

# Postsurgical Urinary Incontinence in Continent Women undergoing Hysterectomy for Uterine Prolapse

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## ABSTRACT

**Objective:** To seek risk factors related to postsurgical urinary incontinence after vaginal hysterectomy. **Materials and Methods:** Sixty-four patients suffering from severe uterovaginal prolapse but without symptoms of stress urinary incontinence were recruited. After undergoing vaginal hysterectomy, 28 patients had urodynamic and/or clinical stress urinary incontinence, while 36 patients presented no such symptoms. Multiple logistic regression analysis was applied to analyze various risk factors predisposing to postsurgical urinary incontinence. **Results:** The positive pessary test (odds ratio = 5.61,  $p = 0.01$ ), sacrospinous ligament fixation (odds ratio = 4.59,  $p = 0.02$ ) and lower maximal urethral closure pressure (odds ratio = 0.98,  $p = 0.03$ ) were the three most significant parameters in predicting postsurgical stress incontinence. **Conclusions:** In the presence of positive predicting parameters, the patients ran a higher risk of developing postsurgical urinary incontinence after correction of uterine prolapse by vaginal hysterectomy. Concomitant addition of anti-incontinence measures may effectively prevent the occurrence of incontinence.

*Key words:* urinary incontinence, prolapse, hysterectomy

## INTRODUCTION

Pelvic organ prolapse is a common condition that can produce numerous symptoms including urinary incontinence and other voiding dysfunctions because of distortion of the lower urinary tract. Indeed, women with severe pelvic organ prolapse rarely complain of stress urinary incontinence (SUI) but they can develop SUI after surgical correction of the prolapse [1,2]. In addition, several previous studies have shown that 15% to 80% of women with pelvic organ prolapse manifested SUI in the urodynamic laboratory after the prolapse had been reduced by vaginal pessary [3-6]. If women at a high risk of potential SUI could be identified before surgery, then a prophylactic anti-incontinence procedure performed during prolapse repair could prevent the possible development of postsurgical urinary incontinence. Many surgeons plan the surgical management of women who have pelvic organ prolapse and SUI based on the results of a barrier test. However, some women with negative barrier tests develop urinary incontinence after prolapse repair and this often causes arguments between surgeons and patients. The purpose of this study was to identify the risk factors for postsurgical urinary incontinence in women who had no clinical urine leakage prior to undergoing vaginal hysterectomy (VTH) for uterine prolapse.

## MATERIALS AND METHODS

Between October 2002 and September 2003, 64 patients with severe urogenital prolapse of International Continence Society classi-

fication stage 3 or 4 [7], without symptoms of SUI, undergoing VTH and modified anterior colporrhaphies were enrolled into this prospective study. The exclusion criteria included clinical urinary incontinence, urodynamic detrusor overactivity before surgery, prior anti-incontinence procedures and any concomitant anti-incontinence procedure. Based on the results of clinical symptoms of SUI and urodynamic testing postoperatively, all patients were divided into two groups. In group 1, 28 patients had urodynamic and/or clinical urinary incontinence after surgery. In group 2, 36 patients had no complaint of SUI. Comparisons in terms of clinical manifestations and urodynamic findings were made between the two groups of patients.

The following protocol process was observed for all patients: before surgery, patients underwent meticulous evaluations, including a detailed history, urogynecological questionnaire, micturition diary, urinalysis or urine culture, pelvic organ prolapse quantification system examination, water cystometry at a filling rate of 60 mL/minute, uroflowmetry, and static and dynamic urethral pressure profiling. Urethral pressure profiles were measured in the sitting position with the bladder filled to its maximum cystometric capacity (for most patients the bladder held 300 mL to 500 mL) and with the prolapse reduced by a properly fitting vaginal ring pessary (generally no. 2 or 3 Smith-Hodge pessary). The pessary was inserted in the posterior vaginal fornix pointing downward, thereby stabilizing the bladder base without urethral obstruction during coughing [8]. A positive pessary test was defined as observable urine leakage with stress during urodynamic testing following reduction of prolapse with a properly fitting pessary.

Having signed up for the study, all the participants underwent VTH with modified anterior colporrhaphies and/or posterior colporrhaphies. Concomitant sacrospinous ligament fixations and vaginal enterocele repairs were performed when indicated. The VTH and modified anterior colporrhaphy procedures were performed as described in our previous report [9]. With the uterus extirpated and the

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abdominal peritoneum closed, the uterosacral and cardinal ligaments were tied to each other across the midline, and then sutured onto either side of the vaginal cuff to prevent vaginal vault prolapse and enterocele. Approximation of bilateral pubocervical fasciae was routinely performed during anterior colporrhaphy not only to reinforce the central part of bladder but also to secure the posterior urethra. If sacrospinous ligament fixations were done to correct severe vaginal vault prolapse, the stumps of the uterosacral and cardinal ligaments were not tied onto the vaginal cuff. The sacrospinous ligament fixations followed Miyazaki's earlier description [10].

After surgery, the Foley catheter was removed on postoperative day 3, allowing the patients to attempt spontaneous voiding. Intermittent catheterization was instituted when there were complaints of voiding difficulty or incomplete bladder emptying. Patients were discharged once the amount of the postvoid residual urine volume was consecutively less than one-quarter of the voided volume.

At follow-up, the patients were evaluated using a urogynecological questionnaire, micturition diary, pelvic examination and stress continence testing at 1 month, 3 to 6 months, 1 year and annually thereafter. Urodynamic studies were performed for all the patients at 3 to 6 months after surgery. The diagnosis of postsurgical urinary incontinence was made if the patient had urodynamic urinary incontinence and/or clinical symptoms of SUI. Occult SUI was diagnosed if the patient had urodynamic urinary incontinence without clinical symptoms of SUI.

The data were summarized as mean  $\pm$  SD or percentages, as appropriate. Analysis was done using the unpaired 2-tailed Student's t test for normally distributed continuous data, the Mann-Whitney U test for continuous data that did not fit a Gaussian curve and the Fisher exact test for categorical data. To compare pre- and post-operative urodynamic data paired-sample t tests were applied. Multivariable logistic regression analysis was done to determine independent predictors of postsurgical urinary incontinence. Statistical significance was considered at  $p < 0.05$ . The Ethics Committee of our University Hospital approved this study protocol for manifestations in patients with severe prolapse and occult urinary incontinence.

## RESULTS

Table 1 shows that both groups were similar in their preoperative characteristics, operating time, blood loss and operative methods. However, patients in group 1 had a significantly higher rate of positive pessary tests ( $p = 0.002$ ). There were no significant differences for the

number of various concomitant surgical procedures performed between the two groups, including posterior colporrhaphy, enterocele repair and sacrospinous ligament fixation.

In preoperative evaluations, urinary irritation symptoms were common in both groups, with more than 80% of women reporting some degree of frequency, 40% urgency and 30% nocturia. Intraoperatively, there were no major significant complications, except one patient in group 1 and one patient in group 2 sustained blood losses of up to 450 mL and 400 mL, respectively. After surgery, four patients (one in group 1 and three in group 2) had urinary retention (post-void residual urine volumes  $>100$  mL) that resolved before day 14 after intermittent self-catheterization. Four patients (2 in each group) developed urinary tract infections but were cured after antibiotic treatment. At follow-up, three patients had stage 1 or 2 recurrent prolapse at 4, 9 and 10 months after surgery, respectively. Among them, one patient in group 1 had a cystocele one in group 2 had an enterocele and another one in group 2 had a cystocele combined with rectocele.

Except for residual urine volume, urodynamic parameters of all patients showed no significant change before and after VTH in group 1 and group 2 (Table 2). The residual urine volumes significantly decreased after surgery in both groups ( $84.1 \pm 95.6$  vs  $37.5 \pm 33.7$ ,  $p = 0.02$  in group 1;  $76.4 \pm 111.3$  vs  $32.6 \pm 30.3$ ,  $p = 0.02$  in group 2).

**Table 1.** Characteristics of Patients

	Mean $\pm$ SD		P value
	Group 1 (n = 28)	Group 2 (n = 36)	
Age (y)	62.3 $\pm$ 8.1	58.7 $\pm$ 11.7	0.150*
BMI (kg/m <sup>2</sup> )	25.1 $\pm$ 2.8	25.5 $\pm$ 3.3	0.452*
Parity (n)	5.1 $\pm$ 2.0	4.2 $\pm$ 1.3	0.081*
Menopause	85.7% (24)	66.6% (24)	0.144†
Severity of prolapse			
Stage 3	57.1% (16)	61.1% (22)	0.818†
Stage 4	42.9% (12)	38.9% (14)	0.787†
Operating time (min)	79.1 $\pm$ 18.0	81.8 $\pm$ 20.4	0.583#
Blood loss (mL)	123.9 $\pm$ 83.4	121.4 $\pm$ 89.8	0.586*
SS suspension	75.0% (18)	47.2% (17)	0.401†
Pessary test	60.7% (17)	22.2% (8)	0.002†
Admission day (d)	5.5 $\pm$ 0.9	5.2 $\pm$ 0.6	0.293*

Data are presented as Mean  $\pm$  SD or % (n). SD: standard deviation; BMI: body mass index; SS suspension: sacrospinous ligament suspension; \*: Mann-Whitney U test; #: Student's t test; †: Fisher's exact test

**Table 2.** Comparison between Pre- and Post-operative Urodynamic Data in Each Group

	Group 1		P value	Group 2		P value
	Pre-operation (n = 28)	Post-operation (n = 28)		Pre-operation (n = 36)	Post-operation (n = 36)	
MFR (mL/sec)	21.04 $\pm$ 11.6	21.64 $\pm$ 11.5	0.811	20.7 $\pm$ 9.6	22.0 $\pm$ 9.7	0.440
R/U (mL)	84.10 $\pm$ 95.6	37.50 $\pm$ 33.7	0.020	76.4 $\pm$ 111.3	32.6 $\pm$ 30.3	0.022
MCC (mL)	402.80 $\pm$ 157.9	372.70 $\pm$ 162.7	0.086	500.3 $\pm$ 124.5	470.7 $\pm$ 124.5	0.113
MUCP (cmH <sub>2</sub> O)	76.30 $\pm$ 39.5	74.80 $\pm$ 35.2	0.670	109.9 $\pm$ 44.3	96.4 $\pm$ 32.1	0.086
FL (mm)	23.10 $\pm$ 8.0	22.10 $\pm$ 5.0	0.479	26.5 $\pm$ 10.9	24.6 $\pm$ 6.4	0.246
Pdet Qmax (cmH <sub>2</sub> O)	18.30 $\pm$ 8.4	19.80 $\pm$ 7.9	0.120	21.5 $\pm$ 30.2	25.4 $\pm$ 14.8	0.419
Pdet Max (cmH <sub>2</sub> O)	35.00 $\pm$ 11.2	33.60 $\pm$ 8.6	0.442	40.9 $\pm$ 14.3	40.1 $\pm$ 18.1	0.802

Data are presented as Mean  $\pm$  SD; P values are calculated by paired-sample t test; SD: standard deviation; MFR: maximum flow rate; R/U: residual urine; MCC: maximum cystometric capacity; MUCP: maximum urethral closure pressure; FL: functional urethral length; Pdet Qmax: detrusor pressure at maximum flow; Pdet Max: maximum detrusor pressure

Comparing the urodynamic data between these two groups (Table 3), group 1 patients had smaller maximum cystometric capacity ( $p = 0.001$ ) and lower maximum urethral closure pressure (MUCP) before surgery ( $p = 0.008$ ). The positive pessary test rate was significantly higher for group 1 patients who had postsurgical urinary incontinence than for group 2 patients who had no urinary incontinence (60.7% vs 22.2%,  $p = 0.002$ ) (Table 1). Of the 17 patients with positive pessary tests in group 1, eight (47.1%) patients had clinical and urodynamic urinary incontinence, one (5.9%) had only clinical symptoms of SUI and eight (47.1%) had occult SUI. The remaining 11 patients in group 1 had negative pessary tests before surgery; among them, one (9.1%) demonstrated both clinical and urodynamic urinary incontinence, and 10 (90.9%) showed only occult SUI.

Multivariable logistic regression was done to determine the independent predictors of postsurgical urinary incontinence. Variables evaluated included age, hormone replacement therapy, menopause, parity, voiding symptoms, residual urine volume, maximum cystometric capacity, MUCP, functional urethral length, positive pessary result and concomitant sacrospinous ligament fixation. Of all the factors analyzed, a positive pessary test (odds ratio = 5.61,  $p = 0.01$ ), sacrospinous ligament fixation (odds ratio = 4.59,  $p = 0.02$ ) and lower MUCP (odds ratio = 0.98,  $p = 0.03$ ) stood out as the 3 significant predictors of postsurgical urinary incontinence (Table 4).

## DISCUSSION

VTH and anterior colporrhaphy together are a conventional procedure to treat prolapse with or without SUI due to urethral sphincter incontinence [2]. Nevertheless, the effects of hysterectomy on urinary

incontinence remain controversial [11-14]. Some authors reported that hysterectomy appeared to have detrimental effects on urinary incontinence because of pelvic nerve or pelvic supportive structure damage [11], while others observed no effect or improved urinary incontinence after hysterectomy [12-14]. A recent meta-analysis showed a summary risk increase of 60% for developing urinary incontinence after abdominal hysterectomy for women over the age of 60 [15].

By contrast with abdominal hysterectomy, there have been fewer studies focused on the outcome and effectiveness of VTH for pelvic organ prolapse, and its effect on postsurgical urinary incontinence. Altman et al compared the abdominal and vaginal routes of hysterectomy, and found no significant differences regarding the development of postsurgical urinary incontinence [16]. There were no significant changes in symptoms of SUI in the vaginal cohort at either the 6 or 12 month follow-up. Stanton et al performed anterior colporrhaphy with or without VTH in 73 patients for prolapse with and without incontinence [2]; they found symptoms of urge incontinence, SUI and prolapse were significantly reduced following surgery, and urodynamic data showed no significant change. The de novo SUI rate was 7% (5/73 patients), 2 patients after anterior repair and 3 patients after anterior repair with VTH. However, of the 29 incontinent patients in their study, 18 failed to attend complete postoperative review, which might have an effect on the disclosure of the true incidence of postsurgical urinary incontinence. In the current study, although as many as 44% (28/64) of patients had postsurgical incontinence after having vaginal reconstructive surgery, the majority of them (64%, 18/28) had only occult SUI that scarcely affected their daily life. Two possible reasons might help explain the higher incidence of postsurgical incontinence in our series than that reported in prior studies. First, our patients underwent postoperative follow-up for a longer period of at least a year. Second, all our patients received VTH, as opposed to the patients in other series who received anterior repair alone. Owing to the aforementioned data, it may seem not justifiable to routinely perform a prophylactic anti-incontinence procedure during prolapse repair regardless of the presence or absence of demonstrable incontinence.

Some investigators define the surgical management of women who have pelvic organ prolapse and concomitant SUI based on the results of urodynamic testing and a pessary test [3-6]. Bergman et al evaluated 67 continent women with genital prolapse; 24 (36%) had decreased abdominal pressure transmission to the urethra during prolapse reduction by vaginal pessary. Therefore, these patients underwent needle suspension in addition to prolapse repair and none had SUI postoperatively. None of the 43 remaining patients who had adequate abdominal pressure transmission to the urethra had postsurgical urinary incontinence [3]. Chaikin et al performed anterior colporrhaphy with or without a pubovaginal sling for patients with severe urogenital prolapse according to urodynamic findings [4]. They reported that two patients (14%) who had positive pessary test results before surgery had postsurgical urinary incontinence, while 10 patients with negative pessary test results had no postsurgical urinary incontinence. In their retrospective study of occult SUI and urogenital prolapse, Klutke and Ramos reported only 4% (1/55) of patients with positive pessary test results undergoing prophylactic Burch retropubic urethropexy had de novo SUI. In addition, of 70 patients without demonstrable leakage on preoperative placement of a pessary, none had SUI after reconstruction of the prolapse [5]. In a prospective randomized trial, Bump et al performed either needle colposuspension or bladder neck

**Table 3.** Comparison between Both Groups in Pre-operative Urodynamic Data

	Mean $\pm$ SD		P value
	Group 1 (n = 28)	Group 2 (n = 36)	
MFR (mL/sec)	21.0 $\pm$ 11.6	20.67 $\pm$ 9.6	0.889 <sup>#</sup>
R/U (mL)	84.1 $\pm$ 95.8	76.40 $\pm$ 111.3	0.151 <sup>*</sup>
MCC (mL)	402.8 $\pm$ 157.9	500.30 $\pm$ 124.5	0.008 <sup>*</sup>
MUCP (cmH <sub>2</sub> O)	76.3 $\pm$ 39.5	109.90 $\pm$ 44.3	0.001 <sup>*</sup>
FL (mm)	23.1 $\pm$ 8.0	26.50 $\pm$ 10.9	0.171 <sup>#</sup>
Pdet Qmax (cmH <sub>2</sub> O)	19.8 $\pm$ 7.9	25.40 $\pm$ 14.8	0.070 <sup>#</sup>
Pdet Max (cmH <sub>2</sub> O)	24.9 $\pm$ 11.2	30.90 $\pm$ 14.3	0.077 <sup>#</sup>

Data are presented as Mean  $\pm$ SD; SD: standard deviation; MFR: maximum flow rate; R/U: residual urine; MCC: maximum cystometric capacity; MUCP: maximum urethral closure pressure; FL: functional urethral length; Pdet Qmax: detrusor pressure at maximum flow; Pdet Max: maximum detrusor pressure; \*: Mann-Whitney U test; #: Student's t test

**Table 4.** Logistic Regression Analysis of Risk Factors for Postsurgical Urinary Incontinence

Risk factor		Odds ratio	95% CI <sup>*</sup>	P value
Pessary test	yes vs no	5.61	1.494-21.076	0.01
SS suspension	yes vs no	4.59	1.266-16.670	0.02
MUCP	yes vs no	0.98	0.969- 0.999	0.03

\*: Confidence interval; SS suspension: sacrospinous ligament suspension; MUCP: maximum urethral closure pressure

endopelvic fascia plication as part of vaginal reconstructive surgery in 32 patients with occult SUI and pelvic organ prolapse [17]. They reported needle colposuspension increased short-term complications without providing additional protection from de novo SUI. Pessary testing neither predicted a patient's bladder function after surgery nor indicated the need for a suspending urethropexy [17].

In our study, of the 17 patients with positive pessary tests in the postsurgical urinary incontinence group, 8 (47%) had symptomatic postsurgical urinary incontinence. Of 11 patients with negative pessary tests in the postsurgical urinary incontinence group, only one (9%) developed postoperative incontinence symptoms. We agree with the investigators of prior studies that it is not necessary to perform prophylactic anti-incontinence surgery on patients with a negative pessary test result [5]. Our patients, who had negative pessary tests but who developed postsurgical urinary incontinence after vaginal reconstructive surgery, had lower MUCP and more concomitant sacrospinous ligament suspensions. Sacrospinous ligament suspensions are often used to treat severe vaginal vault prolapse during a prolapse repair. As a result, the vagina is pulled forcefully in the lateral direction, thus altering the normal vaginal axis, which prevents the vagina from resting on the levator plate during increase in abdominal pressure [18]. Bonny believed that surgical procedures that displace the vagina in an anterior or posterior position predispose the woman to a compensatory abnormality [19]. Sze et al reported that 33% of patients with severe pelvic organ prolapse and SUI had recurrent prolapse after undergoing sacrospinous ligament fixation and transvaginal needle suspension [18]. Maher et al reported that abdominal sacral colpopexy and vaginal sacrospinous ligament suspension were both highly effective for the treatment of vaginal vault prolapse [20]. Among their patients, de novo SUI occurred with slightly greater frequency in the vaginal group (33%) than in the abdominal group (9%), although the difference was not statistically significant. The 33% rate for de novo SUI in the vaginal group is similar to that reported by Morley and DeLancey: 25% of their patients over 60 years of age experienced SUI after vaginal repair [21].

In conclusion, neither urodynamics nor clinical investigation predict with 100% certainty which women with pelvic organ prolapse will benefit from a prophylactic anti-incontinence procedure during prolapse repair surgery. Nevertheless, from our study, a positive pessary test, concomitant sacrospinous ligament fixation and lower MUCP proved to be the risk factors for post-hysterectomy urinary incontinence in continent patients with severe urogenital prolapse. It stands to reason that addition of an anti-incontinence procedure may effectively curb the occurrence of SUI.

## REFERENCES

1. Fianu S, Kjaeldgaard A, Larsson B: Preoperative screening for latent stress incontinence in women with cystocele. *Neurourol Urodyn* 1985; **4**:3-7.
2. Stanton SL, Hilton P, Norton C, Cardozo L: Clinical and urodynamic effects of anterior colporrhaphy and vaginal hysterectomy for prolapse with and without incontinence. *Br J Obstet Gynecol* 1982; **89**:459-463.
3. Bergman A, Koonings PP, Ballard CA: Predicting postoperative urinary incontinence in women undergoing operation for genitourinary prolapse. *Am J Obstet Gynecol* 1988; **158**:1171-1175.
4. Chaikin DC, Groutz A, Blaivas JG: Predicting the need for repair of severe urogenital prolapse. *J Urol* 2000; **163**:531-534.
5. Klutke JJ, Ramos S: Urodynamic outcome after surgery for severe prolapse and potential stress incontinence. *Am J Obstet Gynecol* 2000; **182**:1378-1381.
6. Bump RC, Fantl JA, Hurt WG: The mechanism of urinary incontinence in women with severe uterovaginal prolapse: results of barrier studies. *Obstet Gynecol* 1988; **72**:291-295.
7. Bump RC, Mattiasson A, Bo K, et al: The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol* 1996; **175**:10-17.
8. Bhatia NN, Bergman A: Pessary test in women with urinary incontinence. *Obstet Gynecol* 1985; **65**:220-226.
9. Liang CC, Chang TC, Soong YK: Vaginal hysterectomy with modified four-corner suspension for severe pelvic relaxation and stress incontinence. *J Gynecol Surg* 2001; **17**:41-47.
10. Miyazaki FS: Miya hook ligature carrier for sacrospinous ligament suspension. *Obstet Gynecol* 1987; **70**:286-288.
11. Parys BT, Haylen BT, Hutton JL, Parsons KF: The effects of simple hysterectomy on vesicourethral function. *Br J Urol* 1989; **64**:594-599.
12. Kjerulff KH, Langenberg PW, Greenaway L, Uman J, Harvey LA: Urinary incontinence and hysterectomy in a large prospective cohort study in American women. *J Urol* 2002; **167**:2088-2092.
13. Langer R, Neuman M, Ron-el R, Golan A, Bukovsky I, Caspi E: The effect of total abdominal hysterectomy on bladder function in asymptomatic women. *Obstet Gynecol* 1989; **74**:205-207.
14. Griffith-Jones MD, Jarvis GJ, McNamara HM: Adverse urinary symptoms after total abdominal hysterectomy-fact or fiction? *Br J Urol* 1989; **64**:594-599.
15. Brown JS, Sawaya G, Thom DH, Grady D: Hysterectomy and urinary incontinence: A systematic review. *Lancet* 2000; **356**:535-539.
16. Altman D, Lopez A, Falconer C, Zetterstrom J: The impact of hysterectomy on lower urinary tract symptoms. *Int Urogynecol J* 2003; **14**:418-423.
17. Bump RC, Hurt WG, Theofrastous JP, et al: Randomized prospective comparison of needle colposuspension versus endopelvic fascia plication for potential stress incontinence prophylaxis in women undergoing vaginal reconstruction for stage III or IV pelvic organ prolapse. *Am J Obstet Gynecol* 1996; **175**:326-335.
18. Sze EHM, Miklos JR, Partroll L, Roat TW, Karram MM: Sacrospinous ligament fixation with transvaginal needle suspension for advanced pelvic organ prolapse and stress incontinence. *Obstet Gynecol* 1997; **89**:94-96.
19. Bonny V: The principles that should underlie all operations for prolapse. *J Obstet Gynecol Br Emp* 1934; **41**:669-683.
20. Maher CF, Qatawneh AM, Dwyer PL, Carey MP, Cornish A, Schluter PJ: Abdominal sacral colpopexy or vaginal sacrospinous colpopexy for vaginal vault prolapse: A prospective randomized study. *Am J Obstet Gynecol* 2004; **190**:20-26.
21. Morley GW, DeLancey JOL: Sacrospinous ligament fixation for eversion of the vagina. *Am J Obstet Gynecol* 1988; **158**:872-881.