Surgical management of vaginal prolapse: current surgical concepts

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Introduction: *Pelvic organ prolapse (POP) is a condition defined by a loss of structural integrity within the vagina and often results in symptoms which greatly interfere with quality of life in women. POP is expected to increase in prevalence over the coming years, and the number of patients undergoing surgery for POP is expected to increase by up to 13%. Two categories of surgery for POP include obliterative and reconstructive surgery. Patient health status, goals, and desired outcomes must be carefully considered when selecting a surgical approach, as obliterative surgeries result in an inability to have sexual intercourse postoperatively.*

Materials and methods: *This review article covers the role of traditional native tissue repairs, surgical options and techniques for vaginal and abdominal reconstruction for POP and the associated complications, and considerations for prevention and management of post-cystectomy vaginal prolapse.*

Results: *Studies comparing native and augmented anterior repairs demonstrate better anatomic outcomes in patients with mesh at the cost of more surgical complications, while different procedures for posterior repair result in similar improvements in symptoms and quality of life. In the management of apical prolapse, vaginal obliterative repair, namely colpocleisis, results in very low risk of recurrence at the cost of the impossibility of having sexual intercourse postoperatively. Reconstructive procedures preserve vaginal length along with the ability to have intercourse, but show higher failure rates over time. They can be divided into vaginal approaches which include sacrospinous ligament fixation (SSLF) and uterosacral vaginal vault suspension (USVS), and the abdominal approach which primarily includes abdominal sacrocolpopexy (ASC). There is evidence that ASC confers a distinct advantage over vaginal approaches with respect to symptom recurrence, sexual function, and quality of life. Patients who have had radical cystectomy for bladder cancer are at an increased risk of POP, and may benefit from preventative measures and prophylactic repair during surgery. Importantly, the success rates of POP surgery vary depending on whether anatomic or clinical definitions of success are used, with success rates improving when metrics such as the presence of symptoms are incorporated.*

Conclusions: *The surgical management of POP should greatly take into account the postoperative goals of every patient, as different approaches result in different sexual and quality of life outcomes. It is important to consider clinical metrics in the evaluation of success for POP surgery as opposed to using exclusively anatomic criteria. Preoperative counseling is critical in managing expectations and increasing patient satisfaction postoperatively.*

Key Words: pelvic organ proplapse, apical prolapse, colpocleisis, vaginal reconstruction, abdominal sacrocolpopexy

Introduction

Pelvic organ prolapse (POP) is defined as the descent of any or all of the following: anterior vaginal wall, posterior vaginal wall, and vaginal apex. Symptoms of POP can include a vaginal bulge, pelvic pressure, urinary and fecal symptoms, and sexual dysfunction.[1] Risk factors associated with POP include parity (particularly an instrumented vaginal delivery), aging, obesity, connective tissue disorder, and history of pelvic surgery.[2] In the Oxford Family Planning Association study, the cumulative risk of POP rises from 1% 3 years following hysterectomy to 5% at 15 years after hysterectomy.[3] Furthermore, the study showed that the risk of prolapse is 5.5 times higher in women whose reason for hysterectomy was due to prolapse. It is estimated that up to 13% of women in

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the United States will undergo surgery for POP and that the number of women who will suffer from POP will increase twofold by the year 2050.[4]

The two categories of surgical approach to POP are obliterative and reconstructive. The approach must be tailored to the patient as obliterative procedures, despite their high success rate and low perioperative morbidity, will eliminate the possibility of vaginal intercourse. In this paper, we will discuss the role of traditional native tissue repairs, surgical options for vaginal and abdominal reconstruction for apical prolapse, the latest considerations in abdominal sacrocolpopexy (ASC) and its complications, and considerations for prevention and management of post-cystectomy vaginal prolapse.

Anterior and posterior vaginal prolapse

Anterior colporrhaphy for anterior vaginal wall prolapse (also known as a cystocele) is performed by plicating the pubocervical fibromuscularis towards the midline.[5] It has been performed with both plication along or augmented repair with a biologic graft. In 2019, the FDA halted the use of surgical mesh for transvaginal repair of anterior prolapse.[6]

Many studies have been performed comparing native and augmented anterior repairs. In a prospective randomized trial of 160 women with anterior prolapse who underwent anterior colporrhaphy by Sand et al, they demonstrated recurrence at 1 year in 43% of patients who underwent anterior colporrhaphy without mesh compared to only 25% recurrence in patients with mesh ($p = 0.02$).[7] Another study by Weber et al compared anterior colporrhaphy, mesh augmented anterior colporrhaphy and ultra-lateral anterior colporrhaphy techniques, and found similar anatomic cure rates (between 30%-46%) and symptom resolution.[8] Their definition of cure was stage 0 or 1 (optimal and satisfactory respectively) as defined by the International Continence Society (ICS) POP Quantification (POP-Q) System.[9] In a 2016 Cochrane review by Maher et al, they found that augmented biological graft or absorbable mesh repair provided marginal benefit over a traditional colporrhaphy repair.[10] While anterior colporrhaphy with mesh demonstrated better anatomic success, it came at the cost of more surgical complications.[11] Some of the challenges with traditional suture-based repair identified by the Cochrane review include lack of surgical technique standardization, lack of robust clinical studies, and the question of how success/failure is defined.

Nearly three quarters of women with POP suffer from posterior prolapse.[12] Three methods of repairing posterior prolapse are posterior colporrhaphy, site-specific rectocele repair, or site-specific rectocele repair augmented with a porcine small intestinal submucosa graft. Paraiso et al conducted a randomized trial comparing these three methods, all of which resulted in significant improvements in symptoms, quality of life, and sexual functions. There was no improvement in anatomic outcomes when using the porcine-derived graft.[12]

Defining success and failure

Failure after a POP repair surgery can be defined by need for reoperation, recurrence of symptoms, or anatomic recurrence (e.g. beyond hymen, stage 2+, stage 3+ etc.). In the Pelvic Organ Support Study (POSST), 1,004 women between age 18 to 83 were examined and over 50% of them had stage 2 or 3 POP.[13] If we extrapolate this data, then over half the population fall into that category. Perhaps a strict anatomic definition of failure is too stringent.

The presence of a vaginal bulge is a valuable screening tool for POP.[14] The absence of a vaginal bulge postoperatively has a significant relationship with a patient's assessment of treatment success and Healthcare Related Quality of Life (HRQoL) while anatomic success does not directly correlate with QoL.[15] In a randomized control trial of 322 woman undergoing POP repair by Barber et al, the success rate was approximately 94% when success was defined as absence of prolapse beyond the hymen. Furthermore, subjective cure was associated with improvement in both the patient's assessment of success and overall improvement ($p < 0.001$ and $p < 0.001$ respectively).

Therefore, using anatomic criteria alone as the definition for success may be too strict and many times not clinically relevant. The NIH Pelvic Floor Disorders Network has put forth a recommendation regarding clinically relevant criteria for defining success after POP surgery: no prolapse beyond the hymen, no vaginal bulge symptom, and no retreatment of POP.[15]

Apical prolapse

Apical POP repairs can be divided vaginal and abdominal approaches. The advantage to the vaginal approach is that the peritoneal cavity does not need to be entered for patients with an extensive surgical history. When compared to obliterative repairs, reconstructive repairs correct prolapse while preserving vaginal length to allow for sexual function. Patients need to be aware of the benefits and drawbacks of each option to come to an informed decision on the approach that best meets their needs. Whatever approach is ultimately

chosen, the cornerstone of any good vaginal prolapse repair is solid support of the apex.[16]

Vaginal obliterative repair

Colpocleisis is the standard for vaginal obliterative repair. A total colpocleisis removes all of the vaginal epithelium, while a Le Fort colpocleisis leaves a portion of the epithelium to allow for a drainage tract for women who still have a uterus. It is a highly effective procedure with very low risk of POP recurrence on the order of < 5%.[17] It also has the advantage of shorter operating time, less blood loss and decreased perioperative morbidity. Since it eliminates the possibility of vaginal intercourse, colpocleisis is reserved for women who no longer desire vaginal intercourse. Preoperative counseling before a colpocleisis must be thorough and ensure that woman understand the obliterative nature of the procedure.

Vaginal reconstruction

Two of the best-studied vaginal reconstructive repairs are sacrospinous ligament fixation (SSLF) and uterosacral vaginal vault suspension (USVS). They can be performed concomitantly with a hysterectomy or with a uterine sparing technique. SSLF is an extraperitoneal procedure that supports the vaginal apex by suspending to the sacrospinous ligament with either absorbable or permanent sutures. In a systematic review, anatomic cure rates range from 69%-100%.[18] Common complications reported following SSLF include dyspareunia, recurrence in the anterior compartment, and gluteal pain. The USVS procedure can be performed both vaginally and laparoscopically. Unlike SSLF, this procedure is intraperitoneal. The vaginal apex is sutured to the uterosacral ligament bilaterally. In one cohort study, USVVS was shown to reduce recurrence rate to 13.7%.[19]

Abdominal reconstruction

Abdominal sacrocolpopexy (ASC) is the mainstay of the abdominal approach to POP repair and has been well studied since its first introduction by Lane et al in 1962. ASC can be done by an open, laparoscopic, or robotic assisted method.[20] ASC is considered the gold standard for women desiring a restorative repair of an apical POP.[21] The procedure entails the placement of synthetic mesh on the anterior and posterior aspects of the vagina. The mesh is then suspended to the anterior longitudinal ligament as it passes over the sacral promontory.[22] There is growing evidence that sufficient support for the vaginal apex is imperative in sustaining the structural integrity of the anterior and posterior compartments, and without adequate apical support, vaginal repairs run an increased risk of failure.[23,24]

When compared to vaginal reconstructive surgery, ASC has unique advantages. A comprehensive review by Nygaard et al found that 78%-100% of patients had no apical prolapse postoperatively, and 58%-100% had no prolapse at all.[25] A systematic review conducted by Maher et al found that ASC is associated with a significantly lower risk of awareness of prolapse, recurrent prolapse on examination, and repeat surgery for prolapse.[24] The use of synthetic mesh was associated with superior anatomic outcomes when compared to cadaveric fascia.

ASC may also confer some advantage over the vaginal approach with respect to postoperative sexual function. ASC has been shown to conserve more vaginal length in comparison to vaginal approaches.[26,27] A study by Siddiqui et al, which evaluated postoperative sexual function following ASC, reported a "relatively high" sexual function score of 40 based on the Pelvic Organ Prolapse/Urinary Incontinence Sexual Function Questionnaire short form.[28] Several studies have shown that postoperative dyspareunia was significantly less with ASC compared to a vaginal POP repair.[24,26] Based on these findings, sexually active patients or patients with shorter vaginal length may benefit from ASC over a vaginal POP repair.

With respect to different minimally invasive approaches to abdominal reconstruction, two randomized trials demonstrated that both laparoscopic and robotic techniques result in a similar duration of operation. However, laparoscopy resulted in less postoperative pain compared to robotic assisted surgery.[36,37] The laparoscopic approach has also been shown to have reduced blood loss when compared to the open approach.[24] The robotic approach with ASC is also associated with a faster learning curve, with Geller et al reporting that after 20 cases, the overall time needed to perform the cases decreases dramatically.[38]

Although intraoperative complications are rare, ASC comes with risks which must be carefully weighed when considering the procedure. Nygaard et al discusses the median rates of such complications as: cystotomy (3.1%), enterotomy or proctotomy (1.6%), and ureteral injury (1.0%). Median rates for postoperative events included urinary tract infection (10.9%), wound problems (4.6%), and hemorrhage or transfusion (4.4%).[25] Mesh erosion was 3.4%, and varied depending on the materials used as follows: Teflon (5.5%), Marlex (5%), Mersiline (3%), Gortex (3%), polypropylene (0.5%). Moreover, mesh erosion was a factor which increased over time, suggesting a need for long term follow up of such patients. Vaginal suture erosion also presented as a rare complication which was managed by excision in the office.

Selection of suture type and placement has also been shown to contribute to complications of ASC and presents a valuable lesson in the application of surgical technique. Recent observations suggest that postoperative discitis has increased as a more ASC procedures are performed using a minimally invasive technique.[39] Durdag et al described L5-S1 discitis 3 months following ASC, with likely contribution from penetration of the L5-S1 disk with sutures. The authors of this study recommended careful placement of suture only to the depth of the anterior longitudinal ligament using monofilament sutures.[40]

Similar to other POP repairs, ASC has been found to have degradation of success rates over time. Up to 95% of women enrolled in the CARE trial were eligible for the extended CARE (ECARE) trial, of which 84% and 59% completed 5 and 7 year follow up, respectively. By year 7, the probabilities of failure (including POP, stress urinary incontinence (SUI), urinary incontinence (UI) between urethropexy and no urethropexy groups were 0.27 and 0.22 for anatomic POP, and 0.29 and 0.24 for symptomatic POP. By this time, probability of mesh erosion is up to 10.5%. Interestingly, the same study found that 95% of patients did not seek retreatment for POP. This could reflect that patients found the treatment adequate, or that other health and social concerns took precedence over seeking retreatment.[28]

Prevention and management of post-cystectomy prolapse

Radical cystectomy is the standard of care for recurrent high grade or muscle invasive bladder cancer, and includes removal of the bladder, uterus, ovaries, and anterior vagina. This results in the loss of three levels of vaginal support: the cardinal-uterosacral ligaments hysterectomy), paravaginal attachments (anterior vaginectomy and cystectomy, periurethral fascia and ligamentous support to the pubic symphysis (anterior vaginectomy and urethrectomy).[41] There is a surprising deficiency of information for functional and sexual outcomes for women with muscle invasive bladder cancer who undergo radical cystectomy and urinary diversion. This is important, especially considering the attention to these outcomes in men undergoing urologic procedures.[42] It is critical that in initiating treatment for women with bladder cancer, postoperative sexual function and goals for quality of life must be a part of the conversation. Routine screening for POP can play an important role in the prevention and treatment of this condition and can be done simply through performing a history and genitourinary exam. The single validated question, "Do you ever feel a bulge or that something is falling out of your vagina?" has an 81% positive predictive value for clinically significant POP.[13]

In light of the substantial decreases in quality of life, which can occur following cystectomy, it is important to consider preventative measures when performing this procedure. This may include techniques such as vaginal and uterine sparing when feasible, the inclusion of omental or peritoneal flaps between a neobladder and vagina, or prophylactic apical repair.[43,44] Prophylactic repair would make use of measures discussed through this article, such as ASC or transvaginal sacrospinous ligament fixation. Additional measures such as round ligament preservation and abdominal uterosacral plication also represent potential preventative measures. As with prevention, the discussion of post-cystectomy repair of POP and other complications requires the consideration of numerous factors such as oncologic status, desired sexual outcome, vaginal length, and tissue quality. Conservative interventions such as pessaries are probably suboptimal, as the patient population often has poorer tissue quality, damaged musculature, and shorter vaginal length.[45]

Conclusions

When patients undergo a POP repair, all prolapsed compartments should be addressed simultaneously. The success rate of POP repairs varies considerably depending upon the definition of success used. When strict anatomic criteria are used, the success rates of POP repairs, especially anterior repairs, is lower compared to when a composite definition is utilized. When more clinically relevant criteria, such as the presence of symptoms, are incorporated into the definition of success, then success rates improve. As our understanding of POP has grown over time, it has become clear that proper apical support is required for successful repair. Surgical approach for a POP repair must be tailored to the patient's needs and functional status. Finally, thorough preoperative counseling is paramount in managing expectations and increasing patient satisfaction in the postoperative setting. □

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