

treated. In independent spasm our first care should be to remove, as far as possible, all predisposing or exciting causes. The teeth and gums should be carefully examined, and any source of reflex irritation should be allayed. Means should also be taken to improve the general health, and to strengthen the resisting powers of the nervous system. Thus fresh air, good wholesome diet, change of scene, and general tonics and sedatives—quinine, iron, and bromide of potassium or sodium—should be our principal aids.

(b) *Paralysis of the Muscles of the Tongue; Glossoplegia.*—Section of the hypoglossus in dogs, when bilateral, causes total paralysis of the tongue. The animals cannot drink, and are apt to bite the tongue, which hangs loosely out of the mouth (Landois).

In man paralysis of the muscles of the tongue is usually central. It may be produced by lesions of the cortical motor centre of the tongue, or of the fibres which connect it with the hypoglossal nucleus, or by lesions of the nucleus itself or of the hypoglossal nerve. Hence it is found in cases of cerebral or bulbar hemorrhage or softening, and in certain other forms of cerebral disease, in progressive bulbar paralysis, and in those forms of spinal disease in which the ganglion cells of the hypoglossal nuclei are affected. Thus it is sometimes seen in the advanced stage of tabes dorsalis and in descending secondary sclerosis. The hypoglossal nerve itself may be affected either intracranially, as by the pressure of tumors at the base of the brain, or extracranially, either at its exit from the cranium or in the neck. This may be done by injuries of the upper cervical vertebrae, such as fracture of the atlas, or by tumors or wounds of the neck, by aneurism of the vertebral artery, or by carious or syphilitic processes.

Symptoms. Hypoglossal paralysis may be either unilateral or bilateral, according as one or both nerves are involved, though bilateral paralysis may be caused by a unilateral cortical lesion. In unilateral paralysis the tongue, when protruded, deviates to the affected side. This is due to the unbalanced action of the healthy genioglossus muscle, which in contracting not only throws the tip of the tongue forward, but directs it at the same time to the opposite side. In bilateral paralysis the tongue cannot be protruded, but lies perfectly motionless in the mouth. It is relaxed, anæmic, often atrophied, and deeply furrowed. Not infrequently there are fibrillary twitchings. In unilateral paralysis these symptoms may appear on the affected side of the tongue. "When the tongue is paralyzed it falls backward in the cavity of the mouth as the patient lies on his back, and the glottis becomes partially or wholly closed by it. Paralysis of the tongue thus contributes to the production of stertorous breathing in cases of apoplexy, and may even cause asphyxia, when the paralysis is bilateral and more or less complete." Thus closure of the glottis may be produced in deep narcosis.

In lingual paralysis the speech is much affected, and the power of articulation greatly impaired. In bilateral paralysis, with atrophy, the speech is said to be completely inarticulate and unintelligible, and even when the paralysis is slight, the singing of high notes and falsetto is impaired. Ross states that difficulty is first experienced in pronouncing the letters, s, sh, l, e, i, and at a later period k, g, r, etc.

Mastication is interfered with also to a certain extent, as the tongue cannot direct the food nor compress it against the teeth. Deglutition is likewise affected by the falling backward of the tongue, and also because the food cannot be properly collected on its dorsum and pushed back into the pharynx. Hence regurgitation into the mouth occurs. The salivation of the affected side, which is a prominent symptom in certain cases of lingual paralysis, has not yet been shown to be due to anything more than reflex action. The slight diminution in the tactile sensibility of the affected side, sometimes noticed, seems in certain cases not to exist.

Diagnosis. This is usually very easy. Hutchinson's method of testing the condition of the lingualis muscle is

very simple. He holds it between his thumb and finger and bids the patient protrude the tongue. If either side be paralyzed, the muscle of that side will be flaccid and relaxed, and will not harden like the healthy one on contraction.

The prognosis is naturally dependent on the cause. *Treatment.* This must, of course, be directed against the primary cause. Locally, the galvanic or faradic current may be applied either to the tongue itself or to the nerve in the neck. *William N. Bullard.*

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HYPOPHOSPHITES.—I. GENERAL MEDICINAL PROPERTIES OF THE HYPOPHOSPHITES.—Physiologically, salts of hypophosphorous acid are simply bland saline representatives of their respective bases, and produce no special effect whatsoever, due to the hypophosphorous acid of their composition. What place they hold in medicine has been from theoretical considerations purely. The idea has been that because these salts contain phosphorus in a comparatively low state of oxidation, they will affect the system after the manner of phosphorus itself, and, especially, will yield phosphorus in such chemical combination as to be assimilable for the nutrition of nerve tissues. Clinical experience, however, has failed on the one hand to get the expected results, while on the other it has shown that nearly all of a dose of a hypophosphite, swallowed, reappears in the urine unchanged. Those who prescribe these salts, do so in cases of neuralgia and of nerve exhaustion or malnutrition generally, and in phthisis.

With the exception of the potassium salt the hypophosphites are harmless, and they are, with manufacturing pharmacologists, favorite ingredients of emulsions of cod-liver oil.

II. THE HYPOPHOSPHITES USED IN MEDICINE.—The hypophosphites official in the United States Pharmacopœia are the iron, potassium, sodium, and calcium salts. Ferric hypophosphite will be found treated of under *Iron*.

Potassium Hypophosphite, KH₂PO₃. The salt is official in the United States Pharmacopœia as *Potassii Hypophosphitis*, Potassium Hypophosphite. It occurs in "white, opaque, hexagonal plates, or crystalline masses, or a granular powder, odorless, and having a pungent, saline taste; very deliquescent. Soluble at 15° C. (59° F.) in 0.6 part of water, and in 7.3 parts of alcohol; in 0.3 part of boiling water, and in 3.6 parts of boiling alcohol; insoluble in ether" (U. S. P.). If triturated or heated with an oxidizing agent, such as a nitrate, the mixture will explode. Because of deliquescence, the salt must be kept in well-stoppered bottles.

Potassium hypophosphite follows the rule of potassic salts of being irritant in large concentrated dosage, but in therapeutic doses it is locally bland enough. Again, because a potassic salt, it may tend to induce retrograde metamorphosis of lowly organized material, and hence lead to softening of cheesy deposits in the lungs. This particular hypophosphite is therefore, theoretically at least, not without a possible dangerous tendency in phthisis. The salt is administered in solution, aqueous or syrupy, in doses of from 0.65 to 2 gm. (gr. x.-xxx.) three times a day. A convenient form of giving it is in the official *syrup of hypophosphites* (see *postea*).

Sodium Hypophosphite, NaH₂PO₃·H₂O. The salt is official in the United States Pharmacopœia as *Sodii Hypophosphitis*, Sodium Hypophosphite. It occurs in "small, colorless, transparent, rectangular plates of a pearly lustre, or a white granular powder, odorless, and having a bitterish sweet, saline taste. Very deliquescent on exposure to moist air. Soluble at 15° C. (59° F.) in 1 part of water, and in 30 parts of alcohol; in 0.12 part of boiling water, and in 1 part of boiling alcohol; slightly soluble in absolute alcohol, insoluble in ether" (U. S. P.). Like the potassium salt, this also will explode on trituration

and with an oxidizing agent, and must be kept in well-stoppered bottles.

This sodic salt is a generally serviceable and permissible hypophosphite, having, as usual with compounds of sodium, no active individuality due to the basic radical. It may be given in the same manner and dosage as the potassic salt.

Calcium Hypophosphite, CaH₂(PO₃)₂. The salt is official in the United States Pharmacopœia as *Calcii Hypophosphitis*, Calcium Hypophosphite. It occurs as "colorless, transparent, monoclinic prisms, or small, lustrous scales, or a white, crystalline powder, odorless, having a nauseous, bitter taste, and permanent in the air. Soluble at 15° C. (59° F.) in 6.8 parts of water, and in 6 parts of boiling water; insoluble in alcohol" (U. S. P.).

Being a salt of lime, which salt is assumed to have a reconstituent tendency in phthisical conditions, this hypophosphite is theoretically the one to be preferred for administration in consumption. It is also the one best borne when the stomach or bowels are irritable, as so often happens in the disease mentioned. The salt is given in the same manner and dose as the potassic salt.

The following pharmaceutical preparations of the hypophosphites are official in the United States Pharmacopœia; *Syrupus Hypophosphitum*, Syrup of Hypophosphites. This is an aqueous solution of potassic, sodic, and calcic hypophosphites (wherein the latter salt has been made fully to dissolve by the addition of a little hypophosphorous acid), made into a syrup by the addition of sugar, and flavored with spirit of lemon. By weight the preparation contains fifty per cent. of sugar, and, of the hypophosphites, 4.5 per cent. of the calcic salt, and 1.5 per cent. each of the potassic and sodic. By measure 4 c.c. (fl. ʒi.) contains about 0.18 gm. (gr. iij.) of the calcic hypophosphite, and 0.06 gm. (gr. i.) each of the potassic and sodic salts. This syrup forms a convenient preparation for prescription, and may be ordered in doses of from one to two or three teaspoonfuls, several times a day. *Syrupus Hypophosphitum cum Ferro*, Syrup of Hypophosphites with Iron. This preparation is simply the foregoing syrup charged with one per cent. each of lactate of iron and potassium citrate—this particular iron salt being selected for pharmaceutical reasons only. This syrup forms a convenient combination of hypophosphites with a chalybeate, and may be given, where such combination is indicated, in doses the same as those of the simple syrup. *Edward Curtis.*

HYSSOP.—See *Labiatae*.

HYSSOP, HEDGE.—See *Scrophulariaceae*.

HYSTERECTOMY (from *ἰστέρα*, the womb, *ék* out, and *τέμνειν*, to cut) is the removal of the uterus by a cutting operation and may be accomplished through an incision in the abdominal wall (celio-hysterectomy), by way of the vagina (kolpo-hysterectomy), or by a combination of both methods.

Celio-hysterectomy includes (a) supravaginal amputation and (b) the complete removal. Kolpo-hysterectomy at the present time practically always means the complete removal of the organ.

While dim records of the operation are found as early as 100 A.D., when Soranos¹ is said to have removed the uterus per vaginam, yet as late as 1882, when Ahlfeld² collected the records of sixty-six cases in which the uterus had been removed through the abdomen with only thirteen recoveries, the recorded cases were very few and the mortality was frightful, ranging from eighty to ninety per cent. In its present form, and with its very low mortality of from three to five per cent. when done for the same indications, the operation is essentially a modern one, and as such has been developed during the last fifteen years, and largely in America by Baer, Goffe, and Kelly. With the improved technique and lessened mortality the range of indications for its performance has widened, until now it may include:

For the Abdominal Operation.—All solid or cystic tumors

of the uterus; cancer; uterine rupture during labor; certain conditions of puerperal sepsis; pregnancy complicated by pelvic deformity, cancer, or other serious obstacle to the passage of the child; uterine prolapse or inversion; and incidentally as a step in the removal of complicated suppurative conditions of the uterine appendages.

For the Vaginal Operation.—Bilateral suppurative conditions of the appendages; prolapse; cancer; pregnancy with cancer before the sixth month; certain septic conditions of the uterus; certain rare conditions which may require the ablation of a small movable uterus.

For the Combined Operation.—Cancer, certain complicated fibroids; failure to secure hæmorrhage from below.

For the details of these indications the reader is referred to the articles treating of the various conditions mentioned.

The operation of hysterectomy is always formidable, and as conditions may arise at any time which tax the resources and nerve of the most skilled, and where hesitation or lack of expedient may mean the immediate death of the patient, it should not be undertaken without an adequate practical knowledge both of aseptic surgical technique as applied to abdominal surgery and of the anatomy of the pelvic contents, particularly of the relations of the bladder, ureters, rectum, uterine and ovarian arteries, and large venous trunks.

TECHNIQUE OF CELIO-HYSTERECTOMY.—The patient is prepared as for any abdominal operation; the intestines are thoroughly emptied; for several days she is encouraged to drink water freely; the skin of the abdomen is carefully disinfected; the vulva and vagina are cleansed and packed with 1 to 4,000 bichloride gauze for two days, and the limbs covered with cotton and a bandage to prevent chilling of the surface.

The instruments needed are: Two scalpels, two pairs of strong blunt-pointed scissors, two anatomical forceps, six traction forceps, twelve short hæmostatic forceps, eight long clamp forceps, pedicle needle, retractors, long and small curved needles, strong silk or kangaroo tendon, slightly chromicized catgut nos. 1, 2, 3.

The patient is put in the Trendelenburg position. The abdomen is opened by a median incision beginning half an inch above the pubes and extending upward, as far as may be necessary to allow the delivery of the tumor. In making this incision care must be taken not to injure the bladder which sometimes is drawn high up. Remembering that any injury to the capsule of fibroids will cause free and troublesome bleeding, adhesions are carefully detached, slight ones being wiped free by a bit of gauze and firmer ones divided between two ligatures. Dense adhesions to intestine may require that small areas be detached from the surface of the tumor. The tumor being freed from adhesions is lifted up and out of the abdominal cavity. Large flat gauze pads with strings attached are wrung out of hot sterile salt solution and placed so as to protect and cover the intestines. The finger is passed under the broad ligament on the more accessible side, and, guided by it, the pedicle needle, threaded with a long, strong ligature, is passed through a portion free from veins, so as to include the ovarian artery. This ligature is then firmly tied and occludes the artery and the adjacent large venous trunks. The ovary is to be left outside the ligature, unless it is so diseased that its removal is desirable. A second bite with the same ligature ties off the round ligament. A long clamp is now placed so as to control the vessels on the uterine side and the tissues between clamp and ligatures are divided with the scissors. If the ovarian artery on the other side is easily accessible, it is tied in the same way. Careful inspection of the anterior surface of the uterus will now determine the upper limit of the bladder, and a transverse incision through peritoneum only is made a third of an inch above this point, running from the lower edge of the cut in the broad ligament across the uterus to a corresponding point on the other side. The bladder is freed from the uterus by being carefully wiped down with a piece of gauze held by fingers or forceps. The uterine artery is now exposed, and a finger passed

down by the side of the cervix can feel its pulsation. This artery is to be carefully ligated on one side and then on the other, close to the side of the cervix, the pedicle

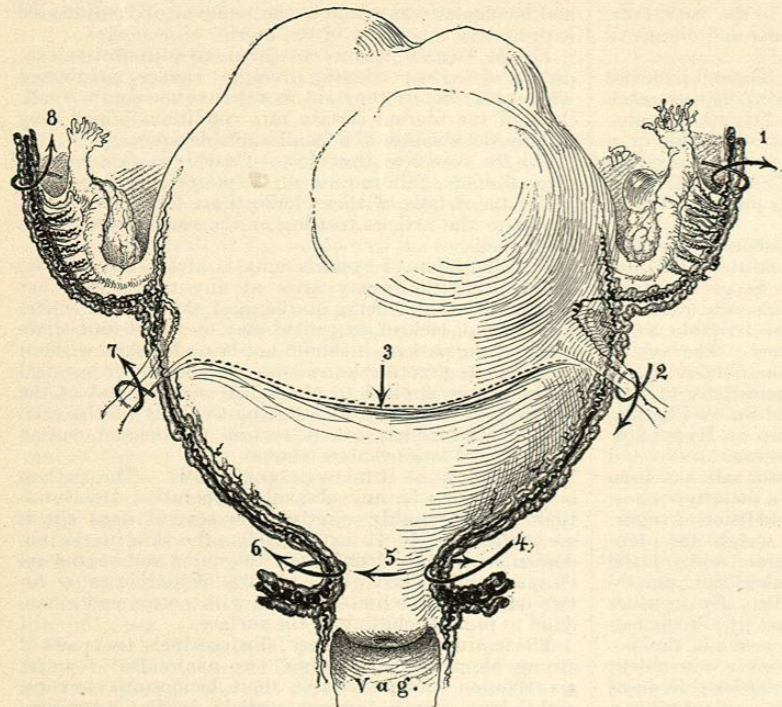


FIG. 2775.—Showing Diagrammatically the Blood Supply to the Uterus and the Successive Steps in Kelly's Method of Supravaginal Hysterectomy.

needle being passed forward and not outward, so as to avoid the ureter. The cervix is then divided and the uterus and tumor are removed.

When the operator has attained confidence in his technique, the procedure is greatly simplified especially in difficult cases, by first securing the ovarian and round ligament arteries on the more easily accessible side, freeing the bladder, securing the uterine vessels, cutting freely across the cervix until its tissue is nearly divided, catching the lower portion of the cervix with traction forceps so as to have it under control in case of unexpected hemorrhage. Tearing carefully the last fibres of the cervix, the operator will see the remaining uterine artery arching across the torn space. After this has been clamped or ligated, and the remainder of the broad ligament has also been clamped, the tumor is removed (Fig. 2775). All bleeding points having been secured by ligatures the edges of the cervical stump are carefully approximated with catgut, and the anterior and posterior peritoneal edges of the pelvic wound brought together, so as to cover in all raw surfaces and leave finally only a seam across the pelvis. The abdomen is then closed.

When it is considered best to remove the entire cervix after securing the arteries by ligature or clamp, the uterus or the cervical

stump is drawn away from the vagina and the dissection is carried down by scissors, keeping close to the cervix so as even to leave a slight ring of its tissue in place.

When the cervico-vaginal junction is reached the scissors are pushed through into the vagina and with this opening as a guide the remaining tissues are easily divided. All bleeding points having been secured, a piece of sterile gauze is pushed down into the vagina so that the upper part comes just above the cut vaginal edges, and the peritoneal edges are drawn together and sewed so as to close off the peritoneal cavity as in the supravaginal operation. The gauze drain is left in place five or six days.

In certain instances, especially when there are inflammatory disease of the appendages and extensive adhesions so that the tumor masses are fixed in the pelvis and the vessels covered in out of reach, it becomes necessary to incise the uterus anteriorly, always keeping strictly in the middle line, and rapidly to enucleate the tumor or tumors. The uterus then being collapsed and its relations easily recognized, the vessels can be secured and the operation completed.

Very large subperitoneal tumors under the vesical peritoneum, or in the broad ligament, are often best removed by a bisection of the tumor, as this allows the tumor to roll up and out on to the surface with the least handling and injury to its cellular investment.

Howard Kelly,³ in a case of fibroid reaching the umbilicus and with extreme adhesions to the colon and

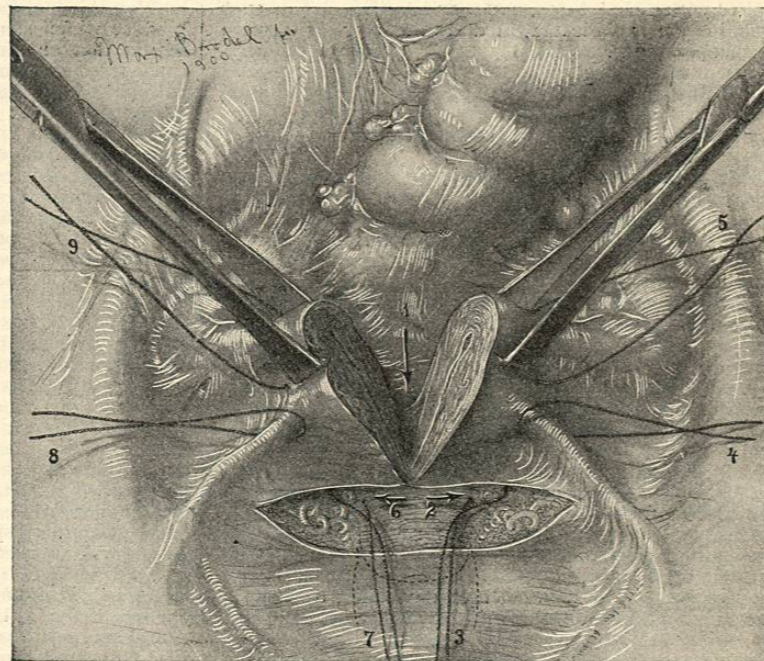


FIG. 2776.—Showing Successive Steps in Hysterectomy after Hemisection in a Case with Extensive and Firm Inflammatory Adhesions about Uterine Appendages. (Kelly.)

adjacent structures, first dissected the bladder from the cervix, then cut cautiously through the cervix transversely, tearing the last few fibres on each side, and as the uterine vessels came into reach clamped them with short-jawed forceps, compressed the vessels and cervix above the incision with long-jawed forceps, cut the vessels, and as the tissues could be pulled into reach after the cervix was loosened, secured the vessels up to the upper edge of the broad ligament, dealing with the adhesions to the colon after the mass had been entirely freed from below and lifted out of the abdomen.

Where there is double pyosalpinx with dense adhesions covering the uterine appendages and all contiguous structures, very great advantages are secured by a preliminary bisection of the uterus as described by Faure,⁴ of Paris, and Howard Kelly,⁵ of Baltimore. Kelly proceeds as follows: If the uterus is buried out of view, the bladder is first separated from the rectum and the fundus found; large abscesses, cysts, or hæmatomata are evacuated by puncture or aspiration; the abdominal cavity is carefully packed off from the pelvis. The uterine cornua are each seized by traction forceps and lifted up; the uterus is incised antero-posteriorly in the middle line, while its cornua are pulled up and drawn apart (Fig. 2776). With a third pair of forceps the uterus is grasped at one side on its cut surface as far down in the angle as possible, including both anterior and posterior walls. The traction forceps of the same side is then released and used for grasping the corresponding point on the opposite cut surface. In this way two forceps are constantly in use at the lower point. The bladder being pushed down or away from the uterine surface, the bisection is carried down to the cervix, or, if the operator prefers, into the vagina. The uterine canal must be followed in the bisection, using a director, if necessary, to keep it in view. Forceps now grasp the uterus well down in the cervical portion, if it is to be a supravaginal amputation, and the cervix is bisected on one side. As soon as it is divided and the uterine and vaginal ends begin to pull apart, the under surface of the uterine end is caught with a pair of forceps and pulled up, and the uterine vessels, which can now be seen, are clamped or tied. As the uterus is pulled farther up the round ligament is exposed and clamped, then a clamp is applied between the cornu and the tubo-ovarian mass and the half uterus removed. The same is done on the other side, and there are left only the tubo-ovarian masses for enucleation under the best possible conditions. Often the tube and ovary can just as well be taken out with the corresponding half of the uterus, leaving the separate enucleation for the most difficult cases. The most critical point in the operation is the bisection of the cervix and the securing of the uterine vessels. The cervix must be slowly and cautiously severed with steady, careful traction on the uterus, so as to prevent sudden tearing out and rupture of the vessels with frightful hemorrhage. By cutting so as to leave a tongue on each side of the cervix the vessels can be caught at a higher level and farther from the ureters.

Kelly also states that if the uterus is densely adherent to the rectum all the way up to the fundus the anterior portion of the uterus should be bisected, the cervix divided, the uterine vessels caught, and the rest of the uterus carefully divided up its posterior surface in a direction from the cervix toward the fundus, leaving a thin layer of uterine tissue on the gut at any point where it may seem necessary.

When the uterus is retroflexed with the fundus low in the pelvis and the cervical end thrust up near the symphysis, it may be caught at any convenient point on its anterior surface and drawn up toward the incision. The vesical fold of peritoneum is cut across and pushed down, and the cervix exposed and caught with two traction forceps, one above and one below. As the cervix is drawn up it is cautiously divided across its axis so as to sever the vaginal from the corporeal portion. As the ends are pulled apart the uterine vessels are ex-

posed and clamped. The uterus may then be bisected from below upward or removed *en masse*.

Celio-hysterectomy for Cancer.—Cullen⁶ states that this operation should be preferred in all cases when the patient is not too stout, but that to employ it in very fat individuals is unsatisfactory, both on account of the large quantity of adipose tissue in the abdominal wall, which materially increases the distance to the pelvic floor, and on account of the deposition of fat between the folds of the broad ligament and beneath the perito-

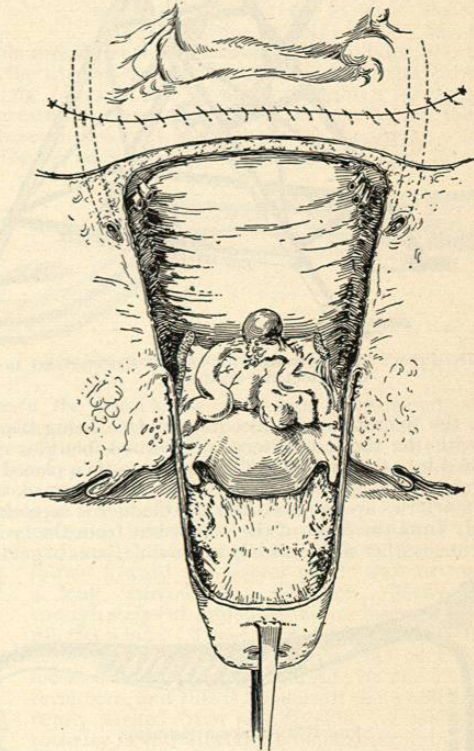


FIG. 2777.—Werder's Operation. The uterine attachments have been separated from above and the uterus pulled down through the vagina by a traction forceps attached to the cervix. The vesical and rectal peritoneum has been united by a running suture. The operation is completed by dividing the vagina at its reflection an inch within the vulva.

neum of the pelvic floor, which renders the free dissection of the ureters and uterine arteries exceedingly difficult.

The great advances in the technique of hysterectomy for cancer have been made by Ries,⁷ Clark,⁸ Rumpf,⁹ and Werder.¹⁰ Ries, in 1895, published a method involving the removal of the pelvic lymph glands after slitting the peritoneum back to the posterior pelvic wall as far as to the point at which the common iliac artery divides, Rumpf being the first to carry out this procedure on the living subject. Clark in 1895, having made the ureters prominent by the insertion of bougies, carried the operation to the point where the uterine artery is exposed, then spread the layers of the broad ligament apart, dissected the uterine artery out for a distance of 2.5 cm. from the uterus to beyond the vaginal branch and tied it, removing the broad ligament close to the iliac vessels and carrying his dissection well down on the vagina even if the disease did not apparently extend beyond the cervix. With all these methods there is the grave disadvantage that the carcinoma is very apt to come in contact with peritoneal or raw surfaces, so that there is always the risk of septic infection or of implanting carcinoma cells in healthy tissue. In 1898 Werder, to avoid this, devised a method