case for a double bladder. In 1670 he examined a man of thirty, whose bladder just back of the urethra corresponded in all respects to a natural organ, but in its upper part, communicating by an extremely fine opening, was found a second bladder of less capacity. The relation of the two parts is clearly shown in his work on Plate 6, Fig. 11.

I have found two cases of loculate bladder in the course of my cystoscopic examinations in women. In the first there was an opening in the right wall of the bladder 1 centimeter in diameter, leading into a basin-shaped cavity a centimeter in depth, situated above and posterior to the ureteral orifice, and near enough to it to be mistaken at first sight for a large ureteral opening. While under observation the bladder contracted rhythmically, throwing the mucosa into numerous folds. With each contraction the oval opening into the diverticulum closed down smaller and narrower, until nothing was left of it except a fine line, with finer lines radiating out from it into the surrounding mucosa.

In another case a number of these loculi were seen in the posterior wall of the bladder in front of the broad ligaments, where its walls were almost cribriform. The pits appeared to be formed by long muscular bundles elevated 2 or 3 millimeters above the surrounding surface, and crossing one another in various directions. The mucous lining of the bladder, passing over and dipping down between these bundles, formed a number of narrow oval pits from 3 to 8 to 10 millimeters in diameter. The larger of these pits varied in size and form according as the muscular fibers were contracted or relaxed. This condition requires no treatment, but demands recognition on account of the liability of small stones to lodge in the pits and the possibility of mistaking it for the result of an inflammatory process. Loculate bladder may be readily distinguished from the pits left by inflammation by the absence of whitish scar tissue, which differs both in appearance and in touch, as tested by the end of the searcher, from the normal mucous surface. Scar tissue is firm and resisting, while the mucosa is soft and yielding.

Exstrophy of the Bladder.—Exstrophy, or eversion of the bladder, from a fissure or defect in its anterior wall, is much commoner in the male than in the female. This defect is due to a failure of the abdominal laminæ to unite in early fetal life, and is analogous to a harelip.

Less degrees of the same defect are more frequently found, such as a superficial furrow in the abdominal wall, dividing the clitoris into right and left halves and separating the labia. A narrow furrow over the symphysis, extending up over the anterior abdominal wall to the umbilicus, is also an indication of a fissure just avoided. The failure of the urachus to close high up leaves a vesico-umbilical fistula, through which the urine escapes; again, instead of a



DESCRIPTION OF PLATE V.

FIG. 1.—Loculate bladder. The loculi are seen as deep depressions in the bladder wall surrounded by muscular bands in a state of contraction. The bladder mucosa is apparently normal.

FIG. 2.—Shows the same loculi with the muscular bands relaxed.

PLATE V.

Fig 1.

Fig 2.

M. Brödel, fec

Lith. L. Prang & Co. Boston, U.S.A

fistula, we may have a fissure into the upper part of the bladder, exposing its mucous surface; and when the defect is still more extensive the fissure is lower down, and, in extreme cases, the whole anterior bladder wall is wanting. When the fissure involves the whole anterior wall of the bladder the symphysis pubis is invariably wanting too, and the right and left pubic rami are simply connected by a fibrous band from 1 to 8 centimeters ($\frac{2}{5}$ to 3 inches) long.

An admirable description of the appearance of the parts is given by Dr. J. J. Schneider (Siebold's *Journal f. Geburtsh.*, etc., Bd. xii, 1832, p. 279). The navel is displaced downward, and sometimes all evidence of its presence is wanting. The recti muscles are widely separated, and a thin membrane between them covers in the abdominal cavity. Low down in the pubic region a rounded mass appears just above the position of the vaginal orifice, the size of a nut or a fist, with its transverse diameter greater than the vertical; its color varies from pale rose to dark red and liverlike. The surface is irregular and wrinkled, or granular and indurated in patches; in fact, the whole external bladder looks like a spongy mass of excoriated flesh. The parts are covered with slime and constantly wet with odorous urine. In children the sensitiveness is generally extreme. The ureters are seen each opening upon the surface of this mass, sometimes between mucous folds, sometimes on the apex of a marked elevation. The orifices discharge jets of urine at intervals, often projecting it a foot from the body. A sound carried into the ureter passes up to the kidney; and frequently a catheter may show a marked dilatation of the ureter above its vesical orifice. In girls the urethra is generally wanting. There may also be an atresia of the vagina and incomplete development of the uterus. Many of these cases are in other respects so malformed and puny that they are born only to die in early childhood; still a number have lived to old age, and several cases of pregnancy under these conditions have been observed.

C. C. T. Litzmann (*Archiv f. Gyn.*, Bd. v) and A. Gusserow (*Berl. klin. Wochenschr.*, 1879, No 2) have studied with especial care the abnormal mechanism of labor, with separated symphysis, and without abdominal pressure. In Gusserow's case a dead child in foot presentation had to be extracted on account of the inability of the mother to complete the labor without the assistance of the abdominal muscles.

In a case of a girl of fifteen (G. T., No. 3869, October 14, 1895) the pubic bones were separated 4 centimeters with a thin, sharp-edged fibrous band between them; above this there had been a total defect of the anterior bladder wall, covered in by inverted flaps of skin taken from the sides, and so adapted as to leave only a small orifice open just above the fibrous band, through which all the urine escaped. By a rectal examination I found an infantile uterus and small ovaries, and on making a cystoscopic examination through the orifice left between the flaps two little oval openings representing a double hymen were discovered on the posterior wall of the bladder; a sound passed through them led up to the cervix uteri.

An exstrophied bladder may become carcinomatous, as shown in Fig. 204.

Treatment.—Success in the treatment of exstrophy will vary according to the extent and position of the defect. Where the opening is high up and not accompanied by any defect in the genitals and lower part of the urinary ap-

Fig. 204.—Exstrophy of the Bladder converted into a Carcinomatous Mass.

Catheters mark the ureteral orifices. The labia majora are widely separated and covered with sparse hairs; between the labia and below the bladder lie the separated halves of the clitoris, with the divided nymphæ to right and left. The vaginal orifice is marked by a transverse slit between the halves of the clitoris. 5/6 nat. size.

paratus, a cure may be effected by a careful funnel-shaped denudation around the opening and side-to-side approximation with silk or silkworm-gut sutures. If the urethra is normal and there is no obstruction to the escape of urine by

this avenue, this simple plastic operation, analogous to that done for vesico-vaginal fistula, ought always to succeed. Where the defect is extensive and a urethra is absent a complete cure is unattainable. The best that can be done is to cover and protect the raw mucous surfaces with flaps from the neighboring skin, reducing at the same time the size of the orifice through which the urine discharges. The operator would better avoid turning the skin surface in, on account of the urinary incrustations which are likely to form on the hairs and keep up a constant irritation. Where a urethra is wanting, no satisfactory substitute for its function can be formed.

For closing in the defect in the abdominal wall the following plans have been successfully tried:

First, by taking three skin flaps from the sides of the opening, one above, and one from each side, leaving them attached by a broad pedicle; the flaps must be large enough to allow for a decided subsequent contraction. They are brought across the orifice and sewed together accurately, closing the defect.

Billroth's plan of treating exstrophy is to loosen up two broad lateral flaps left attached both above and below. These flaps are dissected loose by cutting down to the fibrous aponeurosis overlying the recti, so as to be sure to have enough thickness of tissue to preserve their vitality; then, in about two weeks, when the under surface is freely granulating, they are drawn together and united in the median line over the bladder. If the flaps are made broad enough, it is, as a rule, not necessary to close the openings left at the side, for in five or six weeks they will close of themselves. No attempt is made to close the fistula left above at the navel until after the artificial urethra has been made; then the umbilical fistula is closed by denudation and suture.

Displacements and Alterations in Form and Capacity of the Bladder.—The bladder in women is liable to a remarkable series of peculiar displacements and alterations of form in its effort to carry out the function of a urinary reservoir in spite of a variety of hindrances.

In determining the existence and extent of such abnormalities, the normal conditions must be borne in mind as the sole standard of comparison, and it must not be forgotten that while the male bladder is more or less spherical and has its greatest diameter in the antero-posterior direction, the greatest diameter in the female bladder in moderate distention is transverse, owing to the increased resistance to its expansion backward furnished by the uterus and broad ligaments.

The uterus lying in normal anteposition forms an indentation in the median line of the distended bladder, which can be touched and recognized by a sound introduced through the urethra. The physiological peculiarity in the form of the female bladder disappears after the removal of the uterus, and the male type is assumed with its greatest expansion from before backward.

In marked distention the female bladder rises into the abdomen and has its greatest diameter vertically, when the vault of the bladder may even reach the umbilicus and the distended organ appear like a large monocystic tumor springing from the pelvis. A case of this kind was brought several hundred miles to

see me, expecting an operation for an abdominal tumor. The tumor collapsed as soon as a catheter was introduced, and a large basin of ammoniacal urine was withdrawn.

In another case, by palpation, percussion, and bimanual examination, a monocystic pelvic tumor, rising well up into the abdomen, had been demonstrated, and the patient was brought under anesthesia for operation. Upon passing a catheter, a large amount of limpid urine was discharged and the tumor immediately collapsed.

The distention of the bladder may also take place markedly to the right or to the left side, giving it a gibbous form and making it more liable to be mistaken for a fluctuating tumor connected with the broad ligament. This obliquity of form can be easily demonstrated by passing a sound, which goes in 10 or 11 centimeters outward and backward on one side and but 6 or 7 centimeters on the other. These lateral obliquities are produced by any obstacle to expansion, such as an inflammatory mass or a tumor fixing one broad ligament.

An upward displacement of the bladder not associated with distention is noted in numerous cases in which a large uterus fills the pelvis and the lower abdomen. The most frequent cause of this form of displacement is a fibroid uterus in which both the cervical and fundal ends are involved; the top of the bladder may even come to lie on a level with the umbilicus flattened out on the anterior face of the tumor mass. The simple choking of the pelvis by a mass is sufficient to force the distending bladder up into the abdomen. Among a large number of such cases of upward distention I have seen but one where there was a great hypertrophy of the bladder walls. In cases of upward displacement a moderate amount of fluid in the bladder is often visible to the eye, forming a cushiony prominence on the tumor above the symphysis, fluctuating on palpation.

Downward displacement of the bladder is found in cases with a weak pelvic floor, with relaxed outlet, or where the intra-abdominal pressure is excessive. This displacement is also found in extreme prolapse of the rectum, drawing the posterior vaginal wall well into the sac, and dragging the uterus and the anterior vaginal wall down with it. Where there is a gaping vaginal outlet, the base of the bladder pouts into it as a soft, round, ovoid prominence, yielding to touch, and easily displaced by pressure; the swelling diminishes when the bladder is emptied and returns again as soon as it is distended with urine, or when the patient stands on her feet and the intra-abdominal pressure is exerted. This form of displacement is appropriately called "a cystocele."

Pari passu with the displacement of a prolapsed uterus, that part of the bladder which is attached to the anterior vaginal wall and the lower part of the uterus is likewise displaced, escaping with the vagina and the uterus outside of the pelvis (see Chapter XV). A part of the bladder remains within the abdomen and a part in the prolapsed sac; in this way the organ assumes the form of an hourglass. The entire bladder is rarely found within the prolapsed sac, and even then any marked degree of distention must take place into the pelvis.

In rare cases the bladder becomes completely detached from the vaginal wall and uterus in prolapsus and remains entirely inside the pelvis.

I reported a case of this kind (*Johns Hopk. Hosp. Rep. on Gynecology*, vol. ii, 1892, p. 311) where a large prolapsed sac lay between the thighs, and in front of and behind the uterus were masses of intestines (anterior and posterior enterocele), while the bladder, completely detached from its vaginal and uterine detachments, lay within the pelvis.

Eversion of the bladder through a dilated urethra is the most unusual form of displacement. In eversion both mucous and muscular layers are involved, and the tumor appears between the labia as an ovoid red mass covered with furrows. A careful examination of the under surface may show the presence of the ureteral orifices. The causes of the eversion are an increased intra-abdominal pressure, associated simultaneously with a relaxation of the bladder wall and dilatation of the internal urethral orifice. That part of the bladder which lies opposite to the internal urethral orifice, the posterior pole, is first engaged, and, under the influence of straining efforts, forced down through the urethra, dragging more and more of the viscus with it until the whole organ is turned inside out. Eversion is observed oftener in young children and in the aged.

The bladder may also be displaced by being drawn into the inguinal and femoral canals, and even through the foramen ovale with herniæ.

Diagnosis.—The diagnosis of the form of displacement of the bladder in any given case is not difficult. After distention with fluid a bimanual palpation will outline the different parts, and by means of a graduated sound introduced *per urethram*, measurements made in various directions will determine the exact form.

The diagnosis of an eversion of the vesical mucosa must be made under anesthesia by carefully examining the tumor protruding from the dilated urethra, and if a sound is passed through the urethral canal, the bladder cavity is found to be absent and the pedicle of the tumor at the internal urethral orifice. On pushing back this mass, the bladder cavity is restored, and, if the urethra is sufficiently dilated, by introducing a finger, the absence of any tumor is demonstrated.

Treatment.—The treatment of the various displacements of the bladder often resolves itself into the treatment of the associated conditions which have caused the displacement. By removing ovarian tumors choking the pelvis, and inflammatory masses lateral to the uterus, the free distention of the bladder within the pelvis once more becomes possible. By removing a fibroid uterus the bladder is let down to its normal pelvic position.

Other displacements are treated by repairing the relaxed vaginal outlet so as to lift up the pelvic floor and give an adequate support to the anterior vaginal wall; I rarely find it necessary, as was the custom ten years ago, to operate upon the cystocele itself. In prolapse of the uterus the bladder is restored to its normal position by the operations upon the uterus and the pelvic floor, retaining the uterus in its normal position.

In treating eversion we must, in the first place, put the bladder back into its normal place by elevating the pelvis in the knee-breast posture; with gentle compression and manipulation the tumor may now be forced back into the pelvis. The patient should then be kept in bed, with the foot of the bed elevated, to reduce the pressure on the pelvic viscera. If the displacement persists in returning, a plastic operation may be performed, narrowing the urethra by placing a catheter in its canal as a guide for the size of a new urethra to be formed, and then excising a wedge-shaped piece with its base on the vaginal surface extending through to the urethral mucosa. The denuded surfaces are then brought together by interrupted sutures passed from side to side.

Foreign Bodies in the Bladder. – A variety of foreign bodies are found in the bladder. They either form in the bladder itself, as in the case of vesical calculi, or they may reach the bladder from the exterior, either by perforating its walls, or by descending a ureter into the bladder, or by being introduced through the urethra.

The commonest foreign bodies are calculi, formed of incrustations of phosphates and urates. Small oxalic acid and uric acid calculi may descend from the kidney and lodge in the bladder, and grow there to a large size by the accretion of phosphates and urates.

Foreign bodies may also enter the bladder from the side of the peritoneum, the tubes, or the ovaries, as well as from the vagina. In this way echinococci have ruptured into its cavity; silk ligatures about the pedicle of an ovarian tumor have ulcerated through its walls; dermoid cysts have opened and discharged quantities of hair by the bladder; and the bones of an extra-uterine fetus have also found an exit in the same way. The commonest foreign body which makes its way into the bladder from the vagina is a pessary, usually of large size, which has ulcerated through the vesico-vaginal septum.

By the urethra a large variety of foreign bodies have been introduced; these are usually several inches long, and of a caliber somewhat smaller than the urethra. The commonest object is a bit of a catheter broken off or an entire catheter which has slipped out of the fingers and so entered. Other articles which have been found have been introduced by the patient herself, such as hairpins, toothpicks, crochet needles, etc.

The symptoms produced are at first those of irritation of the bladder, followed later by inflammation.

The patient complains of a suprapubic pain and a frequent desire to urinate; the urine becomes cloudy, and pus soon appears. In a few weeks the foreign body becomes incrusted with urine salts, and the symptoms of cystitis become more urgent and the distress increases.

A small foreign body, such as a renal calculus, may only lodge temporarily, and with its spontaneous escape by the urethra the symptoms cease.

Bodies of an elongate form will, if large enough to put the bladder walls on the stretch, ulcerate through either into the vagina or into the peritoneum, in the latter case producing a rapidly fatal peritonitis.

Diagnosis.—The presence of a foreign body in the bladder may be determined either by touch or by inspection. If the body is long, or is of large size, it may often be easily felt bimanually by palpating the emptied bladder between two fingers in the vagina and the hand pressing down over the symphysis. Upon passing a sound into the bladder the presence of the foreign body may also be demonstrated by the sense of contact with a hard body, as well as by the audible click produced upon striking it.

The simplest and surest way to make a diagnosis is by inspection. The patient is put in the knee-breast position and the vesical speculum introduced, and the bladder, distended with air, is then easily examined in all its parts as already described. If there is any foreign body present which is not wedged in between the bladder walls it will drop into the most dependent part, where it is most easily seen. By means of inspection the diagnosis of the absence or presence of a foreign body can be made with certainty; by this means also its form and position are noted, together with any alterations produced in the bladder walls by its presence.

Treatment.—The treatment in every case is directed to the speedy removal of the foreign body. There are three ways of doing this: (1) Through the intact urethra, (2) through an incision in the bladder walls made through the vagina, and (3) through a suprapubic incision.

1. A small foreign body not more than 10 or 15 millimeters in diameter and a long narrow body, such as a needle or a glass catheter, may be removed through the vesical speculum. The bladder being empty, the speculum is introduced in the knee-breast position, and the object exposed. If it is a small round object it may be picked up by the mouse-toothed forceps and simply lifted out through the speculum, or it may be caught in a scoop and held against the end of the speculum, and withdrawn together with the speculum.

A long body like a glass catheter may be removed by introducing a straight instrument, such as a searcher, into its open end, and then manipulating the end of the speculum until the catheter slips into it; then by pushing the speculum well down on the catheter engaged in this way, its end can be easily caught and withdrawn.

The older writers were wont to try to deliver a calculus through the urethra by catching it between the fingers of one hand in the vagina, or in a virgin in the rectum, and the other hand pressing down above the symphysis, and so forcing it into the urethra and on out.

I succeeded in July, 1895, in removing a glass catheter in this way. The patient was a young woman, about twenty-three years old, with a spherical myomatous uterus filling the pelvis and reaching up to the umbilicus. She had been suffering from retention of urine, and as her physician introduced a glass catheter 13 centimeters (5 inches) long into the overdistended bladder, it slipped out of his fingers and was lost in the bladder. When I examined her I found the myoma and a long rigid body in front of it, with its blunt end projecting into the anterior vaginal wall to the right and its upper rounded end pressing upward directly under the anterior abdominal wall, 4 centimeters below the um-

bilicus. The hymen was relaxed, so that by careful manipulation with two fingers in the vagina I was able to push up the lower end of the catheter while pushing the upper end to the right; by doing this I brought the end into the urethra, when it descended at once, and escaped with a quantity of bloody urine. The patient suffered no further inconvenience from its twenty-four hours' stay in her bladder.

Bodies from 10 to 20 millimeters in diameter may be removed through the urethra after dilating it. Simon has shown that even after a dilatation of 20 centimeters incontinence does not occur if it is carefully done. Two postero-lateral incisions, 2 or 3 millimeters deep, must be made into the external urethral orifice to avoid tearing it when the dilatation is carried up to 20 millimeters or near it; the rest of the urethra, which is more elastic, is then enlarged by a series of successive dilators up to the required size, and the foreign object is either removed through one of the larger specula or grasped by a pair of small stone forceps introduced through the urethra and so withdrawn. The lateral incisions in the urethral orifice are then closed with fine catgut sutures.

Calculi, like other foreign bodies, may be removed either (1) by the urethra, (2) by vaginal incision, (3) by suprapubic incision, or (4) by crushing with the lithotrite.

Stones from 2 to 3 centimeters in diameter should be crushed by means of an instrument introduced through the urethra. If the bladder is first moderately distended with water and a lithotrite inserted, the stone is readily caught in the open beak of the instrument and broken up, and the pieces afterward removed through a speculum from the bladder distended with air.

Dr. H. J. Bigelow's apparatus for litholapaxy, which has served so well in men to reduce the number of cutting operations, by both crushing and washing out the bits of stone, is also available and even easier of application in women, although it has never been widely used on account of the great simplicity of the older operation through the short urethra.

Dr. E. T. Caswell, of Providence, R. I., reported a case (*Med. News*, Aug. 26, 1882) in which he crushed a phosphatic stone weighing, when dried, 100 grains. He used a modified Thompson's fenestrated lithotrite, and washed the fragments out through a straight tube (28 French).

Dr. D. F. Keegan (*Lancet*, Jan. 9, 1897) in an instructive article on *Litholapaxy in Girls and Women*, reports eighteen cases of calculi occurring in women, where he used the lithotrite with success. The calculi were of different varieties—namely, phosphatic, oxalate of lime, and uric acid; the smallest weighed 72 grains and the largest 702 grains. The average length of stay in the hospital was only 5·3 days.

Although nature and art have succeeded in removing stones of large size by the urethra without any diminution of their volume, this is a hazardous procedure, and ought not to be imitated, on account of the imminent risk of a permanent incontinence following.

An extreme case of this sort is reported by Dr. Alex. Dunlap, of Springfield, Ohio (*Amer. Jour. of Obst.*, vol. xiv, p. 853); upon examining the patient, who

was twenty-eight years old, he found a large stone 2 by 2⅛ by 1½ inches in diameter in the bladder; she would not allow any cutting operation to be done, so he caught the stone with a pair of forceps introduced through the urethra, and delivered it slowly by traction. The external meatus was the most resistant portion, but he succeeded in working it through in about three quarters of an hour, by pressing back the tissues over the stone much as an obstetrician may try to help the perineum back over the advancing head of the child. The stone was rough on one side and tore the mucous membrane of the canal considerably; this produced a sharp venous hemorrhage of short duration. In spite of this enormous dilatation, she suffered no serious inconvenience, although unable to hold her water as long as before.

2. The vaginal incision is to be preferred for stones which are so large that they can not safely be removed through the urethra, and is adapted to all but the largest calculi.

The operation may best be conducted with the patient lying in the left semiprone position, with the posterior vaginal wall well retracted, so as to expose clearly the entire extent of the anterior wall from cervix to urethra. A blunt instrument like a male sound is now introduced through the urethra into the bladder, and the vaginal wall is pushed forward in the median line and cut through, opening the bladder; the incision is now extended by drawing apart the edges of the wound and cutting back toward the cervix and forward toward the neck of the bladder until it is large enough to permit the introduction of the blades of a pair of stone forceps, which are used to grasp the stone by its smallest diameter and draw it out through the wound endwise, without laceration of the tissues.

The incision must then be accurately closed with interrupted sutures either of fine silk or silkworm gut. If the bladder is then drained for five or six days the clean-cut vaginal wound ought to heal promptly, leaving no fistula behind. It is best to close the wound at once in this way, although even large wounds may heal spontaneously. Such a case is the one of Dr. F. R. Eccles, of London, Ontario, figured in the text. The patient introduced a hairpin into the urethra and it escaped into the bladder. She married soon after, and at her confinement a large foreign body was felt in the way of the head as it descended; it was pushed up, however, and the labor proceeded normally. Dr. Eccles was called in later and removed the hairpin, incrusted with large, fused twin calculi through an incision in the anterior vaginal wall. No sutures were used to close the wound, which healed spontaneously within five weeks.

3. The suprapubic operation for the removal of calculi (*sectio alta*) is best adapted to those of the largest size, filling the bladder. It is especially suitable for children, where the vaginal route is not available.

After distending the bladder with water, a vertical incision 6 to 8 centimeters long is made in the middle line just above the symphysis, separating the recti and the pyramidales muscles, and pushing aside the fat underlying them, but taking care not to cut the peritoneum. In this way the bladder is exposed and its wall cut through vertically and the stone extracted. The incision in the

bladder wall is now closed with fine interrupted catgut sutures placed close together and embracing the entire thickness of the wall down to but not including the mucosa. The incision in the abdominal wall is then closed with bnried silver wire for the muscles and fascia and catgut for the skin. Then, if the bladder is kept well drained for a week, the wound in its vault will heal by first intention.

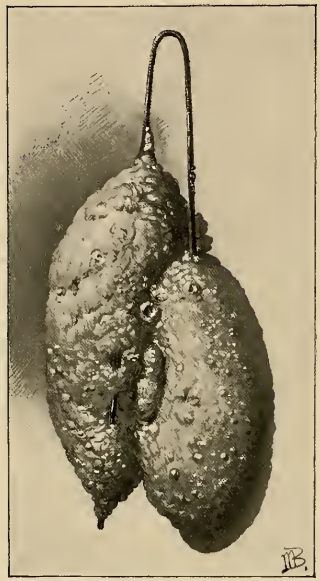


Fig. 205.—Phosphatic Calculus formed upon a Hairpin in the Bladder.

The stone which is shown in the figure was removed from a little girl only eight years old by Dr. F. R. Eccles by the suprapubic operation; the wound, which was not closed completely on account of the unhealthy condition of the vesical mucosa, healed spontaneously in four weeks.

Vesical Fistulæ.—Vesical fistulæ are abnormal channels of communication between the bladder and contiguous or adjacent organs; they are found, for example, (1) between the bladder and the vagina, (2) between the bladder and the uterus, and (3) between the bladder and some portion of the intestinal tract.

History.—It is a remarkable fact that no clear references to these common and distressing disorders are found in the earliest writers preceding the Christian era, and for nearly sixteen hundred years afterward. Toward the end of the sixteenth century and early in the seventeenth several clear descriptions appear almost simultaneously in the writings of Luiz de Mercado, a Spanish physician (1520–1600). Felix Plater (Basel, 1536–1614), and Severin Pineau (born in Chartres in the middle of the sixteenth century).

Plater (see I. Spach, *Gynæc.* etc., Argent., 1597) gives two clear descriptions of fistulæ following difficult childbirths; the second case is appropriately entitled *vesicæ cervicis ulia ruptura in partu.* "As a sequence of a difficult first labor, a young country girl had the opening of the bladder rent to such a degree that there was a long gaping furrow in its place, and the open bladder could be seen. I have twice inspected it myself, and discovered that it was so by using a probe. On account of this injury there is a constant involuntary discharge of urine, and the surrounding parts become excoriated and inflamed."

H. van Roonhuysen (1663) first proposed the closure of such a fistula by suture.

J. Fatio (*Wehe-mutter*, Basel, 1752, p. 284) gives an admirable description

of the way in which he carried this proposal out in 1675 and 1684 by placing his patients in the lithotomy position and exposing the fistula with a speculum; he then freshened its margins with a delicate pair of scissors, and brought the edges together by passing a sharpened quill through them and winding a thread over the ends of the quill to keep it from coming out. Both cases recovered.

A. J. Jobert de Lamballe (*Comptes rend. de l'Acad. des sci.*. 1850, and *Traité des fistules*, Paris, 1852) was the first operator who systematically took hold of this perplexing question and treated a large number of cases, many of them successfully. His plan of treatment for the simpler cases was to bring the cervix of the uterus down by traction with forceps so as to expose the fistula, followed by a broad denudation of the edges of the fistula and their exact approximation by interrupted sutures. When the fistula was a large one, and the approximation difficult on account of the tension, he made incisions in the lateral vaginal walls parallel to the edges of the fistula, so as to permit the tissues to be drawn together ("*par glissement*"). An incision through the vaginal vault detaching the cervix for this purpose has since been known as the incision of Jobert.

G. Simon (*Ueber die Heilung der Blasenscheidenfisteln*, Giessen, 1854), did away with these lateral incisions, and substituted in their place a method with which his name is still connected, the use of a double set of sutures, one introduced at a distance from the wound for the relief of tension (sutures of detention), the other to secure accurate approximation (sutures of reunion).

J. Marion Sims (*On the Treatment of Vesico-vaginal Fistula*, *Amer. Jour. of Med. Sci.*, 1852, vol. xxiii, p. 59), working independently in America, accomplished three things: (1) He devised the duck-bill speculum for the exposure of the fistula with the patient lying in the left semi-prone position; (2) he clearly described the best method of denuding the margins in a funnel form and down to but not including the vesical mucosa; and (3) he sutured the edges of the wound accurately together with the non-irritating (antiseptic?) silver wire, and by this means, coupled with his great skill as an operator, he attained a degree of success in the treatment of these cases never before reached.

Fig. 206.—Section of a Vesical Calculus of the Bladder, Natural Size, removed from a Girl Eight Years Old.

T. A. Emmet (*Vesico-vaginal Fistula*, etc., New York, 1868, and *Principles and Practice of Gynecology*, Phila., 1879) and Nathan Bozeman (*The Gradual Preparatory Treatment of the Complications of Urinary and Fecal Fistulæ in Women*, *New York Jour. Med. Sciences*, October 1, 1887) developed the method of treating large and complicated fistulæ by gradual preparatory treatment, incising the bands of scar tissue, and softening them by pressure so as to make the vaginal walls supple enough to be drawn together.

In spite of the advances made by these great surgeons, a large number of intractable cases remained.

Colpocleisis, or a surgical closure of the vagina so as to make a common pouch out of the vagina and the bladder, was performed in such cases by Simon in 1855, and has been practiced more or less ever since. The great advances which have been made recently can best be signalized by citing the eight indications for colpocleisis accepted by Simon, with the remark that not one of them holds good to-day. They were:

(a) An extensive loss of tissue, rendering it impossible to approximate the margins of the fistula.

(b) Inaccessible fistula.

(c) Destruction of the uterine cervix, bringing the peritoneum dangerously near the seat of operation.

(d) Severe hemorrhage into the bladder after an operation.

(e) Incarceration of the cervix uteri in the bladder.

(f) Atresia of the vagina above the fistula.

(g) Atresia of the urethra, with a fistula above and below it.

(h) Uretero-vaginal and uretero-utero-vaginal fistula.

The first active steps taken in an entirely new direction, with the object in view of relieving these cases without resorting to a procedure involving so much mutilation as does colpocleisis, were those of Rydygier (*Berl. klin. Wochenschr.*, 1887, No. 31) and of A. Martin, of Berlin (*Zeit. f. Gyn. und Geb.*, 1891), who planned to cover in the defect with large flaps dissected up from the contiguous vaginal walls.

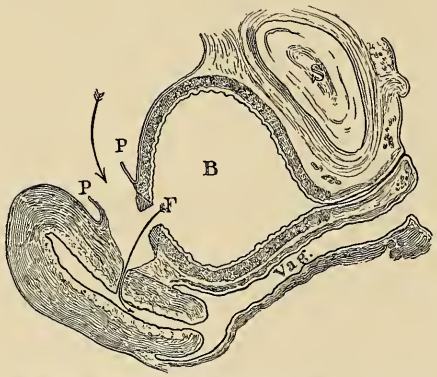


Fig. 207.—Treatment of Vesico-uterine Fistula by a Suprapubic Incision. (v. Dittel.)

The vesico-uterine peritoneum (P-P) is divided, the fistula freed from the uterus, and its margins united by suture.

L. von Dittel (*Abdom. Blasenscheidenfisteln Operation, Wien. med. Woch.*, 1893, No. 25) made a radical departure from all precedent by opening the abdomen and detaching the bladder from the uterus, and so exposing the fistula, which was then sewed up; the sutures only included the bladder walls, and after closing the opening in this way, the vesico-uterine peritoneum was again united and the abdomen closed.

A. Mackenrodt, of Berlin (*Centralb. f. Gyn.*, 1894, No. 8), adopted a somewhat similar plan, but one making a definite advance on the preceding, in that he operates through the vagina and detaches the bladder on all sides from the

fistula, and then sews the bladder up independently and closes the opening in the vagina by drawing its sides together, if possible; if he can not do this, he uses the anterior face of the uterus to fill out the defect. With the exception of this last step, the important outlines of this operation were already defined by Sänger (*Volk. Samm. klin. Vort.*, No. 301) and Walcher (*Centr. f. Gyn.*, 1894, p. 1).

W. A. Freund (*Eine neue Oper. z. schliessung gewisser Harnfisteln beim Weibe., Samm. klin. Vort.*, N. F., 1895, No. 118) again operated in a radically different direction when he used the body of the inverted uterus, bringing it into the vagina through the posterior fornix, to close a large defect in the vesico-vaginal septum.

Dr. E. C. Dudley, of Chicago, succeeded in closing a large intractable fistula by making a semicircular denudation inside the bladder on its mucous surface, extending from one margin of the fistula around to the other; he then sutured this denuded surface to the anterior part of the fistula, and so obtained a closure.

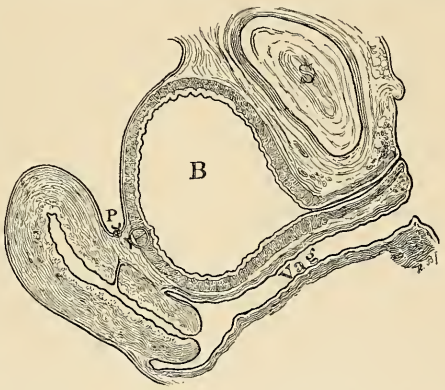


Fig. 208.—Suprapubic Operation for Vesico-uterine Fistula. (v. Dittel.)

The operation completed, the bladder and the peritoneum sutured.

My own plan (*Johns Hopk. Hosp. Bull.*, Feb., 1896) is to split the margin of the large fistula posteriorly, separating the bladder wall from the vagina, and then to denude its anterior margin on the vaginal surface, and to suture the movable posterior bladder wall to the fixed anterior vaginal wall.

Causes.—Vesico-vaginal fistulæ are commonly caused by the traumatism of a difficult labor, resulting from the impaction of the child's head in a narrow pelvis. In consequence of the prolonged pressure, the vitality of the vesico-vaginal septum is destroyed at the point at which it is compressed between the head and the symphysis pubis; in a few days a slough has formed, and the piece of tissue drops out, leaving an opening between the bladder and the vagina. I have repeatedly made pelvic measurements in these cases, and rarely found a fistula following parturition which was not in a contracted pelvis. (See Dr. G. W. Dobbin, *The Use of Pelvimetry in Gynecology*, *Amer. Jour. Obst.*, August, 1895, p. 201.)

The impression which has prevailed in the profession that these fistulæ are often due to the use of the obstetric forceps is erroneous, for they are undoubtedly due not to the use of the forceps, but to too long a delay in using them.

This point was insisted upon by W. T. Schmidt in 1828 (v. Siebold's *Jour. f. Geb. und Frauenz. und Kinderkrankheiten*, Bd. vii, p. 339), and in our own day by T. A. Emmet, of New York.

Other causes are foreign bodies, such as stem pessaries, working their way from the vagina into the bladder, or *vice versa* (Figs. 168 and 170); syphilis; a cancer extending from the cervix uteri will often destroy the anterior vaginal wall and so create a fistula; the perforation produced by a pistol ball (Emmet); hematoma of the septum from coitus, followed by sloughing; the wounds of a vaginal hysterectomy are also to-day a frequent source of vesico-vaginal fistula.

The course of a fistula uninterfered with is toward closure, either by primary union or by granulation, cicatrization, and contraction of its edges. In this way, by cicatrization, a small fistula will usually close entirely in a few weeks' time, and large ones will be reduced to one half or one third their original size. A clean-cut opening, such as that made for the extraction of a stone, may possibly close of itself without any suture, even if it is a large one. In time the margins of a large fistula grow sharp and hard with cicatricial tissue, and in bad cases the cicatrices radiate out over the vaginal walls or pin the fistula down to a pubic ramus. The posterior walls of the vagina may also be involved so as to close the vagina so tight that it is difficult to see the fistula.

Although the tendency of the smaller fistulæ is always toward a spontaneous cure, in some instances a minute opening may persist for many years. I operated, for example, upon a patient who had had a fistula for twenty-three years, and the opening was not much larger than a hair, and yet large enough to permit the constant escape of urine into the vagina with all its disagreeable consequences.

Symptoms.—The symptoms produced by vesico-vaginal fistulæ are quite characteristic. Soon after the confinement which causes it there may be bloody urine, difficulty in urination with symptoms of cystitis, and marked febrile disturbances, followed in a week or more by the escape of a slough, after which the urine, instead of accumulating in the bladder, escapes at once through the opening into the vagina, and so out over the vulva, perineum, and adjacent parts, which are constantly kept wet. The effect of this upon the skin is to produce a painful dermatitis and excoriations, and the vulvar hairs often become incrusted with the urine salts. Areas of excoriation are also found within the vagina, often coated with sabulous material and incrustations. The parts involved may be so exquisitely tender that the slightest movement is painful, and anything like a thorough examination is often impossible without anesthesia.

If the fistula is a small one, the patient may in certain positions retain a considerable amount of her urine and void it naturally. If the vaginal outlet is not broken down, considerable urine may accumulate within the vagina in the recumbent posture to escape on rising; this often leads the patient into the erroneous idea that she holds the urine in the bladder while lying and passes it

naturally afterwards; one of my patients was able to hold even as much as 300 cubic centimeters of urine in this way.

The effect of a fistula on the patient's general health is often most marked; the local discomforts compel her to remain pretty constantly in one place and in one position, preventing her from getting exercise and fresh air; nutrition fails, she becomes emaciated, excessively constipated, depressed, and peevish, and has a cachectic appearance.

In spite of the obstacles rendering conception rare, it has occurred. In one of my own cases, the patient, having a fistula 1·5 centimeter in diameter just back of the neck of the bladder, conceived, and passed through a natural labor and a normal puerperum, after which the fistula was operated upon and cured.

In a case in the hands of L. Winckel (*Handb. der Frauenkrank.*, vol. iii, p. 441) a patient with a fistula became pregnant and passed through her confinement at term, after which the fistula actually healed spontaneously.

Diagnosis.—In making a diagnosis of a vesical fistula, the examiner must investigate all the associated conditions which tend to complicate the case. In doing this he will not only note the size, the form, and the exact site of the fistula, but will also carefully inquire into the condition of the surrounding vaginal walls: whether soft and yielding or fixed by scar tissue, whether the anterior lip of the cervix is involved in the fistula (cervico-vesico-vaginal), whether the neck of the bladder is included (vesico-urethro-vaginal), and whether the fistula is fixed to one or the other pubic ramus. It is most important also to note the position of the ureteral orifices in their relation to the edges of the fistula. Other complications which may occur are the existence of two vesico-vaginal fistulæ, or of a vesico-vaginal fistula and a urethro-vaginal or a vesico-uterine fistula existing together. I have seen one case of vesico-vaginal fistula following a severe labor complicated by a recto-vaginal fistula, and an atresia of the upper vagina with hematometra. In another case with a vesico-vaginal fistula there was also a complete rupture of the recto-vaginal septum (see F. Plater's first case in I. Spach's *Gynæc. Libri*, Argent., 1597, p. 23, index). In still another instance in my hands a large vesico-vaginal fistula, adhering to the pubic ramus, was associated with a wide separation of the symphysis pubis ruptured in a badly managed forceps labor.

The diagnosis of a vesical fistula is made by a consideration of the history, by touch, and by inspection.

The patient gives a history of a constant discharge of urine over her person, dating usually from a severe confinement or from a hysterectomy; if, in spite of the fact that she has this constant flow, she also passes water at regular intervals, the probable diagnosis will then be one of ureteral and not of vesical fistula.

By touch the examiner will often feel more or less scar tissue in the vagina and a large hole in the anterior vaginal wall, which may be filled with the soft prolapsing mucous membrane of the bladder, and the finger can be introduced through this hole into the bladder and carried forward so as to feel the internal orifice of the urethra.

Inspection affords the fullest information about the fistula and the associated conditions. To make a vaginal inspection the posterior vaginal wall must be drawn back and the anterior wall exposed. A large fistula is seen as soon as the accumulated urine is dried out of the vagina; to find a smaller one it may be necessary to hunt among the vaginal folds, when it will often be found near the vault and to one side of the cervix or the other. A vesico-uterine fistula gives evidence of its presence by the urine which escapes from the cervix uteri.

When the fistula can not be found in this way it will usually be detected by injecting the bladder with an aniline solution or with sterilized milk, and then watching to see at what point the colored fluid runs out. If a fine sound is carried into the bladder through the urethra its end can usually be brought out through the smallest fistula.

The cystoscope may also be used to examine the fistula from the vesical side, but this is not so easy as the vaginal examination, because the floor of the bladder lies almost in the plane of vision, and the hole in it with its inverted mucous membrane is seen so foreshortened that it may easily escape notice altogether. It is therefore necessary, in order to get a good view of it, to lift the floor up on the end of the speculum, so as to bring it across the plane of vision.

Treatment.—In describing the various modes of treatment, I shall consider vesical fistulæ under the following heads:

1. Vesico-vaginal fistula.
2. Vesico-utero-vaginal fistula.
3. Vesico-uterine fistula.
4. Entero-vesical fistula.

When the injury occurs to which the fistula owes its origin, the physician is not as a rule aware of the nature of the accident until the slough comes away; then the constant involuntary escape of the urine signalizes what has happened. It may be, however, that the urine will begin to escape some days before the sloughing is complete, when the examining finger detects a soft, crackling mass in front of the cervix; it is important at this time to begin at once the use of mildly antiseptic vaginal douches several times daily, to prevent the accumulation of fetid discharges in the vagina, and to keep the wound as clean as possible. The convalescence will be hastened if the slough is exposed and caught with forceps and the dead tissue cut away; small particles which still adhere to the edges of the wound will then soon detach themselves and leave a clean, granulating surface.

Mild boric acid or mild carbolic acid douches should now be kept up until the fistula is healed either spontaneously or by operation. A spontaneous cure may reasonably be expected only in the case of small fistulæ 1 or 2 centimeters in diameter and may be awaited as long as the wound shows signs of contracting; such a closure may take place in from two to four months, and in exceptional cases after six or eight months.

The efforts made by our predecessors to bring about a cure by simple pos-

ture, or by putting a catheter in the bladder through the urethra, or by placing pledgets of cotton in the vagina, can not be recommended with any assurance of their utility; such measures belong rather to the days when local treatment in gynecology was universal.

Cauterization was at one time extensively employed, and many cures were made in the case of smaller fistulæ. The edges of the sound were treated with the nitrate of silver stick, Vienna paste, caustic potash, tincture of cantharides, or the hot iron, and later with the Paquelin cautery.

The cautery is applied to the edges of the fistula on the vaginal surface so as to destroy the superficial tissue and provoke active granulations, which, meeting across the opening and uniting, close it at once; or in the case of a large opening the further cicatricial contraction is brought about. It is, as a rule, necessary to keep this treatment up at intervals of a week or ten days for two or three months. Such plans of treatment have to-day almost entirely passed out of vogue, and will only be resorted to in the early stages of the affection when it is too soon to operate, or when for some other reason the operation can not be performed.

It is a significant fact that the best results by this plan of treatment have been reached during the early stages of the disease, at a time when the spontaneous cure takes place if it is going to take place at all.

Operation.—The operative treatment is as a rule the only form of treatment to be considered, for in the simpler cases it is invariably successful, and in the more complicated cases nothing short of operation will bring relief.

Preparatory treatment is necessary in most cases where the vagina contains sloughing necrotic tissue and incrusted urine salts, and where the contiguous parts are raw and granulating; these complications will be removed by prolonged repeated warm boric acid vaginal douches, a repeated painstaking cleansing of vagina and vulva, using forceps and cotton to remove and wipe off sloughs and *débris*, followed by occasional applications of weak solutions of the nitrate of silver to the raw surfaces. At the same time bands of scar tissue may be incised so as to diminish the tension on the wound edges.

If a recto-vaginal fistula exists also, in order to avoid infection of the wound, this must either be closed and healed before operating upon the vesico-vaginal fistula, or both closed at the same time. It will be safer in most cases to close the rectal opening first, because there is always a greater risk of this breaking down, in which case the vesical wound would almost certainly be infected and give way too.

The operator need not be embarrassed by finding a marked stenosis of the vaginal orifice at the time of operation, for this may be at once extensively divided with the knife by an incision down beside the rectum, giving all the room necessary to get at the fistula; and after the vesical operation is completed the incised edges may be accurately united again.

With more recent advances made in operating on bad fistulæ, we are able to dispense with some of the elaborate time-consuming preparatory treat-

ment in the way of incisions and vaginal dilators used to get rid of the scar tissue.

The best time to operate is within six or eight weeks after labor, while the tissues are soft and yielding, vascular, and free from the fixation and the atrophy caused by scar tissue. If the fistula is a small one and its edges can be easily drawn together with tenacula, with a little freshening of its margins and several sutures to unite them, primary union is easily secured; large and irregular fistulæ are far more difficult to unite. The operation becomes most difficult after the formation of the scar tissue distorting and fixing the edges. Even pregnancy forms no contraindication to operation, as shown by the successful work of Schlesinger and others.

Instruments needed for the operation are: Speculum, lateral retractors, tissue forceps, fistula knife, fistula scissors, tenaculum, needles, silkworm gut, catgut, and silk.

There are, in general, as briefly indicated above, seven different ways of closing vesico-vaginal fistulæ:

1. The classical method of denuding the margins on the vaginal surface and uniting them by suture (Roonhuysen, Jobert, Sims, Simon).

2. Covering in the defect by flaps transplanted from the contiguous vaginal walls (Rydygier, Martin, Trendelenburg).

3. Opening the abdomen and cutting through the vesico-uterine peritoneum, and so detaching the bladder from the fistula, sewing up the bladder wound, and then reuniting the peritoneum and closing the abdomen (von Dittel).

4. Denudation on the vesical mucosa from one side of the fistula around to the other, and uniting this surface to the freshened anterior part of the fistula (Dudley).

5. Dissecting the bladder loose from the vagina and sewing up the vesical wound separately (Sänger, Walcher, von Winkel). The anterior face of the uterus is used to close the vaginal defect (Mackenrodt).

6. Freeing the bladder around the posterior two thirds of the fistula, and bringing it forward and uniting it to the anterior third, which is freshened on its vaginal surface (Kelly).

7. The posterior fornix is opened and the body of the uterus brought through it inverted and attached to the edges of the fistula on all sides, so closing it (Freund).

Curing a vesico-vaginal fistula by denudation of its margins and approximation of its edges by suture. This is the simplest mode of treatment, and is adapted to all fistulæ in which the edges can be drawn together without much tension; if this can be done with tenacula beforehand, the operator may feel reasonably sure of a successful result. The easiest fistulæ to close in this way are all the small ones, and the larger ones which are situated in the upper part of the vagina near the cervix, where the vaginal tissue is more lax and abundant; and the easiest large fistulæ are the transverse ones.

When the edges can not be brought easily together by traction with the

tenacula in any direction, the denudation and approximation by suture may still be tried if the operator has had such experience in plastic work that he is able to form a good judgment as to the extent to which he will be able to relieve the tension by lateral incisions through the scar tissue, which fixes the edges of the wound. It is worse than useless to denude the edges of a large fistula without having any definite idea as to what can be accomplished until the stitches are put in and pulled upon. It would be far better to let the patient entirely alone, and to confess honestly an inability to relieve her, than to go on cutting away valuable tissues and increasing the size of the fistula every time, with a vague idea that by some chance the operation will succeed. I have seen several women who have been operated upon as many as five and six times in this way who were nothing better, but far worse for it.

The patient is put on the table, either in the left lateral or in the lithotomy position, or with elevated hips, after Simon, in whichever way the fistula can be exposed best; I prefer myself, in almost all cases, to put the patient on her back.

The posterior vaginal wall is drawn strongy backward, and lateral retractors are used on one or both sides, to give a perfect exposure to the field of operation.

The steps of the operation are: (1) Paring the edges of the fistula; (2) passing and tying the sutures.

The edges of the fistula should be pared on the vaginal surface entirely; this creates a freshened area from 5 to 6 or 8 millimeters in breadth, extending down to but not including the mucous membrane of the bladder.

Either a knife or scissors may be used to remove the tissue; a knife is necessary where there is much friable tissue, but in most cases I prefer a delicate pair of scissors which I have had made for this purpose, and I denude in the following manner:

FIG. 209. — SCISSORS FOR PARING THE EDGES OF THE VESICO-VAGINAL FISTULA.

The shanks are made long and slender and the blades are delicate and curved on the flat. ⅔ ordinary size.

With a knife I first outline the limit of the denudation all around the fistula, and when this is done I take the rat-toothed forceps and catch a piece of the tissue to be removed, and begin cutting it off with the scissors. This can be done rapidly, as the outer limit is marked out by the incision with the knife, and the operator does not have to pause to exercise his judgment about it; in addition to this, the sharp straight cut of the knife is better than the jagged edges made by the scissors.

The freshening must be carried down into sound tissue, avoiding the error of simply paring off the surface. Every particle of the tissue within the limits

defined must be removed, or union will not take place; and to make sure that this has been done, little islets of undenuded tissue must be carefully sought out and picked up with a tenaculum and snipped off.

Constant irrigation with a fine stream of water is the best way to keep the field clear of blood during the cutting, but a little piece of sponge grasped in a pair of forceps will often be needed to make firm pressure on some spot which is obscured by the free oozing; this blanches the tissue for a second or two, and as the bleeding begins again the operator can see whether there are any little undenuded areas which do not bleed. The entire wound now has a fresh edge gently beveled on to the vaginal surface.

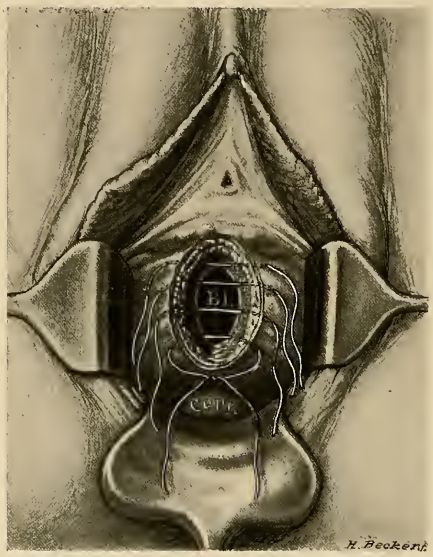


Fig. 210.—Classical Operation, Sutures inserted Transversely instead of Vertically.

Passing and tying the sutures is the next step. To do this I use the ordinary needle holder and small curved needles armed with a carrier made of fine silk.

A tenaculum is often needed to steady the tissues while passing the needle through them, and to catch and hold the point of the needle as soon as it emerges, until it can be grasped by the needle holder again and drawn completely through.

By simply following the direction of least resistance in passing the sutures, in a variety of cases the resulting wound will assume the form of a U, V, ∼, —, |, or \. When possible it is best to avoid bringing three points together as in an H a Y or a X.

As a suture material I prefer to use a fine, flexible silkworm gut, often using catgut between them. Before passing the first silkworm-gut suture, the operator must determine in which direction the edges of the wound will come together with the least traction; he then passes the suture which is to lie in the middle of the wound when it is closed. To do this the needle must pierce the vaginal mucosa about 3 millimeters from its edge, and appear just under the mucous membrane of the bladder; it then enters the opposite side at the

border of the freshened surface and the bladder mucosa, and finally emerges on the vaginal surface 3 millimeters away from the edge of the wound, corresponding to the point of entrance.

Other sutures are similarly introduced on both sides of this first one, about half a centimeter apart, until there are enough sutures laid to close the wound from side to side. Especial care must be taken to secure an accurate apposition of the wound at its angle. The suture first introduced is then tied, and after that those at the sides. The amount of tension made in tying them must be just enough to bring the tissues snugly together; constriction of the tissues within the grasp of the suture loop must be avoided. As a rule there is a little pouting between each of these silkworm-gut sutures, and this is best corrected, after tying them, by passing a sufficient number of fine catgut or even fine silk sutures with a small needle penetrating only about halfway through the septum.

If the fistula lies near the neck of the bladder, the operator can not be too careful to avoid including one or both ureteral orifices in his sutures. This has often been done, and the patient has as a consequence either lost her life, or the intense renal colic brought on has compelled the operator to remove his sutures soon after the operation. This accident will only be avoided by (1) examining the edges of the opening beforehand and making sure that the little ureteral orifices are not situated there, and (2) by taking care not to pass the sutures so deeply that a ureter which opens somewhere near the wound will be caught in its loop.

If the ureteral orifice is found in the margin of the fistula it must be put out of harm's way either by introducing a catheter into it and dissecting it up for a short distance and turning it into the bladder, and then completing the denudation and suture of the fistula, or else by denuding farther out onto the vagina, and so securing a wide enough surface for the closure of the fistula, without coming into contact with the ureteral orifice. This has the effect of turning the ureter up into the bladder without disturbing it.

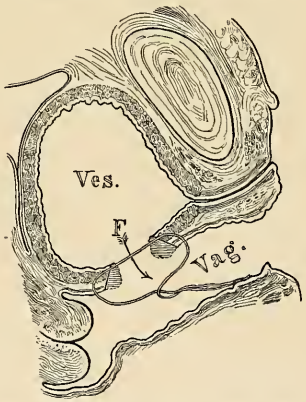


Fig. 211.—Classical Operation for Vesico-vaginal Fistula.

The parallel lines show the tissue removed in denuding the edges of the fistula, and the suture is placed ready to tie. The entire thickness of the vesico-vaginal wall, excepting the bladder mucosa, is included in the suture.

Where the fistula is pinned down at one of its angles to one of the pubic bones, a plan which I adopted in one of my cases may sometimes be put into successful practice. I introduced a long delicate tenotomy knife on the vulvar surface about 3 centimeters from the fixed point, and carrying it under the mucous membrane as far as the fixed point, cut it loose from the bone without puncture. The hemorrhage was but slight.

I was then able to bring the tissues together without undue traction, and a perfect union resulted.

Aside from the danger of including a ureteral orifice in a suture, there is one other risk connected with the operation, and that is hemorrhage into the bladder from the edges of the incision. This occurred in a case operated upon by one of my assistants, and the wound had to be reopened five hours after the operation, when 700 cubic centimeters of blood clots were removed. The stitches were put in again, this time including the mucosa, and the patient then recovered with perfect union. In a case operated upon by J. Bäcker (*Cent. f. Gyn.*, 1893, No. 38) the bladder became distended with blood almost to the navel and ruptured into the peritoneal cavity under violent straining efforts, and the patient died forty-five hours after the operation of acute sepsis.

After-Treatment.—The care of the patient after the operation consists in keeping the bladder empty for five or six days and requiring her to remain in bed. It is a good practice to put a soft gauze pack in the vagina to give gentle support to its walls; a soft-rubber catheter is put in the bladder and retained there for from four to seven days, according to the size of the fistula. I find it tends to relieve the irritation often produced by taking this out for an hour every morning and evening. The vaginal pack should be replaced when it becomes soiled.

In small fistulæ, or larger ones, where the approximation has been easily made, I often do not leave a catheter in at all, but order the patient to empty the bladder herself or have it emptied every three or four hours for four days, when the interval may be lengthened.

The bowels should be opened on the third day by giving a purgative followed by an enema.

The silkworm-gut stitches may be removed in twelve or fifteen days.

The ability to retain the urine always increases as the bladder grows accustomed to the resumption of its normal function.

In addition to the classical method of closing an ordinary vesico-vaginal fistula which I have just described, two other essentially different plans have been successfully carried out by F. Vulliet and A. F. McGill.

Vulliet's procedure (*Nouv. arch. d'obst. et de gyn.*, 1887, p. 512) consists briefly in the union of the tissues denuded on the vaginal surface by two layers of sutures, one buried and one superficial.

The patient had had a fistula for seven years, and had already been operated upon three times, with the effect of filling in the deficiency, about 2 centimeters in diameter, with a thin layer of scar tissue perforated in three places like a sieve. This tissue, not available for plastic purposes, was sacrificed, and a denudation 8 millimeters in diameter made around its border in the sound tissue. The anterior and posterior extremities of the fistula were then caught with forceps and pulled in opposite directions until the edges came into contact. The first suture was then introduced, threaded directly in a small needle. The suture, made of silk and permeated with iodol and glycerin, was passed continuously along the

margin of the fistula, entering and re-entering at points close together. By this means alone the closure was so effective that no more fluid escaped from the bladder in spite of the coughing and straining under anesthesia. Another layer of sutures was then applied below this one, completely closing the wound. Seven days later the superficial sutures were taken out and the union found perfect.

An interesting new method is that of A. F. McGill, of Leeds (*Lancet*, November 8, 1890, p. 967), entitled *An Operation for Vesico-vaginal Fistula through a Suprapubic Opening in the Bladder*. The patient, seventeen years old, had an opening in the vesico-vaginal septum just in front of the os uteri large enough to admit the tip of the index finger.

The operation was performed January 11, 1890. The pelvis was elevated and the bladder opened above the symphysis by a transverse incision, and fixed to the abdominal wall.

The fistula was then pushed up within reach by an assistant with two fingers in the vagina, its edges freshened, and then completely closed by four chromicised catgut sutures passing through the vesical mucosa only.

She was then placed in the lithotomy position and the wound closed on the vaginal surface with four silk sutures, including all the layers but the vesical mucosa.

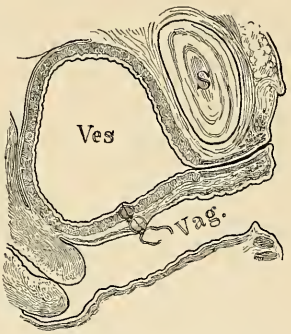


FIG. 212.—VESICO-VAGINAL FISTULA CLOSED BY USING A BURIED SUTURE OF CATGUT IN THE BLADDER WALL AND THEN UNITING THE VAGINA OVER THIS.

The suprapubic wound was now closed in three layers—bladder, abdominal muscles, and skin—leaving an opening for a drainage tube, which was removed on the fifth day. On the eighth day she passed urine by the urethra, in less than a month the suprapubic wound closed, and on February 13th she returned home well.

A method recommended by Sänger and von Walcher involves the separate suture of the mucosa after freeing it from the margin of the fistula. The catgut which unites the mucosa is then buried by a separate layer uniting the vaginal opening (see Fig. 212).

Vesico-vaginal Fistulæ of Large Size.—The type of a simple fistula of small or medium size, in which the edges can be brought together after denudation without undue traction, has just been described. When, however, the defect in the floor of the bladder is large, and there is a great deal of scar tissue in the vaginal walls, it may be difficult or even quite impossible to draw the edges together. Even when the operator succeeds in doing this the sutures are sure to cut through before union has taken place. Among these cases must also be placed a little group in which a fistula of medium size is converted into a large one by the successive parings of unsuccessful operations.

Cases classified under this group have in the past either been cured only

after months of preparations and repeated operations, or they have been abandoned as incurable, and colpocleisis has been done as a last resort.

Within the past few years a number of operative procedures have been devised which now enable us to cope with even this hitherto hopeless class.

I will now describe some of these various methods in detail dwelling particularly on the fact that the most important principle is the fact that we are able to detach the flexible bladder from the rigid vaginal wall, and to draw it together and sew it up independently.

Closure of a Fistula by turning up Vaginal Flaps to form the Base of the Bladder.—One of the first efforts in a new direction in the treatment of fistulæ was that of A. Martin, of Berlin (*Zeitschr. f. Geb. und Gyn.*, No. 19, p. 394), in the case of a large fistula of fifteen years' standing, comprising the entire vesico-vaginal septum, and already operated upon twice unsuccessfully.

To get the tissue to form a new base for the bladder incisions were made through the vaginal wall at some distance from the fistula and parallel to its edges. The vaginal tissue thus outlined was then loosened up in the direction of the fistula, and the edges of the flaps made in this way were drawn together and sewed as in a cleft palate operation; by doing this, that part of the vaginal mucosa which lay between the incision and the edge of the fistula was turned upward so as to form a new floor for the bladder, leaving the raw surface exposed on the anterior vaginal wall. This raw surface was then closed in by using a continuous suture to draw it together as in an anterior colporrhaphy.

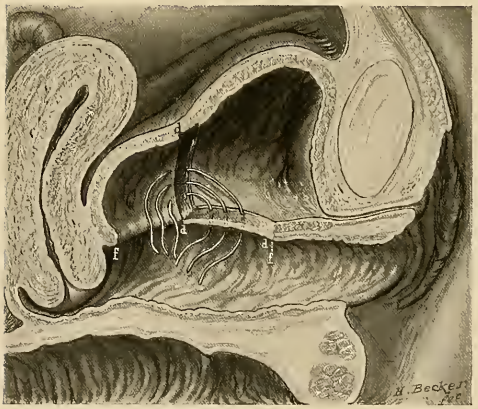


Fig. 213.—Dudley's Operation for Large Vesico-vaginal Fistula with Rigid Margins.

The diagram shows the left half of the bladder. The denudation includes the anterior part of the fistula *f f* from *d* to *d f*, and then extends up over the vesical mucosa as shown. Three of the sutures are represented in place, but not tied.

The wound healed in spite of a catarrh of the bladder down to an opening at the cervix.

This method is analogous to Volkmann's operation for ectopia of the bladder, in which the skin surface of the abdomen is turned inward to form the upper wall of the bladder.

Somewhat analogous to this is the plan of F. Trendelenburg (*Samm. klin.*

Vort., 355, 1890), who closed a fistula as big as the end of the index finger, already operated on seven times, by transplanting a flap from the posterior vaginal wall.

The lower and lateral borders of the fistula were freshened, and then at a corresponding point on the posterior vaginal wall a horseshoe-shaped flap was detached on three sides and sutured to the edges of the fistula. Four weeks later the pedicle was cut through and sutured to the freshly denuded upper edge of the fistula. As the former operations had failed on account of the occurrence of cystitis, a suprapubic opening was made for drainage of the bladder. The case made a complete recovery.

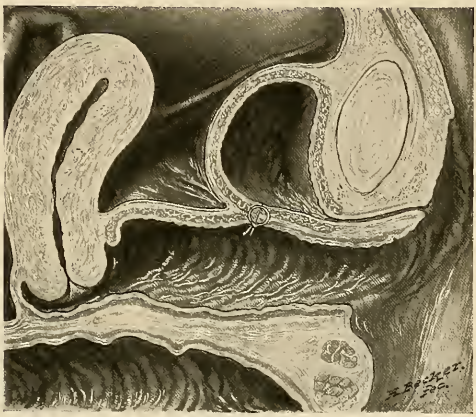


FIG. 214. — DUDLEY'S OPERATION COMPLETED, SHOWING THE NEW SMALLER BLADDER.

The anterior vaginal wall lying between the cervix and the suture consists now of the bladder mucosa thrown out of use by the operation.

Closure of a Fistula by suturing the Denuded Vesical Mucosa to its Anterior Margin.—This plan was carried out by Dr. E. C. Dudley, of Chicago (*Chicago Med. Journ. and Examiner*, May, 1886). In the case operated upon the entire vesico-vaginal septum and the vaginal portion of the cervix with its anterior wall had sloughed away, and the tissues could not possibly be drawn together in the usual way.

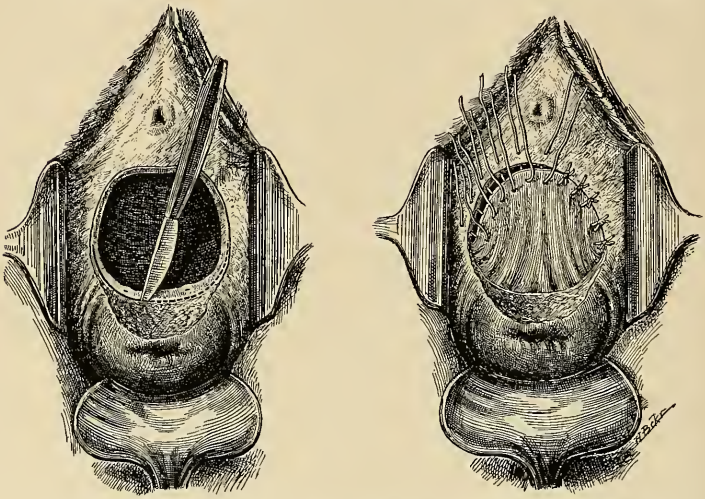
The mucous membrane of the bladder, however, when caught with a tenaculum could be drawn forward to the neck of the bladder at the extreme anterior margin of the fistula without undue traction. The operator therefore began to close the fistula by denuding a strip on the mucous surface of the bladder from side to side about an inch above the posterior edge of the opening. The anterior margin of the fistula was now denuded on its vaginal surface, and the denuded vesical mucosa drawn forward and attached to it on all sides by twenty-two silkworm-gut sutures.

By this remarkable procedure the vesico-vaginal septum was replaced by that portion of the bladder wall which lay posterior to the line of denudation, and the new bladder formed was in this way just so much smaller. The operation was successful and the patient was able to retain her urine all night.

Closure of the Vesico-vaginal Fistula by detaching the Bladder from the Vagina and suturing it Independently (Figs. 217, 218).—A. Mackenrodt, of Berlin (*Centralblatt f. Gyn.*, No. 8, 1894), made a remarkable step in advance when he devised the following plan:

a. The fistula is exposed, and the cervix at one end and the urethral prominence at the other, each caught with a pair of tenaculum forceps, and the tissues between made tense by traction in opposite directions.

b. An incision is next made in the median line extending across the fistula



Figs. 215, 216.—Vesico-utero-vaginal Fistula occupying the Entire Base of the Bladder with Dense Cicatricial Edges and with the Ureteral Openings in the Upper Margin.

The bladder was dissected loose from the uterus and from the lateral vaginal walls around the upper half of the fistula. The lower half of the fistula was then denuded on its vaginal surface and the raw surface of the loosened bladder united to the vaginal denudation.

and through the vaginal walls and down to the bladder, so as to expose the entire base of the bladder.

c. The edges of the fistula are then split so as to separate the bladder from the vagina, and the separation is carried out widely on all sides, extending upward, if need be, as far as the vesico-uterine peritoneum.

d. The movable elastic bladder is now closed by denuding its edges and drawing them together by fine silkworm-gut sutures. Beneath these a second and even a third row of sutures may be placed.

e. After closing the bladder in this way the vaginal wound is approximated as far as the tissues will permit by denuding its borders and drawing the corpus uteri forward and passing sutures from side to side so as to bring the margins together and at the same time hold the uterus in anteflexion. If the vagina

will not come together the uterus is used to fill in the gap, making a firm base in place of the fistulous opening.

Closure of the Fistula by detaching the Bladder Posteriorly and suturing it to the Denuded Vaginal Wall Anteriorly.—My own plan (*Johns Hopkins Hospital Bulletin*, February, 1896) for the treatment of large fistulæ, inoperable by the classical method, is one which was carried out in a case already operated upon five times, with the consequent loss of the entire base of the bladder, including the internal orifice of the urethra and the anterior lip of the cervix.

The patient (M. Y., 3811, Sept. 25, 1895) was forty years old and had had five children; the fistula dated from the third labor eight years ago, and each one of the five efforts made to close it had only served to increase the defect without uniting any part of the tissue.

The opening was 4 by 3 centimeters in size; the ureteral orifices were seen on its posterior border after replacing the congested bladder, which was inverted through it into the vagina; the edges of the fistula were fixed by scar tissue and by scars radiating out over the vaginal walls.

The steps of the operation were the following:

a. A crescentic incision was made around the posterior two thirds of the fistula, separating by a blunt dissection the bladder with its muscular and mucous coats from the vagina and the cervix laterally, and all the way up to the peritoneum.

b. The remaining anterior third of the fistula was then pared on its vaginal

FIGS. 217, 218.—VESICO-UTERO-VAGINAL FISTULA, SHOWING THE WAY IN WHICH THE BLADDER WAS DETACHED FROM THE UTERUS ABOVE FROM *a* TO *x* AND BROUGHT DOWN AND ATTACHED TO THE DENUDED VAGINA AT *b*.

surface, extending the denudation down to but not including the vesical and urethral mucosæ.

c. The ureters were marked out and protected during the next step by passing two flexible ureteral catheters $2\frac{1}{4}$ millimeters in diameter through the urethra, one into each ureter.

d. The detached part of the bladder behind was now easily drawn forward and accurately united by interrupted fine silkworm-gut sutures to the immov-

able anterior third of the fistula on its vaginal surface; each suture caught the under surface of the muscular wall of the bladder so as to turn its edge up into the newly formed bladder. The ureteral orifices were in this way directed upward, and they escaped compression and transfixion through the presence of the catheters. The vaginal opening was not closed.

I left the ureteral catheters in place three days to drain each kidney through the urethra and put the bladder entirely at rest thus avoiding any strain on the healing tissues.

The wound healed throughout, except at the left upper angle, where a fistulous sinus 1 millimeter in diameter was left; through this a little urine escaped occasionally. On leaving the ward the patient could hold 100 cubic centimeters, and did not have to empty the bladder oftener than once in three hours. The raw surface on the anterior vaginal wall was replaced by a firm contracting cicatrix.

Closure of an Extensive Vesico-vaginal Fistula by suturing the Body of the Uterus into the Defect.—This operation was devised and practiced with success in two cases by W. A. Freund (*Samm. klin. Vort.*, No. 118, 1895). The first patient was forty years old, and had lost the posterior wall of the urethra and a considerable part of the sphincter area at the neck of the bladder. The opening into the bladder easily admitted the index finger; the tissues around the fistula were bound to the pelvic bone by extensive radiating scars, and the cervix was hidden in a mass of scar tissue at the vault of the vagina.

Douglas's pouch was opened and the retroflexed uterus drawn out into the vagina and scraped on both sides in front of the broad ligaments until it bled, it was then sutured to the freshened edges of the opening in the bladder and the posterior half of the urethra. The fundus uteri was then removed so as to expose its cavity, and the edges of the wedge-shaped excision were united, providing an exit for the menstrual discharges. After a protracted convalescence, marked by attacks of fever and the discharge of sutures and a varying degree of continence, the patient was able to retain the urine, so that five months later she only passed it twice in three and a quarter hours, and could void it voluntarily as soon as there was any accumulation in the bladder.

Four months after the first operation the defect of the anterior part of the urethra was made up by drawing over it the contiguous vaginal walls and suturing them together. Menstruation took place from the new cervix formed at the open fundus.

The second case was that of a young woman twenty years old, in whom the entire base of the bladder had been lost. The perineum was torn back into the lax sphincter, and there was a recto-vaginal fistula high up. The urethral orifice formed a slit opening into a urethra $1\frac{1}{2}$ centimeter long. The edges of the fistula were surrounded with extensive scar tissue, and the cervix was concealed in a mass of scars at the vault.

At the operation Douglas's *cul-de-sac* was opened; then the recto-vaginal septum was split from the incision in the vaginal vault down through the recto-

vaginal fistula and on downward through the anus. The edges of the large defect in the anterior vaginal wall were now encircled by a broad area of denudation, and the retroverted uterus drawn out through Douglas's pouch and freshened by scraping its borders in front of the broad ligaments. The uterus was now attached to the edges of the fistula on all sides by silk sutures, which had been previously laid through the margins of the fistula.

The scar tissue and edges of the fistula in the recto-vaginal septum were now removed and closed on the rectal side with catgut, and on the vaginal side with silk sutures. The body of the uterus was next united to the urethra, and the fundus uteri removed in a wedge-shaped excision and sutured on all sides. Finally the perineal wound was closed with wire sutures uniting the sphincter and about 1 centimeter of the tissue above it. The bladder was drained with a catheter and the wound healed throughout, except for the formation of a small recto-vaginal fistula, which closed spontaneously after the escape of some silk threads.

Three months after the operation there was no incontinence of urine, and the weak sphincter had recovered its power under the use of hypodermics of strychnin in its immediate neighborhood. All lateral expansion of the bladder had disappeared, and instead of this there was a distention of 18 centimeters upward.

Vesico-utero-vaginal Fistula (Fistula Laqueatica).—These fistulæ are situated at the vault of the vagina close against the cervix, which is frequently involved by the destruction of a portion or all of its anterior lip.

They occur either from extensive sloughing in this region, or more frequently from a laceration of this part of the cervix, often due to the obstetric forceps, extending into the vault of the vagina and on into the bladder. This mode of origin is well shown in a case reported by Dr. H. C. Coe (*Amer. Jour. Med. Sci.*, 1890, p. 487), in which he did a successful suprapubic amputation of the uterus for rupture during labor. Before Dr. Coe operated on the woman, however, an attempt had been made to introduce the forceps through the undilated cervix, which resulted in a rupture of the cervix extending into the bladder and leaving a cervico-vaginal fistula behind.

A similar case of double fistula is also figured by Otto v. Herff (*Zeit. f. Geb. und Gyn.*, vol. xxii, 1891, p. 10).

A case of my own, which I saw April 1, 1885, also goes to prove that these fistulæ are often the result of a tear rather than a sloughing. The patient had had a severe instrumental labor with a stillbirth six weeks before; she came to me with a small fistula just at the vault of the vagina on the right side against the cervix. This fistula opened two ways, from the bladder backward into the cervical canal, and downward into the vaginal vault. See Fig. 220. There is, I think, no other conceivable way in which such fistulæ, lying so close together in this position, could have been brought about, except by a tear extending through the cervix and forward into the bladder, followed by a healing of the vaginal cervix between.

The fistula following a tear is apt to be small, while that following a slough may take in the whole anterior part of the vaginal vault.

Treatment.—A small fistula of recent origin may get well spontaneously, or, as in my own case just cited, may recover after stimulating applications; I used the nitrate of silver stick several times with improvement, and after the patient went home she recovered entirely.

The essential difference between the treatment of these and the vesico-vaginal fistulæ lies in the close proximity of the rigid cervix whose tissues can not be drawn together like that in the flexible vaginal walls. In addition to this, the fistula may form a sinus longer than the ordinary vesico-vaginal fistula, and the denudation and approximation may effect only the closure of the bottom of this sinus, which for this reason refuses to heal.

A variety of operations have been proposed, among them the following are of practical value:

A simple closure may be effected in the absence of any scar tissue surrounding a small fistula by making a deep funnel-shaped denudation on the vaginal surface, and then passing several silkworm-gut sutures from before backward through both edges of the fistula and the anterior cervical lip as well. This will not succeed if there is much destruction of the cervix with scar tissue.

The anterior lip of the cervix may be effectively utilized to close a larger defect in the vault by paring its edges and attaching them by sutures directly to the sides and edges of the fistula pared on its vaginal surface. If there is too much tension created in pulling the cervical lip down and attaching it to the fistula in this way, this may be relieved by splitting the cervix bilaterally up to or above the vaginal vault, in this way elongating the anterior lip, which is then easily pulled out so as to cover in the defect.

The posterior lip of the cervix is in some cases easier to approximate to the anterior edge of the fistula than the anterior lip. When this is denuded and attached so as to fill in the defect, the cervical canal is turned into the bladder, and menstruation henceforth takes place through this viscus.

Dr. N. Bozeman has advocated the preparation of those cases where there is scar tissue and fixation by catching the uterus with forceps and dragging it down daily for some weeks beforehand, so as to gradually overcome the resistance.

Detaching the Uterus from the Bladder and then suturing the Fistula.—The best plan of all, and one doing away with the difficult dealing with the scar tissue, is the following (see A. Wölfler in v. Herff's paper, *Zeit. f. Geb. und Gyn.*, 1891, p. 5):

a. The cervix is caught and drawn down and backward, and separated from the vaginal vault in front. This separation is continued well above the fistula by detaching a part of the bladder from the supravaginal cervix.

b. The edges of the fistula are then pared down to the vesical mucosa, taking care to get rid of all scar tissue.

c. The fistula may then be closed by interrupted fine silkworm-gut sutures, or by buried continuous catgut sutures in two or three layers.

d. After this the cervix may be attached again to the vaginal vault by means of several silkworm-gut sutures.

It is important, for five or six days after the operation, to keep the bladder

empty, and to avoid an infection at the vault by keeping a clean, loose iodoform pack in the vagina.

Trendelenburg (*Volkmann's Samm. klin. Vort.*, 355) recommends the following plan of dealing with vesico-vaginal fistulæ when they can not be satisfactorily exposed on the vaginal side; also for fistulæ in the immediate neighborhood of the ureter, for vesico-uterine, uretero-cervical, and uretero-vaginal fistulæ:

The patient is placed on the table with the pelvis well elevated at an axis of not less than forty-five degrees to the horizontal; by this posture, when the

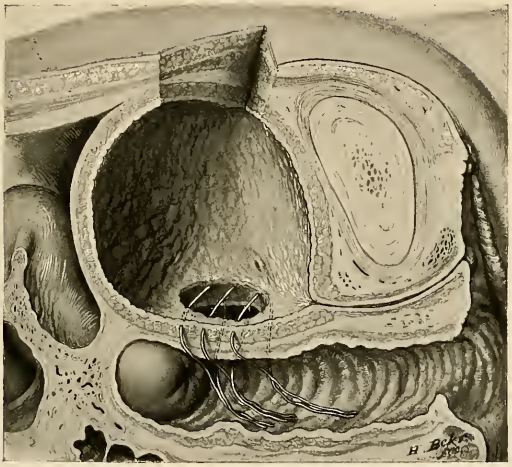


FIG. 219.—SUPRAPUBIC OPERATION FOR VESICO-VAGINAL FISTULA (TRENDELENBURG). SAGITTAL SECTION. SUPRAPUBIC INCISION SEEN ABOVE.

bladder is incised, it at once fills with air, and its entire interior is well exposed to view.

The bladder is opened by making a transverse incision 10 centimeters long across the upper border of the symphysis, separating the attachments of both recti muscles, and exposing the prevesical space; a transverse opening in the bladder is then made 5 to 6 centimeters long. The edges of the fistula now exposed are denuded in the form of a shallow funnel in such a way as to remove a broad band of tissue from the bladder mucosa, and a narrow one from the vagina and cervix. The edges are brought together with silkworm-gut sutures; in the first cases these were tied in the bladder, but later two needles were threaded on one suture, and both ends were passed through into the vagina, where they were tied.

The incision into the bladder is now closed down to an opening left for a T-drain. The patient is compelled to lie in Sims's position until the fifth day,

when she may turn over for a time on her back. The drainage tube is removed from the ninth to the twelfth day, after which the abdominal wound heals of itself.

While the attempt to close a fistula in this way failed in the first two cases, it succeeded in the two following. In the case described in detail by the author the fistula was the size of a plum stone, fixed by scar tissue, and associated with the loss of the right half of the cervix.

Dr. H. C. Coe's case, cited above, in which the uterus had been amputated for a parturient rupture, had a fistula to the left of the cervix situated in cicatricial tissue; a probe entered through the opening into the bladder but not into the cervical canal, although there was a communication on that side too, shown by milk injected into the bladder coming out of the canal. The operation performed was a unique one. He first divided the bridge of tissue separating the fistula from the cervical canal, and then pared the edges of the fistula and excised the entire remaining cervix, leaving nothing but vaginal mucous membrane to be included in the sutures along the entire line of the wound. The opening of the ureter was identified in the upper margin of the fistula and avoided. The wound was now closed by thirteen silver wire sutures and three silk ones. The recovery was complete.

Vesico-uterine Fistula.—The causes which produce a vesico-uterine fistula are the same as those producing some cases of cervico-vesico-vaginal fistula—that is, a tear of the cervix which extends through into the bladder, up into the uterus, and which heals in this group of cases in its lower part, leaving a persistent opening between the bladder and the cervical canal. The result of this is that the urine constantly dribbles out through the cervix into the vagina. If the opening is small the patient may pass some urine naturally, leading the physician to the erroneous conclusion that the fistula communicates with one of the ureters and not with the bladder. This will be disproved by injecting milk into the bladder and seeing it ooze out through the cervix, and by examining the bladder with a cystoscope and inspecting the fistulous orifice, as well as by noting the fact that the discharge of the urine from the cervix lacks the peculiar intermittency of a ureteral flow. If necessary the ureters may be catheterized and their patency demonstrated.

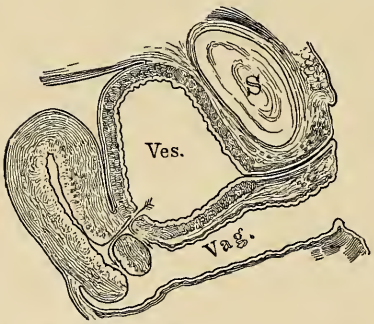


Fig. 220.—Vesico-utero-vaginal and Vesico-uterine Fistula in the Same Patient.

The proper treatment of a vesico-uterine fistula is well described by F. H. Champneys (*Trans. of the Obst. Soc. of London*, 1888, vol. xxx, p. 348), in an article entitled *Description of a New Operation for Vesico-uterine Fistula.*

The procedure is as follows: The patient, thirty-eight years old, had had four severe labors, the last two instrumental. Her pelvis was generally contracted and flattened, and the last labor continued four days and was terminated by the forceps; on the same day the urine began to flow by the vagina, and continued to do so up to the day of operation.

On examining *per vaginam*, the cervix was found rather large and flabby and the canal big enough to admit the index finger for an inch. On injecting the bladder a large stream escaped from the cervix, and a bent probe introduced through the urethra could be passed on directly into the cervical canal.

Operation May 12, 1887. *a*. After passing a probe through the fistula as just described, and bringing it out at the cervix, the latter was steadied with a volsella forceps.

b. A transverse incision $3\frac{1}{2}$ centimeters long was made through the anterior fornix from the vagina and the bladder dissected up from the cervix with scissors and fingers as in a vaginal extirpation of the uterus. The dissection was carried well above the fistula, dividing it into two parts, one opening into the bladder and the other into the cervix, each admitting the index finger easily.

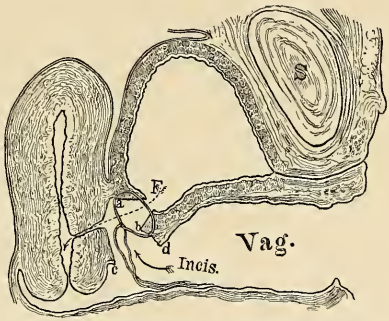


Fig. 221.—Vesico-uterine Fistula treated by dissecting the Bladder Free from the Uterus and sewing up the Fistula.

The long arrow shows the position of the fistula, the short arrow points to the line of incision in front of the cervix separating the cervix (*c*) from the vagina (*d*); the edges of the fistula (*a b*) are then approximated and (*c d*) united again.

c. No freshening was required, as the whole surface was raw. Seven fine silver sutures were passed from side to side to close the opening in the bladder, each one being entered an eighth of an inch from the hole and brought out on its edge, avoiding the mucosa. Four similar sutures closed the cervix. These sutures were all cut short.

d. The vaginal wall was then united to the cervix by four long silkworm-gut sutures, subsequently removed.

A self-retaining catheter was left in the bladder and a gauze pack put in the vagina. The result was a perfect recovery of function.

I operated January 12, 1893, on a somewhat similar case. The patient (F. H., 1750), forty-six years old, had had twelve children, the last two born instrumentally. At the last confinement she was four weeks abed instead of four days, as usual, and from the fourth day on she suffered from incontinence of urine.

Both vaginal walls were found lax and pouting, and the anterior lip of the cervix was completely destroyed. At a point well above the vaginal vault a fistula 1·5 centimeter in diameter opened into the anterior cervical wall. This was treated by exposing the cervix with a speculum and drawing it down, and

then cutting across the vault of the vagina and detaching the cervix from the bladder and so separating the fistula for 1·5 centimeter on all sides from the vagina and uterus, laying bare a hole in the bladder wall 8 millimeters in diameter. This was closed by four silkworm-gut sutures introduced from side to side,

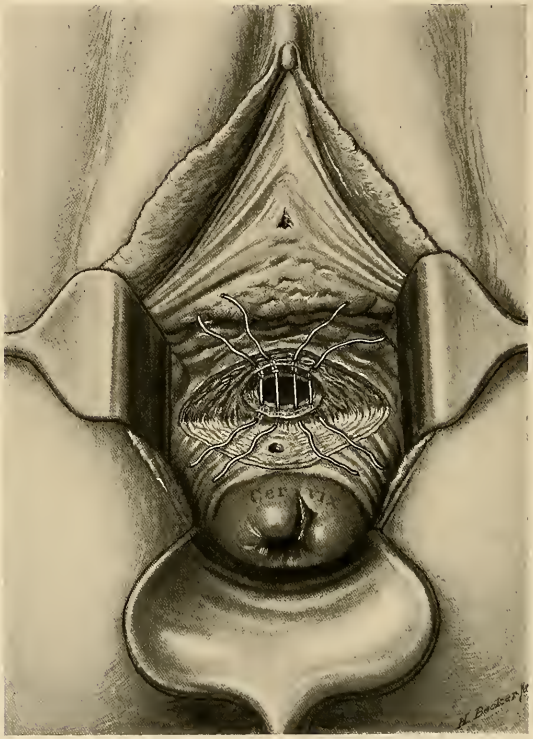


Fig. 222.—Vesico-uterine Fistula, Sutures closing the Bladder in Place but not yet tied.

with fine catgut between for accurate approximation; the cervical part of the fistula was left open, and the vaginal vault was not closed. See Fig. 222. A vaginal pack was then put in and the bladder drained by a catheter.

In two weeks the silkworm-gut sutures were removed and the union found perfect throughout.

Other Vesical Fistulæ.—Aside from the genital fistulæ which have just been discussed, fistulous communications with other organs are but rarely observed. This immunity is due to the fact that some unusual accident is necessary to

establish a communication between the bladder and any of the other abdominal or pelvic viscera.

A communication may be formed in this way between the bladder and a tube or an ovary and between the bladder and the small or large intestine. When the bladder communicates with a tube or an ovary this is brought about in one of two ways: either (1) an abscess of the tube or ovary perforates the broad ligament at its base and so finds its way into the bladder, or (2) an ovarian tumor forms adhesions with the peritoneal portion of the bladder; the septum becomes thinned out and finally breaks, and the contents of the cyst escape by this avenue.

An abscess perforating the broad ligament commonly finds its way into the bladder in the neighborhood of the right or left cornu—that is, at either end of the posterior fold. I have seen a case of a tubercular abscess of the tube on the right side of the pelvis discharging in this way.

A suppurating dermoid cyst may break through into the bladder and the nature of the abscess be determined by the escape of hair (pilimiction) or bones discharged *per urethram*, or even by a tooth found as the nucleus of a vesical calculus. A case of this sort is well described by Dr. G. C. Blackman (*Amer. Jour. of the Med. Sciences*, January, 1869, p. 49). The patient, thirty-six years old, first noticed air escaping from the bladder, then urine passed by the rectum, and she suffered from a cystitis. A calculus was found and removed. This contained a tooth, and in the course of seven years four similar calculi containing teeth as nuclei were extracted. Some months after the last one was removed she began to pass hairs incrusted with phosphatic deposits. Dr. Blackman also gives a careful review of the literature of the subject.

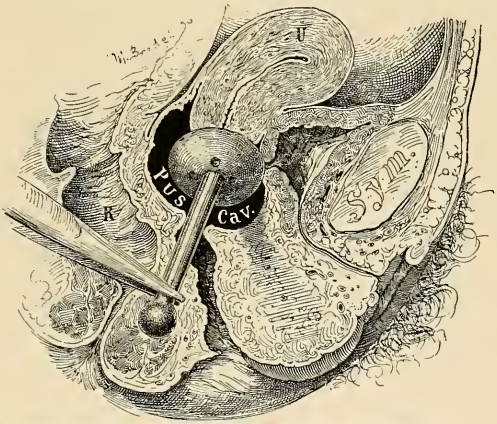


FIG. 223.—VESICO-VAGINAL FISTULA, CAUSED BY A PESSARY SEEN IN SAGITTAL SECTION.

The shank of the pessary lies buried in the recto-vaginal septum. The vagina is atretic and the pus cavity in its upper portion discharges into the bladder, which lies contracted behind the symphysis, by a fistulous opening caused by the cup of the pessary. The hypertrophy of the vesico- and urethro-vaginal septum is also shown, as also in Fig. 224.

Fig. 225 shows the condition found in a patient of Dr. Henry Elsner, of Syracuse, N. Y., in a case of pyuria due to a dermoid cyst. The patient, forty years old, had known of the existence of the tumor for over twenty years.

Three years before the operation the previously movable tumor became fixed above the symphysis, and for the same length of time she suffered from a pyuria.

The tumor was found at the operation to be a right dermoid cyst densely adherent to and discharging its contents into the bladder; after freeing numerous surrounding adhesions, the dense, fibrous sinus, 3 centimeters in diameter, was dissected out down to the bladder just above the symphysis pubis and cut off, exposing a lumen of about 3 millimeters.

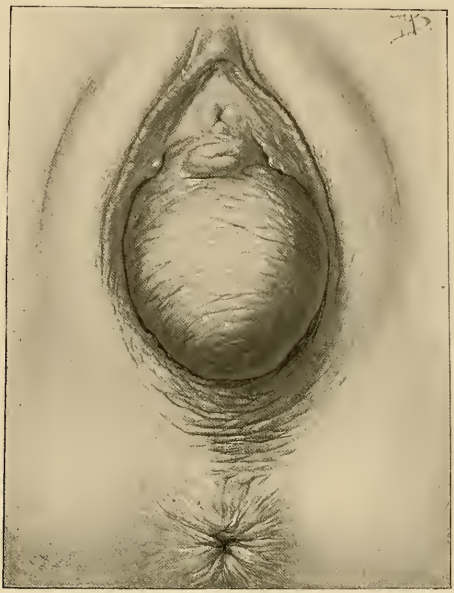


Fig. 224.—Enormous Hypertrophy and Edema of the Anterior Vaginal Wall simulating Cystocele, due to Cystitis. Nov. 27, 1895.

This was closed by six interrupted buried catgut sutures and the vesical peritoneum was then drawn over it and united by six more catgut sutures, leaving a longitudinal linear wound at the site of the attachment. No drain was used. The pus disappeared at once and a perfect recovery followed. When drainage is necessary it is easy to make the wound entirely extraperitoneal by uniting the peritoneum from the bladder up on to the abdominal wall, so as to leave whatever space is desired between the peritoneum and the symphysis.

An extra-uterine sac may also suppurate and open into the bladder, and the nature of the affection first be made clear by the escape of one of the bones through the urethra.

Therig (*Centralbl. f. innere Med.*, Bd. xv, p. 97) has observed in women two cases of paratyphlitie (vermiform appendix?) abscesses breaking into the bladder; both recovered under irrigation.

A case of colo-vesical fistula is reported by R. Harrison (*Twentieth Century Practice*, New York, 1895, vol. i, p. 222). Air bubbles escaped through the urethra and granular cells and spiral vessels were found in the urine, and after death the colon was found adherent to the bladder and a cherry-stone lying in a diverticulum among the adherent intestines. The *débris* in the urine evidently came from the disintegrating kernel of the stone.

The symptoms produced by the communication of any of these extra-

vesical sacs with the bladder are those of cystitis, often with fever and chills, and the admixture of varying amounts of pus with the urine, and it may be with other elements which characterize the kind of tumor.

The diagnosis will be made by the ordinary routine cystoscopic examination, which reveals the secondary catarrhal condition of the vesical mucosa and the intenser area of inflammation around the fistulous opening in whatever part of the bladder it is located; and by passing a searcher into the fistula, and in some cases on into the sac. The bimanual examination will also often show the presence of an inflammatory mass in close communication with the bladder, and in an entero-vesical fistula the passage of air bubbles by the urethra is significant.

In the case of tubercular abscess referred to above I found pus in the urine, varying in quantity at different times, and occasionally tubercle bacilli. The inflammation in the bladder was most intense at the right cornu—that is, in front of the right broad ligament, where there was a group of fleshy granulations. A little bubble of air oozing out between these one day when the patient was being examined in the knee-breast position revealed the presence and position of a fistulous orifice. An examination under anesthesia now showed that the right tube and ovary were contracted down into a small hard mass adherent to the base of the broad ligament, through which they communicated with the opening in the bladder.

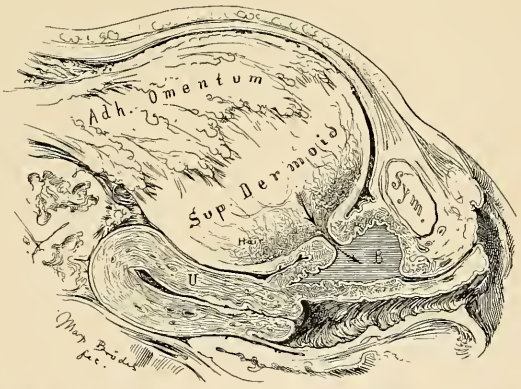


Fig. 225.—Pyuria due to Suppurating Adherent Dermoid Cyst opening into the Bladder (B). Dec. 17, 1896.

Dr. C. P. Noble, of Philadelphia (*Med. and Surg. Reporter*, January 19, 1889), had a case of recto-vesical fistula following an ischio-rectal abscess five years before. After the abscess discharged she passed wind and small pieces of fecal matter by the urethra at irregular intervals.

At the examination an extensive old scar from a pessary was found on both sides, and in the posterior fornix of the vagina, but no fistula could be found after the most careful search. At Dr. Noble's suggestion, however, on the following day hydrogen gas was forced into the rectum, found its way into the bladder, and was lighted at the end of a catheter introduced into the urethra.

Treatment.—The proper line of treatment must depend on the individual case; no general rules can be laid down. The local affection of the bladder tends to a spontaneous recovery when the cause is removed. If the patient's health will permit it, a sac which opens into the bladder should therefore either be enucleated and the source of the discharge stopped, or evacuated and drained in some other direction—into the vagina, or by the abdominal wall—so as to give the bladder a chance to recover.

In one of the worst cases of pyuria I have ever seen a cure was effected by opening and draining the abscess, which lay in front of the uterus, through the anterior fornix in the vagina. In another case a pelvic abscess on the right side, discharging through the bladder, was relieved by enucleating both tubes and ovaries with the uterus, leaving the vaginal portion of the cervix, which was sewed over the fistulous orifice at the base of the broad ligament, so as to divert any discharges into the vagina. The fistula could not be closed by direct suture on account of the friable inflammatory tissue composing its walls.

Hemorrhoids.—Varicose Bladder.—A hemorrhoidal condition of the bladder or vesical varix is a rare affection, in spite of the fact that all the favoring conditions for its frequent occurrence seem to be supplied in the venous stasis so often found in the pelvis, in the enormous congestion of hemorrhoidal venous sinuses, as well as in the congestive disturbances found in association with retroflexion of the uterus. The frequency of inflammatory disturbances in the neighboring genital organs, and the great development of crural and labial varices in pregnancy, as well as the increased amount of blood observed in the bladder in that condition, would also lead one naturally to expect to meet with a varicose condition of the bladder as a common occurrence under these circumstances. When found in men vesical varix is apt to be associated with rectal hemorrhoids. The cause of vesical varix has been shown in them to be due to an insufficient size of the venous channels above the communication of the hemorrhoid and the vesical plexuses, so that a lower rectal congestion brings with it at the same time a vesical stasis. In 1854, Guyon exhibited a case at the Anatomical Society of Paris in which the neck of the bladder was surrounded by a varicose venous circle with diverging dilated submucous ramifications.

H. Picard (*Traité des mal. de la vessie*, Paris, 1878, p. 284) found in an autopsy on a man who died of this disease that the large venous plexuses surrounding the prostate communicated with the hemorrhoidal plexus. The mucosa of a large part of the bladder itself bristled with a great number of varices, forming little bluish tits about its neck, on the base, and extending high up on the lateral walls. Each little titlike projection was the elbow of a vein projecting from 1 to 2 millimeters beyond the surface of the bladder. Some of the vessels near the neck showed abrasions, and others were perforated, demonstrating the source of hemorrhage, and probably of the infection of which the patient died.

In the clinical history the one characteristic symptom is the repeated hemorrhages. In men retention of the urine has also been noted as a common symptom.

The diagnosis between this condition and papilloma and cancer in its

early stages, by symptoms and an external examination, is only made with difficulty. If the hemorrhages come on with an attack of the piles, vesical varix may be suspected, especially if difficulty in urination occurs at the same time. Vesical varix is also found when there is a periodical bleeding alternating between the rectum and the bladder.

All doubt may be easily cleared up in women by making a direct cystoscopic examination of the mucous surface of the bladder, when the blue congested vessels may be easily inspected and their number, size, and distribution determined. In such a case it is better to examine first in the dorsal position under a moderate degree of elevation, to avoid the tendency of the knee-breast position to produce an artificial anemia, temporarily relieving the very condition one wants to see. The inspection should be carefully extended over the whole circumurethral area, and from thence down the urethra as the speculum is withdrawn.

Arbuthnot Lane, at a meeting of the Clinical Society of London (*Lancet*, March 18, 1895, vol. ii, p. 1252), reported a rare condition under the title of *A Nævoid Growth of the Mucous Membrane of the Bladder.*

A child, aged three years and a half, had been passing bloody urine for two years, the blood at times coming away in large clots. When seen by Lane the hemorrhage was so severe and had been so long continued as to endanger life. On examining the patient, several nevoid patches were seen around the anus and on the buttocks. By abdominal palpation the bladder could be distinctly felt above the pubes. When the bladder was opened above the symphysis pubis, large nevoid masses, some as large as grapes, protruded through the wound; most of these were soft and bled easily; a few were hard and apparently cystic. Almost the whole of the mucous surface of the bladder was affected.

As an operation seemed to be practically out of the question, the incision was closed, and afterward the hemorrhage practically ceased, the urine being only a little blood tinged at times.

Treatment.—If the discovery of the varicose condition is made accidentally, and there are no urgent symptoms, nothing should be done, but in a persistently bleeding case in a woman, after diagnosing the cause of the bleeding and locating its position in the bladder, one of several plans may be followed; in a mild case the galvano-cautery introduced through the speculum may be used over small areas at several sittings.

If the urethra is dilated to admit a No. 15 to 18 speculum, one or more ligatures even may then easily be thrown about several of the larger venous trunks by means of a fine curved needle on a fixed handle carrying fine silk, which can then be tied by using a little instrument pronged like a pitchfork to afford a point of counter pressure within the bladder. A more active and direct interference may be made by means of an incision through the anterior vaginal wall, everting and exposing the veins at the neck of the bladder. Several of the larger trunks may then be tied with fine silk and the vaginal incision closed again.

Dr. W. Ryan, of Springfield, Ill., had a case of varix in a woman which he

successfully treated by a suprapubic incision. The patient was thirty-one years of age and married, and for six months had passed large quantities of blood with her urine, in clots; whenever the bladder became distended with the clots her suffering was extreme. She was so anemic and in such a generally depressed state of health that several of her physicians thought she was suffering from a serious renal affection. There were no rectal hemorrhoids at all. Washing out the bladder and the use of injections only made her worse.

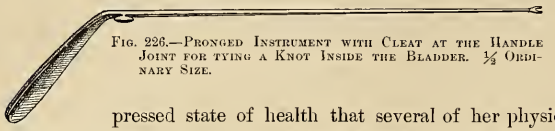


Fig. 226.—Pronged Instrument with Cleat at the Handle Joint for tying a Knot Inside the Bladder. ½ Ordinary Size.

On December 19, 1890, Dr. Ryan opened the bladder above the symphysis pubis and found an extensive dilatation of the veins about the neck of the bladder, at the base, and running up on the sides just under the intact mucosa, about 2 millimeters in diameter. In opening the bladder, some veins about the neck were cut, and continued to bleed moderately through a drainage tube which was left in for five days. After this simple treatment, incision, inspection, and drainage, she made a perfect recovery.

Hyperemia.—By hyperemia or a congestion of the vascular system of the bladder is meant either a local or a general flushing of the vesical capillaries, producing an increased redness of the surface, in contradistinction to a hemorrhoidal condition, where the venous trunks are involved and the capillary veins are greatly distended. A physiological hyperemia of the bladder may be observed when nature determines any large amount of blood to a neighboring organ, as, for example, in pregnancy. A localized hyperemia of the vesical mucosa is often found also associated with inflammatory disease in the immediate neighborhood. The withdrawal of the obturator from the end of the vesical speculum always produces a little patch of hyperemia on the posterior vesical wall by acting for a moment as a piston and sucking the vesical mucosa into the end of the speculum.

Hyperemia of the Trigonum.—This is a common condition localized in the trigonum, and rarely extends beyond its limits, except into the urethra.

The entire surface of the trigonum may be of a deep rosy red, the injection extending around both ureteral orifices; the border of the injected area becomes gradually merged into the surrounding sound tissue. The surface of the mucosa sometimes has a slightly puffy or edematous appearance. The injection may be of a patchy nature only surrounding the ureteral orifices, or it may even be limited to the neighborhood of one ureteral orifice.

The margins of the injection when not limited by the interureteric line are irregular in outline. The most intense injection is often in the area closest to the urethra, which is also deeply injected in its upper part, and characterized by prominent lacunæ.

The symptoms produced by a hyperemia are characteristic. The patient

suffers from a desire to empty the bladder at frequent intervals, either by day or by night, or both; she often complains of a burning or bearing-down sensation, or of a feeling of fullness about the neck of the bladder. The act of urination is sometimes painful, but not always; very often after urinating there is a distressed feeling about the parts, which persists for some minutes or even an hour or more, leaving her much depressed. Other patients may not feel the desire to urinate more frequently than ordinary, but the distress is experienced afterward. The whole area is extremely tender to the touch either by the end of the speculum or a probe.

The causes of this disease are sometimes difficult to determine. I find it in all those cases which have hitherto been diagnosed as "irritable bladder," or "teasing of the neck of the bladder from retroflexion of the uterus," or "pressure of an anteflexed uterus on the bladder," or "neuralgia of the bladder"; it is also the only lesion existing in many of the cases under treatment for a supposed cystitis.

It is frequently observed after abdominal pelvic operations, and appears to be due in these cases to the irritation of the vesical mucosa by the highly concentrated urine discharged during the first few days. I have for the past two years almost eliminated it from my wards by giving every such patient a large rectal enema of normal salt solution before she leaves the operating table; the salt solution dilutes and greatly increases the flow of urine.

Another fruitful cause of hyperemia of the trigonum is the slight mechanical insult of catheterization. It may be that a mild infection lies at the bottom of some of these cases, and that the affection is in reality a form of trigonitis, but this remains to be proved.

Diagnosis.—The diagnosis will not be difficult if all cases of "vesical irritability" are examined by the direct method.

The marked redness in the trigonum is at once apparent, and the evidence is still more decided when there is a patch of it on one side while the other remains clear. Often the patient complains bitterly when the end of the speculum touches this spot, and if it is touched with a searcher she will declare at once that the seat of her discomforts is located there.

The examiner must guard against two errors in making the diagnosis: First, he must not mistake the physiologically greater injection of the trigonum over that of the rest of the bladder for a hyperemia; he will avoid this by familiarizing himself with the appearance of the normal trigonum, and allowing for the slight difference in color which always exists.

In the second place, he must not mistake the hyperemic blush about a urethral orifice, which is so commonly met with as a sign of disease of the kidney or ureter of that side, for a simple hyperemia. A few leucocytes are sometimes found in the urine when the hyperemia is intense.

Treatment.—The treatment should be directed to the cause when it can be discovered. If it follows an operation, recovery is usually spontaneous within two or three weeks. If the urine is highly charged with urea, diluents should be given; water and flaxseed tea, and citrate of potash and lithia in large doses are all useful. I have found the most relief from half-teaspoonful doses of

sweet spirits of niter repeated every two hours; fluid extract of zea maïs and triticum repens in half-teaspoonful doses are valuable, particularly the first remedy. Any articles of diet, such as tomatoes, fruits, or acids, should be avoided when the patient finds that they aggravate her condition. The bowels must be kept well opened all the time. A prolonged hot vaginal douche often gives great relief.

When these means fail, direct topical treatment should be begun by placing the patient in the knee-breast position and exposing the affected area, and applying a 3 to 5 per cent solution of nitrate of silver to the affected area alone. It is easy to do this with a little absorbent cotton twisted on a wire applicator. These applications may be repeated every three to five days as long as the affection continues to improve. If the convalescence comes to a standstill I then inject 4 to 6 cubic centimeters of a 2 to 3 per cent solution of ichthyol in glycerin into the empty bladder, and insert Clark's rubber balloon as described in the next section on cystitis, inflate it, and leave it in for from five to ten minutes.

Cystitis.—Bacteriology: Cystitis is a disease much less frequent in women than in men, and exceedingly rare in children. An infection is the true cause of every case of cystitis, and the continuance of the disease depends upon the continued action of one or other of the various pathogenic micro-organisms. The term cystitis is therefore a collective name for a variety of inflammatory affections having certain symptoms in common in their early stages, but often differing widely in their final forms.

The commonest avenue of infection is through the urethra, in which numerous organisms are constantly found normally; these organisms, together with organisms from the vulva lodged on the external urethral orifice, may be carried into the bladder by the catheter, sound, or other aseptic instrument, or they may be introduced on unclean instruments, and the infection started up in this way. It is also necessary to allow for a few cases in which the organisms enter the bladder from the urethra without instrumentation, especially where the urethra is dilated and patulous, as in women who have borne many children.

The bladder may also be infected from the kidney either when the kidney or its pelvis is diseased, as in pyelitis or pyelonephrosis, or, as has been shown, even when the kidney itself is healthy, the organisms may be eliminated from the body through it, and so may infect the bladder. A claim has also been made by Wreden (*Arch. des Sciences Biologiques*, St. Petersburg, Bd. ii, 5, 1894) that a direct infection of the bladder may take place from the intestine under certain conditions; in support of this are the experiments upon animals, occluding both rectum and urethra, with the invariable result of occasioning a true cystitis, in which usually pure cultures of the organism used in the experiments may be isolated from the bladder.

C. Posner and H. Lewin report a series of experiments (*Centralbl. f. Harn und Sexual-Organe*, Bd. vii, Heft 7, 1896) which throw much light upon this question of a direct infection; they found, after closure of both the rectum and the urethra, that while they were always able to get pure cultures from the blad-

der of either the colon bacillus or the special organism used, these organisms were always present in the blood, and in the substance of the kidneys as well, so that although the result of the investigation does not entirely preclude the possibility of a direct passage of the intestinal bacteria into the bladder, it renders it less probable, while the chances are that the infection travels through the blood into the kidneys and so enters the bladder. In several cases in which they injected coloring matter into the rectum, in no instance did it appear in the bladder or bladder wall. The entrance of the organisms into the blood is explained by the fact that there was always some wound of the intestine or rectum, from the clamp or a ligature, opening up an avenue for their direct passage into the finer blood vessels or into the lymphatics.

It is also possible that as a result of the ligation changing the circulatory conditions from the normal the organisms may have penetrated the unwounded intestinal wall, and so have entered the lymphatic circulation. That this sometimes occurs in the human being is beyond question, for we know that while the bacteria are unable to pass through the normal intestinal mucosa, they do penetrate the mucosa and enter the peritoneal cavity when the vital activity of the intestine is lowered or dead, as, for instance, where there is a strangulation of the intestine, or where the blood supply is cut off. The colon bacillus is not infrequently found free in the peritoneal cavity under such circumstances.

On the other hand, Reymond (*Ann. des mal. des organes gen. urin.*, April, 1893) has proved beyond any question that bacteria can enter the bladder directly from inflammatory areas in the neighboring organs. He was struck by the frequent occurrence of cystitis in women suffering with inflammation of the uterus or of the Fallopian tubes, and in most cases proved by culture that the organism was the same in both organs; as an additional proof, he found in a case of salpingitis in one tube a localized cystitis on the same side in the bladder. To complete his chain of evidence it was necessary to prove that the organisms could pass directly through the walls of the bladder from the neighboring inflamed area. To do this he laparotomized dogs and injected 2 or 3 centimeters of a culture of the uro-bacillus liquifaciens of Krogius, which he had isolated from a case of salpingitis and cystitis, under the peritoneum covering the bladder.

Ten hours latter, on removing the ligature from the penis, he found a cystitis present, and was able to obtain pure cultures of the uro-bacillus from the bladder, cultures from the blood and kidneys remaining sterile. He also demonstrated the organisms in the bladder walls under the spot where the inoculation was made, and at this place the cystitis was most marked, showing in one case an ulcerated area. By further experiments he proved that the organism was able to penetrate the peritoneum.

The clinical cases, together with the experiments on animals, prove his conclusion that cystitis may arise from the passage of organisms directly from a diseased tube or ovary, the blood, kidneys, and other organs remaining sterile, when the predisposing condition is present in the form of a congestion of the bladder caused by the neighboring infected area.

Finally, the infection may come from rupture into the bladder of purulent collections in the other abdominal viscera, as, for instance, in the rupture of tubal, ovarian, or perityphlitic abscesses.

The direct predisposing causes are still to some extent unknown. We do know, however, that in the normal bladder, though there are often pyogenic organisms present, cystitis is not set up; this has been amply proved by experiments both on the lower animals and on the human being, for we know that the typhoid bacillus and many other pyogenic organisms are excreted by the kidneys and pass through the bladder without the least harm being done. This fact gives us an important starting point for our investigations, as it proves that the presence of the bacteria alone is insufficient in the normal bladder to cause an inflammatory reaction.

Melchoir (*Cystite et infection urinaire*, Paris, 1895) found in numerous experiments, after injection of cultures of the various pyogenic organisms, and ligation of the urethra to cause retention, that he was always able to produce a cystitis in animals, the urine containing blood, pus cells, and many bacteria; cystitis superinduced in this way clears up, however, in a few days. This explains the frequent occurrence of cystitis in old men with enlarged prostate glands, and also in women who are suffering with prolapsus of the uterus dragging down the bladder; in both cases there is always a certain amount of residual urine in the bladder.

Melchoir also found that after a slight traumatism of the bladder wall cystitis occurred readily, and under this head we can place the cystitis following catheterization and instrumentation of the bladder, also the cystitis following childbirth.

Stone in the bladder, by pressure and injury to the vesical walls, is often a predisposing cause, and cystitis accompanies very often the growth of either benign or malignant neoplasms of the bladder walls. Further, the ingestion of irritating drugs by their irritating or caustic effects on the vesical mucosa prepare a suitable soil for the entrance of the bacteria. The scanty urine highly charged with urea and various other salts, which is excreted after operation, also acts in the same way. Finally, the congestion of the bladder as a result of pelvic inflammation is an important cause, as proved by Reymond.

The alkaline or ammoniacal urine which was formerly considered as a cause of cystitis is now known to be merely a secondary result of it; it follows the decomposition of the urea into carbonate of ammonia, this decomposing power being the property of certain bacteria.

Many different organisms have been isolated in cystitis. Clado (*Étude sur une bacterie septique de la vessie*, Paris) found one bacterium occurring so often and so virulent in character when injected into mice that he turned his attention entirely to it; he describes it under the name of "Bacterie septique de la vessie." Since the work of Clado many articles have appeared describing various other organisms found in the urine taken from cases of cystitis.

Albarran and Hallé (*Note sur une bacterie pyogène et sur son rôle dans l'in-*

fection urinaire, *Bull. de l'acad. de méd.*, 1888) describe an organism found by them in forty-seven out of fifty cases of infection of the urinary tract, the organism being present in pure culture in fifteen out of the forty-seven cases; this was named by them "bacterie pyogène."

Doyen (*Journal des connaissances médicales*, 1888, p. 226) studied the organisms present in cases of ascending pyelonephritis, and found three varieties of the proteus.

Rovsing (*Blasen-Entzündungen*, Berlin, 1890) studied the urine from thirty cases of cystitis, all but three of which were ammoniacal, and found in five of the thirty the tubercle bacillus, in eight the staphylococcus pyogenes aureus, and in three the staphylococcus pyogenes albus and citreus; he also found in the other cases various undescribed organisms —the streptococcus pyogenes ureæ, the diplococcus ureæ pyogenes, in two cases the cocco-bacillus ureæ pyogenes, and in one case micrococcus ureæ flavus pyogenes.

Krogius, the author of several articles on the bacteriology of cystitis and other urinary infections, has come to the conclusion that the organism, a short bacillus commonly found by him, was in fact an intestinal bacillus, probably the colon bacillus.

Melchoir published in 1895 the results of the bacteriological examinations in thirty-five cases of cystitis, and found that among these the colon bacillus was present in pure culture seventeen times, and was present altogether twenty-four times. The streptococcus pyogenes was found four times, the proteus of Hauser four times, the tubercle bacillus three times, and the gonococcus and typhoid bacillus each once; the remaining organisms were undescribed until he isolated them.

Melchoir also thinks that the organisms described by Clado, as well as those described by Albarran and Hallé and Morelli, are in fact only the colon bacillus which he found so many times, and he compares the modes of growth, size, and general morphology in a convincing manner.

Besides the above, Heyse (*Zeitschr. f. klin. Med.*, Bd. xxiv, 1894, p. 130) has described an interesting case of cystitis from infection by the bacillus lactis aërogenes, with the formation of gas in the bladder. He traced the infection from the intestines, where the bacillus was present in large numbers, to the vagina, where it had also evolved gas, from whence it had evidently been carried into the bladder by catheterization. Heyse also cites a case of pneumaturia described by Senator, who found the torula cervisiæ to be the cause of the gas formation in a diabetic patient.

The bacillus aërogenes capsulatus of Welch has also been isolated from several cases of pyelonephritis, and in one case reported by Goebel, from an autopsy performed at the Hamburg General Hospital, on an old man who had an enlarged prostate, the bladder was found filled with gas, and there were numerous gas blebs beneath the mucous membrane.

Fr. Vahle (*Inaug. Diss.*, Marburg, 1895) describes a case of exfoliative cystitis in a woman suffering with a myoma incarcerated in the pelvis, in which the

organism present was the streptococcus pyogenes; the patient died later of a septic peritonitis.

As in the bacterial infections in other parts of the body, we are likely to find in cystitis two or more varieties of organisms present at the same time, or, in other words, a mixed infection. This is especially likely to be the case in the more chronic forms of cystitis.

For example, Melchoir found in one case of cystitis accompanying carcinoma of the bladder the bacillus coli communis and the proteus of Hauser, in another case of cystitis of long duration, following a urethral stricture, the bacillus coli communis and the streptococcus pyogenes, and in still another case of long-continued cystitis the proteus of Hauser and the streptococcus pyogenes.

The pathogenic bacteria which have been most commonly isolated from the inflamed bladder may be summarized as follows:

The bacillus coli communis, the streptococcus pyogenes, the staphylococcus pyogenes albus, citreus, and aureus, the bacillus lactis aërogenes, urobacillus liquifaciens, the gonococcus Neisser, the typhoid bacillus, the tubercle bacillus, and several varieties of the proteus.

One can well see from this list that almost any pyogenic organism, entering the bladder under favorable conditions, may set up an inflammatory action.

Certain of these micro-organisms seem to follow some definite route of entry to the bladder; the gonococcus, for example, always travels up the urethra, and the cystitis which develops from it belongs to the group of ascending infections; the colon bacillus may take the same route, or it may penetrate the tissues and pass more directly from the bowel into the bladder. This is especially likely to happen if the bowel is adherent to the bladder or opens into it.

The bacillus tuberculosis is often a descending infection, finding its first habitat in the kidney and then traveling down the ureter to the bladder.

Finally a condition has been described by H. Krogius (*Annales des maladies des organes genito-urinaires*, 1894, p. 96, 210), B. Goldberg (*Centralbl. f. Harn und Sexual-Organe*, Bd. vi, 1895, p. 352), and others under the name of "bacteriurie," in which, with no sign of cystitis except the presence of a few pus cells, the urine simply swarms with bacteria when voided, and has a peculiar fetid odor.

To summarize, we find the following facts:

1. That cystitis is always caused by the presence of bacteria.

2. That the mere presence of bacteria is insufficient to cause a cystitis, a further predisposing cause is necessary.

3. That there are various modes of entrance for bacteria—through the urethra, through the ureter from the kidney directly, from inflammatory areas in the uterus or Fallopian tubes, and probably from the rectum under like conditions; still another probable avenue of entrance is through the blood.

4. That under favorable conditions any pathogenic organism may give rise to cystitis.

Distribution of the Inflammatory Area.—From a purely clinical standpoint cases of cystitis may also be classified, according to the location and distribution of the inflamed area, as—

Diffuse cystitis (cystitis diffusa), involving the entire mucosa of the bladder;

Circumscribed cystitis (cystitis circumscripta), where the disease is confined to a patch; or

Scattered cystitis (cystitis dispersa), where the disease is distributed in patches over the surface.

Such a division of the forms serves to direct the attention to a fact of the utmost importance hitherto overlooked in the treatment of these cases—that the cystitis is not always a disease of the entire mucosa of the bladder, but is far oftener found in patches with sound areas between, the sound portion usually preponderating. The practical corollary from this is, that it is irrational to treat the whole inner surface of the bladder by the injection of a strong solution which may seriously harm the sound mucosa.

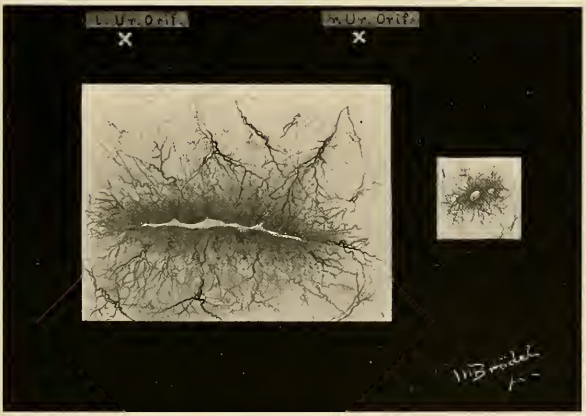


FIG. 227.—LINEAR ULCER OF THE BLADDER ON THE POSTERIOR WALL, APPEARING AS A YELLOWISH-WHITE SURFACE SURROUNDED BY AN AREA OF INTENSE INJECTION, ABOUT 3 MILLIMETERS BROAD; THIS AGAIN IS SURROUNDED BY AN AREA OF INJECTED LARGE VESSELS, WHICH APPEAR TO CENTER IN THE ULCER.

The location of the ulcer is shown by the ureteral orifices. Two other small round ulcers in the same bladder, shown in their relative positions near by. Patient of Dr. P. Harris. Exam. Jan. 19, 1897.

According to the location of a circumscribed cystitis, it may be designated as trigonal, periurethral, fundal, apical posterior, right or left lateral.

If we add to this description of the form and location of the disease the name of the pathogenic organism, the outlined description becomes fairly complete; for example, we often have a cystitis trigonalis (gonococcus), a cystitis posterior (tuberculosa), or a cystitis universalis (bacillus coli communis).

Pathological Anatomy.—In acute cystitis the mucous surface of the bladder becomes intensely red and swollen and sometimes ecchymotic; in the chronic forms the bladder becomes discolored and grayish and the mucosa thickened and the tissue beneath it infiltrated.

In the more advanced stages there is a breaking down of the tissues in the center of the inflammatory area and an ulcer is formed. An ulcer of this kind, characteristically linear, is shown in Fig. 227; in other instances the ulcers are small, round, and grouped. When the inflammation is localized in the trigonum the ulcer formed often gives rise to excessive hemorrhages, runs a protracted course, and responds slowly to all but the most energetic plan of treatment. (See Fig. 228.)

Fig. 228.—Ulcers of the Trigonum of the Bladder, Located Between, and a Little in Advance of, the Ureteral Orifices.

Note the white surface of the ulcers and the deeply injected margins. Patient of Dr. Neff.

When the inflammation extends into the muscular vesical wall (cystitis parenchymatosa), abscesses may form and rupture into the bladder. In exfoliative cystitis the entire mucous lining may be thrown off like a cast, often bringing with it some of the muscular coat.

Clinical History.—The chief symptom common to all cases of cystitis is the frequent passage of urine accompanied with pain, most marked when the disease is situated near the neck of the bladder. The frequency varies from an hourly evacuation all the way down to one every five or ten minutes; tenesmus exists when there is great straining with the passage of small amounts of urine.

The amount of urine evacuated at one time varies from 15 to 20 cubic centimeters to but a few drops, and its emission is not followed by any sense of relief. The urine passed is turbid, flocculent, or contains mucus, and in aggravated cases blood. Pressure over the symphysis and on the base of the bladder through the vagina is painful, and can not be borne in a severe case. Fever and chills are absent, as a rule, and if present usually indicate an involvement of one of the kidneys by an extension of the infection up the urethra. Any instrumental examination of the bladder is so painful that it ought not to be persisted in without anesthesia; for this reason catheterization ought not to be practiced.

When the mucous secretion is in excess, but few corpuscles are found in the urine; in other cases, when there is a higher grade of inflammation (cystitis purulenta) there is a marked amount of pus deposited.

Gas in the urine (pneumaturia) comes from the gas bacillus (see Heyse,

Centr. f. klin. Med., Bd. xxiv), or from the decomposition of diabetic urine; gas is also observed when there is an entero-vesical fistula.

The duration of a cystitis varies from a short-lived affection to one of years' standing; the gonorrheal cases in women are most apt to recover quickly and spontaneously. The catarrh of the bladder which is found associated with calculus recovers when the cause is removed. The most protracted cases are those of tubercular origin and those following labor. When cystitis is associated with a diphtheritis or gangrene of the bladder the termination is speedily fatal. In cases of old standing the muscular walls may become so hypertrophied as to form a hard mass like a tumor behind the symphysis.

Diagnosis.—It is always easy to diagnose a case of cystitis if the proper examination is made; this includes (a) a history of the illness, (b) examinations of the urine, and (c) an examination of the mucous surface affected.

Many women actually under treatment for cystitis only suffer from hyperemia of the trigonum, or mild inflammation of the upper urethra; with a careful examination of the urine and inspection of the bladder such a mistake in diagnosis could not occur. The history of the case includes the characteristic symptoms just referred to, either coming on gradually or dating from some particular occasion; strangury and tenesmus are the most important symptoms. The examination of the urine reveals the presence of bacteria, and when they are found in pure culture they are usually the cause of the cystitis.

In tubercular cystitis the discovery of only a few of the characteristic tubercle bacilli, made after repeated searches, will be sufficient to make the diagnosis clear. In one of my patients, my assistant, Dr. J. G. Clark, exposed an ulcer in the bladder distended with air, and curetted off a little portion, in which numerous tubercle bacilli were found. When the colon bacillus is the infecting organism it is often found in the urine in pure culture.

The direct examination of the inflamed bladder gives the surest information as to the existence of the disease, its grade, and its extent.

The knee-breast position is the most convenient one for seeing all parts of the organ, but in milder grades of cystitis the artificial anemia induced by the posture and expansion tends to obliterate the characteristic signs; it is better, therefore, in these cases to examine in the dorsal position with a slight elevation. The patient should be put under anesthesia for the first investigation, so that it may be thoroughly made. The inspection begins at the posterior wall, and extends in an orderly manner over the whole organ, as described.

In this class of cases one is apt to find at the posterior pole a superficial layer of blood on the mucosa, which has come from the trauma of the end of the specula impinging on the inflamed delicate mucosa. The difference between this and the submucous hemorrhage can be detected by wiping the surface with a pledget of cotton, when the blood comes off. The affected areas are rendered strikingly apparent by contrasting the normal whitish background and the deeply injected patches of inflamed tissue. In the sound parts the capillaries are rarely seen, and the pale mucosa is mapped out by larger branching vessels, but the dis-

eased areas show a fine capillary network, or capillaries so numerous that a general red color of varying intensity prevails.

By the bimanual examination the bladder is found tender to touch, and when the muscular coat is thickened it may feel like a tumor behind the symphysis. In one of my cases I found a hard ovoid mass as big as a hen's egg lying transversely in front of the uterus; this proved to be a tuberculous bladder in the last stages of the disease. (Fig. 229.)

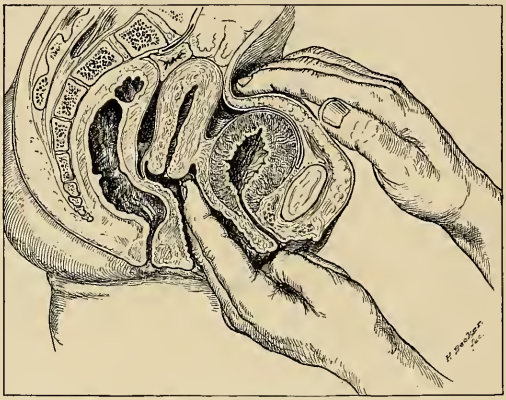


Fig. 229.—Tubercular Cystitis.

Shows the markedly thickened vesical walls and the method of palpating the bladder bimanually.

Treatment.—The treatment of a cystitis will vary widely, according to the cause and character of the inflammation. When there is a continuously acting cause, such as a stone in the bladder, or urine pouring out of an infected kidney, or a stagnation of the urine in an imperfectly emptied bladder, these conditions must be relieved before any progress can be made toward a cure. As a rule, it is sufficient to remove the cause to effect a cure, and this will be done in the instances cited by lithotomy, or by nephrectomy, or by nephro-ureterectomy, when the ureter is involved too, or by relieving a prolapsus of these uterus and the bladder, and washing out the stagnant urine two or three times daily with warm boric acid solutions (2 to 3 per cent).

Treatment of Acute Cystitis.—An expectant palliative plan of treatment should be pursued in acute cases; under these circumstances local treatment or interference of any sort aggravates the intensity of the inflammation. The patient must stay in bed in a warm room, the bowels be kept open, and the diet reduced to liquids and soft food; all stimulants must be prohibited. Prolonged vaginal douches, lasting fifteen to twenty minutes, given three times daily, help to relieve the congestion; hot applications should be kept on the lower abdomen, if they give comfort. Hot sitz baths and dry hot bran bags are also valuable adjuvants.

While the pain is excessive and persistent it is necessary to give the patient as much relief as possible, and to insure some hours of rest and sleep every day. Morphin meets this indication better than any other drug, and the best way to use it is to give enough of it hypodermically in two or three doses to secure about eight hours of continuous rest. During the remaining sixteen hours codeia may be tried, and hyoscyamus and belladonna should be given in suppositories, or an occasional rectal enema of 30 drops of deodorized tincture of opium in 100 to 120 cubic centimeters of warm starch water.

As soon as the inflammation begins to subside, as shown by the lessened pain and frequency of micturition, the convalescence will be greatly promoted by washing out the bladder two or three times daily with lukewarm water containing 2 per cent of boric acid or 2 per cent of ichthyol.

Treatment of Chronic Cystitis.—The treatment of chronic cystitis must always be one of active interference. Four plans of attack are available: (a) medication, (b) irrigation or instillation, (c) direct topical treatment, (d) surgical treatment.

Medication.—A great variety of drugs have been recommended as beneficial in curing or relieving chronic cystitis; there is a large amount of trustworthy testimony in favor of salol in doses of from 3 to 5 grams daily in divided doses; under its use the symptoms abate, and the bacteria in the urine diminish in numbers. Quinin, which is largely eliminated by the kidneys, has a sedative effect on the urinary organs, and is said to act effectively in sterilizing the urine. Salicylate of soda in a 5 to 10 gram dose is also used in some cases with good effect.

In the rarer gonorrheal cases oil of sandalwood or oil of copaiba in capsules, 5 to 10 minims each, give excellent results. Eucalyptus oil has also been found useful in 10 minim doses every two hours. Fluid extract of zea maïs corn-silk), in half teaspoonful doses, is the best drug I know to allay the irritability of the bladder; fluid extract of triticum repens is used in the same way.

A milk diet is of the best service in many cases.

Irrigation.—Irrigation, or washing the bladder out, is a necessary adjuvant to other means of treatment; by this means the bladder is thoroughly cleansed, and enormous numbers of bacteria removed with mucus and other *débris*, often imperfectly discharged in micturition, and for a time at least the bladder walls are relieved from the constant contact with toxic products.

The irrigation may be carried out in two ways: either by letting small quantities of the fluid run in and directly out again, or by injecting larger quantities, so as to distend the bladder sensibly, and then, after an interval of from a few seconds to a minute, letting it flow out again. The latter plan has the advantage of distending the bladder so that its entire mucous surface is cleansed by coming into contact with the solution. The amount of discomfort experienced by the patient should serve as a guide as to the amount of distention to be practiced at each sitting, and with repeated trials it will be found that the bladder grows more tolerant. The irrigating solution is apt to give pain if its specific gravity

is much below that of the urine; for this reason plain warm water, although useful mechanically, is not well tolerated.

A satisfactory solution (see A. S. Lobingier, *Medical News*, Philadelphia, Oct. 15, 1892, p. 425) is made with a powder of boric acid, borax, and chloride of soda in the respective proportions of 4, 2, and 1 grams dissolved in half a liter of hot water, and used warm.

Solutions of the bichloride of mercury have a bactericidal effect and are of the utmost service in most cases of chronic cystitis. It is best to begin using weak solutions of 1 to 100,000 in water in which a little common salt has been added (·6 per cent), and to increase the strength each time until they are used as strong as 1 to 10,000 or 1 to 5,000. It is well to vary these irrigations with the milder boric acid solutions, using them on alternate days, or one in the morning and the other in the evening.

Weak solutions of carbolic acid, not stronger than 1½ per cent, often do good service. When the distressing symptoms have cleared up and the urine still remains purulent, Mr. Nunn (*Lancet*, Feb. 23, 1878) recommends the use of a quinin wash, beginning with one grain of the neutral sulphate to the ounce of water, with one drop of muriatic acid.

When the urine remains alkaline and there is a tendency to throw down phosphates, Mr. R. Harrison (*Twentieth Century Practice*, vol. i, p. 239) recommends irrigation with 5 to 10 grains of citric acid dissolved in a pint of warm water.

The technique of the irrigation is as follows: The patient is put on a table, or if she is too weak she is brought to the edge of the bed with the thighs flexed and the buttocks resting on a perineal drainage pad; the parts are then freely washed with a weak boric acid solution, taking particular care to remove all visible foreign material from the urethral orifice.

As an irrigating apparatus I use a simple glass funnel connected with a glass catheter by a piece of rubber tubing four feet long. A clip or a pair of forceps on the tubing controls the flow of the fluid. Unless the person giving the injection can be relied upon to do it skillfully, it is better to use a rubber catheter in place of a glass one, which may bruise the tissues.

The solution is now poured into the funnel, and allowed to run down and fill the tube and catheter; the injection of any air must be avoided, because it is painful. The catheter is then introduced into the bladder and the funnel held high enough to force the fluid slowly into the bladder; after waiting a while the funnel is now dropped below the level of the table and the fluid flows back again. If the solution is comparatively clear the maenuver may be repeated, but as often as it becomes turbid it should be renewed. Irrigation may also be practiced through a two-way catheter, such as that shown in the text; the fluid runs in the upper arm in the direction of the arrow and returns by the lower.

Instillation.—Instillation differs from irrigation in that the medicated solution is injected in smaller quantities and is left in the bladder for a time in order to secure a more protracted action on the bladder walls. In this way

solutions of nitrate of silver (1 to 2 per cent), sublimate solutions, and iodoform emulsions (5 to 10 per cent) have been used.

Instillations have been systematically used with excellent results by M. Guyon, of Paris. Small quantities of fluid have been used, in accordance with Guyon's dictum that the bladder does not possess an anatomical but a physiological capacity, and a painful bladder must not be distended. Solutions of the bichloride of mercury are used, in a strength varying from 1–4000 to 1–500, beginning with the weaker and gradually increasing up to the stronger solutions, and injecting at first every other day and then every day as the patient's tolerance is tested. A syringe is used holding about 5 grams (1¼ drachms), and from 2 to 5 grams are injected slowly into the bladder and allowed to remain there from fifteen minutes to half an hour. The treatments must be continued for a period varying from some days to several weeks. Out of 34 cases so treated, 12 were cured, 9 were very greatly improved, 9 improved, and 4 unimproved.

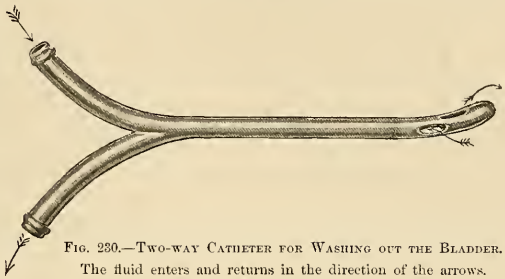


Fig. 230.—Two-way Catheter for Washing out the Bladder. The fluid enters and returns in the direction of the arrows.

Direct Topical Treatment.—By far the most efficient way of treating chronic cystitis is by direct topical applications, which, however, should not entirely supersede the use of internal medication or of irrigations or instillations.

There are two ways of treating the affected areas directly: either by exposing them to view and then applying a medicated solution, or by using a rubber balloon, which is inflated in the bladder so as to distend its walls and bring every point of its mucosa into contact with a medicated substance.

The first plan of exposing and treating the diseased patches is best in old chronic cases where the patches are few in number and do not cover much surface. This is done in the same way and with the same ease with which the bladder is inspected. The patient is put in the knee-breast position and the vesical speculum introduced, the air-distended bladder inspected, and the extent of the disease accurately determined and mapped out on a diagram for future comparison. The application is then made under direct inspection by means of a pledget of cotton twisted on a wire applicator, taking care to touch nothing but the diseased spots. This is easy if the parts are kept under view, and if the cotton is not too wet with the solution. The amount of surface treated at one time must be regulated by the kind of application made and by the extent of the disease. It is also well to proceed cautiously at first by trying any of the stronger stimulating drugs on a limited area and watching the effect. I often use at first a 5 per cent solution of nitrate of silver, following it up by a 3 per

cent solution every four to five days. If the mucosa is acutely inflamed at any point these solutions must not be applied.

The Vesical Balloon.—Dr. J. G. Clark's balloon treatment is applicable to all chronic cases where the disease is not so far advanced as to render any active local interference dangerous on account of the weakened condition of the patient. It is carried out as follows (see *Johns Hopk. Hosp. Bul.*, Feb.–March, 1896):

Method of applying the Vesical Balloon.—Before using the balloon it should be boiled and placed in a boric acid solution or in sterilized water. The capacity of the balloon should always be accurately determined previous to its use by inflating it to the size desired, and counting the number of cylinders or bulbs of air required to fill it.

By observing this precaution there is no danger of overdistending the bladder, as the exact degree of distention is determined by the number of cylinders of air introduced.

The external urethral orifice and surrounding parts are cleansed with soap and water and bichloride solution (1 to 1,000) by the nurse, after which the bladder is catheterized and the patient placed in the knee-breast posture, carefully protected by a sheet.

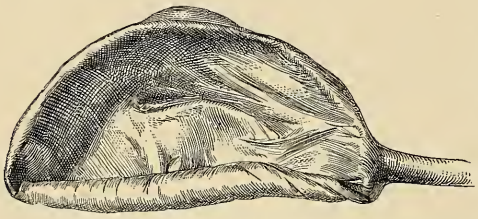


Fig. 231.—Rubber Balloon for Treatment of Cystitis, half rolled, for Introduction into the Bladder. (Ordinary Size.)

The patient should lie with chest flat on the table, her arms hanging over the sides, in order to make the bladder distend perfectly when the speculum is introduced.

A small pledget of cotton rolled on an applicator is saturated with a 20 per cent solution of cocain and inserted into the urethra and allowed to remain for three minutes, when a No. 10 vesical speculum can be introduced without giving the patient much pain. Frequently the patient complains of no discomfort whatever until the end of the speculum impinges upon the inflamed mucous membrane of the bladder wall.

Before the patient is placed in position, the gelatin, which has been previously sterilized, is immersed in a water bath and melted. For ordinary use in private practice, or in a limited hospital service, it is not necessary to have an elaborate apparatus, but a small metallic ointment box is sufficient for all practical purposes.

The temperature of the water bath should be just sufficient to reduce the gelatin to the consistence of cold olive oil, as in this state it will adhere better to the balloon, which can be more easily rolled into the form of a suppository.

Before preparing the balloon for introduction into the bladder the hands should be disinfected. The bag is rolled between the thumb and forefingers in

the same way as a hand-made cigarette. Into the concavity which naturally forms when the balloon is completely collapsed the gelatin is poured to overflowing, and the balloon slowly rolled, more gelatin being added until it as-

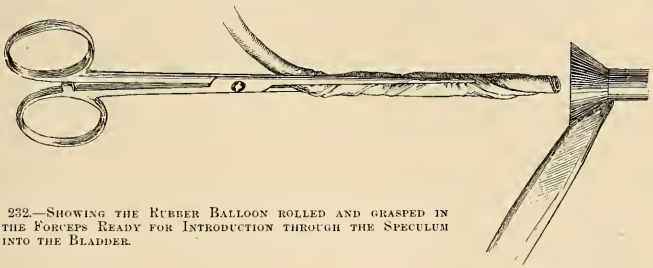


Fig. 232.—Showing the Rubber Balloon rolled and grasped in the Forceps Ready for Introduction through the Speculum into the Bladder.

sumes the form of a suppository well covered with the semi-fluid gelatin. It is now clasped with a long, slender crane's bill forceps (Fig. 232) and inserted through the speculum into the bladder and released.

As the distention progresses the patient suffers considerable pain and an

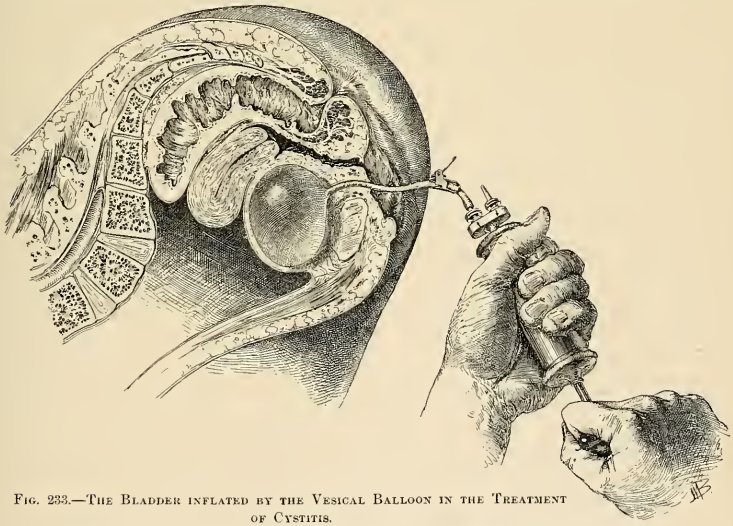


Fig. 233.—The Bladder inflated by the Vesical Balloon in the Treatment of Cystitis.

The patient is in the knee-chest position. The force pump is being used to distend the balloon.

urgent desire to void her urine. By forewarning her of these attendant symptoms she will be able to withstand the pain, and the inflation can be carried up to the desired degree in from three to five minutes.

The pain in chronic cystitis is usually severe during the first two or three applications, but the patient as a rule experiences so much relief subsequently that she is willing to persevere in the treatment.

A rectal suppository of 1 grain of opium, introduced immediately after the treatment, is of great service in alleviating the subsequent suffering. Having inflated the bag up to the required size, the clip on the rubber tube is closed to prevent the escape of the air, and the patient assumes the dorsal or lateral posture.

It is best to leave the balloon in place for fifteen or twenty minutes; to remove it the clip is released, when all but a small amount of air escapes and the rest is aspirated with the air pump, when the collapsed rubber bag is easily pulled out through the urethra.

Another way of using the balloon is the following: The patient empties her bladder and then lies in the right or left semi-prone position, while the urethral orifice is exposed and cleansed. From 5 to 8 centimeters of a 2 per cent solution of ichthyol in glycerin is then injected into the bladder by means of a delicate long-nozzled syringe. The balloon, completely exhausted of all air, is now taken up with aseptic hands, stretched out a little, and rolled together in small compass around a metal staff, so that the rubber projects a little beyond its end. A clasp on the tube prevents air from entering too soon. The size and shape of the balloon rolled up in this way is much like that of a catheter, and the staff gives the stiffness necessary for introduction. The balloon, coated with the ichthyol glycerin, is now grasped so as to prevent its unrolling and pushed through the urethra into the bladder and the staff drawn out. The clasp is then taken off and the balloon inflated, either by a rubber ball insufflator, such as is used in throat work, or by the force pump of an aspirator. The inflation should be great enough to be felt decidedly, but not to cause much pain, when the rubber tube is clamped to prevent the escape of the air. The inflated balloon distends the bladder and brings every point of its mucosa into contact with the ichthyol already injected. The amount of the distention can also be gauged by introducing a finger into the vagina and palpating the base of the bladder, or by examining bimanually. The bladder should not be larger than a goose egg.

The balloon is left in place from ten to twenty minutes, according as the patient can bear it; it comes out collapsed upon letting out the air and pulling on the rubber tube.

A history of a case, of a severe type of chronic cystitis of thirteen months' standing, well represents the efficiency of the vesical balloon.

M. J., admitted October 21, 1895, colored, aged thirty-five years, had been married ten years, with no children, and no miscarriages. She suffered from frequent and painful micturition and hematuria.

About thirteen months ago she began to have slight pain on urination, which grew rapidly worse, and for the last five months blood has frequently appeared in the urine.

The frequency of urination is much greater at night, when she is compelled