Staged or Concomitant Surgery for Correcting Pelvic Organ Prolapse and Stress Urinary Incontinence

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ABSTRACT

Pelvic organ prolapse (POP) and stress urinary incontinence (SUI) coexist in 15 to 80 percent of women with pelvic floor dysfunction. Occult SUI, also referred to as latent, urodynamic, hidden, iatrogenic, or potential SUI, means asymptomatic SUI becomes apparent only during clinical or urodynamic urinary function testing (i.e., stress testing with reduction of prolapsed structures). Although, there may be some clues in the patient history and prolapse reduction tests during clinical evaluation or urodynamic testing which suggest occult SUI, it remains a diagnostic and treatment challenge. Treatment strategies are either concomitant or staged surgeries. Choosing between concomitant versus staged procedures requires balancing the risk of incomplete treatment against exposing the patient to unnecessary surgery. We reviewed the literature about traditional anti-incontinence methods and tension-free midurethral sling (MUS) as prophylactic procedures. Based on this review of evidence-based medicine, we recommend the following. (i) In women with both POP and symptomatic SUI, concomitant surgery for SUI and POP is suggested. (ii) In women with symptomatic POP with asymptomatic SUI, decisions differ between the surgical approaches. (iii) If the surgeons plan to take the abdominal approach (e.g. sacrocolpopexy), concomitant surgery with retropubic urethropexy (e.g. Burch colposuspension) is suggested for such conditions with either positive or negative prolapse reduction tests. (iv) If the surgeons plan to take a vaginal approach, e.g. sacrospinous ligament fixation, or tension-free vaginal mesh (TVM) techniques, concomitant surgery is suggested when the prolapse reduction test is positive; staged surgery is suggested when the prolapse reduction test is negative.

Keywords: pelvic organ prolapse (POP) and stress urinary incontinence (SUI), midurethral sling (MUS), occult stress urinary incontinence, postoperative stress urinary incontinence (POSUI)

BACKGROUND AND CLINICAL PROBLEM

Pelvic organ prolapse (POP) and stress urinary incontinence (SUI) coexist in 15 to 80% of women with pelvic floor dysfunction [1]. Some women with severe POP and coexistent SUI have no urine leakage in their daily activity, what is called occult SUI. The use of the term occult SUI is inconsistent in the medical literature. Occult SUI, also referred to as latent, urodynamic, hidden, iatrogenic, or potential SUI, means asymptomatic SUI which only becomes apparent during clinical evaluation or urodynamic testing (i.e. stress testing with reduction of prolapsed structures) [2]. The incidence of occult SUI with symptomatic and/or advanced POP was 36 to 80%, by reduction of prolapse [2-6]. Postoperative stress urinary incontinence (POSUI), also called *de novo* SUI, refers to a newly symptomatic SUI after operation. It is estimated 11 to 65% of continent patients with severe POP will develop POSUI without any prophylactic anti-incontinence procedures [7-10]. The large discrepancy may come from the different definitions of POSUI and heterogeneity in study subjects.

The clinical presentations of pelvic floor dysfunction are (i) Both symptomatic POP and SUI; (ii) POP with no symptoms of SUI; or (iii) SUI with no symptoms of POP. Some risk factors may dispose patients to POSUI, such as positive pessary test [11], lower maximal urethral closure pressure [12], concomitant sacrospinous ligament fixation [13] or abdominal sacro-colpopexy, etc. [14,15]. The additional anti-incontinence procedure may prevent the occurrence of POSUI. However, the challenge of dealing with women with POP, is figuring out the advantages and disadvantages of either concomitant or staged anti-incontinence surgeries, and the uncertainty of preoperative evaluation methods which may be ambiguously asymptomatic or show no leakage during prolapse reduction testing in a patient with advanced prolapse.

HOW TO DETECT OCCULT STRESS URINARY INCONTINENCE

Women with stage I POP are unlikely to have urethral obstruction and resultant occult SUI. Therefore, prolapse reduction tests and the concomitant anti-incontinence procedures are usually not necessary for such mild POP. Clues in the history-taking suggest occult SUI in women with advanced POP, such as urinary incontinence that improves or resolves as prolapse worsens, the need to manually replace the prolapsed structures into the vagina in order to void, or development of SUI with use of a pessary [9]. There are several prolapse reduction tests to detect occult SUI during clinical evaluation or urodynamic testing, e.g. the examiner's fingers, a large cotton swab, a single speculum blade, ring forceps, or a pessary [16]. Prediction of POSUI differed according to different methods to perform prolapse reduction test. Women who demonstrated preoperative SUI during prolapse re-

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duction test or by urodynamic study were more likely to report POSUI [16].

The predictive rates differed for five prolapse reduction tests to detect occult SUI, including manual, swab, speculum, forceps, and pessary, at a bladder volume of 300 mL [16]. Only 3.7% of subjects (12/313) demonstrated urodynamic stress incontinence without prolapse reduction. The sensitivity was similar among four reduction testing methods (17 to 39%), except for the pessary test (5%). More women leaked after the second method than after the first one among the methods except pessary test (22% versus 16%; p=0.012) [16]. In women with negative preoperative tests, after prolapse repair alone, 0 to 8% might still develop POSUI [4,17]. However, the well-designed Colpopexy and Urinary Reduction Efforts (CARE) 2008 randomized controlled trial reported the rate of *de novo* SUI in women with negative reduction test undergoing prolapse repair alone was as high as 38% [16]. The study concluded that prolapse reduction tests are not a highly effective method [16]. Some authors used maximum urethral closure pressures [18] or pressure transmission ratios (PTR) to detect occult SUI. The use of PTRs values consisting of <0.9 alone, PTR value of <0.9 with leakage, and PTR of <1.0 predicted the incidences of SUI of 73, 69, and 36%, respectively [2]. Prolapse reduction decreases maximum closure pressure and PTR, but does not alter functional urethral length and other filling or pressure flow parameters [13,16].

TREATMENT STRATEGIES; CONCOMITANT OR STAGED SURGERIES

Some surgeons recommend concomitant surgeries for SUI and POP, with the aim of reducing the possibility of secondary surgery. However, there are inherent disadvantages of higher risk of complications and untoward results, e.g. voiding dysfunction, bladder outlet obstruction, detrusor overactivity (DO). Other surgeons recommend staged surgery, meaning to do POP repair first, followed by re-evaluating the presence of SUI postoperatively. Combined surgeries versus a single procedure require balancing the risk of incomplete treatment against that of exposing the patient to unnecessary surgery [5,19].

The reasons to favor the concomitant operation are as follows: (i) The concomitant operation can treat both POP and SUI, or occult SUI, at the same time and reduce the possibility of secondary surgery (for details refer to "Traditional anti-incontinence methods as prophylactic procedures"). (ii) The risk of *de novo* urgency or DO is acceptable with the addition of a tension-free midurethral sling (MUS) as an adjuvant surgery (for details refer to "Tension-free MUS as a prophylactic procedure"). (iii) The high risk of POSUI if no "prophylactic procedure" performed. (iv) The benefit of concomitant operation outweighs the risks of postoperative complications.

The reasons to favor a staged operation are as follows: (i) Some of the "prophylactic procedures" for POSUI are unnecessary because the reduction rate of *de novo* SUI by the "prophylactic procedure" varies, ranging from 12 to 56% (for details refer to "Tension-free MUS as a prophylactic procedure"). (ii) The prolapse reduction test may not be completely reliable. The detection rates of SUI with prolapse reduction vary significantly by reduction method [16]. Moreover, the sample size to use barrier test as a predictor is limited. (iii) Other factors may contribute or predispose to POSUI such as low urethral closure pressure, age and diabetes. (iv) The "prophylactic procedure" may increase postoperative DO, ranging from 6%-30% (as compared with 5% of women undergoing prolapse repair alone). (v) The salvage surgery for POSUI, such as tension-free MUS, is easy and feasible in case POSUI does occur.

Several factors need to be considered before deciding on either the abdominal or vaginal approach, such as anatomic location of the prolapse, medical history, comorbidities, prior surgeries, procedure efficacy-which depends both on the procedure chosen and the surgeon's experience, and patient preference [20].

TRADITIONAL ANTI-INCONTINENCE METHODS AS PROPHYLACTIC PROCEDURES

There were different prophylactic procedures with varying POSUI rates in non-comparative series. Due to their non-comparative study design and the lack of any non-intervention arm, the protective effect remained unclear in the following studies. The Pereyra needle suspension was associated with 0% POSUI (n=24) within 3-6 months after prolapse repair, using a significant decrease in abdominal PTR <1.0 as criteria. The patients with good PTR who received prolpase repair only also did not have any POSUI [21]. The Kelly plication was associated with 50% of patients (15/30) of both subjective and objective POSUI, while another 37% (11/37) developed only objective POSUI after prolapse repair for grade three POP with a positive stress test during preoperative urodynamic evaluation [22]. The Stamey procedure was associated with 23% of patients (7/30) subjective POSUI and with 36% (11/30) objective POSUI three months after prolapse surgery [23]. The pubovaginal sling was associated with 14% (2/14) incidence of POSUI over a mean follow-up of 47 months (range 12 to 108), and with 0% POSUI in patients without occult SUI (0/10) over a mean follow-up of 44 months (range 12 to 96) [3]. A comparative randomized study to compare abdominal-vaginal Muzsnai needle suspension with endopelvic fascial plication for treating patients with occult SUI and urethral hypermobility found 14% (2/14) and 7% (1/15) POSUI (not statistically significant) at six months, and 58% (8/14) and 0% (0/15) postoperative DO (p=0.001) at six weeks, respectively, after a mean follow-up of 2.9 years (range 1.1 to 4.7 years). They concluded needle suspension increased short-term complications without providing additional protection against POSUI. Preoperative barrier testing in women with severe prolapse is not useful for identifying individuals who require a suspending urethropexy [13]. These studies suggested the Stamey procedure [23] and Kelly plication [22] are far less effective than pubovaginal sling [3] and may associated with increase incidence of POSUI.

Burch colposuspension is the most popular traditional anti-incontinence method and has been accepted by many gynecologists or urogynecologists. The series of well-designed CARE surgical trials [14, 24] and follow-up studies [15] were designed to assess whether the addition of standardized Burch colposuspension to abdominal sacrocolpopexy for the treatment of POP decreases POSUI in women without preoperative symptoms of SUI (as illustrated in as Table 1). Women who did not report symptoms of SUI and who chose to undergo sacrocolpopexy to treat POP were randomly assigned to concomitant Burch group or to no-Burch control group. Patients with either a positive or negative preoperative pessary test were followed after abdominal sacrocolpopexy. The POSUI rate was either 23.8% versus 44.1% (p<0.001) in the Burch group and the no-Burch group, respectively, three months after surgery [14]; and it was 32.0 and

Table 1. Comparative Study of Burch Colposuspension as a Prophylactic Procedure in a Randomized Trial of Colpopexy and Urinary Reduction Efforts (CARE) Trials

Comparative studies for Burch

	Treatment	POSUI	DO or urgency
CARE [14]	ASC + Burch (n=157)	23.8%	32.7%
	ASC − Burch (n=165)	44.1%	38.4%
CARE [14]	ASC + Burch (n=157)	6.1%	
(bothersome stress)	ASC − Burch (n=165)	24.5%	
CARE 2yrs [14]	ASC + Burch (n=157)	32.0%	32.0%
	ASC − Burch (n=165)	45.2%	44.5%

ASC: abdominal sacropexy; CARE: colpopexy and urinary reduction efforts; DO: detrusor overactivity; POSUI: postoperative stress urinary incontinence

45.2% (p=0.026) at 24-month follow-up [15]. Regardless of the urodynamic finding of leakage during prolapse reduction, the addition of the Burch colposuspension was beneficial. Even if no leakage was detected, the Burch colposuspension reduced POSUI from 38.2% to 20.8% (p=0.007) [14]. Interestingly, 35% of patients with a negative stress test developed POSUI, while 17% who underwent a Burch colposuspension became incontinent [2]. Moreover, patients who underwent a Burch colposuspension demonstrated a trend towards fewer urge symptoms postoperatively (32.7% versus 38.4%, p-value 0.48) [14].

However, Constini et al questions the beneficial effects of concomitant pelvic floor reconstructive surgeries in a randomized surgical trial [25]. They found that Burch colposuspension does not provide any additional benefit for POP repair in patients with occult SUI. 54.2% of patients (13 of 24) were still incontinent after abdominal repair and concomitant Burch colposuspension, compared with 39.1% (9 of 23) in POP alone with no statistical significance [25]. Albo et al reported that the fascial sling is better than Burch colposuspension to reduce POSUI. At 24 months, success rates were higher for sling than Burch, both in terms of overall success (47% vs. 38%, P=0.01) and the success specific to SUI (66% vs 49%, P<0.001). However, there were more urinary tract infections, voiding difficulties, and postoperative urge incontinence in the sling group [26]. They concluded that the autologous fascial sling results in a higher success rate for treating SUI, but also causes greater morbidity than the Burch colposuspension [26]. Anger et al used Medicare insurance system data to evaluate the effect of concomitant prolapse repair on sling outcomes when compared with the sling procedure alone, by tracking patients for 12 months after surgery. They found that concomitant prolapse repairs in 34.4% of sling cases were more likely to involve postoperative outlet obstruction (9.4% versus 5.5%, p <0.007), less likely to undergo a repeat procedure for SUI (4.7% versus 10.2%, p=0.0005) and less likely to undergo a reoperation for POP after the sling (OR 0.31, 95% CI 0.22-0.44) [27]. They concluded that prolapse repair at the time of SUI surgery may avoid an early repeat operation for either prolapse or SUI with higher postoperative outlet obstruction [27].

TENSION-FREE MIDURETHRAL SLING AS A PROPHYLACTIC PROCEDURE

Tension-free vaginal tape (TVT) was been widely used as a treatment for SUI. Several studies were conducted to see whether a prophylactic TVT procedure performed during prolapse repair may prevent the development of POSUI. Gordon et al reported none of the 30 patients developed symptomatic POSUI at a mean follow-up of 14.2 months (range 12 to 24). However, 10% of asymptomatic patients (3/30) had POSUI, 66% (9/30) had persistent DO, 13.33% (4/30) had *de novo* DO [5]. Groutz et al reported a series (n=100) with 2% subjective POSUI, 15% objective POSUI, 10% *de novo* urge incontinence, and a 28% reduction in preexisting urge incontinence, 72% (13/18) had persistent urge incontinence, 8% (8/100) had *de novo* urge incontinence at a mean follow-up of 27 months (range from 12 to 52 months). They concluded the TVT procedure is effective and safe in patients with occult SUI undergoing prolapse repair [6].

The comparative studies for TVT as a prophylactic procedure are listed in Table 2. Liang et al prospectively evaluated TVT in occult SUI patients undergoing vaginal hysterectomy with anterior and posterior colporrhaphy [17]. When pessary tests were positive, the POSUI was 9.4% (3/32) in TVT group as compared with 64.7% (11/17) in the no-TVT group. When pessary tests were negative, none of the 30 patients

Table 2. Comparative Studies of the Tension-free Midurethral Sling (MUS) as a Prophylactic Procedure

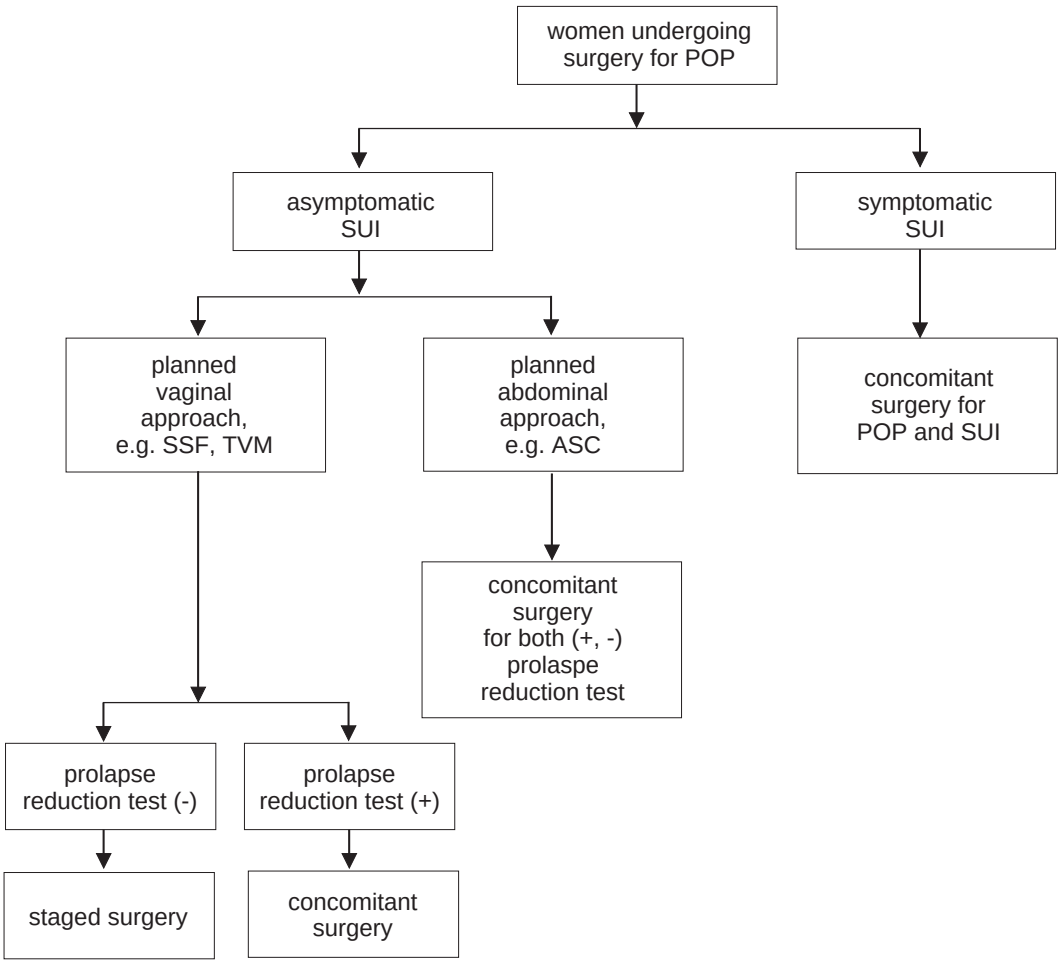
Comparative studies for Midurethral sling

	POP	SUI	Treatment	POSUI	DO or urgency
Liang [16]	III-IV	occult (n=49)	RP + TVT (n=32)	9%	16%
			RP − TVT (n=17)	65%	6%
De Tayrac [28]	II	occult (n=19)	RP + TVT (n=11)	0%	27%
			RP − TVT (n=8)	12%	0%
Meschia [29]	II-IV	occult (n=50)	RP + TVT (n=25)	8%	n.s.
			RP + plication (n=25)	44%	
Araki [11]	II-IV	occult (n=22)	RP + TOT (n=9)	0%	n.s.
			RP − TOT (n=13)	62%	

DO: detrusor overactivity; POP: pelvic organ prolapse; POSUI: postoperative stress urinary incontinence; RP: repair for prolapse; SUI: stress urinary incontinence; TOT: trans-obturator tape; TVT: tension-free vaginal tape

had POSUI. *De novo* DO was noted in 16% of patients in the TVT group and 5.9% in the no-TVT group. They therefore recommended TVT for occult SUI patients undergoing reconstructive surgery [17]. On the contrary, de Tayrac et al conducted a retrospective study in which women with occult SUI and advanced prolapse (n=19) underwent TVT or no intervention after anterior colporrhaphy with mesh, along with other indicated reconstructive procedures. In patients with preoperative occult SUI, POSUI occurred in 0% (0/11) of the TVT group versus 12.5% (1/8) in the control group ($p>0.05$). Moreover, voiding dysfunction occurred in 27.3% (3/11) of the TVT group versus 0% (0/8) in the control group ($p<0.05$). They concluded that prosthetic cystocele repair is as efficient as TVT and the risks from TVT were greater than the benefits in occult SUI [28]. The above two TVT studies with a controlled nonintervention arm reported differing results with limited case numbers. A randomized controlled trial by Meschia et al reported significantly lower POSUI rates in TVT group as compared with the endopelvic fascia plication group, subjective (4% versus 36%; P= 0.01) and objective (8% versus 44%; $P<0.01$). Time for the resumption of spontaneous voiding, rates of urinary retention and *de novo* urge incontinence were similar in the two groups. They recommended TVT for patients with prolapse and occult SUI [29]. Araki et al reported the protective effect of the transobturator midurethral sling (TOT) for women with occult SUI. POSUI developed in none of the concomitant TOT group and 62% (8/13) in the no-TOT group [11]. With a negative stress test, only 4% (2/49) developed POSUI. This study reported the concomitant TOT performance was not associated with postoperative persistent urgency/urge incontinence and development of *de novo* urgency [11].

There were some evidences demonstrated the adjuvant procedures, e.g. TVT at the time of prolapse surgery, may increase the complication rate; including, higher rate of lower urinary tract infection (13% versus 8%), higher rate of intraoperative bladder perforation (5.3% versus 0%), and higher transient urinary retention (20% versus 9.3%) [30,31]. On the contrary, Huang et al reported no bladder perforations during the TVT procedure and no perioperative complications requiring conversion to laparotomy [32]. Lo's review demonstrated the safety and effectiveness of TVT performed with concurrent pelvic relaxation surgery with comparable objective and subjective cure rates, with mean complication rate between 2.7 and 34%, bladder perforation rate between 0 and 13%, transient urinary retention between 9 and 43%. The implanted vaginal tape did not cause urethral obstruction during a short follow-up period, but the possibility of voiding dysfunction needs to be observed over a longer follow-up period [33].



ASC: abdominal sacro-colpopexy; MUS: midurethral sling; POP: pelvic organ prolapse; SSF: sacro-spinous ligament fixation; SUI: stress urinary incontinence; TVM: tension-free vaginal mesh

Fig. 1. The proposed flow chart for surgical treatment for advanced pelvic organ prolapse (POP) with or without stress urinary incontinence (SUI).

PROPOSED FLOW CHART FOR SURGICAL TREATMENT OF PELVIC ORGAN PROLAPSE WITH/WITHOUT STRESS URINARY INCONTINENCE

From this review of evidence-based medical literature [20], we propose the following flow chart for surgical treatment of advanced POP with or without SUI, as illustrated in Fig. 1. In women with both POP and symptomatic SUI, concomitant surgery for SUI and POP is suggested. In women with symptomatic POP and asymptomatic SUI, decisions may vary between the surgical approaches. If the surgeons plan to take the abdominal approach, (e.g. abdominal sacrocolpopexy), concomitant surgery with retropubic urethropexy, (e.g. Burch colposuspension) is suggested in all cases, whether the prolapse reduction test is positive or negative. This is mainly based on the high POSUI rate in the abdominal sacrocolopxy only group in the CARE trials [14,15]. If the surgeons plan to take a vaginal approach, (e.g. sacrospinous ligament fixation or tension-free vaginal mesh (TVM) techniques), concomitant surgery is suggested for the women with a positive prolapse reduction test; while staged surgery is suggested for women with a negative prolapse reduction test.

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