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ORIGINAL COMMUNICATIONS.

VAGINAL LIGATION OF A PORTION OF THE BROAD
LIGAMENTS FOR UTERINE TUMORS OR HEMORRHAGE.¹

BY

FRANKLIN H. MARTIN, M.D.,

Professor of Gynecology, Post-Graduate School of Chicago; Surgeon to Woman's
Hospital, etc.

(With seven illustrations.)

THE idea of this operation came to me while making an examination of a large bleeding fibroid in which the uterine arteries, as large as lead pencils and pumping blood at a fearful rate into the tumor, were conspicuously felt on either side of the cervix. While I had noticed the same fact a great many times before when preparing to make an electro-puncture or in giving an intra-uterine electrical treatment for fibroids, it had never before dawned upon me what a large amount of blood might be shut off from these bleeding masses by throwing a strong ligature around these comparatively superficial blood

¹ Read before the Gynecological Society of Chicago, December 16th, 1892.

channels, which represent fully two-thirds of the blood supply to the uterus.

The first objection which arose in my mind was the fact that there was such intimate anastomosis between the uterine artery and the spermatic or ovarian artery above that a compensatory supply of blood would soon be derived from that source.

I met that objection, mentally, with the fact (*a*) that the compensatory supply of blood must come from a much smaller artery which derives its blood in a single channel from a long distance; (*b*) that the nerve supply to the trunks of the two arteries were comparatively widely separated, and that by the time the nervous mechanism had communicated the fact of blood drought in the uterus and had succeeded in beginning the process of correcting it, the abnormal growth would have been changed in nutrition, atrophy would have begun, and in the meantime blood would have been saved.

The second objection which presented itself to me was the fact that I might not be able to ligate the main artery far enough away from the uterus to prevent collateral circulation being derived from branches given off further back. As collateral circulation is oftenest supplied by arteries arising from the same source or trunk back of the obstruction, this gave me more anxiety than my first objection. Fortunately there were two methods of avoiding the difficulty—viz., (*a*) by being able to ligate the trunk of the uterine artery far enough away from the uterus to include its uterine branch; and (*b*) by ligating not only the uterine artery, but by including *en masse* the whole base of the broad ligament, thereby shutting off all possibility of leaving any anomalous branches, should they exist.

The next questions of interest to me were: (*a*) Is the idea of the operation of ligating the broad ligament for the purpose of controlling hemorrhage, or for changing the nutrition of uterine tumors so as to check their growth and reduce their size, original with me? (*b*) Is the execution of the operation also original?

The idea of ligation of the *uterine artery* as a step in other procedures, or as an adjunct to other operations, is not new. Ligatures have been thrown around the uterine arteries for the purpose of checking acute hemorrhage from the circular artery when that blood vessel has been severed in incision of the cervix in obstetrics, or in its unavoidable incision in operations about the non-puerperal uterus. It is almost invariably ligated

as a preliminary step in vaginal hysterectomy. Masi,¹ of Italy, recommended ligation of the uterine artery as a preliminary operation for uterine cancer, sarcoma, and myofibroma, with a view of completing the operation later by resorting to laparotomy or vaginal hysterectomy for removal of the difficulty. He even went so far as to describe a method of operating based upon a number of observations made upon cadavers. He did not, however, report that he utilized the operation in actual practice. Schröder² executed the operation as a preliminary, afterward removing the uterus by the abdomen or vagina. Martin³ and Fritsch⁴ tied the artery as a preliminary step. Gubaroff and Piergoff⁵ tied the artery, and afterward proceeded to remove the growth. The former found the operation of importance. Rydygier⁶ tied the artery *per vaginam* as a precautionary measure before abdominal hysterectomy. Howard Kelly⁷ recommends ligation of the ovarian and uterine artery in case of hemorrhage in laparatomies, ligating from above. But, so far as I have gone in my investigation of the literature of the subject, I find no reference to any proposition to ligate more of the broad ligament from the vagina than the uterine artery, and that only for controlling troublesome hemorrhage—not with the idea of changing the nutrition of new growths, or of recommending the procedure as an operation in itself.

My proposition, so far as I can learn, of vaginal ligation of the broad ligament, to the extent, if necessary, of even including the ovarian artery of one side, is original.

My proposition of performing this operation, as an operation in itself, for the purpose of obtaining permanent benefit as a curative procedure, is original.

The execution of the operation which I am about to describe as an operation *per se* I believe to be without precedent.

It may not be entirely superfluous to refer to the distribution of the arteries in the broad ligament. This drawing, which I have reproduced from Hyrtel, as borrowed by Hart and Barbour, gives a fair idea of the subject (Fig. 1).

¹ Gazzetta degli Ospitali Milano e Napoli, 1891, p. 811.

² Zeitschrift für Geburtshülfe und Frauenkrankheiten, vol. vi., p. 289.

³ "Pathologie und Therapie der Frauenkrankheiten," 2d ed., 1887, p. 26.

⁴ Chirurgische Lieferungen.

⁵ Centralblatt für Chirurgie, 1890.

⁶ Wiener klinische Wochenschrift, 1890.

⁷ Johns Hopkins Hospital Reports, Nos. 3 and 4, vol. ii.

"The uterine artery springs from the anterior division of the internal iliac and passes downward and inward toward the cervix uteri. It then passes upward between the layers of the broad ligament by the side of the uterus, in an exceedingly tortuous manner, to anastomose with the lower branch of the ovarian. Branches pass from it into the substance of the uterus; these are the curling arteries of the uterus. The vaginal arteries usually spring immediately from the anterior division of the internal iliac artery, but sometimes arise from the uterine or middle hemorrhoidal. A special branch of the

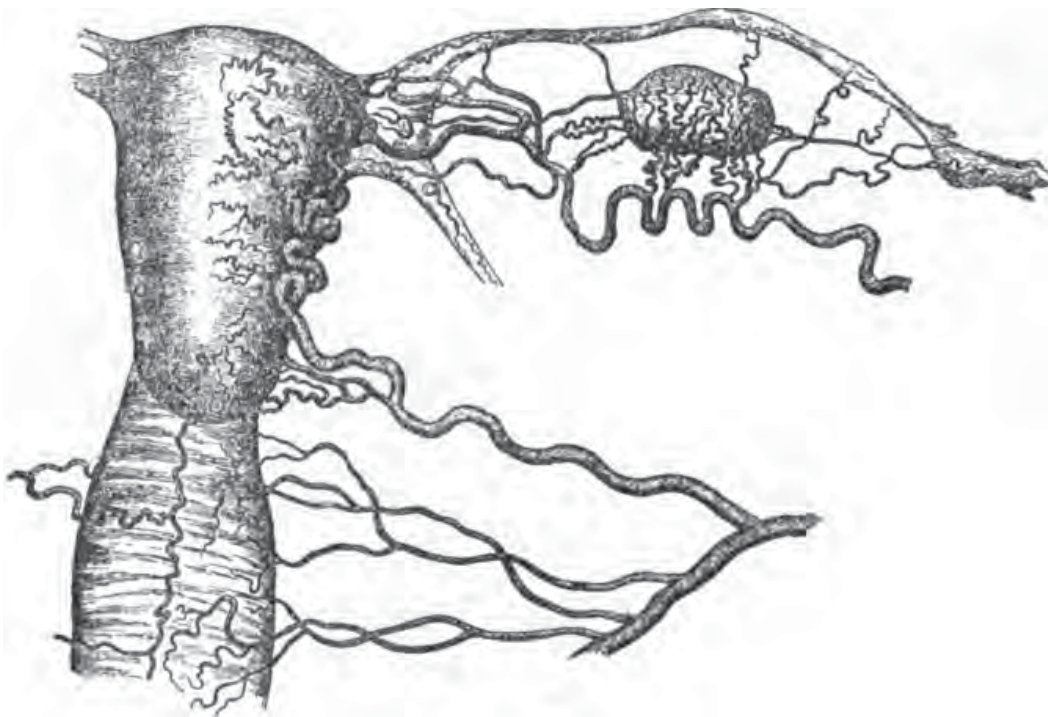


FIG. 1.

uterine artery to the cervix joins with its fellow at the isthmus to form the circular artery, and with those of the vagina to form the azygous artery of the vagina" (Hart and Barbour).

"The ovarian artery of each side is a branch of the abdominal aorta . . . In the pelvis it passes between the layers of the broad ligament, running tortuously toward the upper angle of the uterus. Near this it divides into two branches. The upper supplies the fundus uteri; the lower anastomoses at the side of the uterus with the uterine artery" (Hart and Barbour).

Besides these arterial channels the broad ligament contains

corresponding venous channels with a complex anastomotic network. It also conducts the lymphatic channels and the complete nervous network and supply. Thus through the broad ligaments, almost exclusively, the uterus with its wonderful functions maintains its relations with the outer body. Its blood supply and drain, its system of lymphatics, its intricate nerve communication, its nervous reflexes and nutrition, all must be impaired in exact proportion as the broad ligaments are destroyed.

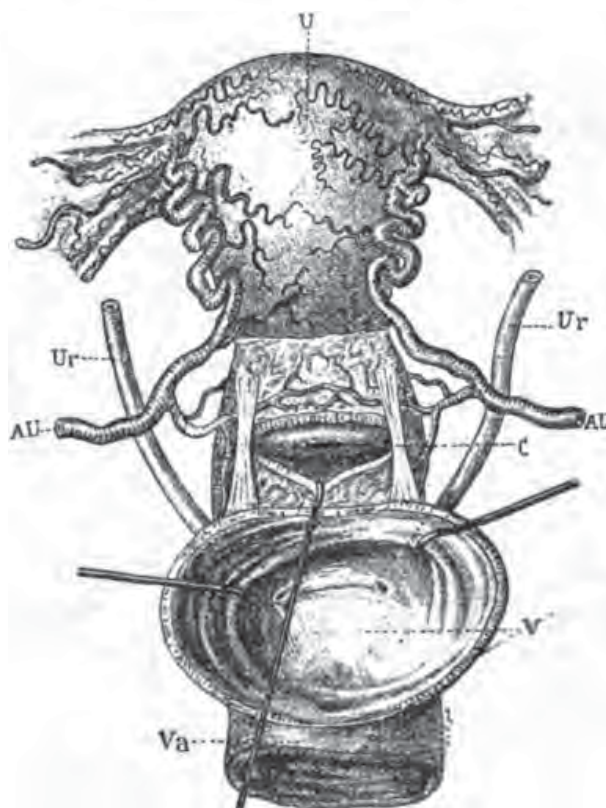


FIG. 2.

The next drawing (Fig. 2) is taken from Pozzi (vol. i., p. 361). U represents the uterus; A U, the uterine arteries; V, a section of the bladder drawn forward; Ur, ureters passing behind the uterine arteries, diverging as they ascend to the side of the pelvis; C, cervix uteri, as seen through a transverse incision of the anterior vaginal cul-de-sac. We can distinguish on the cervix the part not crossed by the peritoneum, which adhered to the bladder before dissection. It must be remembered that this drawing represents the bladder as separated from the uterus, between

which two there is close attachment in the natural state, and that the ureters are unnaturally separated from the cervix in consequence of the displacement of the bladder. As it is desirable to make all operations as simple as possible, it is necessary to bear in mind the relation of the broad ligament to the peritoneal cavity, so that the peritoneum may not be unnecessarily invaded. As the broad ligament is but a fold of the peritoneum, filled with the channels of supply for the uterus, it is obvious that we do not deal with the ligament as a whole, but simply with its contents.

The operation, then, which I propose is the ligation of more or less of the broad ligament with its vessels and nerves, the extent of the ligation depending upon the result sought, from a simple ligation of the base of the ligament, including the uterine arteries and branches of both sides without opening the peritoneum, to a complete ligation of the ligament of one side, including both uterine and ovarian arteries, with partial ligation of the opposite ligament without opening the peritoneal cavity, if possible, but by doing so if necessary.

The results sought in the operation are, first, checking of hemorrhages of the uterus by cutting off blood channels; and, secondly, changing the nutrition of the uterus by interfering with its nerve supply, with the idea of modifying neoplasms which depend upon that organ for their nourishment and growth.

Preparation for Operation.—The two patients upon whom I have performed this operation were prepared as for a vaginal hysterectomy. They were put upon a laparotomy diet for two days before the operation, and the bowels were thoroughly washed out with enemata. Besides the ordinary general bath and the antiseptic bath, on the morning of the operation the external genitals and the vagina were thoroughly cleansed with soap and water, shaved, and rendered aseptic by douching, etc. The patient was anesthetized and placed upon the operating table in the exaggerated lithotomy position, as for vaginal hysterectomy, with an assistant on either side to support the limbs and hold the retractors. A broad, short vaginal retractor, above and below, exposed the cervix, which was transfixed with a strong silk ligature to be employed in handling the uterus. Before tying this ligature a piece of gauze was packed into the cervix to absorb any secretion from the uterus, and the ligature tied so as to retain it. The uterus was then drawn down in order

to put the broad ligaments on the stretch, and then drawn to the right side so as to expose the left vaginal vault. The mucous membrane of the vagina at the utero-vaginal fold on the left side was then caught with a tenaculum and incised with a pair of curved scissors. One blade was then allowed to enter, and a curved incision one and a half to two inches long was made over the broad ligament and at right angles to it (Fig. 3). By means

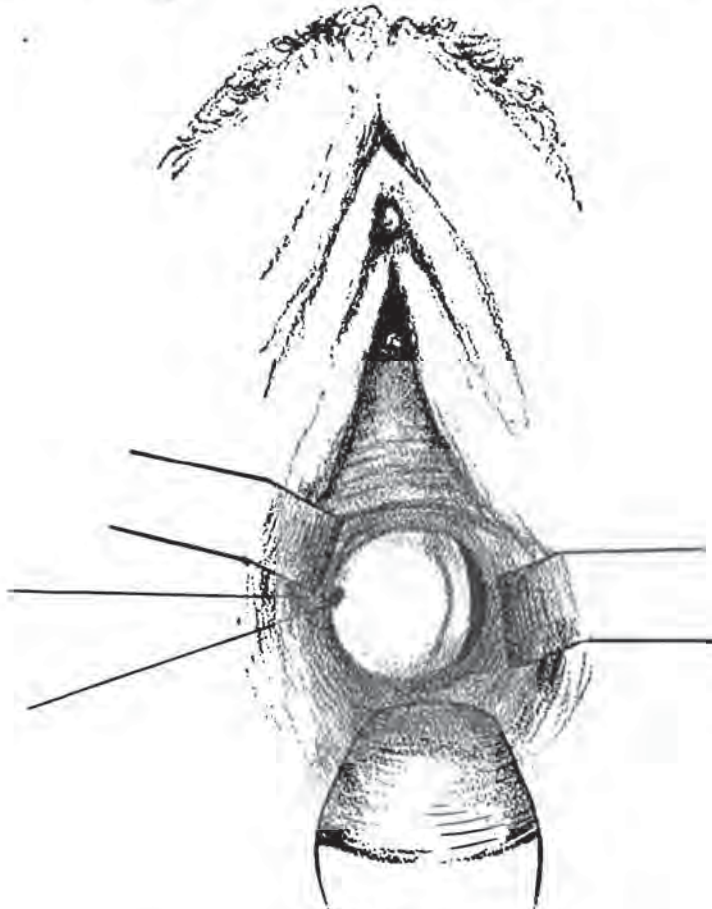


FIG. 3.

of the index fingers of two hands I separated the vaginal tissue from the broad ligament, and carefully separated the broad ligament in front from the bladder for a height of two inches, and laterally for nearly the same distance, using two fingers for the purpose (Fig. 4). By freeing the bladder in this way I avoided the dangers of wounding that organ, and by pushing the separation laterally the ureter is forced out of reach. I then carefully separated the broad ligament posteriorly to the same height as in front, without penetrating the peritoneum.

Then, by passing one finger behind, the other in front, the whole base of the broad ligament, representing two-thirds of its width, was grasped (Fig. 5) for a distance of an inch to an inch and a half from the uterus. In this grasp I could easily feel the throb of the main trunk of the uterine artery and several branches.



FIG. 4.

I then passed a curved pedicle needle (Fig. 6) armed with No. 12 braided silk, and guided by the index finger of the left hand, behind the broad ligament, well up beyond all pulsating vessels.



FIG. 5.

Next, with the same index finger guiding the point of the instrument, I penetrated through the broad ligament. The ligature was drawn through, the needle removed, and the base of the broad ligament firmly tied at a distance of one inch or more away from the uterus. The ligature was cut short, leaving it well buried in the tissues of the ligament. The opposite side

was treated in the same manner, the vagina was well irrigated with bichloride solution, and then the vaginal incisions were accurately approximated with fine catgut, completely burying the silk (Fig. 7). The handling string in the cervix was removed and the vagina packed with iodoform gauze.

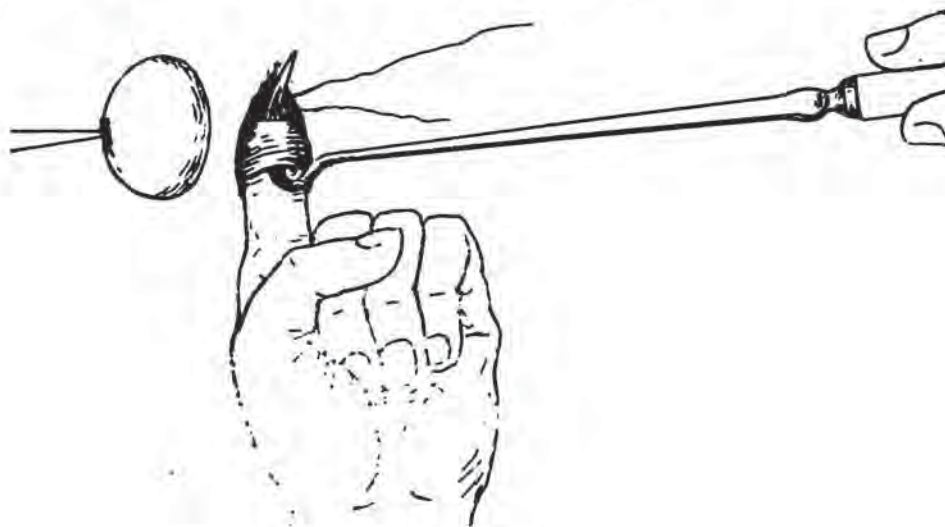


FIG. 6.

The after-treatment was very simple. It consisted in the removal of the gauze on the third or fourth day, followed by antiseptic douches. The vaginal wounds were perfectly healed at the end of a week.

The two cases which I have to report were operated upon



FIG. 7.

within the last month. The shortness of time since the operation will make it impossible for me to speak of remote results.

CASE I.—The first case was that of a maiden lady, 36 years of age, with a multiple intramural fibroid. She had been under the Apostoli treatment, off and on, for more than a year. The tumor, as a whole, had been materially reduced by that treatment and the

consequent hemorrhage modified. In fact, as long as treatments were continued there was no flowing, even at the menstrual periods; but as soon as the electrical treatment was left off for a week or more, the blood flow would return. The patient had every reason to rejoice at the success of the treatment, except in this one particular; she did not see her way clear, however, to continue the electrical treatment forever. I therefore recommended an operation, which was performed November 15th at the Woman's Hospital, with the assistance of Dr. J. Bacon and Dr. White. The details already described were carried out, although with some difficulty on account of the contracted vagina. The operation was not entirely satisfactory to me, as I fear that I did not go high enough on the left side to include all the branches of the uterine artery. I was less timid and more persistent on the right side, and succeeded in transfixing fully two-thirds of the broad ligament, in the centre of which could be distinctly felt the large, throbbing artery. Both of my assistants were satisfied on this point, both by ocular and tactile demonstration. The tying of the ligatures removed all arterial throbbing, which had previously been easily felt about the cervix. The ligatures were cut short and buried by closing the vaginal incisions with catgut, the vagina was packed with gauze, and the patient put to bed. For twenty-four hours there was a slight discharge of venous blood. From that time on there was a slight discharge of straw-colored fluid. She left the hospital on the eighth day. On the fifteenth day I saw her at my office; she had been free from flowing, and reported that she felt much less fulness and pressure in the pelvic region than before the operation. As she was to go to friends at some distance from the city, I asked her to report to me at the end of a month, which she does as follows: "Was quite lame across the abdomen—think it was from my journey; have had a discharge each day, more after stirring around, in the morning usually—not a constant discharge, but in gushes; not any blood since the night following your examination." Thus, while there has been an unusual watery discharge, she has been remarkably free from hemorrhage.

CASE II.—The next case, a married woman about 40, had also been under electrical treatment for a hemorrhagic uterine myofibroma. The tumor had been markedly reduced by intra-uterine applications, but for some reason (probably on account of an irregular uterine canal) the bleeding was not stopped. I

therefore decided to ligate the base of the broad ligaments. The patient was sent to the hospital suffering from a bloody discharge which had been almost constant for several months. She was prepared for the operation and placed upon the table, when, upon exposing the cervix with the retractors, we found that she was flowing quite profusely. The cervix was large, blue, and vascular. The parts were large and the operation very easily executed. I placed the ligature on the left side so as to include fully two inches in width of the broad ligament at a distance of at least an inch from the uterus. When I tightened this first ligature one of the spectators, a well-known gynecologist, called my attention to the fact that the cervix had perceptibly paled in appearance. The broad ligament was easily separated on the right side, and fully as much of it ligated as on the left. If there had been any doubt of the procedure affecting the vascularity of the uterus, it vanished when the second ligature was tied. The cervix immediately paled until it was nearly as white as a piece of cartilage.

The covering of the broad ligament was so loosely attached in this case that, for curiosity, I passed my finger up into the folds, when without any difficulty I came upon the main trunk of the ovarian artery, which could have been ligated without penetrating the peritoneal cavity. This convinced me that ligation of the broad ligament could be accomplished to the extent of including both of its blood channels, should it be deemed advisable, and that too, frequently, without penetrating the peritoneal cavity. It was noticeable in this case that the profuse uterine hemorrhage which was present at the beginning of the operation had entirely ceased at its end. The case was treated like the former, left the hospital on the eighth day, and on the fourteenth day saw me at my office. That was yesterday. There has not been the slightest discharge of blood since the operation. The pelvic pressure has been greatly relieved, and the patient speaks of a feeling of lightness in that region. Upon examination the vaginal wounds were found perfectly healed, there was not the slightest pulsation to be felt in the vaginal vault anywhere, and the uterus had perceptibly decreased in size. So much was the apparent diminution that I shall wait with great anxiety for the next visit of the patient in order to convince myself that I have not been deceived.

With the unimportant evidence presented by these two cases,

I submit this preliminary report on an operation which as yet is scarcely more than theoretical. Judging from such a standpoint, I believe it has a future of more than ordinary importance. However, it is in a field where its apparent merits may soon be practically tested. The procedure, fortunately, while presenting great possibilities in results, as an operation will appear in the minor class.

With our present light on the subject I shall make a conscientious effort to see that it is thoroughly tested in the following conditions:

1. Acute hemorrhage of the cervix from all acute or chronic causes which cannot be readily controlled by milder methods, as (*a*) rupture of the cervix in childbirth, by operation or by any other cause; (*b*) cancer of the cervix.

2. Hemorrhage from the body of the uterus as a result of abnormal growths: (*a*) fibromyomata, (*b*) sarcoma, (*c*) carcinoma, (*d*) intractable hemorrhagic endometritis.

3. For the purpose of changing the nutrition of myofibromatous tumors so that they will shrink in size, and, when of small dimensions, disappear altogether.
