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# *Urinary Incontinence and Pelvic Organ Prolapse*

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**Abstract:** The multifactorial pathophysiology of pelvic floor disorder accounts for the coexistence of several pelvic floor disorders in many women. Up to 54% of women with pelvic organ prolapse (POP) report concurrent stress urinary incontinence (SUI). While POP is a risk factor for coexistent SUI, apical and anterior prolapse can also conceal SUI symptoms that are unmasked by POP repair, resulting in de novo SUI postoperatively. It is important for pelvic reconstructive surgeons to consider the relationship between POP and urinary incontinence in presurgical planning and to discuss with patients the risks and advantages of concurrent versus staged anti-incontinence procedures.
**Key words:** urinary incontinence, pelvic organ prolapse, urogynecology, gynecology

More than one third of US women are affected by at least one pelvic floor disorder (PFD) in the course of their lifetimes.[1–3] The multifactorial pathophysiology of PFDs results in symptoms that affect multiple organ systems, accounting for the coexistence of several PFDs in many women. Up to 74% of women with pelvic organ prolapse (POP) report coexistent symptoms of at least one other PFD, with 37% to 54% reporting concurrent stress urinary incontinence (SUI) and roughly 30% reporting both SUI and urgency urinary incontinence (UUI) or overactive bladder (OAB) symptoms.[1,3,4] In addition, 27% to 34% of women with POP who report no SUI symptoms develop demonstrable SUI following surgical correction of prolapse.[5,6] While POP is a risk factor for coexistent SUI, apical and anterior prolapse can also conceal SUI symptoms that are unmasked by POP repair, resulting in de novo SUI postoperatively.[5–9] Conversely, POP repair has been reported to decrease OAB and UUI symptoms,[10–12] leading to perceived improvement in urinary continence following surgical prolapse repair.[11] It is important for pelvic reconstructive surgeons to consider the relationship between POP and urinary incontinence (UI) in presurgical planning and to discuss with patients the risks and advantages of concurrent versus staged anti-incontinence procedures.

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## *POP and Symptomatic SUI*

PFDs are thought to develop in response to pelvic nerve, muscle, and connective

tissue trauma mediated by an individual's genetic constitution and age-associated neuromuscular decline.[13,14] The neuromuscular compromise required to reach the threshold for symptomatic UI appears to be lower than that for POP, as evidenced by the much higher prevalence of UI compared with POP.[1–3,15] It is not surprising that among the 16% of women whose neuromuscular and connective tissue injury is severe enough to result in symptomatic POP, 44% report concomitant symptoms of SUI, 37% report symptoms of UUI/OAB, and 29% report symptoms of both SUI and UUI/OAB.[1] A 2008 Kaiser Permanente Northern California cross-sectional study of over 2000 women above the age of 40 found that nearly half of women with symptomatic POP report concomitant UI.[3] The prevalence of symptomatic SUI varies with the anatomic location of prolapse, with the strongest correlation to prolapse of the anterior compartment. Samuelsson et al[16] reported the prevalence of UI was 58% among women with anterior vaginal wall prolapse, 55% in those with posterior prolapse, and 72% in women with apical prolapse. However, upon multivariate logistic regression analysis, anterior prolapse was the only compartment found to be significantly associated with UI, and women with anterior prolapse are 2.5 times more likely to have UI than women without anterior prolapse. While anterior colporrhaphy or the Kelly-Kennedy plication are considered substandard treatments for SUI,[17–19] anterior colporrhaphy for surgical treatment of anterior compartment prolapse has been reported to resolve 30% to 37% of SUI symptoms.[20,21] Surgical correction of apical prolapse has also been reported to resolve SUI symptoms in 26% to 30% of women with POP and SUI.[22,23] Of women with persistent SUI symptoms following isolated apical repair, roughly half (55%) choose to proceed with staged anti-incontinence surgery, most commonly midurethral sling (MUS), while 28% seek no further treatment for SUI.[22]

For this reason, most pelvic reconstructive surgeons address preoperative symptoms of SUI at the time of POP repair. In a randomized trial of 134 women with POP and SUI symptoms undergoing transvaginal POP repair with or without concurrent MUS, the women randomized to concurrent MUS were twice as likely to report resolution of bothersome UI symptoms compared with women with isolated POP repair (62% vs. 30%) and a 4-fold decrease in the risk of requiring additional SUI treatment.[24] The utility of concomitant MUS is supported by the 2018 Baessler et al[25] Cochrane review, which concludes that MUS improves postoperative rates of subjective SUI, reducing the risk of SUI to 8% to 19%, compared with a 39% risk following prolapse repair alone.

Nevertheless, about a third of women with POP and SUI will experience resolution of SUI symptoms following isolated POP repair.[22,23] A Norwegian randomized trial comparing SUI cure rates following MUS performed concurrently with POP repair versus staged MUS 3 months following POP repair found that almost half (44%) of women in the staged group opted not to undergo subsequent anti-incontinence surgery, with 66% citing resolution of SUI symptoms as the reason for declining staged MUS.[23] A staged approach to SUI treatment may be warranted if concomitant anti-incontinence procedures substantially increase the risk of short-term or long-term adverse events. According to the OPUS trial, which compared outcomes of women randomized to prolapse repair with or without concomitant retropubic MUS, those in the concomitant MUS group experienced higher rates of bladder perforation (7% vs. 0%), urinary tract infection (31% vs. 18%), major bleeding (3% vs. 0%), and incomplete bladder emptying (4% vs. 0%).[6] Arguably, bladder perforations resulting from sling placement can be managed intraoperatively without long-term

consequences[6] and postoperative urinary tract infections can be treated successfully with antibiotics. In contrast to OPUS, the Colpopexy and Urinary Reduction Efforts (CARE) Trial, found that the addition of Burch colposuspension at the time of abdominal sacrocolpopexy did not change the incidence of serious adverse events when compared with sacrocolpopexy alone (14.5% vs. 14.6%).[7] Ultimately, while most women with POP and SUI symptoms will benefit from concurrent surgical treatment of POP and SUI, this decision should be individualized, taking into account each patient's unique set of comorbidities and treatment goals.

## *POP Without Stress Incontinence Symptoms*

The association between POP, especially in the anterior and apical compartments, and voiding dysfunction has been well-described.[26–28] The prevalence of coexisting POP and voiding dysfunction varies in the literature, depending on the study criteria used to define voiding dysfunction. Over half (54%) of women with advanced stage III or IV POP reported subjective symptoms of voiding dysfunction, including straining to void or a sensation of incomplete bladder emptying.[29] Objective evaluation with multichannel urodynamic testing of this same cohort found that 11% of women were unable to void, 20% voided with Valsalva maneuver, and 58% had a postvoid residual > 100 mL (mean 175 mL).[29] In women with complete posthysterectomy vaginal vault prolapse and without urethral stricture or stenosis, mean peak flow rate was reduced to 11 mL/s (15 mL/s at the fifth percentile in the general female population at 200 mL voided volume), indicative of a functional obstruction.[30,31]

The bladder outlet obstruction or urethral kinking responsible for voiding dysfunction in the setting of anterior or apical prolapse can compensate for deficiencies in the urethral continence mechanism, masking symptoms of SUI.[32,33] Richardson and colleagues compared urodynamic parameters in stress-incontinent women without POP with those in stress-continent women who had POP beyond the hymen. The authors found that stress-incontinent women without POP demonstrated classic increases in maximum urethral closure pressure (MUCP) with positional change from sitting (MUCP 23 cm $H_2O$) to supine (MUCP 29 cm $H_2O$) due to position-induced changes in intraabdominal pressure. By contrast, in women with POP and no SUI symptoms, urethral closure pressures decreased significantly from sitting (MUCP 70 cm $H_2O$) to supine (MUCP 49 cm $H_2O$) due to position-induced POP reduction. After POP was reduced in-office with a pessary, the previously stress-continent women became both clinically and urodynamically inseparable from the stress-incontinent women without POP.[31] The normalization of pelvic organ support can lead to the appearance of new SUI symptoms, or de novo SUI, in 25% to 57% of women, depending on the criteria used to define SUI.[5–9] In the CARE Trial, the rate of de novo SUI after isolated prolapse repair with abdominal sacrocolpopexy was 25% if SUI was defined as bothersome symptoms, but 57% if SUI was defined as a positive answer to any question on the Pelvic Floor Distress Inventory stress incontinence subscale, a positive stress test at bladder volume of 300 mL, or any treatment for SUI following POP repair.[7] In the Outcomes Following Vaginal Prolapse Repair and Midurethral Sling (OPUS) Trial, the rate of de novo SUI after isolated vaginal apical prolapse repair was 44%, with SUI being similarly defined as bothersome incontinence symptoms, a positive cough stress test at bladder volume of 300 mL, or treatment for SUI following POP repair.[6]

Occult stress urinary incontinence is diagnosed when SUI is only evident with the reduction of co-existent POP.[34] Women with POP in the absence of SUI

symptoms should undergo preoperative evaluation to assess for occult stress incontinence masked by POP.[19] Preoperative examination can assist with risk stratification of de novo SUI postoperatively. Studies have correlated the incidence of de novo SUI following surgical POP repair to the degree of preoperative anterior vaginal wall prolapse, reporting that 66% of women with POP-Q point Ba beyond +3 will develop de novo SUI after surgical correction of POP.[35] In addition to pelvic examination, cystometry can further elucidate risk of de novo SUI; however, care must be taken to select and standardize the method of prolapse reduction because detection rate of occult SUI varies significantly by reduction method. In the CARE Trial, occult SUI with cough stress test at bladder volume of 300 mL was detected in 6% of women who had prolapse reduced during cystometry with pessary, in 16% of women with manual prolapse reduction, in 20% of those whose POP reduction was done with scopettes (proctoswabs), in 21% with ring forceps, and in 30% with speculum. The positive predictive value of cough stress test during POP reduction with scopette (proctoswab) for postoperative SUI was 79%, compared with all other reduction methods, whose positive predictive values ranged between 50% and 55%.[5] Compared with women without occult SUI, women with occult SUI have a higher risk of de novo SUI following POP repair regardless of whether a concomitant anti-incontinence procedure is performed (per the CARE trial, women without SUI: 39% without Burch, 20% with Burch vs. women with occult SUI: 60% without Burch, 37% with Burch).[5] This number was even higher in the OPUS trial where 72% of women had UI 3 months after surgery (adjusted odds ratio, 0.13; 95% confidence interval, 0.05-0.34) if they demonstrated occult SUI with cough stress test during POP reduction before surgery.

It is important to note that not all women with de novo SUI seek additional treatment. A 2014 meta-analysis of randomized controlled trials found that 2% and 7% of women undergoing concomitant and staged anti-incontinence surgery, respectively, underwent surgical treatment for de novo SUI following prolapse repair. The number needed to treat with a concomitant anti-incontinence procedure to prevent one woman from developing de novo subjective SUI is 6, whereas the number needed to treat to prevent one subsequent anti-incontinence surgery is 20.[36]

## *Preoperative Counseling and Shared Decision-making*

Anti-incontinence surgery is not risk-free, with roughly 1 in 20 women affected by an adverse perioperative event as a result of concomitant anti-incontinence surgery.[24] A meta-analysis of 33 randomized controlled trials comparing anti-incontinence procedures found that overall, complication rates associated with retropubic midurethral slings, pubovaginal slings, and Burch colposuspension were similar, except for intraoperative bladder perforations, which were more common with retropubic midurethral slings (2.5% to 11.7%). Other common complications include urinary tract infections (0.4% to 31.5%), voiding dysfunction (2.8% to 38.0%), and de novo OAB symptoms (3.1% to 29.0%).[37] A nationwide cohort of Danish women who underwent incontinence surgery between 1998 and 2007 found that the 5-year reoperation rate for an additional anti-continence surgery was highest among women who underwent transobturator midurethral sling (9%) and similar among women who underwent retropubic midurethral sling (6%), Burch colposuspension (6%), and pubovaginal fascial sling (6%).[38] The risk of subsequent surgical and nonsurgical treatment for adverse

events associated with anti-incontinence surgeries must be considered and weighed against the risks associated with reoperation for persistent SUI.

A majority of patients (73% to 84%) express postsurgical satisfaction following anti-incontinence surgery.[39,40] A greater reduction in SUI symptoms and symptom bother are strong predictors of postoperative patient satisfaction, whereas surgical complications, specifically need for urethrolysis and postoperative UUI/OAB are predictors of patient dissatisfaction.[41] When interviewed, patients most frequently cited symptom resolution to be the best aspect of surgery, whereas postoperative pain and catheter-associated complaints were most frequently cited as the worst aspects of surgery.[42] Logically, patients who report a higher level of bother from SUI symptoms preoperatively stand to gain more from anti-incontinence surgery than those with occult SUI. In the best-case scenario, occult SUI patients who undergo successful concurrent anti-incontinence surgery at the time of prolapse repair will have similar urinary symptoms to those they reported preoperatively. The need for prolonged catheterization, voiding dysfunction, or de novo urgency in these patients are not balanced by a resolution of SUI symptoms, and they may be more dissatisfied with these outcomes than patients with similar outcomes who had highly bothersome SUI preoperatively.

The complexity of data surrounding concomitant versus staged anti-incontinence procedures in women with POP without SUI symptoms underscores the importance of nuanced patient-centered preoperative counseling. In 2014, Jelovsek et al[43] used data from the OPUS Trial[6] to create a model for predicting de novo SUI in women undergoing POP surgery. The preoperative predictors identified by this model, including age, body mass index, vaginal parity, diabetes, occult SUI, and UUI were tested and validated in a separate dataset of participants from the CARE Trial.[7] This risk prediction tool can facilitate preoperative value-based discussions with individual patients, enabling the patient and surgeon to tailor intraoperative plans to the patient's unique treatment goals.

## Summary

The relationship between POP and SUI is both anatomically and functionally intertwined. Approximately 37% to 54% of women with POP report concurrent SUI symptoms,[1,3,4] and 26% to 37% of SUI resolves after POP repair.[20–23] In contrast, about 27% to 34% of stress-continent women with POP have occult SUI[5,6] and 25% to 57% will develop de novo SUI following surgical correction of POP.[5–9] Awareness of potential urethral obstruction in the setting of POP, preoperative evaluation of risk factors, and preoperative stress testing with prolapse reduction can assist with predicting the likelihood of de novo SUI. When considering a staged versus concomitant anti-incontinence procedure, the benefit of preventing one case of de novo SUI for every 6 women who have concurrent anti-incontinence surgery must be weighed against the risks of surgical complications and reoperation following anti-incontinence surgery. A thorough discussion and understanding of the patient's personal values and goals are of the utmost importance. As there is no gold standard approach to anti-incontinence procedures in the setting of surgical POP repair, shared patient-physician decision making should be an essential component in the surgical planning process.

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