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Surgery for urogenital prolapse

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Resumen

El prolapso urogenital puede tener un impacto significativo en la calidad de la vida. A medida que la población continúa envejeciendo, el predominio del prolapso urogenital está aumentando, y el riesgo de requerir cirugía para el prolapso urogenital o para la incontinencia urogenital es, aproximadamente, 11%. La mayoría de mujeres que presentan prolapso sintomático sufre de defectos múltiples de la estructura pélvica y requiere de una reparación adecuada para aliviar losr síntomas. Una comprensión de las estructuras pélvicas normales de soporte proporciona la base para el acercamiento anatómico a la reparación. Existen muchas opciones apropiadas para la corrección quirúrgica del prolapso urogenital. Los procedimientos para restablecer el soporte apical incluyen las técnicas de culdoplastia, suspensión uterosacra, suspensión y colpopexia sacrospinosa. La reparación del compartimento anterior se puede alcanzar con la colporrafia y repración del defecto paravaginal. Los defectos posteriores se reparan con colporrafia, reparación del rectovaginal y perineorrafia sitio-específicos. Lo más a menudo posible, la corrección quirúrgica del prolapso urogenital se puede realizar por vía vaginal, evitando los riesgos asociados a laparotomía. La vía laparoscópica para la reparación apical y del defecto paravaginal pueden reducir los riesgos asociados a laparotomía, pero los datos a largo plazo no están todavía disponibles con estas técnicas. El refuerzo mediante uso de injertos para las reparaciones anteriores y posteriores puede ofrecer tasas mejoradas de éxito, particularmente en pacientes con prolapso recurrente, sin embargo, son necesarios estudios futuros y los riesgos asociados al uso de estos injertos deben ser considerados.

Palabras clave: Prolapso. Compartimento anterior. Cistocele. Defecto paravaginal. Compartimento posterior. Rectocele. Técnicas quirúrgicas.

Summary

Urogenital prolapse can have a significant impact on quality of life. As the population continues to age, the prevalence of urogenital prolapse is increasing, and the lifetime risk of requiring surgery for urogenital prolapse or incontinence is now approximately 11%. The majority of women presenting with symptomatic prolapse suffer from multiple defects of pelvic support and require comprehensive repair to relieve symptoms. An understanding of normal pelvic support structures provides the basis for the anatomic approach to repair. Many appropriate options exist for surgical correction of urogenital prolapse. Procedures to reestablish apical support include culdoplasty techniques, uterosacral ligament suspension, sacrospinous suspension and colpopexy. Repair of the anterior compartment can be achieved with colporrhaphy and paravaginal repair. Posterior compartment defects are repaired with colporrhaphy, site-specific rectovaginal repair and perineorrhaphy.

Most often, surgical correction of urogenital prolapse can be performed vaginally, which avoids the risks associated with laparotomy. Laparoscopic approaches for apical support and paravaginal repair may reduce the risks associated with laparotomy, but long-term follow-up data are not yet available with these techniques. The use of graft reinforcement for anterior and posterior repairs may offer improved success rates, particularly in patients with recurrent prolapse. However, further outcome studies are needed and the risks associated with the use of mesh must be considered.

Key words: Urogenital prolapse. Anterior compartment. Cystocele. Paravaginal deffect. Posterior compartment. Rectocele. Support procedures.

Pelvic floor anatomy and function

The pelvic floor is composed of the muscles and connective tissues that lie between the pelvic peritoneum and perineum. It is attached to the bony pelvis and forms the base of the pelvic cavity, providing the major support for the pelvic viscera. The two most important supportive components of the pelvic floor are the pelvic diaphragm and the endopelvic fascia.

The pelvic diaphragm consists primarily of the bilateral levator ani muscles and their superior and inferior fascia. Although each levator ani muscle is composed of three parts (the puborectalis, pubococcygeus and iliococcygeus muscles), they function together as a single unit in providing support. Attached in the midline posteriorly and to the pelvic sidewalls bilaterally, these muscles form a platform which spans the inferior aspect of the bony pelvis. Under normal conditions, this platform, also

called the levator plate, is oriented horizontally in the standing patient and provides the major muscular support for the pelvic organs. The levator ani muscles contain an abundance of Type I slow-twitch fibers which allow prolonged involuntary contraction and maintenance of resting tone. Anteriorly, the urethra, vagina and rectum pass through a gap in the pelvic diaphragm called the levator (or genital) hiatus. The levator hiatus is the region of the pelvic floor where pelvic support defects become evident as the pelvic organs prolapse through this gap in the levator musculature.

The endopelvic fascia is a complex layer of connective tissue that invests the pelvic viscera and functions to maintain the upper pelvic organs in proper position upon the levator plate and provide support to the lower pelvic organs as they pass through the levator hiatus. Upper level support consists of condensations of the endopelvic fascia which extend from the upper vagina, cervix and lower uterine segment laterally to the pelvic sidewall just above the superior fascia of the levator ani. This layer of support consists of the cardinal and uterosacral ligaments and the upper portion of the arcus tendineus fascia pelvis. Although individually named, these structures actually form a continuous layer of connective tissue that attaches the pelvic organs to the pelvic sidewall and superior aspect of the levator plate.

Lower level support can be further divided into central and lateral support layers. Central support is provided by the pubocervical fascia between the bladder and vagina and the rectovaginal fascia between the rectum and vagina. These fascial layers provide support for the lowermost portions of the pelvic organs to the level of the perineum. Lateral support is maintained by the fascial layers surrounding the lower and mid-vagina and the attachments of these layers to the pelvic side wall at the arcus tendineous fasciae pelvis. This fascial layer forms a connective tissue sling which surrounds the mid-vagina and suspends it from the pelvic side wall at a level just above the levator muscles and levator hiatus.

Pathophysiology of urogenital prolapse

Although the mechanisms by which the pelvic diaphragm and endopelvic fascia interact to provide support are not entirely known, it is generally agreed that both are necessary for normal pelvic support. These layers have different characteristics and properties and, therefore, sustain different types of damage and different manifestations of injury.

The pelvic diaphragm is a unique muscle layer with both fast and slow-twitch fibers. The presence of both types of muscle fibers allows involuntary maintenance of resting tone, but also the capability of voluntary contraction with rapid increases in tone. This muscle layer can be weakened by direct injury or by denervation injury and has the potential for rehabilitation through exercise and electrical stimulation. The endopelvic fascia is a connective tissue layer with little regenerative capacity. Damage to this layer can rarely be corrected without surgical repair.

Pelvic support defects can occur whenever there is weakening of the pelvic diaphragm or endopelvic fascia. Childbirth trauma is by far the most common cause of pelvic floor dysfunction. The process of vaginal delivery stretches and weakens the pelvic diaphragm and endopelvic fascia, resulting in direct injury to these structures, as well as denervation injury to the pelvic floor muscles. Under normal conditions, increases in intra-abdominal pressure are transmitted downward and posteriorly, compressing the upper vagina against the levator plate which has the capability of increasing tone in response to this pressure vector. With loss of levator strength and tone, the levator plate becomes more vertically orientation, resulting in a widened levator hiatus. Increases in intra-abdominal pressure become directed anteriorly toward the levator hiatus, resulting in further disruption of the fascial attachments, eventually leading to prolapse of the pelvic organs through the levator hiatus. Factors which exacerbate this process include increasing age, estrogen deficiency, genetic predisposition, and any process which creates chronically increased intra-abdominal pressure (obesity, heavy lifting, chronic cough, straining at stool).

Assessment of support defects

Several authors have proposed classification and grading schemes for describing pelvic support defects. Bonney's 1914 classification of defects as upper or lower is straightforward and remains conceptually useful[1]. Loss of upper (apical) support results in uterine prolapse, enterocele and, when the uterus is absent, prolapse of the vaginal apex (vaginal vault prolapse). Loss of lower support results in cystocele and/or rectocele, depending on whether or not the defect is anterior or posterior. Three basic compartments are thus defined: the upper compartment or vaginal apex, and two lower compartments, the anterior compartment (between the bladder and vagina) and the posterior compartment (between the rectum and vagina). DeLancey's classification divides fascia support into three levels. Level I support is defined by the uterosacral-cardinal ligament complexes and is responsible for supporting the vaginal apex. Level II support is defined as the midvaginal support derived from the attachments of the lateral edges of the vagina and endopelvic fascia to the arcus tendineus along the pelvic sidewall. Loss of support at this level leads to paravaginal defects, cystocele and rectocele. Level III support is defined by the fusion of the vagina to the perineal body and urogenital diaphragm. Loss of level III support leads to urethral hypermobility and deficient perineum[2].

A common and practical method of grading prolapse is to describe the defect in relation to the hymenal ring. Grade I indicates mild prolapse with the prolapsing organ not reaching the hymenal ring. Grade II prolapse indicates moderate prolapse with the prolapsing organ descending to the level of the hymenal ring and Grade III prolapse indicates severe relaxation with the prolapsing organ descending past the hymenal ring. Grade IV prolapse (procidentia) is used to describe the situation in which the majority of the presenting organ has descended past the hymenal ring.

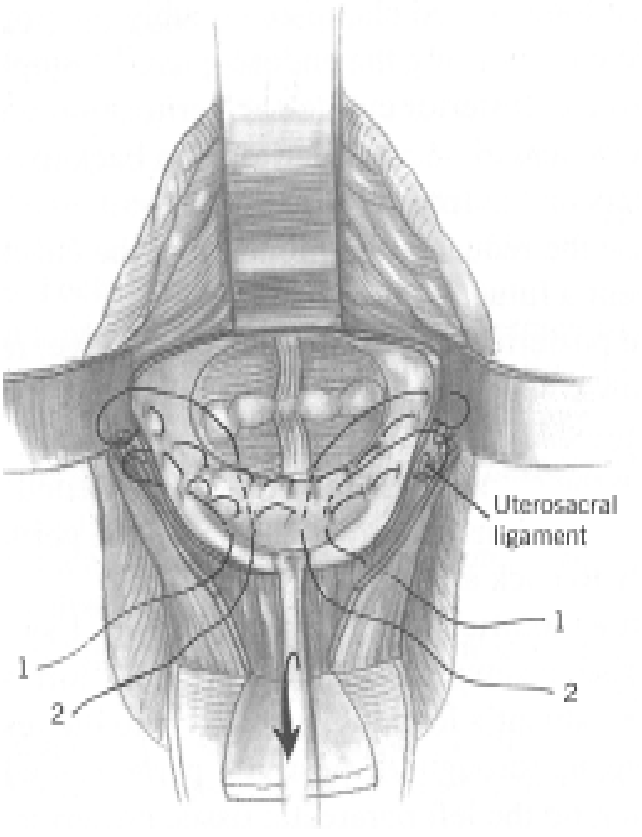
In 1996, the International Continence Society, the Society of Gynecologic Surgeons and the American Urogynecological Society adopted a standardized method for grading pelvic organ prolapse: the pelvic organ prolapse quantitation (POP-Q) system[3]. The system refers to points on the vagina with reference to the hymen, assigning stages (0-4) based on the most dependent part of the prolapse. The POP-Q system has gained acceptance as the appropriate method for describing prolapse in research and reports of surgical management of prolapse.

Management of pelvic organ prolapse

The goals of therapy for pelvic support defects are relief of symptoms and restoration of normal pelvic organ function. Asymptomatic patients may be managed with observation and modifications to minimize exacerbating factors. This may include initiation of hormone replacement in postmenopausal women and measures to reduce intra-abdominal pressure such as weight loss, cessation of smoking and use of laxatives and bulk forming agents in patients with constipation. Pelvic floor muscle exercises and pelvic floor muscle rehabilitation should be encouraged for all patients with pelvic organ prolapse.

For patients with continued symptoms despite behavior modification and pelvic muscle exercises, the use of a pessary may provide relief of symptoms. Because the use of pessaries will not correct the muscular and fascial defects responsible for prolapse, pessaries are most useful in patients who are not surgical candidates or who wish to postpone surgery. Frequent evaluations of these patients are necessary as prolapse may continue to worsen and adjustments in size and type of pessary may become necessary. It is also important to periodically evaluate the vaginal mucosa, especially in postmenopausal women who are at risk of ulceration secondary to pressure created by the pessary. Patients using pessaries are also at increased risk of urinary tract infection if the pessary results in urinary retention.

Figure 1. McCall Culdoplasty



The definitive treatment of pelvic support defects is surgical repair. The goals of any surgery for urogenital prolpase are to restore the normal anatomic relationships of the pelvic organs. This is best accomplished by reestablishing the fascial attachments at the vaginal apex and reconstructing the weakened endopelvic fascia layers of the anterior and posterior vaginal walls. In the majority of patients, these goals can be achieved with a vaginal approach which results in repositioning of the upper vagina upon the levator plate. Care must be taken to identify and repair all defects present and most patients will require a comprehensive procedure which addresses all three surgical compartments: the vaginal apex, the anterior compartment, and the posterior compartment.

Surgery for urogenital prolapse

Reconstructive pelvic surgery can be performed with vaginal, abdominal and laparoscopic approaches, however, because of high success rates and low morbidity, the vaginal approach is usually preferred. The vaginal approach avoids the potential complications associated with laparotomy, which is an important when considering the advanced age and medical comorbidities seen in the population at highest risk for urogenital prolpase. The abdominal approach for treating urogenital prolapse is usually reserved for those patients who have undergone previous procedures which have resulted in scarring and shortening of the vagina and wish to maintain vaginal function.

The majority of patients with urogenital prolapse require a combination of procedures which address all three surgical compartments. Hysterectomy itself does not resolve the problem of urogenital prolapse, but does typically result in better access to the support structures of the vaginal apex. For this reason, hysterectomy is often performed in conjunction with surgery for urogenital prolapse, particularly when a vaginal approach is performed.

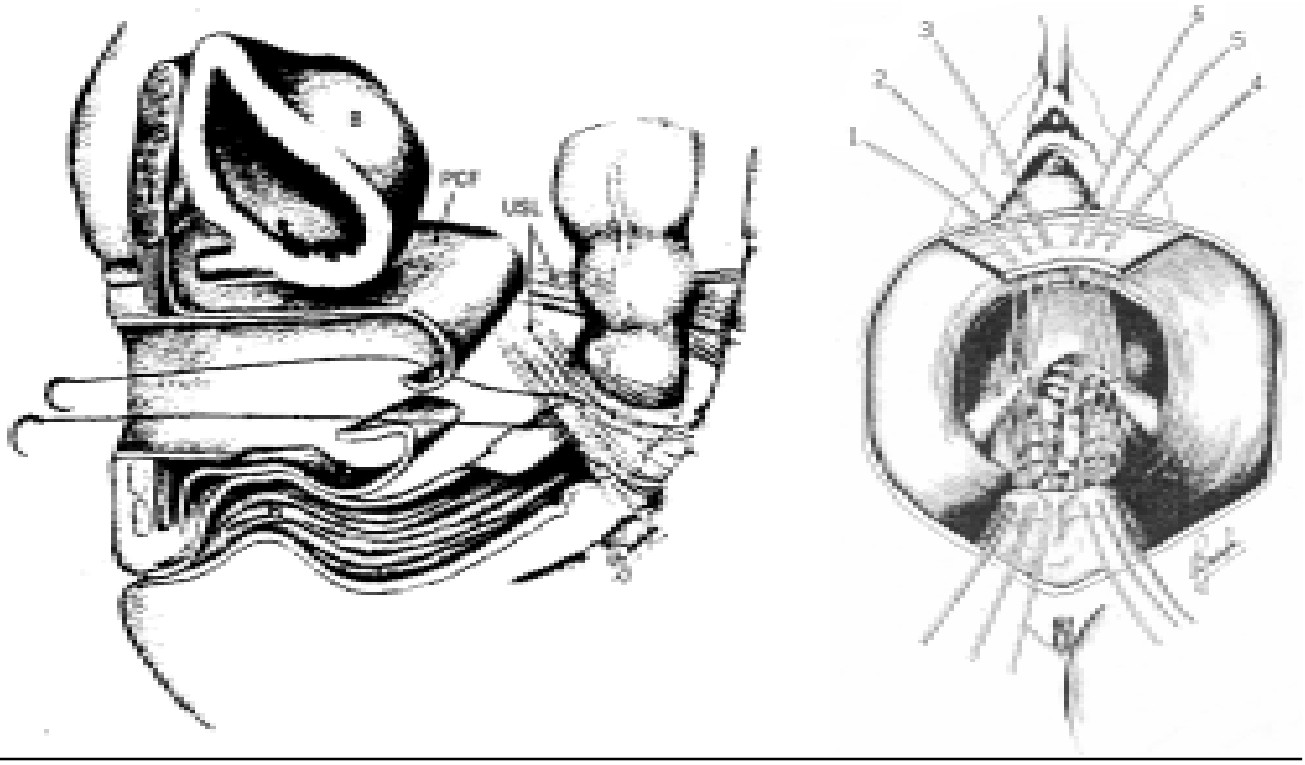
Most reconstructive pelvic surgeons agree that reestablishing the support for the vaginal apex is critical to successful prolapse surgery. Several options for reestablishing apical support have been described including culdoplasty, uterosacral suspension, sacrospinous suspension and sacrocolpopexy. Options for reestablishing fascial support of the anterior compartment include colporrhaphy and paravaginal repair. Concurrent management of stress incontinence must be considered when performing surgery to correct anterior compartment prolapse. Posterior compartment prolpase is usually managed with colporrhaphy and perineorrhaphy.

Apical support procedures

Culdoplasty

Culdoplasty was popularized by McCall in 1957[4] and has undergone numerous modifications since that time. The technique described by surgeons at the Mayo Clinic involves excision of the enterocele sac peritoneum and suture placement through full-thickness vagina and both uterosacral ligaments[5]. Several bites are also taken across the anterior rectum (Figure 1). When the sutures are tied, the vaginal apex is reattached to the uterosacral ligament complexes and the cul-de-sac is obliterated.

Figure 2. Uterosacral suspension



Long-term success rates with technique are reported at 82-89%[6-8]. Cystoscopy is performed after the suspension sutures are tied in order to assure ureteral patency.

Uterosacral Ligament Suspension

Similar to the culdoplasty technique, uterosacral ligament suspension utilizes the dense connective tissue of the proximal uterosacral ligament complex for reattachment of the vaginal apex. The technique involves placement of suture through anterior vaginal wall, then into the ipsalateral uterosacral ligament, then back through the posterior vaginal wall. Culdoplasty can also be combined with uterosacral suspension. Shull[9] describes placement of three sutures on each side of the vaginal apex and the use of permanent suture (Figure 2). Uterosacral suspension is usually performed vaginally, but can also be performed abdominally. The use of laparoscopy to identify the uterosacral ligaments has also been described[10]. The uterosacral ligaments are tagged with suture via the laparoscopic approach, then the enterocele is entered vaginally and the uterosacral sutures are utilized to complete the suspension of the vaginal apex.

Reported success rates for uterosacral suspension range from 85-95%[9,11-13]. Because the risk of ureteral compromise has been reported as high as 11%[12], intraoperative cystoscopy to assure ureteral patency is essential when performing uterosacral suspension.

Sacrospinous Ligament Suspension

Popularized by Nichols[14] for treatment of posthysterectomy vaginal vault prolapse, sacrospinous ligament suspension is an effective approach for supporting the vaginal apex. The technique involves incising the rectal pillar to expose the sacrospinous ligament. Non-absorbable sutures are placed through the ligament two finger-breadths medial to the ischial spine and attached to the vaginal mucosa. After the remaining vaginal incisions are closed, the sutures are tied, bringing the vaginal apex into position at the sacrospinous ligament. Unilateral fixation is most commonly utilized, however, bilateral fixation has been described as well. Overall success rates are reported between 73-97%[8,15-17]. Potential complications include pudendal or sciatic nerve injury, rectal injury, and hemorrhage from pudendal vessels. Because the vaginal apex is pulled into a more posterior position, there is also risk of subsequent anterior vaginal wall prolapse[8,16-18].

Sacrocolpopexy

Although morbidity is greater with abdominal surgery when compared to vaginal approaches, an abdominal approach to vaginal apex repair may be indicated in some patients. Significant vaginal scarring and shortening may preclude successful apical suspension to uterosacral or sacrospinous ligaments. Patients who have failed previous vaginal surgery for urogenital prolapse are also candidates for the abdominal approach. In 1962, Lane[19] described the technique of suturing graft material between the vaginal apex and the sacrum. Several variations have been described since, including the use of different graft materials[20-24]. Most techniques describe the use of synthetic mesh with success rates of 85-100%, but the risk of mesh erosion has been reported as high as 12%[25,26]. The use of autologous grafts minimizes the risk of mesh erosion, but increases morbidity

related to graft harvest. Cadaveric grafts appear to have significantly lower success rates related to degeneration of the graft material[27]. Potential complications of sacrocolpopexy include risks related to laparotomy such as wound infection, ileus, adhesions and incisional pain. Other complications include the potential for massive hemorrhage from presacral veins and the risk of mesh erosion which may be delayed several years. The laparoscopic approach to sacrocolpopexy has been described and offers the advantage of reduced morbidity compared to laparotomy, however, long-term data on success rates are not yet available for the laparoscopic approach[28].

Anterior compartment support procedures

Anterior Colporrhaphy

The use of anterior colporrhaphy to repair anterior vaginal wall defects is based on the theory that generalized attenuation of the endopelvic fascial layer between the bladder and vagina (the pubocervical fascia) is responsible for central anterior defects (cystocele). Plication of the pubocervical fascial layer with excision and excess vaginal epithelium and closure results in correction of the defect. Success rates over 90% have been reported[29]. The use of absorbable and synthetic mesh has been described with improved success rates[30-32], but with synthetic mesh, a 30% vaginal erosion rate was noted[30]. Further studies are needed to better define the role of mesh reinforcement for repair of anterior defects.

Long-term success with anterior colporrhaphy for correction of urinary stress incontinence is poor and colporrhaphy alone should not be considered adequate for treatment of stress incontinence. Pubovaginal sling or mid-urethral sling should be considered in these patients and can be performed concurrently with colporrhaphy. In patients with cystocele and stress incontinence, the performance of concurrent pubovaginal sling appears to reduce the risk of recurrent cystocele[33].

Paravaginal Repair

Defects in anterior vaginal wall support may also result from lateral detachment of the pubocervical fascia from the arcus tendineus of the pelvic side wall. In this case, central repair alone will not be sufficient to correct the anterior compartment. The paravaginal defect is repaired by reattaching the lateral edge of the pubocervical fascia to the arcus tendineus, usually with permanent suture[34,35]. The abdominal approach for paravaginal repair has been the most extensively studied and reported, but vaginal and laparoscopic approaches have also been described[36,37]. As with anterior colporrhaphy, paravaginal repair has high cure rates for repair of cystocele, but is not considered adequate for treatment of stress incontinence.

Posterior compartment support procedures

Posterior Colporrhaphy

Defects in the posterior vaginal compartment manifest as rectocele and loss of perineal support. Care must be taken to identify enteroceles in these patients as well. Careful review of bowel function is essential when considering repair of posterior compartment defects. Chronic constipation, as a cause of the defect or as a result of the defect, is often present and requires treatment to optimize long-term success of posterior defect repairs.

Two theories of posterior compartment repair have emerged in recent years. The traditional approach to repair is based on the assumption that the rectovaginal connective tissue is intimately attached to the posterior vaginal epithelium. In this case, excision of the central defect with reapproximation of the lateral connective tissues and vaginal skin will correct the defect[38]. Although plication of the levator muscles has been suggested in many descriptions of this technique, bringing these muscles together between the rectum and vagina can result in an abnormal shelf of tissue. Because this type of plication has a significant risk of causing dyspareunia, it should be avoided in patients who plan to be sexually active.

The site-specific approach to repair of the posterior compartment is based on the theory that specific breaks in the rectovaginal connective tissue layer are the cause of the posterior compartment defects. These defects may occur proximally, at the vaginal apex (high rectocele), at mid-vagina (mid-rectocele), or distally as a detachment of the rectovaginal fascia from the perineal body (low rectocele)[39]. Repair of these specific defects will restore the integrity of the rectovaginal fascial layer. The use of both absorbable and permanent suture has been described in repairing this layer[40-42].

In patients with a large, ballooning rectum, plication of the muscularis of the rectum to reduce rectal caliber prior to repair of the rectovaginal fascia may be helpful. In patients with poorly identified rectovaginal connective tissue, the use of graft material has been advocated to achieve satisfactory repair of the posterior compartment. With this approach, the vaginal epithelium is dissected laterally to the pelvic sidewall to allow placement of graft material. The use of allografts, xenografts and synthetics has been described[43,44], however, long-term data concerning success rates and potential mesh complications is required to evaluate these techniques.

Perineorrhaphy

Perineorrhaphy can be considered a distinct component to posterior compartment repair specifically designed to reconstruct the perineal body and lower third of the vaginal canal. The perineum is restored by bringing the bulbocavernosus and transverse perinei muscles with their attached connective tissue together in the midline. Restoration of the perineal body can add length to the vaginal canal, but care should be taken to avoid narrowing of the introitus in patients who plan to be sexually active.

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