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Original Articles

THE UTILIZATION OF THE BROAD LIGAMENTS IN COMPLETE DESCENT OF THE UTERUS, HYSTEROMYOMECTOMY AND REMOVAL OF UTERINE APPENDAGES.*

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END-TO-END APPROXIMATION OF THE BROAD LIGAMENTS IN A NEW OPERATION FOR COMPLETE DESCENT WITHOUT REMOVAL OF THE UTERUS.

In place of vaginal hysterectomy and other operations so often performed for complete descent of the uterus, I propose a new operation, the essential factor of which is the utilization of the broad ligaments as supports of the pelvic floor without removal of the uterus, but before entering on a description of this operation it may be well to outline briefly the mechanism of complete descent and to set forth some of the reasons why the older operations frequently have proved inadequate. In so doing I shall draw freely on my own writings without giving further credit.

I desire at the outset to disclaim any proposition that the uterus is supported and held in place by ligaments alone; it is supported by the whole pelvic floor, of which it is a part. In saying that the broad ligaments are utilized, I mean always that these ligaments and their adjacent structures are utilized.

Mechanism of Descent.—The uterus in its normal position lies transversely across the pelvis, the fundus pointing in a slightly upward anterior direction and the cervix in a slightly downward posterior direction. The long axis of the uterus in this normal direction makes an acute angle with the long axis of the vagina which extends obliquely, not vertically, from the vulva upward and backward in the direction of the hollow of the sacrum. Accordingly, mobile anteversion with some degree of antelexion is the normal position of the uterus; at any rate, the uterus in its normal range of movements does not deviate, unless temporarily, beyond the limits of a certain normal anteversion and antelexion.

The practical significance of this acute angle between the axis of the uterus and vagina in the etiology and treatment of descent is very great because the uterus in the act of prolapse usually descends through the vaginal canal in the direction of that canal, i. e., a coincidence of the two axes is a prerequisite to descent. Since an essential condition of descent is a coincidence of the two axes, it follows that one factor at least in the treatment of descent must be to restore the normal angle between the axes.

The mechanism of descent also has an important bearing on the treatment and, therefore, may be mentioned in detail as follows. In labor the anterior wall of the vagina is so depressed, stretched and shortened by the advancing child that during and after the second stage the anterior lip of the cervix uteri may be seen behind the urethra. This location of the cervix, so close to the anterior wall of the pelvis, necessarily involves great stretching of the uterosacral supports which normally hold the cervix uteri and, together with it, the upper extremity of the vagina close to the hollow of the sacrum. This function of the postuterine ligaments having been temporarily impaired, the upper extremity of the vagina is displaced forward so that after delivery the uterus having sufficient space between itself and the sacrum, instead of maintaining its normal anterior position, may fall backward into retroversion and thereby bring its own axis into line with the direction of the vagina.

If the puerperium progress favorably with prompt involution of the pelvic organs and if the relaxed vesicovaginal wall and other parts of the pelvic floor, especially the uterosacral supports and the broad and round ligaments, recover their normal tone, then the whole pelvic floor, including the uterus, resumes its normal relations. But if the enlarged heavy uterus remain in the long axis of the vagina, and especially if the fundus uteri be incarcerated under the promontory of the sacrum with the sacral supports stretched so much and for so long a time that they can not recover their contractile power, and if normal involution of the pelvic organs be arrested, then the descent may not only persist, but may progress with constantly increasing cystocele and rectocele until the entire uterus has extruded through the vulva.

It is most important to remember that complete prolapse of the uterus is only an incident to prolapse of the pelvic floor. The whole mechanism is that of hernia and the condition is hernia for the extruded hernial mass drags after it a peritoneal sac which, hernia-like, contains small intestine. This sac forces its way to the pelvic outlet and extrudes through the vulva, having the inverted vagina for a covering.

The above mechanism would suggest at once shortening of the uterosacral ligaments to draw the cervix uteri back to its normal location near the hollow of the sacrum and shortening the round ligaments to draw the corpus forward so as to restore the normal direction of the uterine axis. These procedures might be curative in cases of retroversion or retroflexion without great descent, but when not only the uterus, but also the whole pelvic floor, are in extreme downward hernial displacement the uterosacral and round ligaments, even though shortened, do not have sufficient power to give permanent support. The strain on them is so great that they are

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apt to stretch out and permit the descent to recur. Adequate sustaining power under the uterus is now essential. Shortening the uterosacral and round ligaments, however, may in some cases be indicated as a supplementary operation.

Frequently the change in the direction of the vagina from the normal oblique to the abnormal vertical is still further increased by injury to the vaginal outlet; the perineum may be torn in any direction and, what is more serious, it may be torn away from its pubic attachments, and in this way may be displaced backward toward the tip of the coccyx; in fact, such displacement is so common as a result of injuries to the perineum as to suggest the propriety of a change in the terminology from laceration to displacement of the perineum. The upper extremity of the vagina being displaced forward and the lower extremity backward, and the direction of the overstretched, dilated vagina now being vertical, the heavy uterus, having its long axis in the same direction as that of the vagina, has all the conditions favorable to progressive descent.

It is clearly most important to appreciate the fact that, since in nearly every case of procidentia the lower extremity of the vagina is displaced backward, with associated subinvolution of the pelvic floor and especially subinvolution or rupture of the perineum or of some other portion of the vaginal outlet, therefore the posterior wall of the vaginal outlet and the perineum must be brought forward to their normal location

under the pubes, so as to give support to the anterior vaginal wall; otherwise, whatever the operation on the vaginal walls and broad ligaments, the vagina will fall again, will drag the uterus after it, and the hernial protrusion (cystocele, rectocele and prolapse) will be reproduced.

The treatment, therefore, of procidentia must always

include an adequate operation on the perineum, or, more comprehensively speaking, on the posterior wall of the vaginal outlet. The operation must be performed so that it will carry the lower extremity of the vagina forward to the normal location close under the pubes; for in no other way can the normal oblique direction of the vagina be secured.

Reasons for Failure of the Older Operations. — In passing it may be well to mention, for the purpose of condemning it, an operation perhaps more frequently performed than any other for the cure of complete descent, namely, the operation which generally passes under the name of Stoltz. This operation is designed to narrow the vagina, and thus to maintain the uterus somewhere in the pelvis above the constriction. Operations of this class usually consist of the removal of an elliptical piece from the anterior or posterior vaginal wall, or from both, and closing the exposed surfaces by means of purse-string sutures. No effort is made to restore the normal axes of the uterus and vagina. The whole purpose is to make the vagina so narrow that the uterus can not pass through it. Such operations gen-

Fig. 1.—VAGINAL HYSTERECTOMY. A. Incisions have been made from the posterior vaginal fornix to the cul-de-sac of Douglas and from the anterior vaginal fornix to the utero-vesical cul-de-sac. The uterine and ovarian arteries in both ligaments have been securely ligated. The left ligament has been cut away from the uterus and is drawn to the vulva and held by forceps. The uterus has been drawn through the vulva and is hanging by a shred to the right ligament from which it is being cut away. The wound made by the removal of the uterus with its peritoneal and vaginal margins shows between the ligaments.

B. The last stitch of a continuous catgut suture is being taken to unite the peritoneal margins of the wound. The line of suture thus made runs from one ligament to the other and at either end includes the ligament. Closure of the peritoneum as here shown is nearly complete.

C. The ends of the broad ligament are shown to be united in front of the peritoneum by means of a continuous catgut suture. Another suture is closing the vaginal margins of the wound by a line of union running across the upper end of the vagina from side to side. When this suture is complete the united broad ligaments will lie between peritoneum and vaginal wall, and must necessarily sustain the rectum, vagina and bladder on the health level.

erally fail, because they leave the uterus and vagina in the same axis and because the restricted vagina can not resist the downward force of the uterus, which almost invariably dilates the vagina a second time and forces its way through with reproduction of the hernia. Moreover, the operation always does permanent harm, because it shortens the vagina, thereby making it draw the cervix away from the sacrum toward the pubes so that the body of the uterus may have room to fall backward to the position of incurable retroversion. We may without discussion perhaps throw out all operations belonging to the Stoltz group. The same may be said of all plastic operations in which the vaginal surfaces are exposed by superficial denudation and brought together by sutures, even though some of these operations are correct in principle so far as they aim to force the cervix uteri backward into the hollow of the sacrum.

The older plastic operations of elytrorrhaphy having been followed so frequently by partial or complete recurrence of the descent, many operators, especially in women who have passed the menopause, substitute the mutilating operation of vaginal hysterectomy for the unsatisfactory operations of superficial elytrorrhaphy. Complete prolapse, being hernia, should be treated, as pointed out by Reynolds and others, according to the established principles of herniotomy by reducing it and then excising the sac in such a way as to expose strong fascial surfaces which should be firmly united by sutures. The absurdity of treating any other hernia by superficial denudation and reefing or tucking in the surfaces by sewing them together must be apparent to anyone.

An efficient operation on the vaginal walls should have for its object, not narrowing the vagina, but restoring the normal direction of it with a double purpose; first, so that the upper extremity, together with the cervix uteri, shall be in its normal location within an inch of the second and third vertebræ, just where the uterosacral ligaments would hold it if their normal tonicity and integrity could be restored; and, second, so that the lower extremity of the vagina shall be brought forward against the pubes. The fulfillment of these two indications by restoring the normal obliquity of the vagina will hold the cervix uteri so far back toward the sacrum that the corpus uteri must be directed forward in its normal anterior position of mobile equilibrium. With these conditions secured, the uterus being at an acute angle with the vagina and having little space posteriorly, can not retrovert and turn the necessary corner which would permit it to prolapse in the direction of the vaginal outlet. To accomplish this, perineorrhaphy already has been declared necessary as a means of forcing the lower end of the vagina toward the pubes.

Before describing the proposed operation I would repeat the fact that the various plastic operations on the vaginal walls (elytrorrhaphy) have proved so unsatisfactory that many surgeons are inclined to abandon them and to adopt the radical measure of vaginal hysterectomy in their place. This operation, however, if performed by the familiar method of ligating the broad ligaments, cutting them from the uterus, and then letting them retract to the sides of the pelvis is inadequate because the ligaments thus retracted can not perform their functions of holding up the pelvic floor; consequently many hysterectomies performed in this way have been followed by a continuance of the downward displacement of the rectum, vagina and bladder, a condition not materially improved by the mere absence of the uterus. In order to utilize the normal supporting

power of the ligaments, I devised and in 1902 published an operation by which the severed ligaments were approximated end to end between the peritoneal and vaginal sides of the wound made by the removal of the uterus. I again present the operation unmodified, because I desire to make use of this principle of end-to-end approximation in the new procedure for the surgical treatment of complete descent of the uterus, a description of which will follow. Figure 1 will serve to illustrate the treatment of the broad ligaments by end-to-end approximation in vaginal hysterectomy.

Proposed Operation on the Broad Ligaments and Excision of the Cystocele.—To appreciate the part which the broad ligaments properly may have in a correct operation, it is only necessary to observe the fact that vaginal hysterectomy as above described results in holding up the pelvic floor and with it the rectum, vagina and bladder, because in this operation the broad ligaments are fixed to the vaginal wound. Since the condition of procidentia is hernia not alone of the uterus, but of the rectum, vagina and bladder as well, let us try to hold up the pelvic floor, including the uterus, by similar means, even though the uterus be not removed.

Following the suggestion of Emmet Sims, Reynolds and others who have striven to draw structures in the neighborhood of the lower margins of the ligaments in front of the cervix for the purpose of forcing it back, I found myself stripping the structures more and more from the sides of the uterus and drawing them in front of it, but not until I actually severed a considerable portion of each ligament from the sides of the uterus did I secure the best results. In future operations I shall emphasize that part of the procedure as shown in the drawings more than I have done yet. Figures 2, 3, 4, 5, 6, 7, 8, 9 and 10, with their legends, will illustrate the proposed method of holding up not only the uterus, but also the rectum, vagina and bladder by end-to-end approximation of the broad ligaments and adequate excision of the cystocele, without removal of the uterus.

In addition to approximation of ligaments, it must be borne in mind that other supporting structures also are brought together in front of the cervix uteri, notably the adjacent parametric structures, and if the operation is sufficiently extensive, the round ligaments. In extreme cases it would be well to separate the bladder entirely from the cervix uteri, as would be done in vaginal section, so as to expose the round ligaments. These ligaments then could be brought down in front of the cervix and included in the sutures which are used to approximate the cut ends of the broad ligaments. Such adjustment of the broad and round ligaments, together with the adjacent parametria in front of the cervix, necessarily would give great strength to the pelvic floor.

The question frequently has been asked whether in cutting away the lower halves of the broad ligaments troublesome hemorrhage is not encountered. I should fear such hemorrhage if the ligaments were severed with the uterus in its normal location, but would not fear it with the uterus outside the body. Besides, since a shaving is removed from each side of the uterus, the incision usually would be safely inside the utero-ovarian anastomosis. At any rate, the uterus being outside the body, hemorrhage could be controlled easily if it did occur.

I ask a trial for this operation, in the hope that it will prove more effective than the more superficial elytrorrhaphy, which, in a degree, has been unsatisfactory. At least, it will be less mutilating than the alternative operation, vaginal hysterectomy. (See Figs. 2-10.)

Fig. 2.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—Cervix held steady by flat vulsellum forceps. The bladder lies in front of the prolapsed uterus. The dotted line extending in the median direction on the anterior wall of the cervix from a point at the uterovaginal attachment to the urethrovaginal wall, mark (Figure 4) the direction of an incision to be made by means of sharp pointed scissors through the vaginal layer of the vesicovaginal septum. The incision extending around the anterior half of the cervix at the uterovaginal attachment is made through the vaginal wall to, but not into uterine tissue.

Fig. 4.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The bladder has been stripped off uterus, and the peritoneum exposed (Figure 3), the vesicovaginal septum is drawn down over the anterior uterine wall by a forceps, and the vaginal layer of the septum is being split on the median line with scissors.

Fig. 3.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—Bladder being stripped from uterus by blunt dissection, which is accomplished readily and quickly by sponge pressure and is continued to the peritoneal reflexion of the vesico-uterine pouch precisely as it would be if the operator were going to open into the peritoneal cavity between the uterus and bladder. Observe here, just beneath the sponge, the translucent peritoneum, which for the present purpose is not usually to be incised.

Fig. 5.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The vaginal layer of the vesicovaginal septum is being stripped away from the bladder wall by the same kind of blunt dissection used in Figure 3. The bladder as it is separated is pushed out of sight.

Fig. 6.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The lower two-thirds of each broad ligament, and to avoid wounding the utero-ovarian anastomosis, a thin shaving of the cervix is being cut away with sharp pointed scissors. The right ligament has been severed and the left is being severed. The redundant vaginal layer (cystocele) which has been stripped off from the bladder is held by forceps out of the way of either side.

Fig. 8.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The lower two-thirds of the severed broad ligaments have been united end to end by catgut sutures, thus forcing cervix still further back. The redundant vaginal wall (cystocele) has been cut away on the right and is being cut away on the left.

Fig. 7.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The severed lower two-thirds of the broad ligaments are being approximated end to end by catgut sutures. First suture in place and being drawn tight. These ends as they are drawn together already are forcing the cervix back.

As already explained, the cut ends of these ligaments when united pull down together with them the adjacent parametric structures and in extensive operations also the round ligaments. Too tight tying is apt to strangulate the tissues, cause the sutures to cut out and prevent union. Number one or two chromic catgut ordinarily is used. Silkworm gut is better but difficult to remove.

Fig. 9.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The severed ends of the broad ligament having been united in front of cervix, and the cystocele excised, the cut edges of the vaginal wall are being approximated from side to side. The first suture, which is being drawn tight, shows how the margins are approximated near the cervix. The other sutures show the method of union between this first suture and the others, which are introduced but not tied. Observe that these sutures all catch up the uterine wall, thus forcing the bladder up so that it can not come down again between the uterus and the vagina. This forcing up the bladder is a very essential factor in the success of the operation.

END-TO-END APPROXIMATION OF THE BROAD LIGAMENT
IN SUPRAVAGINAL AND COMPLETE
HYSTEROMYOMECTOMY.

The older operation of hysteromyomectomy, by which the broad ligaments were ligated and permitted to retract to the sides of the pelvis was, in many cases, unsatisfactory, because the ligaments thus retracted could no longer contribute their part to holding up the pelvic floor and because consequently the operation often was followed by descent of the rectum, vagina and bladder to the vulva and in some instances outside the vulva. The purpose of end-to-end approximation is to utilize the ligaments in the performance of their normal sus-

Fig. 10.—BROAD LIGAMENT OPERATION FOR COMPLETE DESCENT OF THE UTERUS.—The redundant vaginal wall having been removed (Figure 8) the lateral margins of the vaginal wound are being united by interrupted sutures. As the result of this union the cervix and upper end of the vagina have been forced back to their normal location in the hollow of the sacrum. B and C show the lines of union complete. At the urethral end of the wound the redundant vaginal wall can not be disposed of always by a median line of union. It may be necessary, as shown here, to unite that part in a direction at right angles to the main line of union. Traction is being made by tenacula at each end of this transverse line of union. The cervical lines of union also have the T shape.

Fig. 11.—SUPRAVAGINAL HYSTERECTOMY.—Median incision. Abdominal wound held apart by retractor. Myomatous uterus delivered through the wound. Broad ligament on either side clamped by two long forceps preparatory to supravaginal amputation of the uterus. Cervix uteri between tips of forceps. Bladder in front.

Fig. 12.—SUPRAVAGINAL HYSTERECTOMY.—Semi-diagrammatic. A transverse incision has been made in front of the cervix uteri at the vesical reflexion, each end terminating where the broad ligament joins the uterus. A similar incision has been made through the peritoneum on the posterior wall of the uterus, but on a line rather higher than the one on the front. The bladder has been stripped away from the cervix as far down as possible by the same kind of sponge pressure as shown in Figure 3. The posterior peritoneum has been stripped down toward the vaginal portion of the cervix in the same manner. The broad ligament has been divided on either side between the forceps and the utero-ovarian anastomosis has been clamped by an additional forceps.

taining functions. I published the essential principle of this operation in 1902, and here present it again in order to set forth certain modifications in technic.

Supravaginal Hysteromyomectomy Without Drainage.—Figures 11 to 16, with their legends, will explain the operation of supravaginal hysteromyomectomy as

Fig. 13.—SUPRAVAGINAL HYSTERECTOMY. Semi-diagrammatic. The myomatous corpus uteri is being cut from the cervix by means of scissors. Observe the triangular incision is directed not in the lateral but in the anteroposterior direction. The tumor having been removed, the next step will be to secure the uterine and ovarian arteries by means of catgut ligatures on either side. This having been done the forceps are to be removed. The broad ligaments and the two sides of the cervical stump are then to be brought together.

Fig. 14.—SUPRAVAGINAL HYSTERECTOMY. Semi-diagrammatic. Looking down on the cervical stump and severed broad ligaments instead of looking at the anterior wall of the cervix as in Figure 13. Uterine and ovarian arteries secured by ligature. Two running catgut sutures catching up the peritoneal covering of the cervical stump and of the broad ligaments, one anterior and one posterior to the cervix and broad ligaments, have been passed in such a manner that when tied they will draw into apposition the two lateral surfaces of the cervical stump and will unite the ligaments, end to end.

Fig. 15.—SUPRAVAGINAL HYSTERECTOMY. Semi-diagrammatic. The posterior continuous suture shown in Figure 14 has been drawn taut and tied. The anterior suture is being drawn taut preparatory to tying.

Fig. 16.—SUPRAVAGINAL HYSTERECTOMY. Semi-diagrammatic. The broad ligaments having been drawn together as shown in Figure 15 the approximation is completed by an additional running catgut suture beginning at the lower end of the line of union on the posterior side of the united ligaments and continuing over the edge of the ligaments down on the anterior surface to the bladder. This completes the closure of the pelvic wound.

Fig. 17.—SUPRAVAGINAL HYSTERECTOMY. The corpus uteri has been removed, as shown in Figure 13. The uterine and ovarian arteries have been tied with catgut. The cervical stump is being held up and steadied by two forceps and divided anteroposteriorly into two equal lateral fragments clear to the vagina by means of scissors. In a very short, easily dilatable patulous cervix the uterine dilator introduced from above downwards might be used to dilvise the cervical canal widely in place of cutting with scissors.

Fig. 18.—SUPRAVAGINAL HYSTERECTOMY. Semi-diagrammatic. The cervix having been divided or dilated as explained in the legend of Figure 17, a short strip of gauze is introduced from above downward into the vagina. The two fragments of the cervix and the cut ends of the broad ligaments are then ready to be united by sutures. The first suture is introduced but not tied. The operator may use the same form of suture as shown in Figures 14, 15 and 16, or may adopt any other form which the case may require.

Fig. 21.—COMPLETE HYSTERECTOMY. Semi-diagrammatic. Continuation of Figure 20. The cervical stump having been removed, the cut edge of the vagina is drawn up by means of forceps and included in a continuous suture which closes the upper end of the vagina against the united broad ligaments which are brought together end to end. This form of suture is here introduced to show a method of union. Other forms of suture may be better suited to individual cases.

Fig. 19.—SUPRAVAGINAL HYSTERECTOMY. Semi-diagrammatic. Continuation of Figure 18. Vaginal gauze drain. End to end approximation of the broad ligaments by continuous suture. This suture is here intended to suggest a method of closure. Other forms of suture and methods of closure are permissible.

Fig. 22.—REEFING OF BROAD LIGAMENTS AFTER REMOVAL OF UTERINE APPENDAGES. For explanation see following page.

Fig. 20.—COMPLETE HYSTERECTOMY. Semi-diagrammatic. The myomatous corpus having been removed and the cervix split, the two lateral fragments are being removed by means of scissors, care being taken to keep close to the cervix in order to avoid the ureters.

Fig. 23.—REEFING OF BROAD LIGAMENTS AFTER REMOVAL OF UTERINE APPENDAGES. For explanation see following page.

modified from the original publication. To secure simplicity, the non-essential anatomy has been omitted.

Supravaginal Hysteromyomectomy with Drainage.—There may be some pathologic condition in connection with the ligaments or the cervical stump which would indicate drainage so that any secretions which might form in the line of union may find their way into the vagina instead of into the peritoneum. Figures 17, 18 and 19, with their legends, illustrate the operation as modified for vaginal drainage.

Complete Hysteromyomectomy.—If the entire uterus is to be removed, the operation will go forward as already described for the removal of the myomatous corpus uteri. The cervix then may be cut out and the wound closed as shown in Figures 20 and 21.

ADVANTAGES OF END-TO-END APPROXIMATION.

1. The broad ligaments, in the anatomic sense, take the place of the excised uterus and form a pouch posteriorly like the cul-de-sac of Douglas, and anteriorly a depression that answers to the uterovesical pouch, thus conforming to the normal anatomy.

2. The broad ligaments, thus united, together with adjacent structures, hold up the rectum, bladder, vagina and other parts of the pelvic floor, and in so doing prevent the descent of these organs which so commonly results from hysterectomy as ordinarily performed.

3. The broad ligaments and adjacent structures, in occupying the space left by complete hysterectomy, prevent the intimate union of the rectum and bladder, a union which would leave only a thin wall between them, through which infection might pass from one to the other.

4. The operation is performed more easily and quickly by this method than by that of transverse suturing of the wounded ligaments.

5. There is, after closure, much less intraperitoneal traumatism and consequently less danger of sepsis, adhesions and secondary hemorrhage.

6. The mortality of the operation in my own cases during the last four years has not risen above 1 per cent.

REEFING THE BROAD LIGAMENTS IN THE REMOVAL OF THE UTERINE APPENDAGES.

The old and obsolete method of ligating the broad ligaments *en masse*, cutting off the tube and ovary and then dropping the raw stump back into the pelvic cavity, although surgically crude, yet had the advantage of shortening the broad ligaments and consequently of holding up the uterus and the other parts of the pelvic floor. A large proportion of the cases of removal of the appendages are complicated by backward or downward displacement of the uterus, and the displacement is apt to be increased by the modern operation of whipping over the edge of the broad ligament after removal of the appendage. The right side of Figure 22 shows the cut edge of the ligament. Instead of a running suture to unite the peritoneum on either side over this cut edge, I proposed, in 1902, to double it on itself and thereby to shorten the ligament. Although I have in no respect modified this operation, I venture to introduce it here both because of its effectiveness in holding the uterus in normal position and because the presentation of it completes the list of procedures in which I have been specially interested for the preservation of the functions of the broad ligaments and their adjacent structures in pelvic surgery. Figures 22 and 23 will serve to illustrate the method.

Figure 22 on the left side shows the anatomy of the circulation and two ligatures thrown around the ovarian artery, but not tied. The right side shows diseased appendages being cut away, the ligatures having been tied so as to shut off the blood current from the artery as it emerges from the infundibulopelvic ligament and from the utero-ovarian anastomosis.

Fig. 23 on the right side shows the raw edge of broad ligament after removal of the appendages. This ligament is being shortened by closure on itself by means of a continuous catgut suture. The left side shows complete closure and folding on itself of the broad ligament.

DISCUSSION.

DR. EDWARD REYNOLDS, Boston, said that if he disapproved of the proposed operation Dr. Dudley knows that he would say so, but as he listened to the paper he said to himself "Dudley has struck it this time." He would not, however, do this operation in young women likely to become pregnant. But nineteen-twentieths of the cases in which prolapse occurs are in women who will not again be pregnant. In Dr. Dudley's operation the natural supports are utilized so to fix the bulk of the support across the floor of the pelvis. This will so protect the natural supports that they are not likely to be broken down.

DR. E. E. MONTGOMERY, Philadelphia, agreed with Dr. Reynolds. He does not know of any condition that gives more trouble than an extensive prolapse, and after the description of this perfect procedure one is surprised that it has been overlooked so long. He has pushed off the bladder and tucked it up in order to keep it from pushing down, and then cut out a semicircular section on either side and lengthened the anterior wall of the vagina and overcome the cystocele, but this is not nearly so effective as the method mentioned by Dr. Dudley.

DR. R. WALDO, New York, said that if the broad ligaments hold, this operation may cure the disease, but we do not know that they will hold. All surgeons have had sad experiences wherein they have stitched fibrous tissues together. This does not always hold. Another principle which it is very essential to remember is the necessity of holding the fundus of the uterus forward, for in procidentia one of the first things to happen is retroversion. This operation will hold back the cervix. Dr. Waldo has operated for complete procidentia through the vagina anteriorly, bringing the fundus forward and stitching it there.

DR. F. J. TAUSSIG, St. Louis, said that it is as difficult to estimate the value of an operation for prolapse as it is that of an operation for uterine cancer, for in either case we have to wait three, four or five years after the operation to see if we have secured a permanent result. The method of using the broad ligaments instead of the round and the uterosacral ligaments is an improvement. Dr. Taussig recalls having seen Mackenrodt do a similar one in 1901, and since then he notes that Mackenrodt has given up this method. This method does not take into consideration the bladder. We know from experience in operating for prolapse that the recurrence is usually in the shape of a cystocele, and it is to guard against this that we must strive as much as possible. Seventy-five per cent. of these cases occur in women over 40. For these reasons the Freund-Wertheim uterovaginal plastic operation, in which the uterus acts as a plug for the cystocele, should be employed. Dr. Taussig finds in the reports of this operation 148 cases with a return of the prolapse in 5. This certainly speaks well for the operation. He believes it should receive more consideration at the hands of American surgeons.

DR. D. H. CRAIG, Boston, thinks that any of us who have had experience in the employment of the broad ligaments, as suggested some time ago by Dr. Dudley, have had occasion to be well satisfied with the manner in which they have functionated in their new relationship. The original causation of cystocele and other forms of descent of the vaginal wall, however, is almost invariably a laceration of the vaginal outlet, Dr. Craig emphasized the necessity of attacking certain

other conditions early; in his opinion if all these lacerations were promptly repaired cystocele would become of historical rather than of practical interest. Physiologically, the broad ligaments are required to possess enormous ability to elongate upward during pregnancy. In cystocele this ability simply manifests itself in the reverse direction, and since these ligaments have once partly elongated downward as the result of abnormal conditions below them, it may be that they possess an ability to elongate still further after the operation. To guard against this, operation must be done as early as possible and every item of injury to the vaginal outlet repaired. With this proviso the operation seems to Dr. Craig the best yet suggested.

DR. E. C. DUDLEY, Chicago, stated that he has not performed the operation in young women, because his cases had occurred in women past middle life, but he would not hesitate to do so. The remarks relative to the operation of Mackenrodt, he declared, were irrelevant. Mackenrodt has never published a description of this operation, nor of any operation similar to this, nor has Dr. Dudley ever had any reason to think Mackenrodt ever performed it. The fact that he performed some other operation and subsequently gave it up as being unfit has nothing to do with the subject. In putting forth this operation Dr. Dudley said that he has had constantly before his mind anatomic conditions and the utilization of anatomic structures in such a way as to make them perform their functions with the least disturbance of normal relations. He emphasized the great importance of separating the bladder completely from the uterus, and pushing it up out of the way. He also reiterated the opening statement of this paper that the operation does not depend wholly on the supporting power of the ligaments, but also on other adjacent structures, the integrity also of which is restored by adjustment of the ligaments, this being an essential condition of success.

MILK IN INFECTIOUS DISEASES.

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Milk has been used for so long a period and to such an extent that its status as a food ought to be settled beyond cavil or doubt. Unfortunately this is not the case. In this article it is my purpose to consider the objections to milk as a food for the sick, as well as its merits. Before discussing the advantages it may be well to consider briefly the actual conditions present, particularly in the digestive organs, in persons suffering from an infectious disease.

In infectious diseases it has not been found possible to prevent a steady loss of body weight by any method of feeding, save in rare instances. This varies in an average daily loss of from 0.33 to 0.5 of 1 per cent of the entire weight during prolonged fevers. A man weighing 150 pounds would lose from one-half to three-quarters of a pound daily or from 10 to 15 pounds in twenty days, notwithstanding that proper nourishment was supplied. In pneumonia the loss has been as high as 15 pounds in twelve days.

While the reserve fat is drawn on, the loss is chiefly in nitrogenous elements. It would seem to be an easy solution of the problem of feeding the sick to furnish as much nitrogenous food as is lost by excessive metabolism. Experiments show that if this is done the digestive organs are overworked, flatulence and loss of appetite may ensue, while in extreme cases an autointoxication may develop and instead of a gain there is a loss.

A man in health requires food equivalents of from 2,500 to 3,000 calories if measured in heat units. This must be divided among the chief classes of food in the proportion of 100 to 125 gm. of protein, 50 to 100 gm.

of fat and 300 to 500 gm. of carbohydrates. The normal man can not get along well with protein or fat alone or with fat and carbohydrates without protein; neither can the man with an infectious disease, though perhaps the body's demand is not proportionally so great. In speaking of the need in fevers, Leyden of Berlin says: "Fats and carbohydrates are just as necessary as albumin, no one is preferred to the others." It has been estimated that a man ill with some form of fever needs from 2,000 to 2,500 calories to maintain complete renewal of structure. As this can not be entirely done, the actual need of the system is much less. Clinical experience is in entire accord with this view, as is easy to demonstrate that a patient does very well on much less. A laboring man if fed on milk would require 5 liters or approximately 3,000 calories a day, while 2 liters, 1,200 calories, have been found sufficient for an average patient stricken with an infectious disease.

There is a progressive weakening in digestion as an infection advances. The secretion of saliva is diminished or entirely checked, while mastication is difficult because of the dryness of the mouth and tongue. The gastric juice contains a diminished amount of hydrochloric acid, which may be entirely absent in some cases. The stomach may be weak and irritable, with its motor function impaired. According to Hoesslin, "on the part of the intestines fats and carbohydrates are quite well absorbed." These changes in the digestive organs vary according to the variety and intensity of the infection and its duration. It used to be taught that when the temperature was high absorption of food could take place only to a slight extent. This theory has long since been exploded, though probably tenaciously held yet by some. Proper food correctly administered does not apparently increase the temperature. Indigestion with flatulence and possibly a decomposition of albuminoids producing an autointoxication may exaggerate symptoms and cause a rise in temperature.

In a number of instances made in typhoid fever by experts attached to the U. S. Department of Agriculture it was found that about 80 per cent. of the protein in milk appears to be assimilated. It was also found that nitrogenous elements were more easily assimilated and in larger quantities when water was given freely. This was especially true when the temperature was high.

It is the ordinary custom at the beginning of an infection to stimulate the action of the bowels for the purposes of elimination. When this is done the patient is ready to be placed on a gradually increasing diet, whether he craves food or not, in order that the body may be fortified to withstand any demands made on it. Of what shall this diet consist? What shall be the chief article of food? To the unprejudiced, careful investigator milk is found to possess the necessary constituents that make it an almost ideal food for the sick. It contains protein, fat and carbohydrates, together with a small amount of salts usually required by the system, or all the ingredients needed to sustain and to nourish the body.

As a rule, milk is easy to obtain and, being a liquid, is readily administered. This is of great importance in sickness among the poor or in families where skilled preparation of food can not be expected. As each liter or quart contains 35 grams of albumin, 35 grams of fat and 45 grams of sugar, or energy represented by 610 calories, it does not require an expert or a chemist to estimate the amount of nutritive products the patient is receiving each day. It is probable that no other food