TOTAL ABDOMINAL HYSTERECTOMY

Anatomy and Technic

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THE operation of hysterectomy has been a matter of evolution over a period of approximately fifty years. Probably the greatest impetus and contribution to the technic was given by Dr. Lewis A. Stimson, a founder and the first professor of surgery in Cornell University Medical College. On Jan. 9, 1889, Dr. Stimson described before the New York Surgical Society the technic of two total abdominal hysterectomies which he had just performed. In these two operations Dr. Stimson had applied ligatures "to the uterine arteries alone underneath the peritoneum" with the object of preventing, first, hemorrhage from the retraction of the blood vessels, second, the sloughing of the pedicle. In this meeting Dr. Stimson asked the opinion of his fellow members of the relative value of total or subtotal hysterectomy, saying that he himself believed the total to be the better procedure. In July of that year Dr. Stimson published his paper entitled "On Some Modifications in the Technic of Abdominal Surgery Limiting the Use of the Ligature en Masse" and stating that if the cervix was left in situ it should be covered with a flap of peritoneum, thus solving the problem of the treatment of the pedicle or stump which had so long been a stumblingblock in hysterectomy. The value of this and the isolation before ligation of the uterine artery was quickly recognized. These two procedures have revolutionized the operation of supravaginal hysterectomy, but total hysterectomy, which Dr. Stimson advocated, has not been, at least in this country, generally accepted for benign conditions of the uterus.

The ease with which the supravaginal method may be carried out and the brilliant work of the leaders of the next decade have led to its great popularity in the United States, so much so that in Europe today the supravaginal hysterectomy is called "the American operation." In France, Doyen, Wiart and Forgue, and in Germany and Austria, Bumm, Doederlein and Weibel, and before the latter Wertheim, have all advocated the total operation for nonmalignant conditions necessitating hysterectomy. In England Mr. Herbert Spencer has for years practiced total hysterectomy for benign conditions of the uterus and has published statistics for all of his cases. The wisdom of this routine practice lies in the knowledge that cancer is not infrequently associated with fibroids of the fundus and that

cancer of the cervix has been reported by numerous surgeons to have developed later in the cervical stump. The incidence of cancer occurring with fibroids is probably about 5 to 8 per cent. Munro-Kerr found in his cases 5 per cent malignancy in 200 fibroid tumors of the uterus, and quotes Ellice McDonald as finding 5 per cent malignancy in 700 myomata uteri. Polak studied 900 fibroids and found cancer undiagnosed and present in 2 per cent. The difficulty of curetting out all tissue from a uterine cavity distorted by myomas might be a reason for not diagnosing even a suspected case of malignancy, and a second reason is that sarcoma rarely begins in the endometrium. An additional reason for the removal of the cervix together with the fundus was first given in 1896 by Chrobak, of the University Clinic of Vienna, who reported three cases of cancer that had developed in the stump of a cervix several years after supravaginal hysterectomy had been done. In 1910 Dr. John Obsorn Polak collected from American literature alone 256 cases of carcinoma occurring in the cervix one year or longer after a supravaginal hysterectomy had been done; and from all literature 900 cases of carcinoma occurring in the cervix thus left. Masson reported 29 cases of carcinoma in the cervix after supravaginal hysterectomy seen in five years at the Mayo Clinic. In the Woman's Hospital the incidence of carcinoma developing in the cervical stump one or more years after a supravaginal hysterectomy is 7 per cent of all patients who come to the clinic for treatment of carcinoma of the cervix. Spencer quotes Peham and Amreich that carcinoma is 27 times more frequent in the cervical stump than in the cervix of women who have not had a subtotal hysterectomy. If this be so is it not probable that we are making tissue favorable to the development of cancer when we leave a cervix in doing a hysterectomy? Tissue that has been devitalized by any means such as by burning, cauterization, cutting off the blood supply, makes that tissue more liable to become infected. Leucorrhea is a frequent symptom after supravaginal hysterectomy in women who have never had a vaginal discharge before. Leucorrhea results from the degenerative changes that follow in the mucous glands of the cervix. A chronically diseased cervix stimulates tissue reaction and cell proliferation and thus paves the way to the development of cancer. Leucorrhea and backache are such common symptoms after the subtotal operation that many surgeons cone out the cervical canal from above at the time of the amputation of the fundus, or cauterize the cervical canal from below immediately preceding the abdominal part of the operation. This later treatment, however, may be a source of severe infection as the slough lies so close to the abdominal wound. The coning out of the cervical tissue may or may not cure the leucorrhea and may prevent the development of cancer depending upon how thoroughly the

base of the glands is destroyed; but Peterson has shown that only one-third of the adenocarcinoma of the cervix begins in the cervical canal while two-thirds are of epithelial origin and begin in the portio of the cervix, which is not destroyed by the coning out or cauterization of the canal. Years ago Doederlein was asked what he considered the best treatment of the cervix to be; he replied, "Die beste Stump behandlung der Zervix ist eben deren ganzliche Wegnahme." This seems to be true today, for as Dr. W. J. Mayo has written, "We must look upon local lesions as an invitation to cancer without regard to just what the actual cause of cancer may be"—"Leaving the cervix leaves an average cancer liability." And again Dr. Mayo says, "I believe total hysterectomy is a wise procedure if it can be done safely and usually it can."

The value of the total hysterectomy and the development of a simple technic was shown in 1917 by Dr. F. F. Baldwin of Columbus, Ohio. Dr. Baldwin wrote, "It entirely removes the possibility of malignant changes in the retained cervix and more or less morbidity from inflammatory or degenerative changes which may be present or which may occur in the part that is left behind." A year or two later Polak of New York published his technic, demonstrating particularly the removal of the cervix. Worrall of New Zealand at this time presented his method of leaving a strip of the lateral walls of the uterus so as not to disturb the insertions of the ligaments and thus prevent prolapse. Lahey has much the same technic with especial guidance on cutting out the cervix. Obviously though, this strip of uterus should not be left if cancer is present in the fundus and not infrequently cancer may be present and not diagnosed. Kennedy of the Woman's Hospital utilizes the cervical ligaments to prevent prolapse as in the vaginal hysterectomy. Richardson of Baltimore, in 1929, presented an admirably planned technic with the attention directed especially to the prevention of hemorrhage.

The higher mortality in the total hysterectomy is a deterrent to many surgeons. It may be desirable then to consider the mortality of the two operations. A fair statement is that of Diamant-Berger of the Hôtel Laboisière who says, "All surgeons perform daily the subtotal, how many on the other hand have the same experience with the total. Is it not true then that they reserve the total operation for the most seriously ill, the infected, or those suspected of cancer of the fundus? Il est donc artificiel et illogique de comparer des choses qui ne sont au fond pas comparables meme entre les memes mains." Certainly one cannot acquire the same skill in doing the less frequent operation as in the operation which one performs daily. Polak has estimated that the mortality of subtotal hysterectomy should be not over 1.5 per cent and the total not over 2 per cent. While many may

consider these figures too low and the ratio between the two operations to be too small one must bear in mind that to the mortality rate for the subtotal operation certain figures must be added to tell the whole story. When a cervical stump is left that has an unsuspected carcinoma, or when carcinoma develops in it later, the subsequent mortality or morbidity should be added to the primary mortality of the subtotal operation. Radium treatment for carcinoma in the cervical stump is more difficult and more liable to be followed by a vesical fistula, as the bladder is directly over the cervical canal. Radium burns of the intestine are not unusual if a supravaginal hysterectomy has been previously performed and intestinal adhesions resulted. Treatment or amputation of an infected cervix left after the subtotal operation should also count against the incomplete operation. It may, however, be of interest to view the statistics of several hospitals (staffs) for both total and subtotal hysterectomies, and also the statistics of individual operators. Read and Bell give the figures as shown in Table I for 14 surgeons in ten years at the Chelsea Hospital in England.

TABLE I

	SUBTOTAL HYSTEREC-TOMY	MORTAL-ITY	TOTAL HYSTEREC-TOMY	MORTAL-ITY
Read and Bell	1,739	2.1%	605	3.1%
Fullerton and Faulkner	609	4.4%	1,078	4.1%
Weibel	not given	4.25%	not given	3.55%
Nelson gives:				
Mayo Clinic (1926)	217	1.8%	229	1.3%
Ford Hospital	122	3.2%	476	2.9%
C. H. Mayo (1931)	3,085	1.2%	1,588	1.8%
Kennedy, W. T.			191	3.1%
Individual Surgeons—Total Hysterectomy for Fibromyomas:				
Lockyer	195			1.54%
Spencer	325			1.8 %
Ott	375			0
Richardson	not given			0

This list makes over 2,712 total hysterectomies done not only by individuals but by the staffs of general hospitals with a mortality less than 2 per cent.

The criticism may be made that the statistics given above are for the total hysterectomy as done by specially trained groups and not by the great number of surgeons doing gynecology as part of general surgery, for as Dr. John G. Clark wrote several years ago of "The Abdominal Operation for Cancer of the Cervix," "The universal benefit of any medical or surgical measure cannot be great if its execution is so difficult as to render it highly hazardous except in the hands of a very few specialists." It is with the desire to help simplify

the operation of total hysterectomy that I report this technic. The usual objections given to total hysterectomy are:

I. More difficult technic.
II. Danger of hemorrhage.
III. Danger of injuries to bladder or ureters.
IV. Infection from the vagina.
V. Shortening of the vagina, or prolapse of the vault of the vagina.

It may be well to consider these objections first.

I. *The technic.*—A consideration of the anatomy of the tissues involved may help to a better understanding of the technic to be described. The complexity of the structures in the pelvis, and the multiplicity of terms used by different writers have led to much confusion as to the purpose of these structures. The best description today of

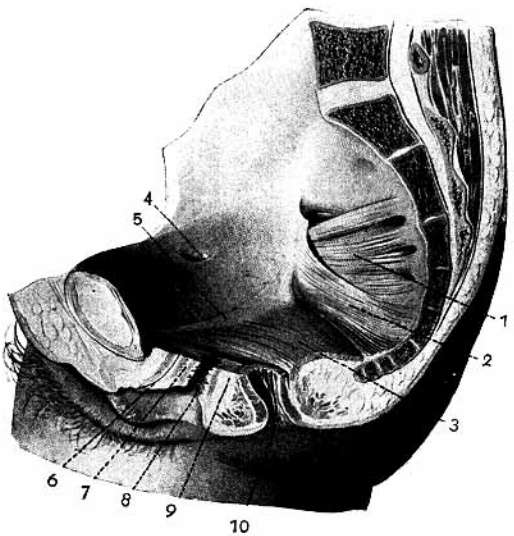

Fig. 1.—The connective tissue takes its origin from the arcus tendineus. *1*, M. piriformis; *2*, M. coccygeus; *3*, M. levator ani; *4*, obturator canal; *5*, arcus tendineus m. levator ani; *6*, urethra; *7*, urethrovaginal septum; *8*, vagina; *9*, rectovaginal septum; *10*, rectum.

the pelvic anatomy is, I believe, that written by Dr. Julius Tandler, Professor of Anatomy in the University Clinic in Vienna. Briefly summarized it is as follows: An analysis of the endopelvic fascia (called "endo" within the pelvis simply to distinguish it from the fascia that is outside, lining the walls of the pelvis) shows that first, it is a true muscle fascia. The connective tissue takes its origin from the Arcus (Fig. 1) tendineus on each side of the pelvis and extends to the midpelvis to be inserted into the lateral walls of the uterus, cervix and vagina. The underlying muscle is derived from the organs to which it is attached. Second, this endopelvic fascia covers over the pelvic organs, separating one organ from another, and from the serosa which lies above or around each organ (Fig. 2). It sends down septa be-

tween the bladder and uterus known as the "septum vesicovaginale" and between the uterus and rectum, the "septum rectovaginale" (Fig. 3).

Third, in some places this endopelvic fascia is greatly strengthened and forms true ligaments but in others it exists merely as an areola network whose interstices are supplied with fat to fill in the spaces between organs. From above the endopelvic fascia appears as a broad sheet of fascia. Anteriorly at the base of the bladder it is much thickened and together with its muscle which is derived from the vagina and bladder it extends from the os pubis to the vagina and cervix as the "ligamentum pubovesico-vaginale." Laterally on each side of the pelvis the endopelvic fascia is composed of thick bundles of connective tissue and smooth muscle and extends from the pelvic wall, to be inserted into the lateral walls of the uterus and cervix. Looking from above the endopelvic fascia (Fig. 4) radiates like an open fan from the lateral wall of the uterus to the pelvis. In sagittal section it is three-cornered. The muscle is thickest at its insertion into the uterus but varies in amount, with the age and development of the individual. In pregnancy the muscle is greatly thickened and the blood supply increased to make a vascular muscle sling for the uterus. Later in life this muscle atrophies and the fat is absorbed. The nerves, lymphatics, and blood vessels supplying the uterus, cervix and upper vagina lie in its depths. The whole forms the so-called "parametrium." A variety of names have been given to this structure. It is known as the "Ligamentum transversum Colli" of Markenrodt, the "Ligamentum cardinale" of Koch, "The Sustentaculum" of Bonney, "the upper pelvic floor" of Polk, etc. (The anterior and posterior lamella of the peritoneum cover the parametrium, the fallopian tube and mesosalpinx, and include the ligamentum ovarii proprium and mesovarium to form the "broad ligament.") At the anterior edge of the parametrium the endopelvic fascia continues on each side of the pelvis as a thick bundle of connective tissue and smooth muscle to form the so-called "Ligamentum Teres." At the posterior edge of the parametrium on each side it forms in similar way the "Ligamentum Sacrouterinum" which unites with its fellow from the other side to surround the rectum. Between these different ligaments are spaces filled by areola connective tissue and fat. This whole sheet of endopelvic fascia when seen from above might be likened to a cartwheel whose spokes are the ligaments joined at a central point, the hub—or uterus. When the hub or uterus is cut away the spokes, or ligaments, must be united at a new central point. This joining of ligaments ensures a long vagina without danger of prolapse.

II and III. *Hemorrhage, Bladder and Ureters.*—The blood supply of the body of the uterus, the cervix and the upper vagina and bladder comes from the uterine artery which is derived on each side from the

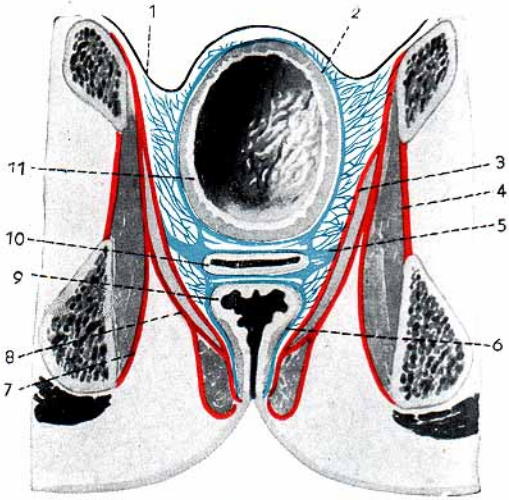

Fig. 2.

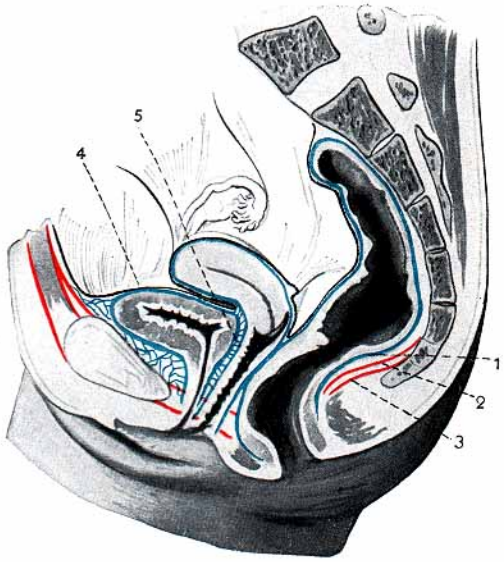

Fig 3.

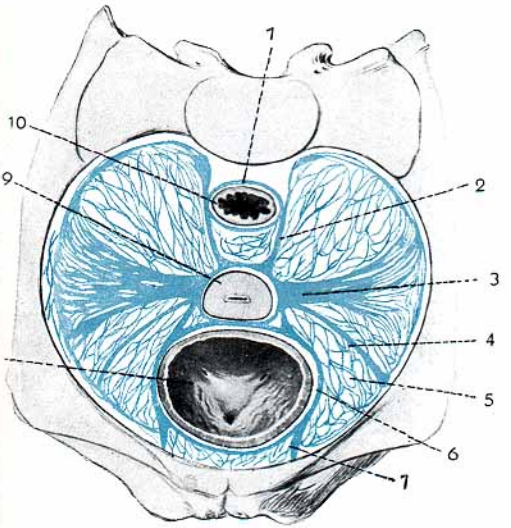

Fig. 4.

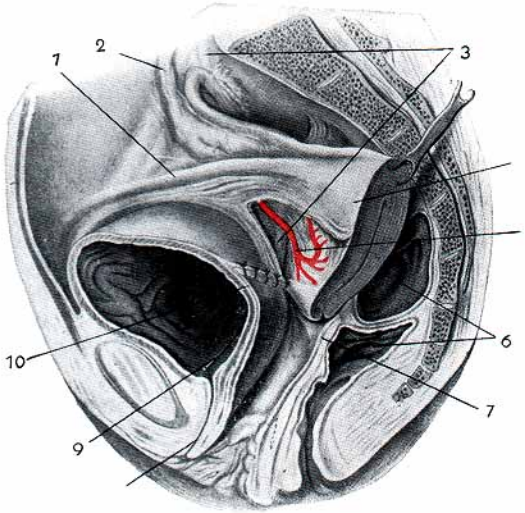

Fig. 5.

Fig. 2.—The endopelvic fascia covers over the pelvic organs, separating one from another. *1*, Peritoneum; *2*, perivesical connective tissue; *3*, pelvic fascia; *4*, obturator membrane; *5*, endopelvic fascia; *6*, perirectal connective tissue; *7*, obturator fascia; *8*, deep perineal fascia; *9*, rectum; *10*, vagina; *11*, bladder.

Fig. 3.—Septa between bladder and uterus and between uterus and rectum. *1*, Perirectal connective tissue; *2*, pelvic fascia; *3*, deep perineal fascia; *4*, perivesical connective tissue; *5*, perivaginal connective tissue.

Fig. 4.—The endopelvic fascia radiates like an open fan from lateral wall of the uterus to the pelvis. *1*, Perirectal connective tissue; *2*, sacro-uterine ligament; *3*, cardinal ligament; *4*, ligamentum teres; *5*, loose connective tissue; *6*, perivesical connective tissue; *7*, pubovesical ligament; *8*, bladder; *9*, uterus; *10*, rectum.

Fig. 5.—Dissection showing the blood supply of the uterus; *3*, ureters; *4*, uterus; *5*, annular artery; *6*, rectum; *7*, posterior vaginal wall; *8*, vagina; *9*, sound; *10*, anterior wall of vagina.

hypogastric artery. After the uterine artery has crossed the ureter and before it enters the uterus it gives off three or four branches. The branch nearest to the uterus (Fig. 5) is the annular artery which unites with the artery on the opposite side to supply the cervix. The second branch is the anterior vaginal artery which supplies the upper vagina and the third branch is the vesical which goes to the posterior wall of the bladder. The uterine veins follow the course of the uterine arteries. The venous return is carried up by the uterine veins to the

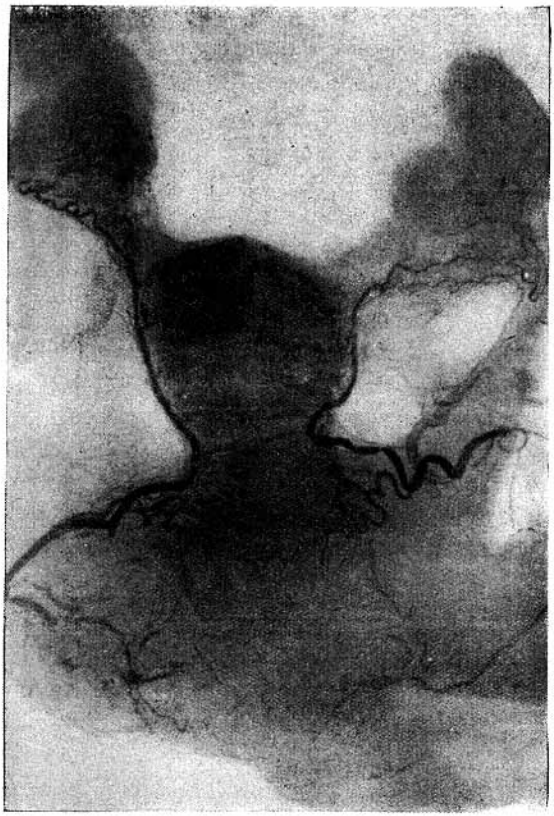

Fig. 6.—Blood supply of the uterus after injection of the two uterine arteries. (From Deve, Théses d. l. Fac. de méd., Paris.)

hypogastric veins and on the right side to the inferior vena cava, on the left usually to the left renal vein. In 1892 Dr. William M. Polk demonstrated, before the American Gynecological Society, the anatomical arrangement of these vessels and advocated ligating the uterine artery median to the anterior vaginal branch. These arteries and the plexus of veins have been clearly shown by x-ray after injection (Fig. 6) of the blood vessels of the uterus. Faure and Wiart in France, Bonney in England, Richardson and Lahey in this country have stressed the importance of properly applied clamps to control the

arterial bleeding and the venous oozing at the vaginal angles. Bonney says, "If the arteries have been properly isolated and the clamp has been applied at a point *just distal* to the *origin of the vaginal branch* the remainder of the operation is practically bloodless." If the bladder is pushed off the anterior surface of the uterus to its interureteric fold the ureters are sufficiently far below the uterine arteries to be out of danger of injury. When the uterus is pulled upward and obliquely backward the uterine artery lies at nearly a right angle to and now well above the ureter. It is usually possible to see the course of the uterine artery after it is located at the lateral wall of the uterus, and to palpate it between thumb and forefinger before ligating it just median to the ureter. A ligature at this point shuts off the arterial blood supply to the uterus, cervix and bladder and a second ligature on the uterine artery as it enters the uterus shuts off the venous return. If the uterine artery is not visible a little gentle palpation or teasing of the tissues will find it, or if not successful the "trick" as Weibel terms it will locate it, i.e., a deeper palpation with the fingers at the posterior part of the parametrium close to the uterus, as described years ago by Stimson. To quote Bonney again, "No forceps are needed in cutting through the cardinal ligament when this vessel is controlled." Considerable time is saved in operating by ligating the uterine artery at these two points. There is freedom from active bleeding and also from the continued venous oozing that is so troublesome. It eliminates too the placing of clamps deep in the pelvis in close proximity to the ureters at their entrance to the bladder.

IV. *Infection.*—The danger of infection from the vagina in performing total hysterectomy is, I believe, far less than the danger of infection in cutting across the cervix in the subtotal operation. There are no glands in the vault of the vagina, and therefore it is easier to disinfect this area than to render sterile a cervix that may harbor infection in the depths of its racemose glands, or to render sterile a sloughing growth in the cavity of the uterus that one may have to cut into in removing the body of the uterus. Read and Bell state that pulmonary embolism is the cause of one-third of the deaths following subtotal hysterectomy and only one-tenth of the deaths in total hysterectomy. Other writers place the mortality from embolism in subtotal hysterectomy as high as 50 per cent. A low-grade infection is frequently the cause of thrombosis and embolism. The higher percentage of embolism in the subtotal operation may perhaps be due to infection from a diseased cervix or infection from the intrauterine cavity. The thorough cleansing of the vault of the vagina is a most important part of the preliminary preparation of the patient and should be done personally by the surgeon, or at least supervised by him.

V. *Prolapse of Vaginal Tissues.*—The shortening or prolapse of the vagina following total hysterectomy is due to the improper suturing or

not suturing of the ligaments which were inserted into the uterus. When the uterus is cut away these ligaments should be fastened to one another and to the cut edges of the vagina. This prevents either the shortening or the prolapse of the vagina.

The Operation of Total Abdominal Hysterectomy: The investigation of a patient's condition before operation should include the usual examination of heart, lungs, and also the throat for infection, the routine urinalysis and a phenolsulphonephthalein test of the kidneys. The blood count should be not less than 3,500,000 red cells and 70 per cent hemoglobin, or the operation should be postponed until a blood transfusion can be given. The white cells should be between 5,000 and 10,000. The blood pressure of normal average for the age of the patient. All cervical erosions *must be healed before operation to prevent* infection. The patient should be in the hospital at least twenty-four hours before the operation to care for the intestinal tract and prevent the farewell lunches or dinner parties that are not infrequently the cause of much postoperative trouble. A sedative the night before operation and a preliminary hypodermic of morphine and atropine help to quiet the nerves for the operation. If the patient is elderly or a poor risk I have been in the habit for several years of having a solution of gum acacia and glucose given intravenously during the operation as a supportive measure, and at the closure of the abdominal incision, to have given by rectum a quart and a half of saline solution, or what Dr. John Clark termed "an internal hot water bottle" to offset the loss of body fluids.

Step 1: When the patient is under the anesthetic and in the lithotomy position, after cleansing the external genitalia and catheterizing the bladder, the entire vagina should be thoroughly scrubbed out with sterile gauze sponges on long sponge forceps, and tincture of green soap, and with plenty of hot water. Especial care should be given to cleaning around the cervix at the vault of the vagina. Then give a douche of sterile hot water, using a long nozzle to reach to the vault of the vagina. A sterile weighted speculum, double tenaculum, Deaver vaginal retractors, cervical dilator, gloves, and long intrauterine syringe will be needed. Inject an ounce of 3½ tr. iodine into the uterine cavity and withdraw the iodine in the syringe at the external os so as to avoid any washing out of cancer cells. Paint thoroughly with fresh iodine the cervix and vault of the vagina. Suture the external os, and pack snugly in the vault and around the cervix three yards of two-inch iodoform gauze. This helps lift the vault of the vagina when cutting out the cervix, and remains in situ forty-eight hours after the operation, as it keeps the tissues protected. There is no danger of sewing this gauze to the vaginal edge as there is so much elastic tissue in the vagina that it can be pulled up as soon as the cervix is cut out.

Step 2: After a median abdominal incision from the pubis to the umbilicus (or curved to right or left and then above if the abdominal wall is thick), protect the edges of the wound with gauze, insert a self-retaining retractor, place the patient in Trendelenburg position and pack back the intestines. (Three Bissell rubber pads or pockets filled with Turkish toweling are a decided help and do not sandpaper the intestines as gauze packs do.)

Step 3: An artery clamp is placed on each round ligament close to the uterus and the tissue pulled taut. The peritoneum just in front (Fig. 7) of the right round ligament is nicked and blunt tipped scissors introduced to push the bladder back. The vesical peritoneum is cut after the bladder is pushed away and several Allis clamps placed on the cut edge. The round ligaments are then cut across and each tied, leaving the suture 2 or 3 inches long with a clamp on each so

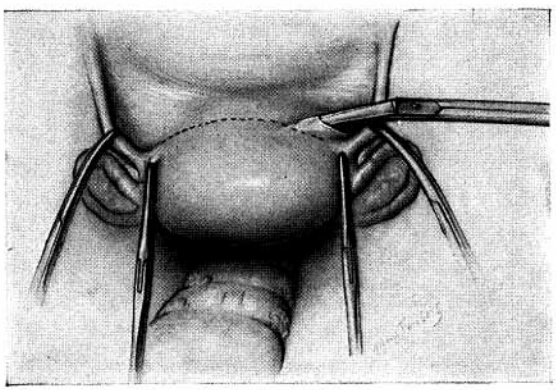

Fig. 7.—The peritoneum in front of the right round ligament is nicked and blunt tipped scissors are introduced to push the bladder back.

that the round ligaments may be readily identified as they are to be used in the closure of the vagina.

Step 4: A sharp toothed Kocher forceps is clamped on each side of the uterus. (No sharp toothed or elevating forceps should be applied to the fundus, as cancer may be present and unsuspected.) Pass a small artery forceps directly under each fallopian tube and push the tissues downward to allow the ureters to drop farther away. The tubes and ovaries are then removed or left as deemed best, ligating the ovarian arteries at the infundibulo pelvic ligament or at the uterus. I always leave normal ovaries if the pathologist reports no carcinoma in the fundus, and the tube with each ovary, if there is no appearance of infection in the tube, as there is less disturbance of the blood supply to an ovary if the corresponding tube is left. If the tubes are removed it is desirable to leave at least one ovary and if there is doubt as to its condition it may be placed just above the

peritoneum when closing the abdominal wound. I have done this several times and so far I have never had to remove the ovary, nor do I know of any trouble ever resulting from having left it. Each ovary and tube is ligated separately to avoid mass ligatures. If the tube is to be left I wipe out the lumen of the tube with small cotton wound applicators dipped in carbolic and the last one is dipped in alcohol. All blood vessels are ligated by sewing in the ligature to prevent slipping. The entire field is cleared of clamps before proceeding to the next step, except the two Kochers on the uterus and the Allis clamps on the vesical peritoneum.

Step 5: Pick up the bladder with thumb and fingers and snip (Fig. 8) the vesical ligament with blunt tipped angle scissors, cutting to-

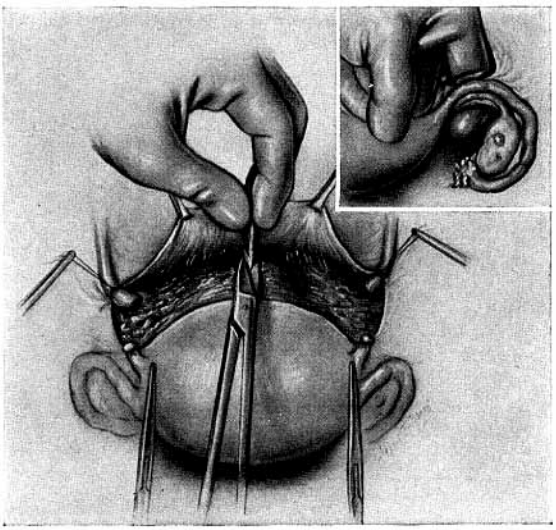

Fig. 8.—Step 5.

ward the uterus until the bladder is freed to the interureteric fold. When this fold is reached we know the bladder is free to the trigone and the ureters have dropped down in the pelvis. One can usually see the ureters entering the bladder and palpate each between the fingers as a flat cord, and it is almost always possible except in the very fat to trace easily the ureters through the parametrium.

Step 6: Locate the uterine artery at its entrance into the lateral wall of the uterus. Pull the uterus up and obliquely backward (Fig. 9) and palpate with thumb and forefinger the uterine artery for approximately three-fourths of an inch from its insertion into the uterus. When certain that the blood vessels only are in the grasp of the fingers, *while still holding them,* carry a needle with suture directly under the vessels and tie at this spot which is *median to the ureter,* at

right angles to it and now well above the ureter. I suture the uterine artery again just as it enters the uterus, and then suture the uterine artery to the fascia.

Step 7: Cut each uterosacral ligament just above its insertion into the fascia and place a Kocher clamp on each ligament. Cut the fascia at this level entirely around the cervix, going approximately one-fourth inch above the ligated uterine arteries. Cut the parametrium on one side to about one-half of its depth and then the opposite parametrium. Continue cutting first one side and then the other until well down to the vagina. Usually when the parametrium is entirely cut through it is possible to pull the uterus up and out of the pelvis.

Step 8: To ascertain if the cervix is freed down to the vagina cut between the uterosacral ligaments and push forward the uterus to free it from the rectum (Fig. 10). In a similar way in front push a finger down, pressing back on the uterus to free it from the bladder. Test with a finger anteriorly and one posteriorly (Fig. 11). If the lateral dissection has been continued downward sufficiently far the fingers will meet below the cervix.

Step 9: Pick up a bit of vaginal tissue between the uterosacral ligaments and nick it transversely. When the vagina is opened it is easy to push in a curved artery clamp, fasten it on the vaginal tissue, and cut the tissue close to the cervix. (I use a different clamp on the vaginal tissue from the one on the fascia simply to identify the edges of the vagina and work more quickly when suturing.) Repeat the clamp and cutting until near the bladder. Then clamp and cut the vaginal tissue on the other side from posteriorly to the bladder. In this way the vaginal tissue near the bladder is left to the last when it will be easily seen and the bladder can be protected from injury. If one is in doubt how broad the cervix is and how far out to cut the vagina, it is better to introduce a finger into the vagina rather than to put a hook into the cervix and draw it out as often advised to do. When the cervix is entirely cut out I apply iodine on a sponge to the vaginal edges and remove the excess iodine with a dry sponge. Up to the incision of the vagina the operative field will be almost bloodless if the ligatures have been properly applied. When the vagina is cut through there is some slight bleeding from the branches of the external vaginal arteries which supply the middle portion of the vagina and from the inferior hemorrhoidal artery, but this is checked by the suturing of the vaginal edges.

Step 10: Close the edges of the cut vagina (Fig. 12) with No. 2 plain catgut suture, beginning on the right posteriorly, passing the suture from without into the vagina and out at the extreme right end of the tissues and return into the vagina and then out at the an-

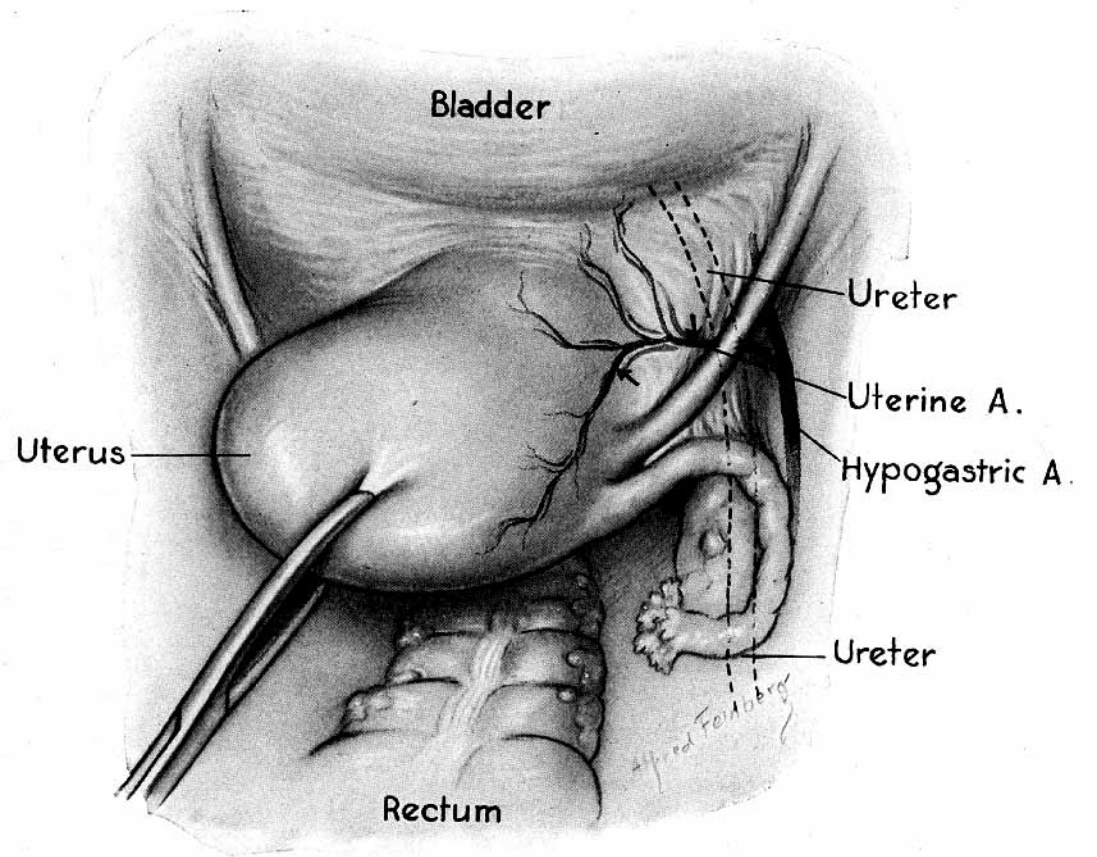

Fig. 9.—Step 6.

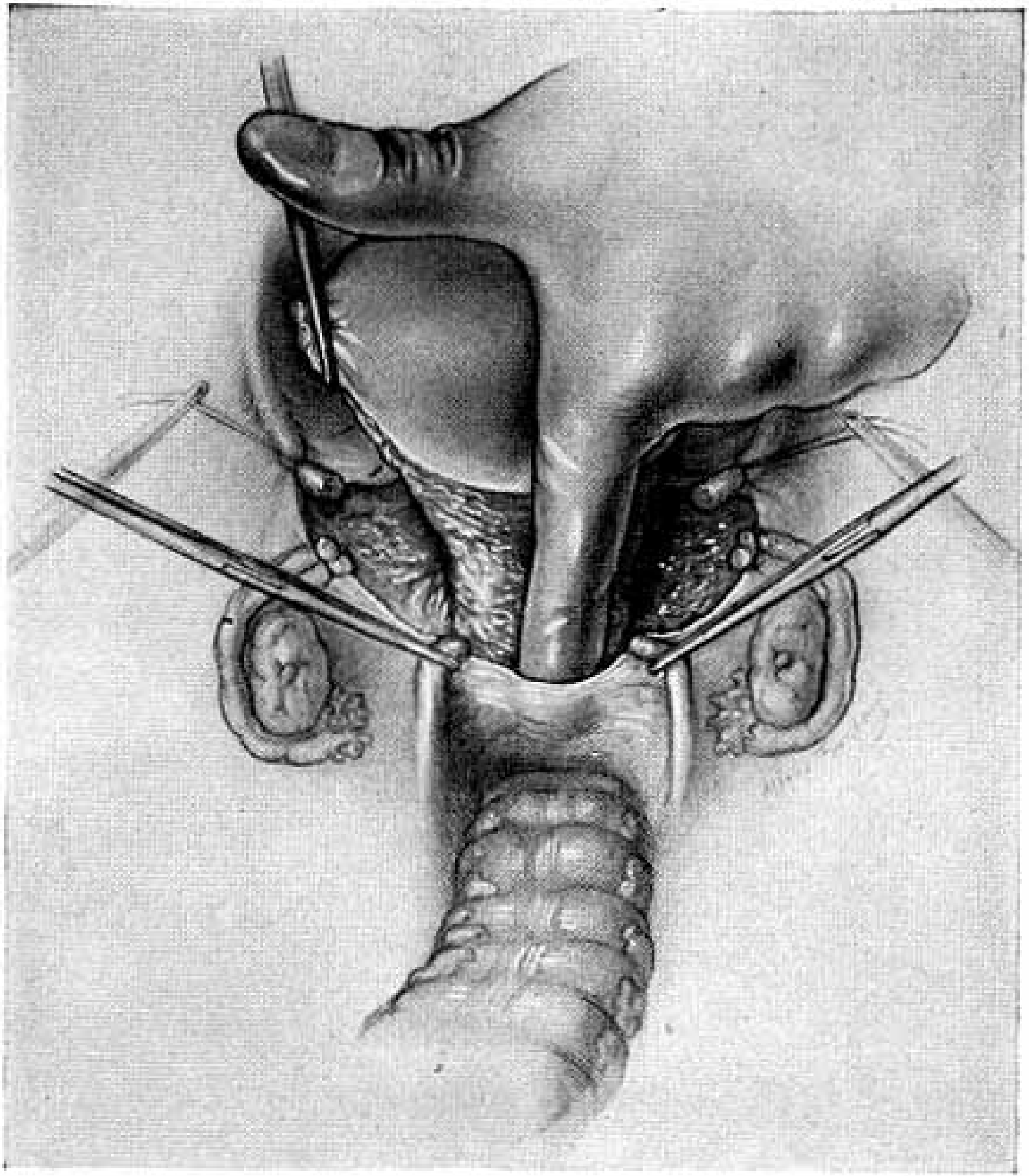

Fig. 10.—Step 8.

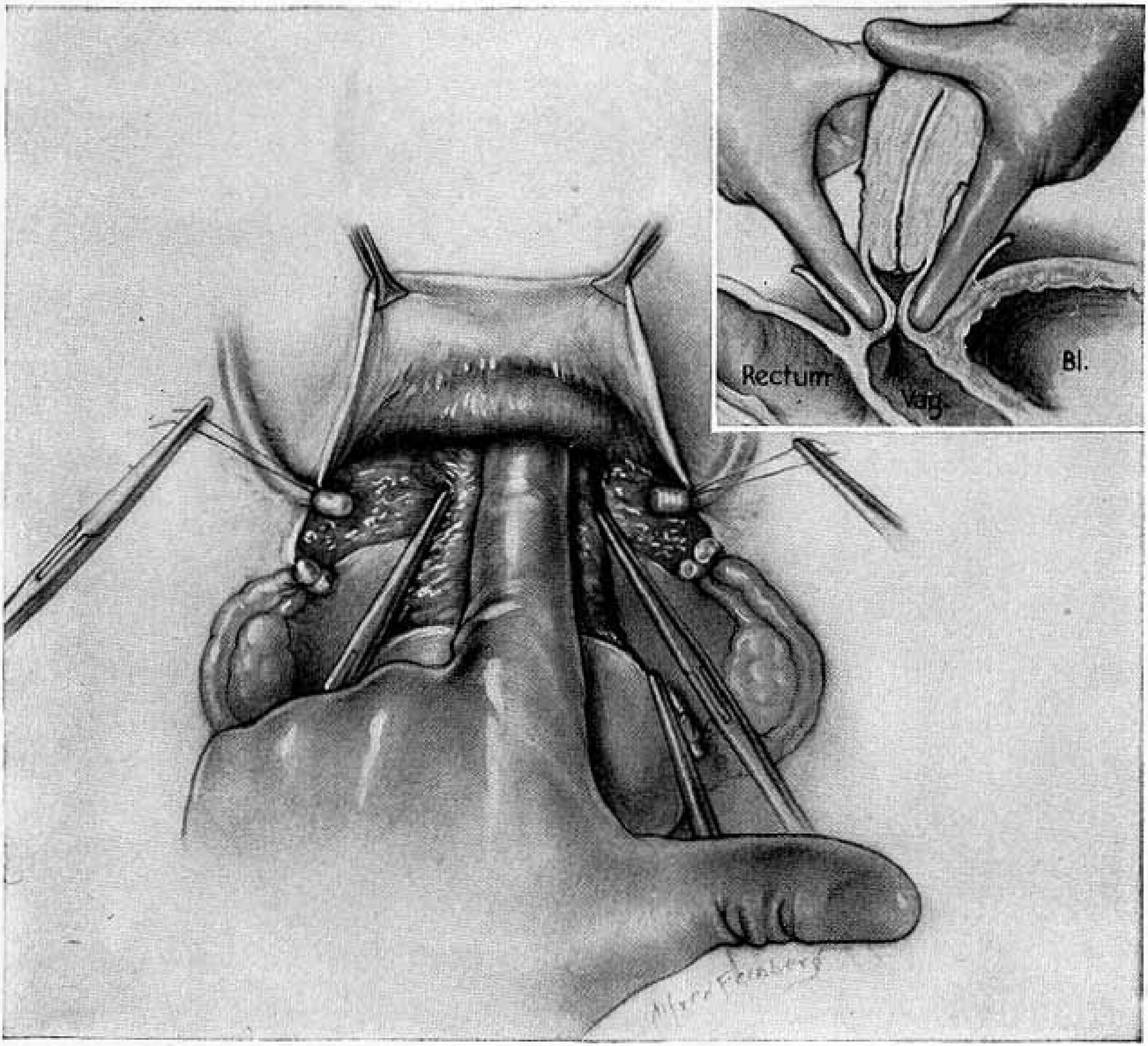

Fig. 14.—Step 8.

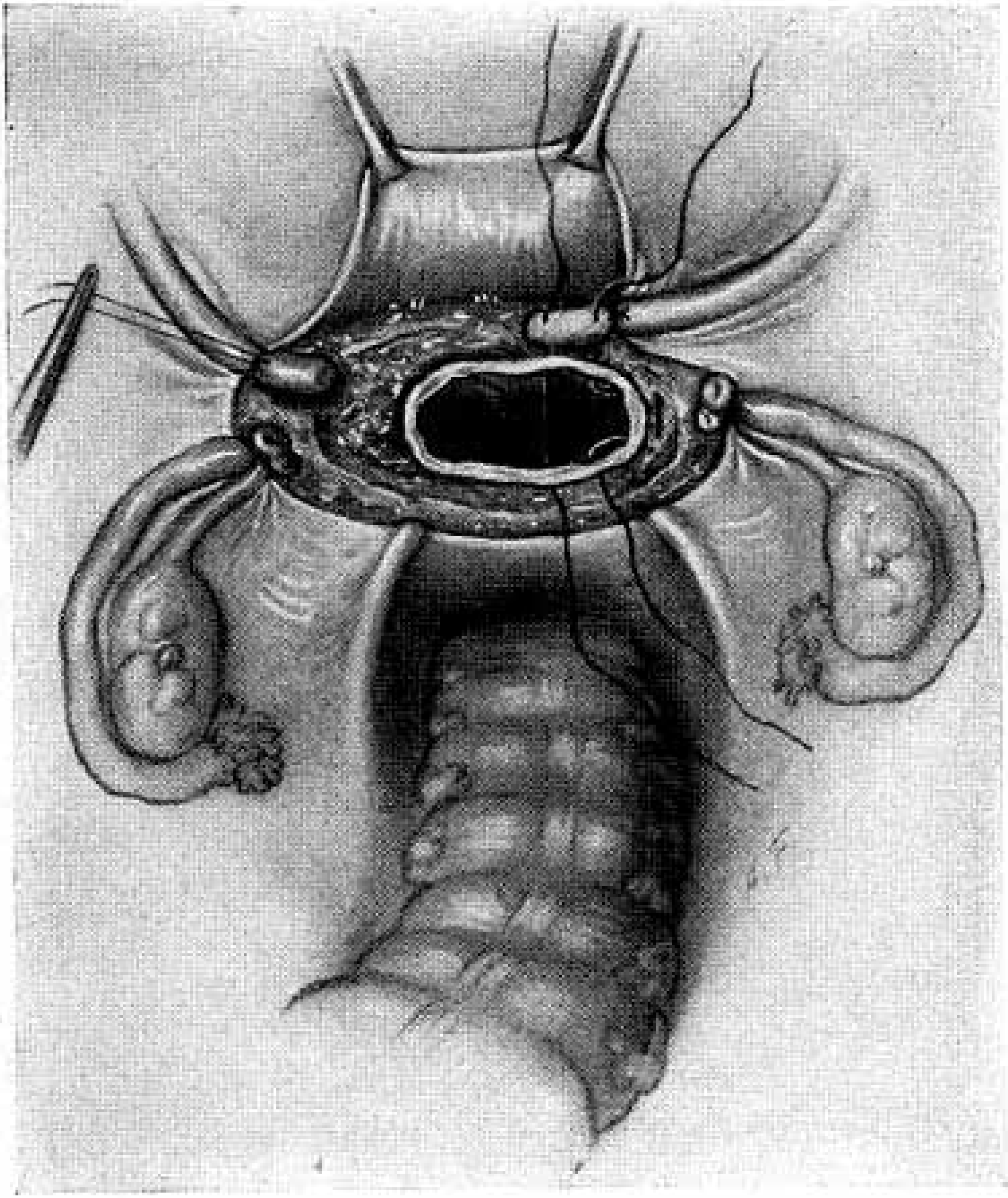

Fig. 12.—Step 10.

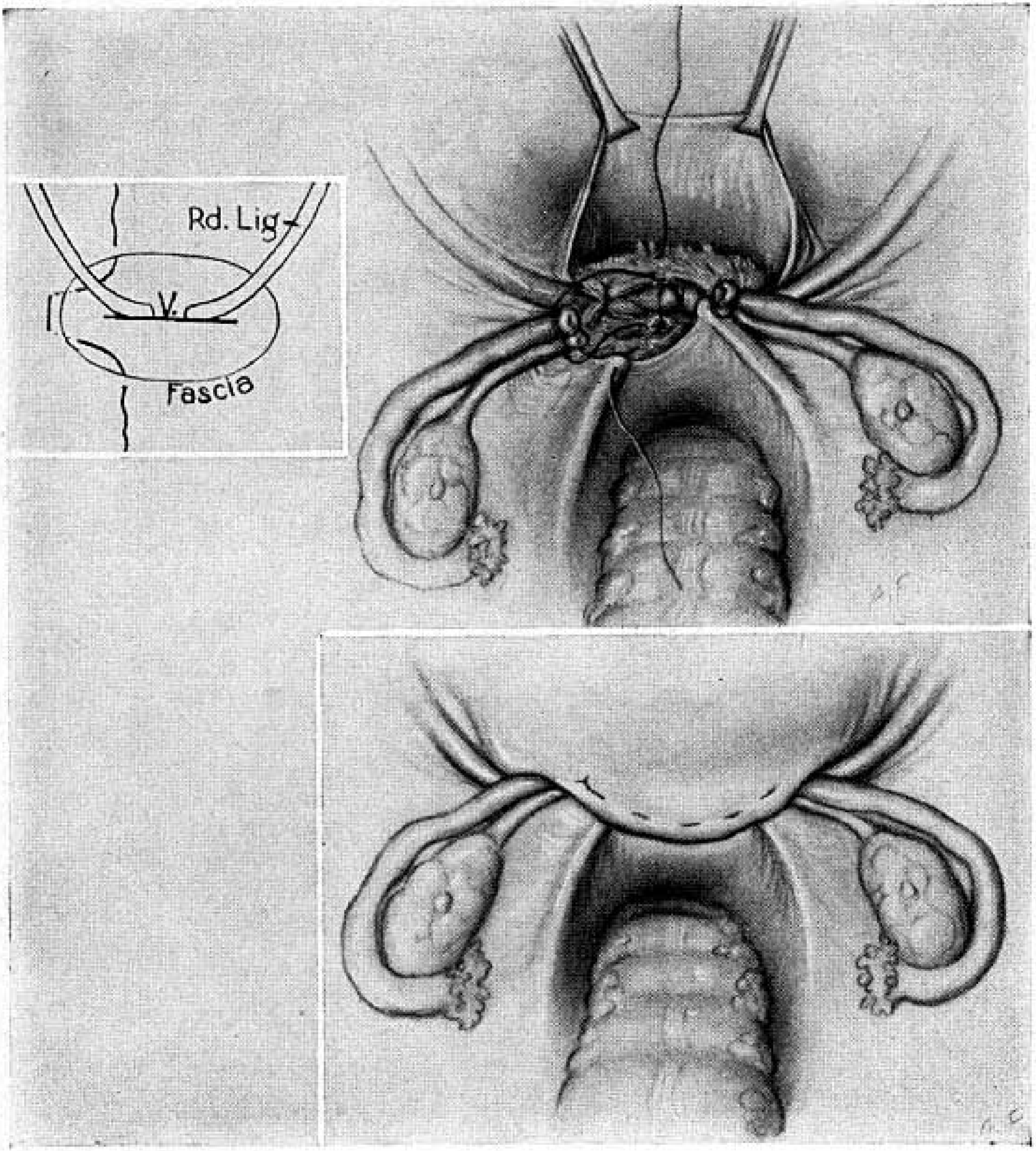

Fig. 18.—Step 11.