

Fig. 492.—Vesical Speculum Introduced with the Patient in the Knee-Breast Posture.

dilatation may be made and the speculum introduced without much discomfort" (Kelly).

Posture of the Patient.—"Two postures are available, an elevated dorsal and a knee-breast. The dorsal position (Figs. 490 and 491) 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 cm. (eight or twelve 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.

"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.

"The knee-breast position (Fig. 492) is the one position most satisfactory and applicable in all cases. The patient kneels with her knees separated ten or twelve inches, close to the end of the table, and, keeping the buttocks as high as pos-

sible, lets the back curve in, and brings the side of the face down on the table. If she squats a little, dropping 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" (Kelly).

An apparatus like that shown in the text (Fig. 493), 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 the speculum it is well to calibrate it, that is, to measure its diameter in millimetres 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 mm. only, it cannot be dilated up to 10 or 12 mm. 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 practised 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.

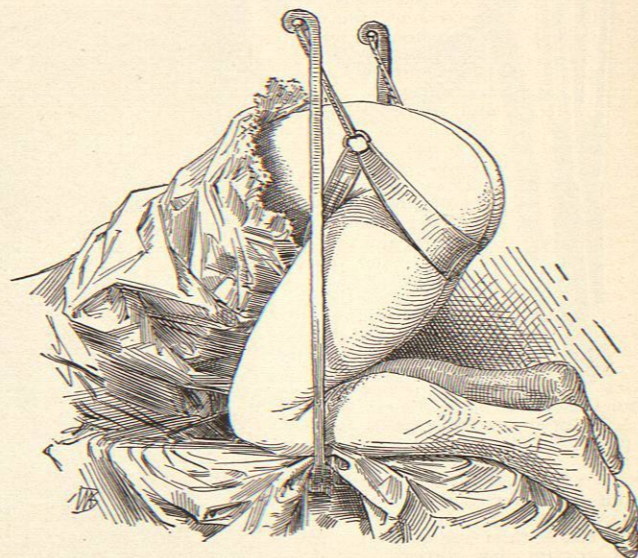


Fig. 493.—Patient in a Harness in the Knee-Breast Position for Cystoscopic Examination.

"To calibrate the orifice, the small end of the conical dilator (Fig. 485, 2) is pushed into the urethra until it fits snugly, when the index finger marks the point in con-

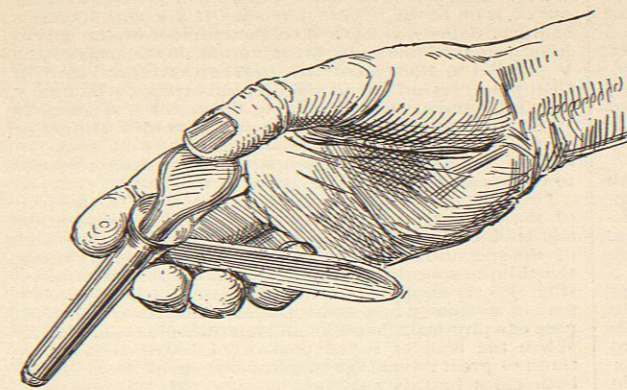


Fig. 494.—Holding the Vesical Speculum Ready for Introduction. The thumb presses the obturator firmly in.

tact with the urethral orifice; the dilator is then withdrawn and the diameter in millimetres 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 the speculum to be used.

"Boroglyceride foras the best lubricant for dilator and speculum because it is colorless. Vaseline 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 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 mm. deep and from 3 to 5 mm. long, are made at the posterior margin. I have never seen any serious bleeding nor have I 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" (Kelly).

Introducing the Speculum.

"A skilful examiner will select a suitable speculum, No. 7, 8, 9, or 10, or one of the half sizes between, according to the case, the age of the patient, or 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 urethra. Beginners in cystoscopy are apt to select a larger speculum, using 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. 494 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 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 boroglyceride 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. 495); indeed, after practice, a few seconds will be sufficient to determine by actual sight whether any portion of the interior is sound or diseased.

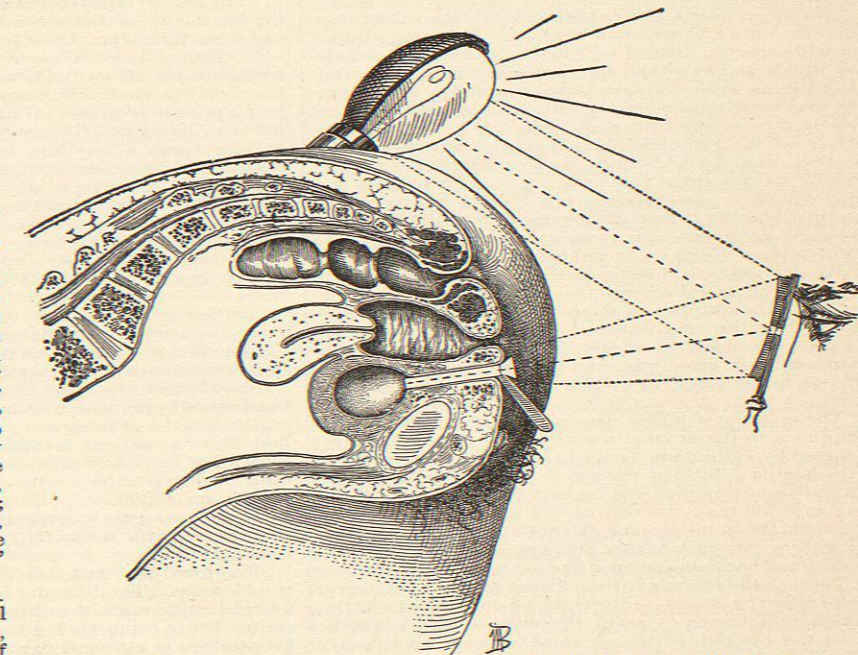


Fig. 495.—Examination of the Bladder with the Patient in the Knee-Breast Position.

"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.

"The inspection of the bladder naturally begins with the posterior hemisphere about the posterior pole, opposite the internal urethral orifice, from 3 to 5 cm. distant from the anterior wall, but not more than 2 or 3 cm. from the end of the speculum, which is pushed well into the bladder.

"The whole posterior hemisphere is first examined at 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 cm. 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 hyperæmia 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 cm. 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 anæmic 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 urethral orifice; this usually looks like a fine transverse line about 2 mm. 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. In some young nulliparous women, the urethral opening is indicated by a small round black point which has not been observed in older women

who had borne children (Hunner and Lyon). Immediately around the ureteral orifice is a paler area about 1 mm. broad, and surrounding this a rosy area 3 or 4 mm. 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, 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. 485, 1) enough urine can be caught up with pledgets of cotton or in a small graduate to answer the purpose 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 inter-ureteric line is often distinctly seen 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.

"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 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 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 disease, 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" (Kelly).

MENSURATION OF THE FEMALE BLADDER.

G. L. Hunner and I. P. Lyon have recently published (*Journ. Am. Med. Assn.*, 1899, vol. xxxiii, p. 1515) some very interesting and instructive results of their work on bladder capacity, "undertaken primarily to afford to the gynecologist some additional information on the size, shape, position, internal mensuration, and capacity of the bladder, and incidentally to furnish the anatomist with some of the same data."

"1. All measurements were made on living women with the bladder perfectly healthy—most cases—or so slightly disturbed from the normal as not to affect the accuracy of the results. 2. All examinations were made with the women in the knee-breast posture, with the rectum, vagina, and bladder all—with a few exceptions—dilated by atmospheric pressure, produced by simply opening these cavities to the outside air by the insertion of a speculum, by the methods so well known from the writings of Kelly. . . .

"It was found that by this method of dilatation no discomfort was felt by the woman, and consequently no resistance, either voluntary or involuntary, was offered by her, thus adding to the uniformity of the observations. On the contrary, it was found that distention by fluid to discomfort was subject to the peculiar and varying irritability or tolerance of the subject, and thus gave no uniform basis of comparison. . . .

"The woman was put in the knee-breast posture and the three pelvic cavities were each allowed to dilate by natural atmospheric pressure. A closely fitting catheter was then introduced into the bladder, attached at its external end to a long soft-rubber tube. The tube was then closed by a clamp, and the woman then rotated carefully by assistants from the knee-breast into the dorsal position. The rubber was then introduced into a deep vessel

of water and from below upward into an inverted glass, graduated cylinder completely filled with water, and was held pointing upward in this position by an assistant. The clamp on the tube was then released, and the entire content of the bladder was then expressed by the ordinary gynecological bimanual method, with one hand exerting pressure on the bladder externally from the abdominal wall and the other pressing at the same time on the bladder from within the vagina or rectum. . . .

"The air thus expressed was gathered in the glass cylinder, displacing from above down an equal amount of water, and the amount read off on the graduated cylinder, thus determining the exact air capacity of the bladder. . . .

"In the 25 women examined, the average bladder capacity by atmospheric distention was found to be 303 c.c., individual cases ranging from a minimum of 160 to a maximum of 545 c.c. . . . The capacity in general follows the general size of the bladder by internal mensuration, and also in a general way the size of the woman. Measurement was also made, in 22 cases, of the fluid contents of the bladder, boric solution being used for the purpose. On anesthetized patients the solution was introduced through the double-barrelled catheter until it overflowed through the upper barrel; on those without anaesthesia, until discomfort was caused to the woman. The average fluid capacity was thus found to be 429.7 c.c., varying in individual cases from a minimum of 210 to a maximum of 840 c.c. The average fluid capacity of the bladder was thus found to be more than one-third greater than the air capacity, a difference that would be expected because of the elasticity of the bladder walls under increased pressure.

"With reference to the influence of anaesthesia on the capacity, it was shown that the average capacity of the bladder is somewhat greater than without anaesthesia, explained, doubtless, by the relaxation of the bladder during anaesthesia."

Instrumental Mensuration.—"The second chief object of study was to gather some statistics on the internal mensuration of the bladder under atmospheric dilatation in the knee-breast posture. The importance of such measurements to the gynecologist is apparent, but they have never before been accurately ascertained."

The distance of certain points from the internal urethral orifice was measured. "The points chosen were: 1. The *vertex*, or summit, the most prominent and distant point in the concavity of the upward and anterior bulging of the ventral wall, usually placed well above the reflexion of the peritoneum and the departure of the urachus. 2. The most prominent and distant point in the upward and dorsal bulging of the *posterior wall*. This point is found a few centimetres above the peritoneal reflexion, and is usually opposite the end of the cystoscope when held in the axis of the patient's body. Quite frequently, however, the cystoscope must be directed more posteriorly to bring this point into view. 3. The point of the greatest outward bulging in the *left lateral wall*. 4. The point of greatest outward bulging in the *right lateral wall*. . . .

"The average measurements obtained for these four points were: to summit, 7.14 cm.; to posterior wall, 5.77 cm.; to left lateral wall, 6.70 cm.; to right lateral wall, 5.92 cm. . . .

"The *asymmetry* of the dilated bladder, shown by the unequal lateral measurements, is of interest. In 16 cases the left lateral measurement is greater than the right; the reverse is true in 6, and in 3 the left and right internal measurements are equal. The occasional asymmetric position of the bladder has been noticed by anatomists, but never before has this asymmetry been recorded in so large a proportion of cases. This tendency of the bladder to be placed more to the left than to the right, at least when the patient is in the knee-breast posture with the pelvic cavities dilated with air, may be explained by the fact that the rectum in women is found much more commonly on the right than the left within the pelvis, and thus the distended rectum tends to displace the blad-