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Laparoscopic or Robotic Sacrocolpopexy with Tension-Free Sling to Prevent and Treat Symptomatic or Occult Stress Urinary Incontinence

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ABSTRACT

Objective: This retrospective review was conducted to assess whether the concomitant use of a tension-free sling (TVT) with minimally invasive sacrocolpopexy for the treatment of pelvic organ prolapse decreases postoperative stress urinary incontinence (SUI) in women with and without preoperative symptoms of stress incontinence.

Design: Women who reported symptoms of SUI and chose to undergo minimally invasive sacrocolpopexy received a concomitant retropubic tension-free sling, and women who did not report symptoms of SUI and who chose to undergo sacrocolpopexy to treat prolapse received a prophylactic concomitant mini-sling. These patients were compared with those that did not have a sling procedure and chose to proceed with a step approach. They were evaluated 3 months and 1 year after surgery. The primary outcomes included measures of stress incontinence (symptoms, stress testing, or treatment) and urge symptoms. Complications with the additional procedures were also tabulated.

Setting: University hospital, single-surgeon cases

Patients: Of 236 women who underwent minimally invasive sacrocolpopexy, 157 were symptomatic with SUI and 75 were not symptomatic with SUI. They are compared with 100 patients who underwent a prolapse repair without incontinence repair in the 2 years prior to this study.

Interventions: One hundred and fifty-seven symptomatic patients underwent a concomitant retropubic sling and 75 asymptomatic patients received a mini-sling.

Measurements and Main Results: One year after surgery, 6.4% of the women in the TVT group and 7.2% of the mini-sling group met 1 or more of the criteria for stress incontinence ($p = 0.38$). There was no significant difference between the TVT and the mini-sling group in the frequency of urge incontinence (12.7% versus 13.4%, $p = 0.44$). After surgery, women in both groups were less likely to report bothersome symptoms of stress incontinence compared to those reported previously in the literature (24.5% versus 6.7%, $p < 0.001$). Major sling complications included cystotomy (8.1%), infection (UTI) (15%), and catheter use for 2 days (12.6%).

Conclusions: In women with or without stress incontinence who were undergoing minimally invasive sacrocolpopexy for prolapse, a full or mini-sling significantly reduced postoperative symptoms of SUI without increasing complications or other lower urinary tract symptoms.

KEYWORDS: sacracolpopexy, prolapse, SUI, sling, prophylaxis

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INTRODUCTION

Pelvic organ prolapse is a condition in which the pelvic organs, including the uterus, bladder, and bowel, protrude into or past the vaginal introitus [1,2]. It is estimated that 50 percent of parous women lose pelvic floor support. Treatment for pelvic organ prolapse and stress urinary incontinence involves surgical repair of site-specific defects in pelvic floor support. Women have an 11% lifetime risk of surgery for prolapse or urinary incontinence by 80 years of age, and almost 1/3 of women (29%) have a second surgery [3]. Pelvic floor dysfunction, therefore, is a major health issue for older women and points to the need for improved treatment and long-term treatment outcomes. A prolapse correction operation that decreases the risk of reoperation should therefore be the desired outcome.

Many women with prolapse also have lower urinary tract dysfunction, such as stress urinary incontinence [1-3]. Stress incontinence is a symptom that refers to leakage of urine during events that result in increased abdominal pressure, such as coughing or sneezing, physical exercise, lifting, bending, and even changing positions. While some women with prolapse have concomitant stress incontinence, others do not. This is in part related to the obstructive effect of the prolapsed pelvic organs, which creates urethral kinking. When prolapse is treated with the use of a pessary or surgery, stress incontinence may develop. The risk of symptoms of stress incontinence after surgery ranged from 8 to 60% in a small series [4-9]. Brubaker et al. proposed several options. One option for patients who require surgery to correct prolapse but who do not have symptoms of stress incontinence is to perform a prophylactic continence operation at the time of prolapse repair. Other options include performing only the prolapse repair (which in some women will result in the need for subsequent surgery to treat stress incontinence) or to perform preoperative testing in an attempt to predict which patients will have postoperative incontinence. This would allow the surgeon to selectively perform continence procedures on the basis of the test results. Uncontrolled trials suggest that performing stress incontinence procedures at the time of the initial surgery may reduce postoperative stress incontinence [9,10]. However, up to 20% of women who undergo these procedures can have complications, including difficulty voiding, urinary urgency or urge incontinence, or urinary tract injuries [11-13]. Thus, the relative benefit and harm associated with routinely adding a continence operation in women undergoing prolapse surgery requires evaluation. Brubaker et al. demonstrated that routine addition of a continence procedure, regardless of preoperative symptoms and testing, was beneficial and did not increase morbidity. At our institution, we noted that approximately 30% of our patients developed de novo stress incontinence after correction of their prolapse using a minimally invasive colpopexy approach (unpublished data). We also noted that prolapse was rated bothersome for patients, but de novo incontinence was considered hateful and intolerable. Most of our patients did not want a staged procedure; i.e., first having prolapse repair followed by an incontinence procedure 8 weeks later, if they demonstrated or experienced stress leakage. Our premise is to demonstrate that a minimally invasive continence operation can be safely added therapeutically or prophylactically without adding any complications, thus significantly reducing the need for a subsequent operation to treat stress incontinence.

Sacrocolpopexy is an abdominal prolapse repair surgery that restores pelvic anatomy in most women, although data on long-term (5 to 10 years) durability is limited [14]. In sacrocolpopexy, graft material is attached between the vagina and sacrum, supporting the vagina (Figure 1). The retropubic TVT sling (Figure 2) is effective in treating stress incontinence, and there is evidence of its durability during 10 years of follow-up [13,15-17].

A mini-sling is a new concept introduced in 2006 and very little data is available. Our group conducted the Minimally Invasive Colpopexy and Sling Study in 2007 to evaluate whether using a prophylactic minimally invasive mini-sling at the time of minimally invasive sacrocolpopexy for prolapse reduces postoperative symptoms of stress incontinence in women who do not report preoperative symptoms of stress incontinence. We compared these patients to those having a retropubic sling at the time of their prolapse repair because they either complained of or demonstrated stress incontinence on prolapse reduction preoperatively. We also evaluated the effect of adding the retropubic or mini-sling on surgical complications and on other lower urinary tract symptoms.

Rationale for the use of a tension-free sling over Burch colposuspension

Since a laparoscopic approach was used for prolapse repair procedures, the logical route of incontinence correction would be a laparoscopic Burch colposuspension. Our experience was that the surgical time was much decreased and patients did better postoperatively after a tension-free sling than the laparoscopic Burch in terms of efficacy, complications, and postoperative morbidity. Our personal observations were confirmed by a randomized trial of laparoscopic Burch colposuspension versus tension-free vaginal tape. The TVT was found to have similar long-term efficacy to laparoscopic Burch. Therefore, the tension-free tape was the chosen procedure for

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Figure 1. A schematic of sacral colpopexy showing the graft attachment between the vagina and the sacrum.
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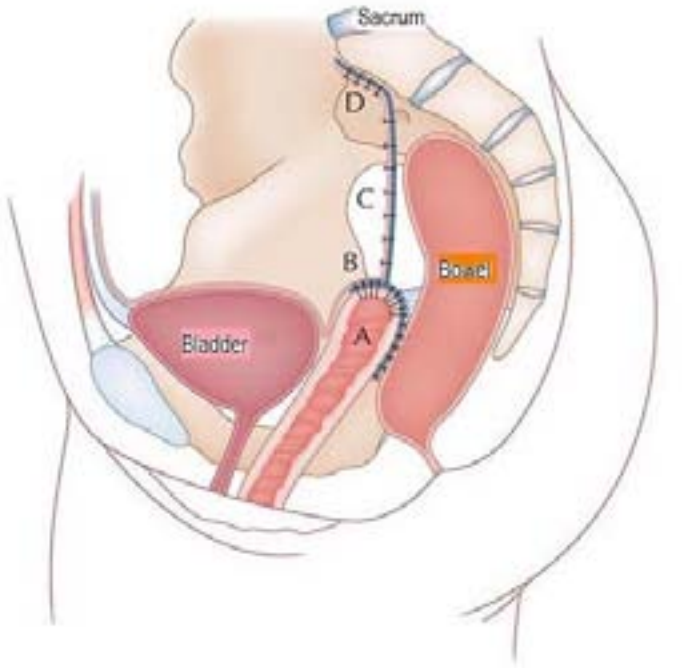
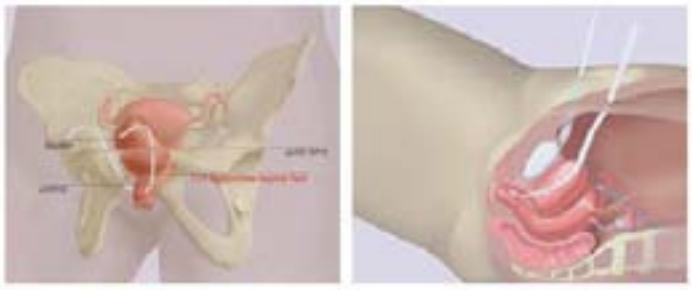


Figure 2. A schematic of a TVT sling for incontinence (courtesy of Ethicon Endosurgery).
http://dx.doi.org/10.3834/uij.1944-5784.2012.04.13f2



treatment of stress urinary incontinence in our study.

Rationale for a full sling and a mini-sling

After reviewing the CARE trial and our experience with 100 prolapse repairs in the past 2 years prior to this, it was unethical to perform zero incontinence procedures on these women undergoing prolapse repair, as the rate of postoperative stress incontinence was reported at 41.3% in the untreated, previously continent patients. At our institution, we had a similar experience showing a 30% incidence of postoperative stress incontinence in the untreated patients that were continent prior to prolapse repair (data from 100 patients who underwent a colpopexy for prolapse alone). This means that almost 1 out of 2 to 3 patients would need a second operation to correct their incontinence after prolapse surgery. Patients are often bothered by prolapse but usually not to the extent that they detest incontinence. Our experience has been that patients were very unwilling to go through a staged second procedure despite thorough counseling and preparation. It is also cumbersome and burdensome for patients and families with respect to time off from work, sexual abstinence, and weight-lifting restrictions. Our goal, therefore, is to evaluate the use of a prophylactic incontinence procedure that would not increase any additional risk to the patient when done concomitantly with prolapse repair.

METHODS

The methods used in the study were strictly followed as per the CARE trial such as to provide a very similar work-up and follow-up, though using a different approach for prolapse repair and incontinence repair. The CARE trial was the basis of our evaluation [20]. We had been performing all abdominal prolapse repair procedures laparoscopically or robotically and needed to define a minimally invasive incontinence procedure that could be performed prophylactically with minimal additional risk to the patient. Women who underwent sacrocolpopexy for stage II, III, or IV prolapse were included if they did or did not have symptoms of stress incontinence prior to surgery. All women undergoing minimally invasive colpopexy between July 2007 and June 2009 were followed and evaluated. Prolapse was staged with the use of the pelvic organ prolapse quantification (POP-Q) system, a standardized quantitative method for assessment of prolapse [22]. At the time of the initial exam and visit, all women were categorized as either stress continent or incontinent on the basis of their responses to questions regarding symptoms of stress incontinence on the Pelvic Floor Distress Inventory (PFDI) questionnaire. They were labeled stress continent if they responded "not at all" or incontinent if they responded "moderately" or "quite a bit" to symptoms of leakage with coughing, sneezing, laughing, bending, or walking, or to the urodynamic finding of leakage

during prolapse reduction [23]. None of the women had a contraindication to a mid-urethral sling, and all had evidence of some loss of anterior vaginal support, implying that the urethra was not fixed behind the pubic bone. Post colpopexy, the bladder was filled at cystoscopy with 300 cc of normal saline, and all continent patients underwent a Crede test with demonstrable leakage. A prophylactic mini-sling was used to correct this. Patients who were incontinent prior to surgery underwent a retropubic mid-urethral sling. The patients, operating room staff, and physician and nurse practitioner were aware of the treatment assignments, and the consents appropriately stated the use of either a full sling or a mini-sling. Follow-up was to be maintained for 1 year after surgery. Follow-up examinations with the use of the POP-Q were performed by the urogynecological nurse practitioner.

Preoperative urodynamics were completed in accordance with the study protocol without prolapse reduction and then again with placement of the prolapsed vagina into the normal anatomical position (prolapse reduction) using a cube pessary. Preoperative urodynamic results were reviewed in the operating room, as well. The women completed validated questionnaires at baseline and again at follow-up, including the basic questions for the severity of urinary incontinence and the PFDI and Pelvic Floor Impact Questionnaire (PFIQ) for the assessment of pelvic symptoms and their effect on the quality of life [24-29]. The primary outcomes were stress incontinence and urge symptoms 3 months and 1 year after surgery. Women were characterized as having stress incontinence if any of the following were present: 1) symptoms, as defined by a "yes" response to any of the questions on the PFDI stress incontinence subscale regarding leakage with coughing, sneezing, laughing, physical exercise, lifting, or bending over; 2) stress incontinence during standardized stress testing at maximal bladder capacity or 300 cc, whichever was less, in either the supine or standing position with a Valsalva maneuver or cough provocation; or 3) any treatment for stress incontinence after the study surgery. We considered women to have bothersome symptoms of stress incontinence if they reported being bothered "quite a bit" or "moderately" in response to 1 of the 3 questions on stress incontinence on the PFDI. The urge endpoint was defined as any of the following bothersome symptoms (defined as "moderately" or "quite a bit" according to the PFDI): urge incontinence, urgency, frequency, nocturia, enuresis, or treatment for any of these symptoms identified after the initial surgery. Stress and urge symptoms were also described with the use of the stress subscale and the irritative-voiding subscale of the PFDI, respectively. Higher scores represented increasing levels of symptoms and increasingly bothersome symptoms.

Serious adverse events were defined as untoward medical occurrences that were life threatening or fatal, required prolonged hospitalization or readmission for the initial surgery, any condition that resulted in persistent or clinically significant disability, or any other important medical condition. Since surgical treatment for stress incontinence was a component of the stress incontinence endpoint, it was not included among the adverse events. Serious adverse events were reviewed by a hospital committee to determine which events were plausibly related to the retropubic or mini-sling intervention, and which were classified using the Dindo-Clavien grading system [30].

The null hypothesis was that there would be no significant difference in the number of women with persistent stress incontinence 1 year after sacrocolpopexy with a TVT retropubic sling compared with sacrocolpopexy with a mini-sling. The 2 groups were compared at baseline according to age, body mass index (defined as the weight in kilograms divided by the square of the height in meters), and prolapse stage.

RESULTS

Of the 236 women who were recruited, 157 received the retropubic sling with their minimally invasive sacrocolpopexy and 75 underwent minimally invasive sacrocolpopexy with placement of a prophylactic mini-sling. One surgery was discontinued due to severe bradycardia secondary to electrolyte imbalance within the first 5 minutes of surgery. Another surgery was converted to a vaginal mesh repair when densely adherent GORE-TEX mesh (W. L. Gore & Associates, Inc., Flagstaff, AZ) was discovered from a prior prolapse repair. Another surgery was converted to a laparotomy by preference of general surgery colleagues who preferred to proceed with the rectopexy portion of the procedure abdominally. The fourth patient was excluded because the procedure was changed to sacrohysteropexy since she decided to preserve her uterus.

Of the 232 women, 53% had previously undergone hysterectomy. There were no significant differences between the 2 groups in baseline characteristics (Table 1).

All women were divided into 2 groups on the basis of a response of "rarely" or "never" to 3 questions on stress incontinence in the PFDI questionnaire, in response to bothersome symptoms of stress incontinence if they reported being bothered "quite a bit" or "moderately" in response to 1 of 3 questions on stress incontinence on the PFDI, or if they demonstrated pessary or urodynamic leakage with prolapse reduction. Of those, 66.5% reported either stress leakage of urine preoperatively when queried or demonstrated leakage with prolapse reduction.

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Table 1. Baseline characteristics of the 232 women in the study population.
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Characteristic	Retropubic TVT group (n = 157)	Mini-sling group (n = 75)	No incontinence procedure group (n = 100)	p value
Age (years)	61.3 ± 8.9	59.3 ± 9.8	58.1 ± 6.9	0.27
Race				
White	89 (57%)	39 (52%)	55 (55%)	
Black	21 (13%)	9 (12%)	15 (15%)	
Hispanic	32 (20%)	19 (25%)	21 (21%)	
Asian	15 (10%)	8 (11%)	9 (9%)	
BMI (mean)	30.1 ± 6.3	28.6 ± 7.1	31.3 ± 5.3	0.75
Sexual activity				
Yes	103 (65%)	52 (69%)	58 (58%)	0.24
Previous vaginal deliveries				
Range	0-7	0-6	1-5	
Median	4	3	3	
Previous cesarean deliveries				
Range	0-3	0-2	0-2	
Median	0	0	0	
Prior hysterectomy	88 (56%)	35 (47%)	45 (45%)	0.06
Prior surgery for incontinence	15 (9.5%)	18 (24%)	12 (12%)	0.001
Prior surgery for prolapse	54 (34%)	30 (40%)	36 (36%)	0.03
POP-Q stage				
II	30 (19%)	20 (27%)	28 (28%)	
III	89 (57%)	48 (64%)	56 (56%)	
IV	38 (24%)	7 (9%)	16 (16%)	

The stages of the pelvic organ prolapse quantification system (POP-Q) are as follows: in stage II prolapse, the vagina is prolapsed between 1 cm above the hymen and 1 cm below the hymen; in stage III, the vagina is prolapsed more than 1 cm beyond the hymen but is less than totally everted; and in stage IV, the vagina is everted to within 2 cm of its total length.

Baseline urinary symptoms and test results are shown in Table 2. The overall rate of concomitant hysterectomy (always a supracervical hysterectomy except in 2 cases) was slightly higher in the preoperatively continent group: 44.0% in the retropubic sling group compared with 53.0% in the mini-sling group (p = 0.06).

Three months after surgery, 6.4% (10 women) in the retropubic sling group and 8% (6 women) in the mini-sling group met 1 or more criteria for stress incontinence (p = 0.38). The sling was indeed protective against stress incontinence (odds ratio: 0.41; 95% confidence interval: 0.24 to 0.70). Results based on the 3 components of the stress incontinence measures are shown in Table 3. "Bothersome" stress incontinence was similarly decreased in both groups and significantly decreased compared to no incontinence treatment in our untreated group (0.8% versus 24%, p < 0.001). With the urodynamic finding of leakage during prolapse reduction, the addition of the retropubic sling

Table 2. Baseline urinary evaluation by the PFDI questionnaire and the results of the stress test without prolapse reduction.
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Variable	TVT retropubic group (n = 157)	Mini-sling group (n = 75)	No incontinence treatment group (n =100)
PFDI questionnaire			
Stress incontinence+	110 (70%)	0	0
Bothersome SUI++	42 (27%)	0	0
Urge symptoms*	50 (32%)	21 (28%)	30 (30%)
Bothersome UI	15 (10%)	6 (8%)	8 (8%)
Positive urodynamic stress test**			
Without prolapse reduction	101 (64%)	0	0
With prolapse reduction	47 (30%)	0	0
Detrusor overactivity on urodynamics	23 (15%)	12 (16%)	15 (15%)

+ Based on a response of "yes" to any one of the 3 questions on the Pelvic Floor Distress Inventory (PFDI) questionnaire regarding stress incontinence with coughing, sneezing, or laughing; physical exercise; or lifting or bending over.
++ A response of "moderately" or "quite a bit" on the PFDI questionnaire.
* A response of "yes" to any one of the questions on the PFDI questionnaire regarding urgency, urge incontinence, frequency, nocturia, or enuresis.
** Stress testing was performed with the bladder volume at maximal cystometric capacity or 300 cc, whichever occurred first with bladder filling.

was beneficial. If no leakage was detected with urodynamic prolapse reduction preoperatively, the mini-sling reduced postoperative stress incontinence to 7.2% compared to 38.8% as seen in our untreated patients ($p < 0.001$). In preoperatively continent women, rates of postoperative stress incontinence remained significantly lower in the mini-sling group than reported in the CARE trial with the control group (7.2% versus 41.3%, $p < 0.001$).

The percentage of women who met 1 or more criteria for urge outcomes at 3 months after surgery did not differ significantly between the 2 groups (12.7% in the retropubic sling group versus 13.4% in the mini-sling group, $p = 0.44$). There were no significant differences between the 2 groups according to the PFDI subscales for irritative voiding and obstructive voiding, or for voiding symptoms or pain and pressure with bladder filling. Urinary retention was rare, being reported by 1 woman in the retropubic sling group at 2 weeks, requiring a half-sling slit revision to correct it. There was no significant difference in the duration of surgery when either sling procedure was added: 11 +/- 3.5 minutes for a retropubic sling part compared with 6 +/- 2.5 minutes for a mini-sling part ($p = 0.54$). The groups also did not differ significantly in estimated intraoperative blood loss (75 +/- 50 ml for sacrocolpopexy plus retropubic TVT versus 68 +/- 45 ml for sacrocolpopexy with a mini-sling, $p = 0.46$).

The percentage of women who had serious adverse events within 3 months after surgery was similar in the 2 groups (1.27% in the TVT group and 1.33% in the mini-sling group, $p = 0.74$). A total of 3 adverse events were recorded: 1 myocardial infarction on postoperative day 1, 1 bowel injury and repair with extensive adhesion lysis, and 1 presacral ooze of about 125 cc requiring pressure and a few extra sutures placed for hemostasis. No serious adverse events were plausibly related to the sling procedures. Major sling complications were cystotomy (8.2% in the TVT group), UTIs (15%), and catheter use for 2 days (12.6%). There was 1 postoperative infection that required a second laparoscopic look and 1 persistent cervical bleed that was taken back to the operating room requiring excision of some graft over the cervical OS. The outcomes for stress incontinence and urge symptoms were similar among the 194 women who completed 1 year of follow-up at the time of the analysis. Among these women, 8 out of 125 (6.4%) in the TVT group compared with 5 out of 69 (7.2%) in the mini-sling group met 1 or more criteria for stress incontinence ($p = 0.62$). In contrast, 16 (12.7%) of those in the TVT group and 9 (13.4%) of those in the control group met 1 or more criteria for urge outcome ($p = 0.37$). One patient in the treatment group had post-procedure treatment for stress incontinence in the form of periurethral bulking with some relief.

Table 3. (A) Urinary evaluation 3 months after surgery. (B) Urinary evaluation 1 year after surgery.
http://dx.doi.org/10.3834/uij.1944-5784.2012.04.13t3

Variable	Retropubic TVT group (n = 157)	Mini-sling group (n = 75)	p value
Stress incontinence outcome	10 (6.4%)	6 (8%)	0.66
According to symptoms+	6 (3.8%)	4 (5.3%)	0.74
According to stress testing++	3 (1.9%)	2 (2.7%)	0.34
According to treatment	1 (0.63%)	1 (1.3%)	0.53
Bothersome stress incontinence $	32 (20%)	19 (25%)	
Urge outcome	20 (12.7)	10 (13.4)	0.44
Bothersome symptoms #			
Urge incontinence	4 (2.5%)	3 (4%)	0.36
Enuresis	0 (0%)	0 (0%)	
Frequency	9 (5.7%)	5 (2.7%)	0.27
Urgency	6 (3.8%)	5 (2.7%)	0.74
Nocturia	11 (7.0%)	8 (10.7%)	0.34
Treatment of urge symptoms	3 (1.9%)	1 (1.3%)	0.24
Serious adverse events to 3 months			
All intraoperative events (cystotomy) Dindo-Clavien Grade I	13 (8.2%)	0 (0%)	< 0.001
Urologic and gynecologic events (UTI) Dindo-Clavien Grade II	24 (15.3%)	8 (10.7%)	0.65
Sling related events (2 days with catheter) Dindo-Clavien Grade IIIa	20 (12.7%)	4 (5.3%)	0.02

Table 3b.

Variable	Retropubic TVT group (n = 157)	Mini-sling group (n = 75)	No incontinence treatment group (n =100)	p value
Stress incontinence outcome	11 (7%)	5 (6.6%)	38 (38%)	0.38
Bothersome stress incontnence $	1 (0.63%)	0 (0%)	24 (24%)	< 0.001
Urge outcome	20 (12.7%)	10 (13.4%)	12 (12%)	0.58
Treatment of urge symptoms	3 (1.9%)	1 (1.3%)	3 (3%)	0.28

+ Values were based on the number of women who responded "yes" to any one of the two questions on the Pelvic Floor Distress Inventory (PFDI) questionnaire regarding stress incontinence with coughing, sneezing, or laughing; physical exercise; or lifting or bending over. ++Stress testing was performed with the bladder volume at maximal cystometric capacity or 300 cc, whichever occurred first with bladder filling. $ Bothersome was defined as a response of "moderately" or "quite a bit" on the PFDI questionnaire. # Values were based on a response of "yes" to any one of the questions on the PFDI questionnaire regarding urgency, urge incontinence, frequency, nocturia, or enuresis (see Methods).

DISCUSSION

A sling procedure at the time of minimally invasive sacrocolpopexy for prolapse significantly reduced the risk of postoperative symptoms of stress incontinence in women 3 months postoperatively. This was maintained 1 year after the surgery, as well. The procedure chosen was based on the level of preoperative symptoms and findings on objective testing. A full retropubic sling was used for symptomatic, pessary-induced or urodynamic stress incontinent patients. Women who were continent prior to surgery and remained continent with prolapse reduction were prophylactically treated with a miniature version of the sling. The rationale was to treat symptomatic patients and utilize prevention in asymptomatic patients. Our own experience had been an approximately 25% chance of developing stress incontinence after prolapse repair in the absence of a continence procedure. The prophylactic addition of a mini-sling did not increase the frequency of urinary retention, urge incontinence, urgency, urinary tract infections, or intraoperative or postoperative complications. In our study, we have demonstrated that the use of a mini-sling has decreased the rate of new onset stress incontinence to the same level as the treated group, without the additional risks associated with a full sling, such as a cystotomy. Ongoing follow-up of these women will provide further information with respect to the long-term usefulness of adding a prophylactic mini-sling at the time of sacrocolpopexy. At our institution, we have been adding the prophylactic mini-sling procedure to the surgical correction of these patients and will continue to follow up on them.

Criteria for the endpoint of stress incontinence included symptoms, stress testing, or treatment. More women reached the stress endpoint on the basis of reported symptoms, rather than on testing or treatment. One patient in the incontinent group was treated for stress incontinence within the 1-year follow-up using a periurethral injection. She was elderly and had severe incontinence prior to her prolapse repair, with very low urethral closure pressures. We used strict criteria and a "yes" to any symptom classified as stress or urge incontinent. Despite that, we see a very significant cure rate both in the symptomatically incontinent patients and potentially incontinent patients. The fact that stress incontinence and urge incontinence outcomes were similar in both groups suggests that we might not be able to cure all patients even if we used a retropubic sling for all patients.

Approximately 40% of the women had at least 1 bladder symptom preoperatively that was not related to stress incontinence. While a mini-sling reduced the risk of postoperative stress incontinence substantially, many women had some other bladder symptoms postoperatively. Of those, 13% reported at least 1 urge type of symptom 3 months after surgery. This result may not be substantially different from that in women without clinically significant prolapse. Among older, community-dwelling women, a 61% rate of urgency and 41% rate of obstructive voiding have been reported [2]. We show that preoperative urodynamic testing does seem to be of value in identifying more patients who benefit from the addition of the full retropubic sling by demonstrating preoperative incontinence. Our study was designed to detect incontinence at 3 months and 1 year postoperatively as the primary endpoint. The limitations of our study include a retrospective analysis, short follow-up of only 1 year, and an inability to collect additional quality-of-life data. We did not have an untreated group at the same time; rather, the untreated group is from the period prior to this intervention that led to this approach. However, long-term follow-up is needed to assess the durability of the observed benefits of a sling operation in combination with minimally invasive sacrocolpopexy. Our findings cannot be generalized to women undergoing prolapse surgery other than minimally invasive sacrocolpopexy (i.e., by the vaginal approach) or continence procedures other than retropubic slings—full or mini (i.e., a transobturator sling). Our results show that in women undergoing a minimally invasive sacrocolpopexy who do not have preoperative symptoms of stress incontinence or a fixed urethra, the addition of a mini-sling markedly reduces the risk of postoperative stress incontinence without increasing the risk of surgery or adverse urinary symptoms, such as urge incontinence. Further research is needed to determine whether this finding applies to a vaginal approach to incontinence and prolapse repair.

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