BRITISH MEDICAL JOURNAL

LONDON SATURDAY APRIL 12 1947

A STUDY OF THE SURGICAL ANATOMY OF THE VAGINA, WITH SPECIAL REFERENCE TO VAGINAL OPERATIONS

BY

WILFRED SHAW, M.D.Cantab., F.R.C.S., F.R.C.O.G.

Surgeon in charge of the Obstetrical and Gynaecological Department, St. Bartholomew's Hospital, London ;
Gynaecologist, St. Andrew's Hospital, Dollis Hill

The Vulva and Anterior Vaginal Wall

The fold of skin containing the body of the clitoris is usually well defined. On each side is a groove, lateral to which lies the inner fold of the labium majus. The prepuce of the clitoris forms a hood over the glans, and on each side passes downwards into the labium minus. The labia minora are also attached to the under surface of the glans at a point in the midline which corresponds to the frenulum. These anatomical relations are not always carefully illustrated in gynaecological diagrams. On each side of the urethral meatus is a small depression which is perhaps best referred to as the *parameatal recess* (Fig. 1). The recess is well defined in virgins and is best displayed by pulling the labia minora outwards at the level of the meatus. The recess is never well marked in severe cases of prolapse, and it is usually not well defined in women of post-menopausal age. In front, the remains of the hymen terminate in the midline at a point about $1/6$ in. (0.4 cm.) below the external meatus, but the termination is variable, and in a multipara the hymen sometimes passes into the posterior lip of the external meatus.

If a nullipara is examined in the lithotomy position with a Sims speculum introduced to retract back the posterior vaginal wall, the anterior vaginal wall can be seen to be held up and supported by the underlying tissues. It is therefore wrong to maintain that the anterior vaginal wall is supported solely by the perineum and the levator ani muscles.

In front, below the hymen in the anterior vaginal wall, about $1/4$ in. (0.6 cm.) below the urethral meatus, is a transverse groove. This groove is best displayed if the cervix is pulled down with a vulsellum forceps, and it is often well defined in prolapse of the anterior vaginal wall. It is believed that the groove indicates the posterior margin of the urogenital diaphragm. It is suggested that this groove should be named, and a convenient terminology might perhaps be the *submeatal sulcus*.

About $1\frac{1}{2}$ in. (3.8 cm.) from the meatus in the anterior vaginal wall is a second groove which is nearly always well defined. The groove represents the approximate position of the junction of the urethra with the bladder, and the distance between the two grooves is usually about $1\frac{1}{4}$ in. (3.2 cm.). The groove has a slight convexity in the direction of the meatus, and it is suggested that it should be called the *transverse sulcus of the anterior vaginal wall*. The distance between the submeatal sulcus and the transverse sulcus is about $1\frac{1}{2}$ in. It will be shown that the transverse sulcus is

formed as the result of the fusion of the underlying fascial tissues and represents the upper limit of a ligament which will be described later. Between the two sulci the rugae of the anterior vaginal wall are arranged more or less transversely, but the vaginal wall is attached loosely to the underlying tissues so that rugose pouches are formed. Unless the tissues have been damaged in childbirth, or unless the patient is of menopausal or post-menopausal age, a specialized fold of skin can be distinguished which passes from the lateral vaginal wall deep to the hymen to the vicinity of the submeatal sulcus. This fold is small and is best referred to as the *oblique vaginal fold*. Its significance is unknown, but below and lateral to it is a recess, lying lateral to the urethra, which is best referred to as the *para-urethral recess*.

If the anterior vaginal wall is followed down towards the cervix the limit of the bladder is indicated by a convex groove directed towards the cervix. In cystocele the bladder prolapses between the transverse vaginal sulcus and this *bladder sulcus* (Fig. 1), and it is obvious that very little supporting tissue intervenes between the bladder and the vaginal wall—far less than is found between the submeatal sulcus and the transverse vaginal sulcus in the vicinity of the urethra. Between the transverse vaginal sulcus and the bladder sulcus the rugae are arranged according to a definite pattern. Immediately below the transverse sulcus their direction is transverse, but subsequently they become arched, with the convexity of the arch directed towards the urethral meatus. Further upwards towards the cervix they become transverse, and, finally, slightly convex near the bladder sulcus. The arching of the rugae is caused by the adhesion of the vaginal wall in this neighbourhood to the underlying fascial tissues.

Definition of the Fascial Layers

The fascial layers which lie deep to the anterior vaginal wall can be demonstrated at operation and by cadaver dissection in cases of cystocele in the following way. The cervix is pulled down with vulsellum forceps and firm traction applied both downwards and posteriorly so that the anterior vaginal wall is stretched. An incision is made in the midline, starting at about the level of the transverse vaginal sulcus and extending below the bladder sulcus to reach the front of the cervix. On each side, from the lower end of this midline incision, an oblique or a transverse incision is made (Fig. 2). In the operation of anterior colporrhaphy the direction of the lateral incision depends

upon the severity of the cystocele and upon the amount of the anterior vaginal wall which is to be removed. Kocher's forceps are now applied to the lower angles of the vaginal flaps and downward traction exerted. With experience it is possible to reach the correct layer of cleavage with the first incision, but if there is any doubt about the correct layer, gentle traction, applied downwards and laterally to the Kocher's forceps, will gently tear through the tissues until the vesico-vaginal space is opened up. Firmly attached to the vagina is a well-defined layer of fascia called the vaginal fascia, while covering the bladder is a much thinner layer of tissue which forms the vesical fascia. The vesico-vaginal space lies between these two

the vaginal wall to move upon the underlying fascial layers. It is for this reason that the rugose vaginal pouches are found in this area.

Discussion

Operations for prolapse are performed so often that most of the above points are well known. In the average case of prolapse of the anterior vaginal wall the submeatal sulcus and the transverse vaginal sulcus are well defined. Though the two sulci are obvious, little attention has been paid to them previously, and it is one of the purposes of this paper to draw attention to their significance. Exceptions, however, are not uncommon. Sometimes other sulci can be seen between the submeatal sulcus and the transverse vaginal sulcus, and are caused by the arrangement of the pouches of the vaginal wall in this neighbour-

FIG. 1

FIG. 2

FIG. 3

FIG. 1.—The cervix has been drawn down. (1) Parameatal recess. (2) Hymen. (3) Submeatal sulcus. (4) Para-urethral recess. (5) Oblique vaginal fold. (6) Transverse sulcus of the anterior vaginal wall. (7) Arched rugae of the vaginal wall. (8) Bladder sulcus.

FIG. 2.—The incisions for anterior colporrhaphy. The oblique lines indicate the direction of the incisions for different degrees of prolapse of the anterior vaginal wall.

FIG. 3.—The appearance after the dissection of the vaginal flaps. (1) Post-urethral ligament. The well-defined cranial border is emphasized. In the illustration the vesico-vaginal space has been opened up, and the vaginal fascia (2) remains attached to the vaginal wall. (3) Bladder septum. (4) Vesico-cervical ligament.

fascial layers. The dissection is now carried in an upward direction as far as the level of the transverse vaginal sulcus. The vesico-vaginal space is always easy to define except in advanced cases of cystocele when the bladder wall has been prolapsed for a long time. In old-standing cases of this kind the vesical and vaginal fascias fuse, so that thick strands of tissue pass between the two fascial layers, and these must be cut through with a scalpel to allow the dissection to proceed in the correct layer of cleavage. Except in these old-standing cases, if once the vesico-vaginal space is opened up, the vesical and vaginal fascias can be separated from each other with the help of gauze wrapped round the finger. Moreover, the separation is bloodless, for there is no communication between the vascular systems of the two fascial layers. Anteriorly, at the level of the transverse vaginal sulcus, the vaginal fascia fuses with the vesical fascia so that there is no true vesico-vaginal space between the transverse vaginal sulcus and the submeatal sulcus. It is therefore necessary to use a scalpel to separate the vagina from the fused fascial layers. The connecting tissues are, however, loose, and they allow

hood. Sometimes, in severe degrees of prolapse, the transverse vaginal sulcus is held up almost in its normal position. It is of interest that such patients rarely complain of imperfect control of micturition.

The nomenclature of the vaginal and vesical fascias is not universally accepted even at the present day. Even in recent descriptions of vaginal operations the subvaginal fascial layers are referred to as the pubo-vesical fascia, pubo-vesical ligament, paravaginal fascia, and pubo-cervical ligament, and some authors even describe the fascial layers as forming part of the urogenital diaphragm. Usually the vaginal fascia is referred to under these terms, for the vesical fascia is never so well defined, presumably because the bladder alters so much in size.

Much has been written of the fascial tissues of the pelvis, particularly by the Viennese—Tandler (1926), Halban and Tandler (1907), and Peham and Amreich (1934)—but very important contributions have been made both in this country and in America. The term "pelvic fascia" should be restricted to the dense fascial tissues covering the levator ani and obturator internus muscles. All other fascial layers

should be considered as forming the endopelvic fascia. This distinction is of the greatest importance, because the endopelvic fascia always contains plain muscle cells and has an intimate relation to the adventitia of the pelvic veins, with the result that the small veins of the pelvis form plexuses in cavernous-like tissue. One of the functions of the endopelvic fascia is to fix and support the pelvic organs. At the same time the endopelvic fascia is arranged in such a way that it allows for distension of the pelvic organs. Lastly, it regulates the venous return at different degrees of distension.

Peham and Amreich showed that the basal portion, or ground bundle of the endopelvic fascia, lies on the upper surface of the levator ani muscles on each side of the midline and passes backwards to terminate in Mackenrodt's ligament. Passing upwards from the ground bundle

great difficulty if Fothergill's technique is followed. It is for this reason that I always start vaginal operations on the anterior vaginal wall not immediately below the urethra but from a point near the cervix.

The Post-urethral Ligament

The vaginal and vesical fascias fuse in the vicinity of the transverse vaginal sulcus, and pass downwards to become attached to the margin of the urogenital diaphragm at the submeatal sulcus. In addition, the fused fascial layers form a strong supporting layer of white tissue, and its function is clearly to support the urethra. The fused fascial layers should therefore be regarded as forming a ligament, and I suggest that the name *post-urethral ligament* (Fig. 3)

FIG. 4

FIG. 5

FIG. 6

FIG. 4.—The vesico-cervical ligament has been divided, the bladder retracted upwards, and the vesico-cervical space exposed. (1) Post-urethral ligament. (2) Bladder. (3) Peritoneum of the utero-vesical pouch. (4) Vaginal fascia. (5) Front of the cervix.

FIG. 5.—The method of introducing the sutures after excising all redundant vaginal flaps. In front the stitch is intended to suture the vaginal wall to the post-urethral ligament, and at the same time to suture the post-urethral ligament to the front of the uterus. The lower sutures pass through the vaginal wall and the vaginal fascia, and then through the front of the cervix.

FIG. 6.—Technique for the operation of vaginal hysterectomy for prolapse before suturing the pedicles together. (1) Post-urethral ligament. (2) Bladder. (3) Peritoneum (diagrammatic). (4) The pedicle containing the round ligament, the ovarian ligament, and the Fallopian tube. (5) The pedicle containing the uterine vessels. (6) The pedicle containing the utero-sacral ligament. (a) The suture is passed through the vaginal wall, then through the peritoneum covering the bladder, the procedure being repeated on the opposite side. (b) The suture is passed through the vaginal wall, the vaginal fascia, the first pedicle, and then through the post-urethral ligament, the procedure being repeated on the opposite side. (c) The suture is passed through the vaginal wall and the utero-sacral pedicle, and repeated on the opposite side.

are septa which fix the bladder, vagina, uterus, and rectum, and it is in these septa that the blood vessels pass to reach the pelvic organs. If dissections are made between the fascial layers an almost bloodless operation can be obtained, which has been emphasized by Spalding (1926) particularly, for the vascular systems of the different fascial layers and septa do not communicate except at well-defined points.

The fascial layers are difficult to distinguish by histological examination, as Goff (1931) has emphasized, but they can be defined at operation. For example, the vaginal fascia is utilized in many operations for cystocele, as in Halban's operation, and many American surgeons employ a rather similar technique. Fothergill (1917) as much as anyone realized the importance of the endopelvic fascia, and in the operation known by his name the vaginal fascia and the vaginal wall are sutured to the front of the cervix. Nevertheless, the vesico-vaginal space is exposed only with

should be applied to this band of tissue. The upper cranial margin of the post-urethral ligament is usually well defined, and it is this margin which is responsible for the formation of the transverse vaginal sulcus. In the midline, the post-urethral ligament is adherent to the bladder for a short distance upwards towards the cervix, and it is for this reason that the rugae of the anterior vaginal wall are arched in this area, for here the anterior vaginal wall and its vaginal fascia are fused to the vesical fascia. On each side the ligament is attached to the pubic ramus as far down as the junction of the rami of the pubis and of the ischium. It is important to bear in mind that the sheet of tissue which forms the post-urethral ligament has an inclination which corresponds to that of the axis of the vagina. It must therefore lie almost perpendicular to the urogenital diaphragm. There is no reason to believe that it forms part of the urogenital diaphragm in any way at all. Clearly, it has a corresponding position, and perhaps

serves a somewhat similar function to Denonvillier's fascia (Tobin and Benjamin, 1945) or the recto-prostatic fascia. The terminology I have suggested is tentative, but it seems to me preferable to the other alternative—namely, pubo-urethral. It is one of the main purposes of this paper to draw attention to the post-urethral ligament. I have studied the literature carefully, and I am convinced that the importance of this ligament has not been emphasized. Some writers seem to confuse the ligament with the membranous sphincter. I suppose that most gynaecologists regard the ligament as being part of what they term the pubo-cervical fascia or pubo-vesical fascia. If careful dissection is made, the well-defined cranial limit of the ligament, combined with its dense consistency, impresses me with the importance of regarding the ligament as a separate entity. I differ from Amreich in the interpretation of the ligament, for he regards this as partially surrounding the urethra, whereas I interpret it as a transverse sheet of tissue lying below and behind the urethra. The attachment of the ligament to the pubic rami is of very great importance, and obviously the ligament must support the urethra. Furthermore, in cases of urethrocele the ligament is stretched and relaxed. The relation of the upper limit of the post-urethral ligament to the junction of the urethra and the neck of the bladder seems to be variable. Efforts have been made to define the upper limit with the help of a cystoscope during the operation of anterior colporrhaphy. It is well known that if a curved sound is passed into the female urethra a fold can be felt, as Jeff Miller (1932) has emphasized, at the point where the urethra joins with the bladder. The fold is produced by the inward pressure of the upper margin of the post-urethral ligament on the neck of the bladder.

The Vesico-cervical Ligament

This ligament is a continuation of the vesical fascia on to the anterior surface of the supravaginal portion of the cervix. It consists of a thin sheet of tissue which contains plain muscle cells and which has a linear attachment to the cervix. It is easy to define, and it is divided in both Fothergill's and Halban's operations. On each side of the vesico-cervical ligament lies the bladder septum, which is much thicker and more vascular, and which passes from the vesical fascia to the fascia covering the cervix. In the operation of anterior colporrhaphy a few fibres of the bladder septum must be divided before the bladder can be separated from the front of the uterus. Afterwards the separation is simple, and it can best be carried out with the help of a piece of gauze wrapped round the index finger.

The Vesico-cervical Space

This space lies above the vesico-cervical ligament and intervenes between the bladder and the cervix. It is bloodless and can always be accurately defined. It is bounded cranially by the vesico-uterine ligament, which is a reflection of the vesical fascia from the top of the bladder on to the front of the uterus in the neighbourhood of the junction of the body with the cervix. The ligament is never well defined, but it is seen best at abdominal hysterectomy, when it must be cut through before the bladder can be separated from the front of the uterus.

Technique of Anterior Colporrhaphy

The method which I employ at the present time is based upon the identification of the different ligaments and fascial layers. The view is taken that the direct support of the bladder, between the transverse vaginal sulcus and the bladder sulcus, consists only of the vesical and vaginal fascias together with the anterior vaginal wall. The indirect supports are not being considered here, for they must be dealt with by more elaborate procedures. If the fascial

layers have been stretched, and particularly if the patient is asthenic with loss of plain muscle tone of the fascial layers, a cystocele will develop. Fundamentally, the operation consists in mobilizing the bladder, retracting it upwards and anteriorly, and then deliberately suturing the cranial margin of the post-urethral ligament to the front of the uterus in the neighbourhood of the utero-vesical pouch of the peritoneum. In this way the space through which the bladder can herniate is obliterated.

A vertical incision is made in the anterior vaginal wall, with lateral incisions at the lower end, as already described. The vesico-vaginal space is opened up and the lateral flaps are separated from the vesical fascia with the help of gauze wrapped round the finger. Beyond the level of the transverse vaginal sulcus a scalpel must be used to cut through the fascial tissues to separate the vaginal flaps from the post-urethral ligament, for here there is no clearly defined space between the vaginal walls and the post-urethral ligament. If the dissection proceeds too far laterally at this level, cavernous sinuses are opened up, and this should be avoided.

The next step is to cut through the vesico-cervical ligament and a few fibres of the bladder septum, and then to strip and separate the bladder from the cervix in the vesico-cervical space until the bladder can be pushed back as far as the margin of the post-urethral ligament (Fig. 4). The redundant vaginal tissues of the flaps, including the vaginal fascia, are then excised. If the separation has been good only a small number of blood vessels require ligature—namely those belonging to the cut edges of the vaginal walls and perhaps a few small vessels in the bladder septa. If necessary, the vaginal fascia can be separated from the flaps and used to form a reduplicating layer, but this is regarded as unnecessary in the average case. If the cystocele is extensive the bladder may be invaginated either by means of a purse-string suture or by a series of reefing sutures.

The post-urethral ligament is sutured to the front of the uterus as follows (Fig. 5). A suture of No. 2 chromicized catgut is passed through the cut edge of the vagina about $1\frac{1}{2}$ in. (3.8 cm.) below the urethra, starting on the patient's left side. The suture is now passed through the post-urethral ligament and then through the front of the cervix near the utero-vesical pouch. It is then passed through the post-urethral ligament on the other side of the midline and, finally, through the vaginal wall of this side at a point $1\frac{1}{2}$ in. below the urinary meatus. The assistant now pushes back the bladder, and when the suture is tied the post-urethral ligament becomes sutured directly to the uterus. As a result, the space through which the bladder can prolapse is obliterated completely and a firm ligamentary support by means of the post-urethral ligament is given to the bladder. Various modifications are possible. Sometimes the post-urethral ligament can be sutured direct to the front of the uterus by a series of interrupted sutures arranged to form a horizontal layer. In severe cases of cystocele more than one of these key sutures can be introduced. I believe that the only technique comparable to the above is that described by Lockyer (1913).

The next part of the operation consists in suturing the cut edges of the vagina, including the vaginal fascia, to the front of the supravaginal portion of the cervix, just as in the original Fothergill technique. The cut anterior vaginal wall between the cranial margin of the post-urethral ligament and the meatus is now dealt with. The pouches are redundant and a fair amount of vaginal tissue can be excised. If there has been stress incontinence a shelf can be fashioned by a series of interrupted Lembert sutures introduced through the post-urethral ligament. The operation

is of fundamental importance in the treatment of stress incontinence associated with cystocele, and the end-results are excellent, for the urethra is stretched and elongated both upwards and backwards as the result of the operation.

Modification of Fothergill's Operation

A midline incision is made in the anterior vaginal wall and the lateral incisions are placed transversely. The vaginal flaps are dissected free as in an anterior colporrhaphy, and the bladder is mobilized in the same way. I suture the post-urethral ligament to the front of the upper part of the supravaginal portion of the cervix, as in the technique for anterior colporrhaphy. The lateral incisions are continued round the back of the cervix and the cervix is then amputated. If the prolapse of the uterus is of a severe degree not only the bladder septum but the basal portions of Mackenrodt's ligament are sutured to the front of the cervix. The object is to take up the slack in a lax ligament, and the procedure is usually successful. Moreover, the suture tends to make the uterus anteverted. Subsequently, the raw surface of the cervix is covered by the Bonney-Sturmdorf technique. Gough's (1931) method is a great help if there is extensive prolapse of the upper part of the posterior vaginal wall.

Vaginal Hysterectomy for Prolapse

This operation is perhaps the most suitable form of operative treatment for post-menopausal women with severe degrees of prolapse of the uterus. The operation is relatively simple provided that the cervix can be pulled down outside the vaginal orifice, and provided that the uterus is not much enlarged. The method is used if patients are in the child-bearing period of life and suffer from symptoms, such as menorrhagia, which demand surgical or radiological treatment, and have a moderately severe degree of prolapse of the uterus. The technique becomes difficult if the uterus does not prolapse to the extent that the cervix can be pulled through the vaginal orifice. My impression is that most patients with prolapse maintain that they feel very much better in themselves if the uterus is removed, which is a factor of very considerable importance.

Technique

A midline incision is made in the anterior vaginal wall, from which pass transverse incisions near the cervix. The technique of an anterior colporrhaphy is employed to mobilize the bladder after cutting through the vesico-cervical ligament. The vesico-cervical space is identified, the bladder retracted upwards, and the peritoneum of the utero-vesical pouch exposed. This procedure is very simple provided that the vesico-cervical space has been opened up cleanly. The peritoneum is now cut through and the body of the uterus pulled down through the opening in the utero-vesical pouch. The fundus of the uterus can usually be hooked down with a finger. In difficult cases vulsellum forceps or uterine-holding forceps are necessary. The uterus is now removed by the method advocated by Franz and by Mayo. Curved clamps with horizontal striations are applied on each side of the uterus to contain the ovarian ligament, the Fallopian tube, and the round ligament. The tissues are cut through on the uterine side of the clamps. A second pair of clamps is now applied to the uterine arteries at the base of the broad ligaments and the uterus further separated with a scalpel. At this stage of the operation the uterus is drawn downwards, which exposes any prolapse of the peritoneum of the pouch of Douglas. This is regarded as being an important step in the operation, and it is quite simple to separate cleanly any prolapsed peritoneum of Douglas's pouch and to divide it along its attachment to the sigmoid. The next step in the operation is to hold up the cervix with vulsellum forceps and to finish the circular incision through the vaginal wall at the back of the cervix. Clamps are placed on each side to include the utero-sacral ligaments. After this the uterus

is removed completely by cutting through the intervening tissues with a scalpel. In simple cases only six clamps are required. More are necessary if the uterus is enlarged or if there is difficulty in pulling down the uterus. In vaginal hysterectomy for prolapse I never now employ the method of dividing first the lateral supports to pull down the uterus. In my hands it is much more difficult, and I place great emphasis on mobilizing the bladder and then pulling down the fundus of the uterus to ensure that the ureters are well away from the operation area. Nor do I first open Douglas's pouch, because I maintain that it is of the greatest importance to remove as much peritoneum as possible from the region of Douglas's pouch, and this can best be done through traction on the uterus to expose the redundant peritoneum.

A shelf is now formed to support the bladder (Fig. 6). A suture is passed through the cut vaginal wall as in the anterior colporrhaphy operation, $1\frac{1}{2}$ in. (3.8 cm.) below the urinary meatus. It then passes through the post-urethral ligament, then through the peritoneum at its cut edge near its attachment to the bladder. The suture then passes through the other side of the post-urethral ligament and finally through the vaginal wall. The object of the stitch is to join the peritoneum to the post-urethral ligament and to obliterate the space through which the bladder prolapses. If the cystocele has been of a moderate or slight degree this stitch alone helps greatly to hold back the bladder, but if there has been a severe degree of cystocele the bladder must first be invaginated with a purse-string suture. The next stitch passes, as before, through the vaginal wall, then through the post-urethral ligament, and then through the tissues enclosed in the first clamp—namely, the ovarian ligament, Fallopian tube, and round ligament. The suture is then passed through the tissues contained in the corresponding clamp of the opposite side, then through the post-urethral ligament, and finally through the vaginal wall. Neither suture is tied at this stage of the operation. The next step is to ligature together the tissues of the two sides as in Mayo's operation. The untied sutures are now tied. The first suture draws the post-urethral ligament upwards under the trigone of the bladder to support the bladder as in the operation of anterior colporrhaphy. The second suture, after being tied, draws together the shelf formed by the round ligaments, the ovarian ligaments, and, to a minor extent, the Fallopian tubes, and the shelf is anchored to the post-urethral ligament. Lastly, the cut edges of the vaginal wall are sutured together with a series of interrupted stitches.

One of the most difficult technical problems in the operation of vaginal hysterectomy for prolapse is to prevent the subsequent development of a hernia of Douglas's pouch. If the prolapse is of a severe degree, I always begin the operation of colpoperineorrhaphy before closing completely the posterior part of the incision. If the patient is elderly and has agreed that the vagina can be made so small that further sexual intercourse will be impossible, the problem is simple, for the utero-sacral ligaments, the rectal septa, and even the two levator ani muscles can be sutured to the posterior part of the shelf. The vagina can then be narrowed and shortened and an excellent prognosis can be given. If, however, the patient wishes to continue her sexual life the problem is much more difficult. For its solution the vagina must not be shortened or narrowed to the extent of preventing sexual intercourse, yet care must be taken to avoid the recurrence of prolapse. It may be most convenient if the method I use for colpoperineorrhaphy is now described.

Colpoperineorrhaphy

Lane's tissue forceps are attached to the vaginal wall in the midline, well above the level of the levator ani muscles. Two further Lane's forceps are applied on each side to the termination of the labium minus into the remains of the fourchette. A midline incision is made through the vaginal wall to meet a second transverse incision made with a scalpel along the line of the remains of the fourchette. In

this way the two flaps are demarcated, and the vaginal tissue they contain is dissected clear of the underlying tissues, which consist mainly of scar tissue in prolapse cases. The technique is different from that of the operation of anterior colporrhaphy, for the dissection is made with a scalpel between the vaginal wall and the vaginal fascia. Great stress is placed upon dissection of the vaginal wall laterally on each side along the course of the remains of the hymen, otherwise the levator ani muscles will not be sufficiently exposed. The vaginal fascia is now cut through as in Amreich's technique (Peham and Amreich, 1934), high up above the level of the levator muscles, so that the recto-vaginal space is exposed. If the rectum is now retracted back with a finger the rectal septa, with their veins and arteries, can be exposed. The septa represent the downward continuation of the utero-sacral ligaments. They terminate in the ground bundle on the upper surface of the levator muscles. Their veins and arteries are easily torn, and they require careful ligation. The next step is to excise the redundant vaginal tissue contained in the flaps.

With cases of complete procidentia and after vaginal hysterectomy for prolapse the incision is continued upwards until it joins the incision at the top of the vagina. Redundant vaginal tissue is excised when necessary. Bleeding comes from the descending branches of the vaginal artery, which must be ligatured in the space between the vaginal fascia and the vaginal wall. In cases of prolapse of Douglas's pouch it will be necessary to excise the peritoneal sac if a vaginal hysterectomy has not been performed. A recurrence of a hernia of Douglas's pouch can be prevented by suturing the two utero-sacral ligaments and the upper parts of the rectal septa direct to the shelf of tissue which has been formed in the operation of vaginal hysterectomy. In severe cases the upper and anterior parts of the two levator muscles must be identified and then sutured to the shelf as in Everard Williams's technique, but this procedure almost always shortens and narrows the vagina. The vagina may therefore be shortened in two ways—either by excising a great deal of redundant vaginal tissue in its upper part or by suturing the levator ani muscles to the shelf formed from the two broad ligaments. Recurrence of a hernia of Douglas's pouch can be prevented with certainty if the vagina is shortened drastically. If, however, the patient is to resume sexual relations the vagina must be left long, and in these cases only the utero-sacral ligaments are sutured together.

The next step is to suture together the two levator ani muscles. Great stress is placed upon suturing them together at least 2 in. (5 cm.) above the level of the vaginal orifice, and for this to be done the muscles must be exposed as far forwards as this. Two fingers placed in the aperture thus formed will indicate how narrow and how long the vagina has been made. The first sutures through the two levator muscles should include the rectal septa, and this again is regarded as an important step in the operation. The two levator muscles are now sutured together with interrupted stitches, and the vagina fashioned into the shape of a hollow tube in the usual way.

Operations for Stress Incontinence

These cases can be grouped into those in which the condition is associated with cystocele and prolapse of the uterus, and those in which only the urethra prolapses in the lower half of the anterior vaginal wall. In the prolapse operations, whether anterior colporrhaphy, Fothergill's operation, or vaginal hysterectomy for prolapse, the post-urethral ligament is sutured in such a way that it is stretched in a sagittal direction. Not only that, it is pulled upwards as well. Experience shows that many patients

have so much control that they find it difficult to pass urine until they are up and about. If the urethrocele is well marked, a series of reinforcing or reefing sutures are introduced through the post-urethral ligament on each side of the urethra to form, when tied, a further support to the urethra. In my view, it is fundamentally wrong to mobilize the urethra from the pubic rami by cutting through the post-urethral ligament as recommended by some gynaecological surgeons. The end-results for stress incontinence in these cases are extremely satisfactory.

The difficult cases are when stress incontinence is complained of without prolapse of the bladder. In these cases an effort is always made to separate the bladder from the vaginal wall and to stitch the upper edge of the post-urethral ligament to the front of the cervix. If this can be done the end-results are good. Alternatively, the following technique is employed. A midline incision is made through the lower parts of the anterior vaginal wall and two vaginal flaps are dissected away superficial to the post-urethral ligament. The incision is continued upwards towards the cervix and the bladder separated from the anterior vaginal wall by working upwards towards the situation of the cervix. The post-urethral ligament is now separated from the vaginal wall laterally. The next step is to pass a series of mattress sutures. These start cranially, first through the vaginal wall on one side of the upper limit of the incision, then through the post-urethral ligament, and finally are brought down through the vaginal wall at a corresponding point at the other side of the incision. When this suture is tied the post-urethral ligament is drawn upwards and fixed to the anterior vaginal wall much higher up than normally. Two or three sutures of this kind should be inserted. Subsequently the post-urethral ligament is reinforced by a series of Lembert's sutures, which form an additional shelf below the urethra. The end-results of this operation are extremely good. The Stoeckel-Goebel, and the more modern Aldridge (1942), method should perhaps be used only when this relatively simple operation has failed.

Summary

A description has been given of the different folds and sulci in the anterior vaginal wall, and an explanation has been offered of their arrangement.

Attention has been directed to the condensed fascial layer which intervenes between the urethra and the anterior vaginal wall. The topography of this layer of tissue has been described, and it is suggested that the layer should be called the post-urethral ligament.

The methods of defining the different fascial layers and the intervening spaces that surround the vagina have been described.

A description has been given of the various methods of surgical technique in the treatment of prolapse which make use of the post-urethral ligament.

REFERENCES

- Aldridge, A. H. (1942). *Amer. J. Obstet. Gynec.*, **44**, 398.
 Fothergill, W. E. (1917). Eden and Lockyer's *New System of Gynaecology*, 2, 627, Macmillan, London.
 Goff, B. H. (1931). *Surg. Gynec. Obstet.*, **52**, 32.
 Gough, A. (1931). *J. Obstet. Gynaec. Brit. Emp.*, **38**, 844.
 Halban, J., and Tandler, J. (1907). *Anatomie und Aetiologie der Genitalprolapse beim Weibe*, Braumüller, Vienna and Leipzig.
 Lockyer, C. (1913). *Practitioner*, **91**, 755.
 Miller, C. J. (1932). *Clinical Gynaecology*, p. 444, St. Louis.
 Peham, H. von, and Amreich, J. (1934). *Operative Gynecology*, 1, Lippincott, Philadelphia.
 — (1934). *Ibid.*, **2**, 601.
 Spalding, A. B. (1926). *Amer. J. Obstet.*, **12**, 655.
 Tandler, J. (1926). *Veit Stoeckel Handbuch*, 1, Part II, p. 342.
 Tobin, C. E., and Benjamin, J. A. (1945). *Surg. Gynec. Obstet.*, **80**, 373.

Among legacies left to St. Thomas's Hospital by the late Baroness Riddell are £1,000 to endow a bed for members of the clergy or professional classes, £1,000 to found a medical scholarship for a son of the clergy or professional classes, and £1,000 to found the Lord Riddell Surgical Scholarship.