Management of Urinary Incontinence before and after Total Pelvic Reconstruction for Advanced Pelvic Organ Prolapse with and without Incontinence

Yu Song1,2, Xiao-Juan Wang3, Yi-Song Chen2,3, Ke-Qin Hua2,3

1Medical Center of Diagnosis and Treatment for Cervical Diseases, Obstetrics and Gynecology Hospital of Fudan University, Shanghai 200011, China
2Shanghai Key Laboratory of Female Reproductive Endocrine Related Diseases, Shanghai 200011, China
3Department of Gynecology, Obstetrics and Gynecology Hospital of Fudan University, Shanghai 200011, China

Abstract

Background: The effectiveness of an anti-incontinence procedure concomitant with prolapse reconstruction for pelvic organ prolapse (POP) in preventing urinary incontinence (UI) after surgery remains controversial. Our study aimed to describe the incidence of pre- and postoperative UI for pelvic reconstructive surgery and evaluate the management of POP associated with UI.

Methods: A total of 329 patients who underwent total pelvic reconstruction between June 2009 and February 2015 at a single institution were identified. These patients were divided into two groups (Group A [Prolift reconstruction]: n = 190 and Group B [modified total pelvic reconstruction]: n = 139). Data regarding surgical procedures and patient demographic variables were recorded. Chi-square and Student’s t-tests were used for two independent samples.

Results: A total of 115 patients presented with UI preoperatively. The average follow-up time was 46.5 months, with 20 patients lost to follow-up (6.1%). The cure rates of stress UI (SUI), urgency UI (UUI), and mixed UI (MUI) were 51% (30/59), 80% (16/20), and 48% (14/29), respectively. The cure rate of UUI after total pelvic reconstruction (80% [16/20]) was higher than that of SUI (50.8% [30/59], χ² = 5.219, P = 0.03), and the cure rate of MUI (48%, 14/29) was the lowest. The cure rate of patients with UI symptoms postoperatively was lower than that of those with symptoms preoperatively (9.1% [28/309] vs. 16.2% [50/309], χ² = 7.101, P = 0.01). There was no difference in the incidence of UI postoperatively between Groups A and B (P > 0.05). The cure rate of SUI in patients undergoing tension-free vaginal tape-obturator was not higher than that in those who did not undergo the procedure (42.9% [6/14] vs. 53.3% [24/45], χ² = 0.469, P = 0.49). There were no differences in the cure rate for POP or UI between these two types of reconstructions (P > 0.05).

Conclusions: No correlation between the incidence of UI and POP was identified. The results suggest that UI treatment should be performed after POP surgery for patients with both conditions.

Key words: Pelvic Organ Prolapse; Recurrence; Urinary Incontinence

Introduction

Among elderly women, pelvic organ prolapse (POP) and urinary incontinence (UI), including stress UI (SUI), urgency UI (UUI), and mixed UI (MUI) are major pelvic disorders, and these conditions always present simultaneously, especially in severe prolapse,[1,2] which has similar risk factors, such as injury during labor, constipation, and chronic cough.[3,4] Many cases of UI resolve after corrective surgery for POP,[5] however, de novo cases of UI may occur after corrective surgery for POP.[6,7] Patients without UI before pelvic reconstruction exhibit UI symptoms and physical signs after the operation, and this condition is called postoperative UI (POSUI).[8,9] Occult UI (OSUI) is used to describe a patient with advanced prolapse who develops UI after a reduction in genital prolapse, which is considered the main feature of POSUI.[10] To date, no correlation between POSUI and POP is identified.

Address for correspondence: Prof. Ke-Qin Hua, Department of Gynecology, Obstetrics and Gynecology Hospital of Fudan University, 419 Fang Xie Rd., Shanghai 200011, China
E-Mail: huakeqin_dfwz8@126.com

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the occurrence of POP and UI has been identified, and the therapeutic options for both conditions are distinct.

In the recent years, total pelvic reconstructions with the wide use of mesh implantation have increased. Huang et al.\textsuperscript{[11]} described a cohort of 34 women with an overall success rate of 97% for surgical anatomic correction after 24 months and 94% after more than 2 years. During this time, the tension-free vaginal tape-obturator (TVT-O) procedure has been shown to benefit patients with severe SUI. After analyzing 5 years of follow-up reports, Tommaselli et al.\textsuperscript{[12]} demonstrated that the objective cure rate for SUI after TVT-O was 82.6%. Basu et al.\textsuperscript{[13]} reported that UUI resolved in 61.7% of 128 participants after prolapse repair. Therefore, prolapse correction may impact UI occurrence and outcomes. This finding raises questions concerning how to manage prolapse when treating concurrent UI and whether management strategies can decrease the occurrence of UI after pelvic organ reconstruction.

However, the methods for reducing prolapse in urodynamic evaluation vary. For example, many authors recommend treating OSUI simultaneously during surgical correction of the prolapse; however, this approach may lead to SUI overtreatment and increased complication risks.\textsuperscript{[14,15]} Other authors, with the purpose of reducing costs as well as the risk arising from additional surgical procedures, recommend a single procedure for POP without prophylactic anti-incontinence therapy or a second treatment according to the postoperative reassessment.\textsuperscript{[10,16]}

In our study, we described the presentation of UI (including SUI, UUI, and MUI) pre- and postpelvic reconstruction surgery and aimed to discuss the appropriate management of POP associated with or without UI.

**METHODS**

**Ethical approval**

This study was approved by the Ethics Committee and the Institutional Review Board of Obstetrics and Gynecology Hospital of Fudan University, Shanghai, China (No. 2013-35). All patients included in the study provided informed consent and agreed to the operation.

**Patient selection**

For this retrospective study, data were analyzed from 329 patients who underwent total pelvic reconstruction between June 2009 and February 2015 at the Obstetrics and Gynecology Hospital of Fudan University, China. All patients with or without UI who chose reconstructive surgery were diagnosed with Stage III genital prolapse in at least one part according to the Pelvic Organ Prolapse-Quantification system. Patients with concurrent medical issues, such as neoplasm, menstrual disorders, or severe disease that were deemed unsuitable for surgery, were excluded.

A detailed past medical history, physical examination, X-ray, electrocardiogram, laboratory tests, and cardiorespiratory function evaluation were obtained for each patient. Patients also underwent an uro-gynecological examination, including urinary dynamic testing, stress tests, pad testing, and voiding diaries.\textsuperscript{[17]} For the purposes of the study, SUI was defined as an involuntary loss of urine during physical activity, coughing, or sneezing, according to the International Continence Society. SUI was divided into light, medium, and heavy degrees according to the subjective symptoms as follows: light, leakage of urine when coughing and sneezing, at least two times a week; medium, leakage occurs during daily activities such as brisk walking; and heavy, leakage occurs when standing with appropriate reference testing.\textsuperscript{[18]} OSUI was defined as leakage of urine when the patient was asked to cough in a sitting or standing position when the prolapse was reduced by pessary use.\textsuperscript{[19]} UUI was defined as involuntary loss of urine associated with urgency. MUI was defined as involuntary loss of urine associated with urgency and exertion, effort, sneezing, or coughing (i.e., UUI and SUI).\textsuperscript{[20]}

The total pelvic reconstructions performed included operations by Prolift (Group A)\textsuperscript{[7]} and modified total pelvic reconstruction according to our procedures (Group B), which were described in a previous article.\textsuperscript{[21,22]} Many POP patients with SUI of medium grade or above accepted a simultaneous TVT-O procedure according to their requirements. Follow-up evaluations were performed at 6 and 12 months after surgery.

**Statistical analysis**

We calculated either the mean ± standard deviations or the median (range) for continuous variables as well as the frequencies (percentages) for categorical variables. The differences between groups were calculated using Chi-square tests, Student’s t-test, or the Mann-Whitney test as appropriate. A value of $P < 0.05$ was considered statistically significant. Statistical analysis was performed using SPSS software, version 16.0 (SPSS Inc., Chicago, IL, USA) and Excel software (Microsoft Excel 2007, Microsoft Corp., Seattle, WA, USA).

**Results**

The clinical characteristics of 329 patients who underwent total pelvic reconstruction between June 2009 and February 2015 are shown in Table 1. Preoperatively, 115 POP patients suffered from UI, including 64 cases of SUI (including 48 cases of evident SUI and 16 cases of OSUI), 21 of UUI, and 30 of MUI. A total of 190 patients selected to undergo total pelvic reconstruction with the Prolift procedure (Group A) and 139 underwent modified total pelvic reconstruction (Group B). There was no difference between the two groups with respect to age and the incidence of concomitant UI and/or obstruction [Table 1].

The mean follow-up time for patients was 46.5 months (range, 12–80 months). A total of 20 patients (6.1%, 20/329) were lost to follow-up, including 5 with SUI, 1 with UUI, 1 with MUI, and 13 without the symptoms of UI [Figure 1]. Seventy-six patients had UI following surgery, including eight patients with recurrent SUI who accepted TVT-O, 40 with persistent UI who did not accept TVT-O or other
therapy, and 28 with de novo UI. SUI occurred in 48 (63%, 48/76) patients and was the main type of postoperative UI. MUI was the next most prevalent UI and occurred in 21 (27%, 21/76) patients. The remaining seven patients experienced symptoms of UUI (9%, 7/76).

The cure rates for each type of UI were as follows: SUI 51% (30/59), UUI 80% (16/20), and MUI 48% (14/29).

However, there were 17 cases of de novo SUI, 2 cases of de novo UUI, and 9 cases of MUI that occurred postoperatively. The cure rate of UUI after total pelvic reconstruction (80%, 16/20) was higher than that of SUI (50.8%, 30/59; P = 0.03), and the cure rate of MUI (48%, 14/29) was the lowest. The cure rate of patients with UI symptoms postoperatively was lower than that of those with symptoms preoperatively (9.1% [28/309] vs. 16.2% [50/309]; P = 0.01). There was no difference in the incidence of UI postoperatively between Groups A and B (P > 0.05).

The cure rate of SUI in patients undergoing TVT-O was not higher than that in those who did not undergo the procedure (42.9% [6/14] vs. 53.3% [24/45]; P = 0.49). Among patients with MUI, 53% (16/30) experienced resolution of stress urinary symptoms, and this number was equal to those with a single SUI without a TVT-O procedure. There were no significant differences in recurrence rates between OSUI and evident SUI (P > 0.05). It showed that patients without UI before surgery, after Prolift reconstruction, had MUI significantly more than that in modified total pelvic reconstruction (7.6% [8/105] vs. 1% [1/99]; P = 0.03). The above results are shown in Table 2.

Among cases of postoperative incontinence, 75% (57/76) occurred within 3 months after surgery and most were SUI cases [Figure 2]. There were 23 cases of POP recurrence, and

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**Table 1: Baseline demographic and clinical characteristics of patients who underwent pelvic reconstructions in Group A (Prolift reconstruction) and Group B (modified total pelvic reconstruction)**

| Characteristics                          | Group A (n = 190) | Group B (n = 139) | Statistics | P   |
|------------------------------------------|-------------------|-------------------|------------|-----|
| Age (years), mean ± SD                   | 62.9 ± 9.0        | 62.8 ± 10.9       | 0.002*     | 0.99|
| Body mass index (kg/m²)                  | 24.38 ± 12.88     | 23.73 ± 12.62     | 1.702*     | 0.09|
| Previous total hysterectomy, n (%)       | 24 (12.6)         | 20 (14.4)         | 0.214†     | 0.64|
| Parity (times), median (range)           | 2.0 (0–6.0)       | 1.5 (0–9.0)       | 1.001†     | 0.23|
| Preoperative bladder capacity (ml)       | 372.17 ± 97.33    | 373.99 ± 73.96    | 0.015*     | 0.88|
| Preoperative residual urine (ml)         | 73.01 ± 57.45     | 66.86 ± 67.71     | 0.692†     | 0.62|
| Postoperative residual urine (ml)        | 44.11 ± 39.7      | 41.53 ± 35.91     | 0.220†     | 0.89|
| Postoperative catheter reservation (days), median (range) | 5.5 (2.0–9.0)     | 6.5 (2.0–12.0)    | 0.850†     | 0.38|

Data were shown as mean ± SD, median (range), frequencies (proportions). *Student’s t-test; †Chi-square test; ‡Mann-Whitney test. SD: Standard deviation

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**Figure 1:** The flowchart of preoperative and postoperative urinary incontinence for a total of 329 patients with POP. POP: Pelvic organ prolapse; UI: Urinary incontinence; SUI: Stress urinary incontinence; TVT-O: Tension-free vaginal tape-obturator; MUI: Mixed urinary incontinence; UUI: Urgency urinary incontinence.
SUI and UUI are the most common types of UI. However, each type of UI has distinct mechanisms, clinical characteristics, and treatment strategies. Studies concerning the treatment of prolapse with accompanying SUI have reported conflicting results. Treating POP and SUI simultaneously may lead to overtreatment; however, treating POP alone might require a two-step surgery for UI after pelvic reconstruction. One purpose of the current study was to discuss the appropriate strategy for managing POP accompanied by UI.

Similar to POP, SUI is mostly attributed to loose pelvic floor connective tissue. Consequently, SUI is almost always accompanied by POP. The rate of SUI (28.6%, 94/329, single SUI + MIUI) in this study population was higher than that in the general population (17.1%), confirming that SUI is increased in patients with POP. Unfortunately, surgically curing POP does not necessarily guarantee resolution of symptoms of SUI. For example, many POP patients with SUI continue to suffer from UI after POP correction. In this study, compared with 64 patients preoperatively, only one patient suffered from recurrence of both POP and SUI. Postoperatively, there were 48 SUI cases, including 17 de novo cases. However, POP and SUI must be related. For example, a portion of SUI patients experienced relief of symptoms after total pelvic reconstruction. This phenomenon may be due to total or partial recovery of POP impacting mid-urethral urinary continence. Therefore, distinguishing between POP and SUI is necessary to offer patients the best treatment strategy.

In general, mid-urethral sling surgery (TVT-O or homologous) is ideally suited for solitary SUI of a moderate grade or higher. The objective cure rate of solitary SUI by TVT-O 5 years after the operation is 82.6%. In the current study, 14 patients who suffered from POP and SUI accepted TVT-O surgery and 8 experienced recurrence of SUI symptoms, indicating that the therapeutic effect of combination surgery was poorer than that of a single operation for SUI. We propose that the correction of POP could impact the formation of SUI, but this impact did not translate into an accurate preoperative forecast. This result could be due to inaccurate estimation of the impact of urinary continence induced by the degree of recovery of POP. More importantly, the cure rate of SUI in patients undergoing TVT-O was not higher than that in those without, and 53% (16/30) of patients with MUI experienced resolution of stress urinary symptoms after prolapse correction, equal to that after a single SUI without the TVT-O procedure. In addition, on average, SUI developed approximately 6 months after the operation. Based on these results, we recommend treating these conditions separately and performing total pelvic reconstruction before considering therapy for incontinence. However, for prolapse patients with serious symptoms of SUI, it may be difficult to undergo multiple surgeries; therefore, treatment should be considered on a case-by-case basis.

Richardson defined OSUI in 1983 and thought that a zigzag and obtuse urethra explained the symptoms of SUI; another noted that bulging of the posterior wall of the vagina pressed against the urethra, contributing to urinary continence. In this study, four patients with OSUI accepted the TVT-O procedure and SUI recurred in three of these patients. In addition, only four of the nine OSUI patients without TVT-O developed SUI symptoms. Therefore, the TVT-O procedure for the treatment of MUI did not decrease the recurrence of SUI. This phenomenon may be due to improper setting of the pelvic organs during surgery or differences in surgical procedures that more or less caused development of UI.
together, these findings suggest that treating OSUI with a simultaneous TVT-O procedure is unnecessary.

UIU is another common type of UI in this patient population, and its pathogenesis is related to POP. In this study, the incidence rate of UIU (2.3%, 7/309) in the postoperative period was lower than that in the preoperative period (6.4%, 21/329). Considering the addition of MUI cases, the postoperative rate (9.1%, 28/309) was also lower than the preoperative rate (15.5%, 51/329), but it was equivalent to that in the general population (11.7%). This finding may indicate that the surgical correction of POP is a major contributor to the decreased incidence of UIU and may be related to factors such as decreased friction, physical damage, and infection of the vaginal wall. Therefore, a short period of observation postoperatively for POP is necessary to prevent overtreatment of UI before using another management strategy, such as medicine therapy.

Finally, we would like to emphasize the importance of the urinary dynamic test. In this study, all types of UI, including MUI and UIU, were confirmed by urinary dynamic test pre- and postoperatively. The majority of patients in our cohort did not accept a simultaneous TVT-O procedure, and a minority of these patients continued to suffer from recurrent, persistent UI. Importantly, all patients were satisfied with the treatment experience, after receiving a detailed explanation of the surgery expectations and risks. Adequate examination and dissemination of relevant information, including risks and benefits, is necessary for POP patients preoperatively.

In summary, there are some relationships between POP repair and the occurrence and prognosis of different forms of UI. A full preoperative medical assessment and close postoperative follow-up are necessary. We suggested treating UI after the POP operation for patients with both conditions except for those with severe SUI. Due to the limitations of our clinical data and hospital-based retrospective study that could not be representative of the whole country, a prospective study with a larger sample is the best way to determine the correlation between UI and POP to guide evidence-based management.

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Conflicts of interest
There are no conflicts of interest.

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全盆底重建术前后尿失禁发生和治疗的研究

摘要

背景：盆底重建术同时行抗尿失禁手术用于预防盆腔器官脱垂患者术后尿失禁仍然存在争议。本文研究目的是描述盆底重建术前、术后尿失禁发生的情况，以及评估盆腔器官脱垂合并尿失禁的处理。

方法：2009年6月至2015年2月我院共计329名患者行全盆底重建术纳入研究。这些患者分成两组：A组行Prolift重建术，190人；B组行改良全盆底重建术，139人。记录患者的手术方式及一般资料。卡方检验、t检验用于两个独立样本分析。

结果：术前共有115人患尿失禁。平均随访时间46.5月，20名（6.1%）患者失访。压力性尿失禁、急迫性尿失禁及混合性尿失禁的治愈率分别是51%（30/59）、80%（16/20）及48%（14/29）。盆底重建术后急迫性尿失禁的治愈率（80%，16/20）高于压力性尿失禁（50.8%，30/59；P=0.035），而混合性尿失禁的治愈率最低（48%，14/29）。术后有尿失禁症状患者的治愈率低于术前有症状的患者（9.1% [28/309] vs. 16.2% [50/309]，P=0.007）。术后尿失禁的发病率在两组间没有明显差异（P>0.05）。TVT-O治疗压力性尿失禁与未行TVT-O之间没有明显差异（42.9% [6/14] vs. 53.3% [24/45]；P=0.493）。两种盆底重建术在治疗盆腔器官脱垂合并/不合并尿失禁没有明显差异（P>0.05）。

结论：尿失禁的发生和盆底手术没有明确关系。抗尿失禁治疗应在盆底重建术后再进行。