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Functional Outcomes for Incontinence and Prolapse Surgery

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Abstract

The majority of women with pelvic organ prolapse and stress urinary incontinence report more than one symptom that affects urinary, bowel, or sexual function. Most research studies on outcomes following surgery for pelvic organ prolapse and stress incontinence focus on anatomic outcomes and relief of symptoms specific to prolapse and/or stress incontinence. Pelvic symptoms related to voiding function such as de novo urgency or incontinence, bowel function, and sexual function are clinically important outcomes but are infrequently reported. Deterioration of pelvic symptoms postoperatively is associated with decreased patient satisfaction, which underscores the importance of effectively assessing functional and anatomic treatment outcomes. Future studies of reconstructive pelvic surgery should routinely include multiple domain functional outcomes specifically addressing voiding, defecatory, and sexual function.

Keywords

Functional outcomes; Pelvic reconstructive surgery; Pelvic organ prolapse; Sexual dysfunction; De novo urinary symptoms; Bowel symptoms; Defecatory dysfunction; Urinary incontinence; Dyspareunia; Voiding

Introduction

Over the next 40 years, a substantial increase in the number of surgeries for pelvic organ prolapse (POP) and incontinence is anticipated due to the aging of the US population and rising incidence of pelvic floor disorders [1]. Women with POP complain of a vaginal bulge or pressure, but they often report other coexisting pelvic symptoms that affect urinary, bowel, and sexual function. Additionally, new pelvic symptoms such as de novo urinary and defecatory symptoms are reported by 22% to 27% of patients after surgery for prolapse and incontinence [2•]. Similarly, women who have undergone mid-urethral sling surgery for stress urinary incontinence (SUI) may complain of worsening overactive bladder symptoms and voiding dysfunction [3, 4]. Women who report new pelvic symptoms after prolapse

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surgery are less likely to report satisfaction with surgery, regardless of objective cure measured as Pelvic Organ Prolapse Quantification (POP-Q) stage 0 or 1 or no urinary leakage on cystometrogram [2•]. Therefore, the absence of a bulge or SUI during a postoperative pelvic examination does not accurately reflect postoperative pelvic floor function and patient satisfaction [5].

The goal of prolapse or anti-incontinence surgery is to correct associated pelvic symptoms and to improve quality of life [6]. However, relatively few studies report functional outcomes on all aspects of urinary, bowel, and sexual function following surgery for POP and/or SUI. The aim of this review is to report pelvic functional outcomes of urinary symptoms, bowel symptoms, and sexual function after pelvic reconstructive surgery for prolapse or incontinence.

Measurement of Functional Outcomes

Outcomes are measured by clinicians and researchers to determine the efficacy, safety, and side effects of treatment. The “success” of various surgical procedures treating pelvic floor disorders that negatively impact quality of life is difficult to define. Anatomic outcomes are frequently reported after surgery for POP, and the clinical significance of this outcome is limited. In addition, surgeon bias as a result of the lack of blinding at the time of postoperative prolapse assessment may lead to lower recurrence rates based solely on this outcome [7]. Therefore, anatomic outcomes alone do not provide adequate data on the efficacy and safety of pelvic reconstructive surgery.

Functional outcome measures are essential to capture improvement following pelvic reconstructive surgery. Because the pelvic organs are in close proximity to each other, functional outcomes that should be measured following surgery for POP and SUI must include bladder, bowel, and sexual function assessments. Several studies show that pelvic floor repairs impact lower urinary tract and defecatory symptoms [2•, 8]. Sexual function must also be considered for sexually active women. Pelvic surgery may negatively alter sexual function due to pain, narrowing of the introitus, denervation of the clitoris, or a change in body image. Age, partner availability, health, and psychosocial stressors are also important factors affecting the quality of sexual function. These functional outcomes and quality-of-life measures are best captured using questionnaires that have been validated in the population that is being assessed [9].

Functional Outcomes for Pelvic Organ Prolapse Surgery

Transvaginal Prolapse Repair

Surgery for POP is directed toward the vaginal compartment(s) that require correction of herniation of the pelvic organs. Vaginal reconstructive surgery is less invasive, and patients have a quicker recovery when compared with abdominal surgery for prolapse. Sexual function may be altered after vaginal procedures to correct prolapse. Traditionally, accommodation of three fingerbreadths in the introitus after vaginal surgery is considered to allow adequate caliber for sexual function; therefore, excessive trimming of vaginal epithelium should not be performed because this may drastically reduce vaginal caliber [10].

Because of an approximately 30% rate of prolapse recurrence after vaginal prolapse repair, mesh- or graft-augmented repairs have been utilized by many pelvic surgeons [11]. The complications associated with mesh and lack of data on improvement in symptomatic outcomes compared with traditional vaginal surgery, and paucity of long-term outcome data have led to scrutiny of use of permanent synthetic mesh in vaginal reconstructive surgery [12]. Furthermore, sexual function may deteriorate if vaginal stiffness, mesh erosions, or

chronic infection result after graft or mesh materials are placed in the vagina for prolapse repair.

Anterior Vaginal Compartment Procedures

Anterior colporrhaphy refers to the plication of the fibromuscular layer of the vaginal to reduce prolapse and support the bladder, and is the traditional vaginal procedure for cystocele repair. When cystocele is accompanied by voiding dysfunction, including overactive bladder symptoms, urinary hesitancy, or incomplete bladder emptying, repair of the prolapse often improves these symptoms [13, 14]. However, anterior colporrhaphy can also lead to de novo voiding dysfunction, including SUI, overactive bladder symptoms, and urinary retention. Short-term retention and voiding difficulties usually resolve within a few weeks postoperatively [13]. Extensive dissection of the anterior vaginal wall can cause denervation injury and result in more severe voiding dysfunction, including persistent retention or urinary urgency and frequency.

Straightening of a kinked urethra by repair of the cystocele can unmask occult SUI; this is generally believed to be the cause of de novo SUI following cystocele repair [15]. An increased rate of de novo SUI of 12% has been reported after trocar-guided mesh anterior repair, compared with 6% in the traditional anterior colporrhaphy in a recent randomized trial. This increased rate of SUI may be due to greater correction or even overcorrection of the urethrovesical angle in the mesh group [16]. In contrast, a study comparing anterior repair with the addition of a surgeon-styled polypropylene patch mesh resulted in a 7% de novo SUI rate, which was similar to the traditional anterior colporrhaphy group at 36-month follow-up [17]. In terms of composite voiding function, Nguyen and Burchette [18] reported significant improvement in urinary symptoms using psychometrically robust questionnaires for urinary incontinence at 12 months in women who underwent anterior colporrhaphy with and without transobturator, polypropylene mesh augmented repair. The percentage with cure or improvement of existing symptoms and generation of de novo symptoms was not categorized [18].

Biologic materials have also been used in anterior compartment prolapse, with contradictory reports in anatomic outcomes [19, 20]. In one small study using porcine dermis graft in the anterior compartment, there was no difference in postoperative rates of SUI and overactive bladder when compared with traditional anterior colporrhaphy [20].

Pain with intercourse is uncommon after anterior colporrhaphy. However, the use of synthetic, permanent materials in the anterior compartment incurs the risk of vaginal mesh erosions and dyspareunia. When anterior colporrhaphy was compared with transobturator, polypropylene mesh-augmented repair, de novo dyspareunia was present in 16% and 9% of patients, respectively, which was a nonsignificant difference. These patients underwent other concomitant vaginal procedures for prolapse that may have also contributed to dyspareunia [18].

The most recent Cochrane review attempting to analyze composite outcomes of anatomic and functional significance at the time of anterior repair reported that the concomitant use of mesh reduced the risk of recurrent anterior vaginal wall prolapse on examination; however, this reduction in risk did not translate into improved functional or quality-of-life outcomes [21••]. Therefore, the most appropriate surgical technique for anterior compartment prolapse remains controversial.

Posterior Vaginal Compartment Procedures

The goal of posterior compartment repair should be to improve bowel function and preserve sexual activity via correction of posterior vaginal wall prolapse. Obstructive defecation

symptoms of vaginal splinting, straining with bowel movements, and incomplete emptying often improve after posterior repair, but fecal incontinence and constipation may not be improved after posterior colporrhaphy [22-24]. Anal incontinence should be evaluated prior to surgery for posterior vaginal wall prolapse because it may coexist in women who undergo rectocele repair in up to 19% of patients. The coexistence of anal incontinence may be a result of an anal sphincter defect or impaired rectal sensation [10]. Posterior colporrhaphy alone may not improve anal incontinence, and formal overlapping anal sphincteroplasty may be warranted. De novo anal incontinence is thought to be quite rare following posterior colporrhaphy; however, a transanal repair using dilation of the rectum may create anal sphincter injury.

A traditional posterior colporrhaphy includes plication of the fibromuscularis with possible inclusion of the levator ani. If posterior colporrhaphy sutures are not placed in continuity of each other, ridging of the posterior vaginal wall and possible postoperative dyspareunia may result [25]. Dyspareunia rates after posterior colporrhaphy range from approximately 5% to 20% postoperatively [24]. Levator ani plication creates a shelf to further strengthen the posterior colporrhaphy, but this may lead to increased pain and dyspareunia by reducing vaginal caliber [26]. Perineorrhaphy accompanies a posterior colporrhaphy to complete the repair by narrowing the vaginal introitus via plication of the superficial perineal muscles to repair the perineal body.

Graft or mesh material has been utilized in the posterior compartment repairs but does not appear to provide any added anatomic benefit compared with traditional surgery [12, 23]. Long-term data with grafts or mesh are lacking, especially with functional outcomes. In two studies in which a total of 128 patients underwent posterior repair with or without graft use as part of prolapse and incontinence surgery, overall sexual function as measured by a validated questionnaire was improved [23, 27]. Reported dyspareunia rates of 6% to 20% did not significantly differ after posterior colporrhaphy, site-specific, or graft-augmented rectocele repair [23]. A multicenter, prospective study of prolapse repair using trocar-guided transvaginal mesh in the anterior and posterior compartment reported significant worsening of sexual function score at 1 year after surgery. The decline in sexual function was attributed to a decrease in behavioral-emotive and partner-related domains. An association between sexual function and anatomic success was not seen, and dyspareunia rates were low overall [28]. Site-specific rectocele repairs do not appear to significantly worsen dyspareunia rates [23, 24]. This technique may be reserved in sexually active women to improve vaginal bulge and rectal emptying symptoms and help decrease the risk of new-onset dyspareunia, as long-term efficacy outcomes remain unknown.

Apical Vaginal Compartment Procedures

Vaginal sacrospinous ligament fixation or suspension attaches the apex of the vagina to the sacrospinous ligament on one or both sides to correct or prevent vaginal apical prolapse.

Urinary incontinence may occur after vaginal vault suspension procedures secondary to the straightening of the vesicourethral junction [29, 30]. Most commonly, however, preoperative voiding dysfunction resolves in patients after apical suspension [30, 31]. Constipation and obstructive defecation are unchanged after posthysterectomy sacrospinous ligament suspension and may be secondary to little change in a concomitant posterior compartment defect [30]. Studies comparing sacrospinous ligament suspension to abdominal sacrocolpopexy report higher postoperative dyspareunia (up to 15%) in women who undergo vaginal colpopexy [29, 30].

Uterine preservation may be sought by some women with uterine prolapse. The belief that sexual function may be negatively affected after hysterectomy has not been supported in the

literature to date [32]. Prospective studies of sacrospinous hysteropexy reported postoperative improved urinary symptoms (excluding obstructive voiding symptoms) [31]. Defecatory symptoms, excluding pain and fecal incontinence, were improved at approximately 12 months of follow-up [33].

Enterocoele occurs in patients who have undergone previous hysterectomy and are experiencing small intestinal prolapse through the apex of the vagina. This defect rarely occurs in isolation and is more commonly part of a multiple compartment defect [10]. A common vaginal enterocoele repair or prevention is the McCall culdoplasty. McCall culdoplasty is the vaginal obliteration of the cul-de-sac utilizing the uterosacral ligaments, and this may lead to a shortened vagina or introital stenosis [34].

Alternative vaginal procedures for suspending the vaginal apex involve uterosacral ligament suspension. Webb et al. [35] reported 22% of sexually active women who underwent modified McCall culdoplasty that includes a uterosacral suspension had dyspareunia. Women who underwent modified McCall culdoplasty in one retrospective study had similar postoperative sexual function and mild de novo postoperative SUI when compared with sacrospinous ligament suspension [36]. Most studies report improved urinary symptoms after transvaginal uterosacral ligament suspension and minimal postoperative changes in bowel function using validated and nonvalidated outcome assessments [37]. Studies reporting on sexual function after uterosacral ligament suspension are lacking. Silva et al. [38] reported 4 of 34 sexually active women had de novo dyspareunia after uterosacral ligament suspension as a result of vaginal constriction or a “tight introitus.” Preoperative pain with intercourse is relieved in 68% to 100% of patients after uterosacral ligament suspension [38, 39]. Overall, de novo dyspareunia occurs in approximately 0% to 20% of patients postoperatively [38, 40].

Transabdominal Prolapse Repair

The recurrence rate of apical prolapse is lower after abdominal sacral colpopexy (ASC) compared with sacrospinous ligament suspension, but patients who undergo ASC incur longer operating times and recovery time than patients undergoing sacrospinous ligament suspension [21••]. ASC can improve irritative and obstructive voiding symptoms at 1 and 2 years after surgery [41, 42]. As with vaginal surgery, straightening a kinked urethra after prolapse correction can lead to postoperative de novo urinary incontinence. For this reason, a concomitant anti-incontinence procedure should be considered in patients with even mild symptoms of SUI. In patients without overt SUI symptoms prior to surgery, preoperative testing should be performed to evaluate “occult” SUI. Accurately reproducing the position of the vaginal apex preoperatively during urodynamic testing with prolapse reduction may be challenging, and no one method of prolapse reduction has been shown to be superior than others [43, 44]. Therefore, de novo SUI may occur after ASC in previously continent women.

Brubaker et al. [45] noted higher rates of SUI in patients who underwent ASC without Burch colposuspension compared with those who had a concomitant Burch procedure (44% vs 24%). Based on this study, Brubaker et al. [45] have recommended concomitant Burch colposuspension in all women undergoing ASC. However, an analysis in the Cochrane review of surgical management of prolapse reported that concomitant anti-incontinence surgery did not significantly reduce the rate of postoperative SUI (RR, 1.39 [95% CI, 0.53-3.70]) [21••].

Most studies report the lack of an association between the stage of POP and severity of bowel symptoms [46, 47]. Interestingly, apical prolapse repair results in improvement in obstructive defecation, overflow incontinence, and in rectal sensation. At 1 year after

abdominal sacrocolpopexy, bowel symptoms of anal incontinence and obstructed defecation were improved. These beneficial effects are likely due to vaginal lifting and repositioning of the bowel [48]. Enteroceles may also be repaired abdominally by a Moschcowitz or Halban procedure. When combined with ASC, abdominal enterocele repairs may increase the risk of postoperative defecatory dysfunction [43].

For women with shortened vaginas, an abdominal route to apical support should be considered to lessen the risk of further vaginal shortening and maintain sexual function. Lower rates of dyspareunia were noted with ASC compared with vaginal sacrospinous ligament suspensions [29, 30]. Sexual function improved at 1 year after sacrocolpopexy with or without Burch colposuspension, likely as a result of improved pelvic symptoms of bulging, incontinence, and pain [49].

Obliterative Procedures

Obliterative procedures for surgical treatment of POP are reserved for women who do not desire coital function and have medical comorbidities that preclude extensive vaginal reconstructive surgery. The rate of de novo SUI is as high as 27% in women who undergo obliterative vaginal surgery [50]. Therefore, an evaluation for stress incontinence should be performed preoperatively to determine the need for a concomitant anti-incontinence procedure. Many surgeons believe that older adult women with significant prolapse are thought to be at higher risk of voiding dysfunction, including irritative voiding symptoms and retention after anti-incontinence surgery, than younger women because of the effects of prolapse and aging on lower urinary tract function. Overactive bladder and urgency urinary incontinence were improved at 1 year after colpocleisis in a multicenter study [51], and a recent retrospective study reported an improvement in SUI and low voiding dysfunction rates after obliterative vaginal surgery with concomitant mid-urethral sling [52].

Postoperative improvement of all bowel symptoms was reported in a multicenter cohort study of women undergoing colpocleisis with or without levator plication [51]. At 1 year after surgery, improvement in bothersome obstructive bowel symptoms (digital assistance, straining, incomplete emptying) as well as incontinence of liquid and flatus was also noted. De novo defecatory symptoms are uncommon after colpocleisis [53].

While improved urinary and defecatory symptoms as well as health-related quality of life after obliterative surgery have been reported [54], loss of coital function may occur in up to 13% of women following colpocleisis [55].

Laparoscopic or Robotic-Assisted Prolapse Repair

Laparoscopic or robotic-assisted procedures have been widely adopted by clinicians for minimally invasive treatment of POP via the abdominal route. Functional outcome data on laparoscopic sacrocolpopexy are lacking. A large series reported that among women who underwent laparoscopic sacrocolpopexy, the rate of de novo SUI was 12%. Among women who underwent laparoscopic sacrocolpopexy and a concomitant transvaginal mid-urethral sling procedure, the rate of urgency urinary incontinence was 12%, while 1.2% developed urinary retention requiring urethrolisis [56]. A systematic review of laparoscopic sacrocolpopexy including approximately 1,000 cases reported less than 10% sexual and bowel dysfunction; however, larger studies with better functional outcome assessment using validated quality-of-life questionnaires are needed [57].

There is a lack of robust, long-term anatomic or functional results after robotic-assisted abdominal sacrocolpopexy (RSC). Women who underwent RSC had similar prolapse symptom and sexual functional scores at 1 year postoperatively compared with those who underwent ASC [58]. A recent trial comparing laparoscopic and robotic ASC reported

comparable anatomic outcomes after 12 months of follow-up. Additionally, there were no differences between groups in urinary, bowel, or sexual outcomes as measured by validated questionnaires [59]. A recent retrospective study showed parallel improvement in pelvic floor function in those who underwent RSC as compared with ASC at 44 months' follow-up; however, the study was limited by significant loss to follow-up [60].

Functional Outcomes for Stress Urinary Incontinence Surgery

Surgical correction of SUI is recommended when conservative treatment methods have failed. Prior studies have reported on objective outcomes and cure rates of surgical management of stress incontinence [61]. Functional outcomes of stress incontinence surgery include de novo lower urinary tract symptoms and sexual dysfunction. Anti-incontinence surgery can lead to urinary urgency by denervation injury, bladder outlet obstruction, and/or unmasking of detrusor overactivity at higher bladder capacities that are present after treatment of SUI [62].

Urine loss during intercourse is common, and this symptom is underreported by women unless specifically questioned by clinicians [63]. Sexual function usually improves if incontinence is improved. An improvement in sexual function is seen in women after surgical correction of SUI at 6 months after surgery due to less urine loss and embarrassment related to urine leakage during intercourse [64].

The optimal management of women who present with both stress and urge (mixed) urinary incontinence is unclear. Among women with mixed incontinence who undergo anti-incontinence surgery for SUI, detrusor overactivity symptoms may be alleviated, worsened, or remain the same after surgery [65, 66]. While clinicians often treat women with mixed urinary incontinence with conservative measures prior to recommending surgery, data for the optimal method of treating women with mixed urinary incontinence are lacking.

Abdominal Retropubic Procedures for Stress Urinary Incontinence

The most widely studied abdominal retropubic procedure for treatment of SUI is the Burch procedure. Similar continence rates and overactive bladder symptoms have been noted after open and laparoscopic Burch procedures [67]. Preliminary findings reported less de novo detrusor overactivity and postoperative voiding dysfunction with laparoscopic Burch colposuspension, possibly because of laparoscopic variation of the colposuspension technique with less dissection and looser knot tying [68].

Women with successful surgery for incontinence had greater improvement in sexual function scores. Improvement in mean sexual function scores was seen after patients were randomly assigned to Burch colposuspension or autologous rectal fascia sling procedures at 2 years postoperatively [69].

Vaginal Procedures for Stress Urinary Incontinence

Transvaginal needle suspension procedures for the treatment of SUI have been largely replaced by the placement of suburethral (proximal or mid-urethral) slings. Because of high cure rates and minimally invasive techniques, these procedures are widely utilized compared with abdominal retropubic procedures. A multicenter, randomized trial comparing Burch colposuspension and pubovaginal sling procedures found improved SUI treatment success with pubovaginal sling placement with similar rates of de novo UUI (3% in both groups) [70].

Continence is achieved by primarily two mechanisms with the sling procedure. The sling creates a stable backboard for the urethra to close upon, and upward displacement or

mechanical kinking of the sling occurs with increased abdominal pressure. Voiding dysfunction or retention after suburethral sling placement may be a result of overcorrection of the increased outflow resistance. Following a sling procedure, preoperative detrusor overactivity may be unmasked with increased bladder volumes, or de novo symptoms may be a result of infection, foreign body reaction, denervation, or anatomic urethral obstruction. A cohort study of 247 women after rectus fascia pubovaginal sling with a mean follow-up of 51 months reported continence rates of about 88%, with resolution of urgency urinary incontinence in 74% of the women with preoperative mixed urinary incontinence. De novo urgency developed in 7% of women [71].

Synthetic mid-urethral slings, specifically the tension-free vaginal tape (TVT) procedure, were developed in the late-1990s and have gained significant popularity since their inception. The procedures can be performed with less operating room time, incur similar rates of postoperative voiding dysfunction, and carry with them less major morbidity compared with other operations for SUI [72]. Urgency urinary incontinence after mid-urethral sling placement occurs in 6% of cases, and unspecified urgency occurs in approximately 22%. De novo urge symptoms may occur in approximately 7% of patients [61]. In a multicenter trial of the TVT, Nilsson and Kuuva [73] reported resolution of urge symptoms in 56% patients with mixed incontinence, while 6% of the women developed new-onset urge urinary incontinence [73]. Transobturator (TOT) mid-urethral slings were developed after the TVT. Level I evidence suggests that the subjective success rate and postoperative urge urinary incontinence rate following TOT procedures are comparable to those of TVT; however, the rate of voiding dysfunction may be lower with TOT [74].

Clinical Recommendations

Preoperative assessment of a woman with POP should include detailed history of symptoms of POP and/or incontinence, as well as of associated defecatory symptoms and sexual function. This assessment should be performed using standard history taking as well as the use of brief validated questionnaires. Both current sexual function as well as future sexual plans should be discussed at the initial visit. Preoperative testing in the form of urodynamic evaluation and anorectal testing are individualized based on symptom severity. Detailed preoperative counseling on functional outcomes should be provided to all patients planning to undergo surgery for POP and/or SUI. Such counseling should include the rate of improvement as well as the risk of development of de novo urinary, defecatory, and sexual symptoms. A patient-centered approach in which the patients' goals for the surgery are discussed, along with detailed preoperative assessment and counseling will maximize satisfaction following surgery.

Conclusions

Functional outcomes of urinary, bowel, and sexual symptoms have a significant impact on the quality of life of women. Over the past decade, there has been a gradual change in how outcomes following surgery for POP and SUI are measured. An appreciation of the importance of the impact of functional outcomes on overall quality of life has led to a gradual shift from measuring anatomic outcomes only to anatomic and patient-reported functional outcomes. Larger studies in which long-term functional outcomes following surgery for POP and/or SUI are assessed are required.

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