

Efficacy of Mid-Urethral Sling and Urethral Dilation for Stress Urinary Incontinence Combined with Urethral Stricture in Women

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ABSTRACT

Objective: To investigate the potential clinical benefits of mid-urethral sling (MUS) and urethral dilatation (UD) operations for the treatment of stress urinary incontinence (SUI) combined with urethral stricture.

Study Design: Descriptive study.

Place and Duration of the Study: Department of Urology, Beijing Chao-Yang Hospital, Capital Medical University, Beijing, China, from January 2017 to 2022.

Methodology: Patients with Qmax <15ml/s or PVR >50ml, and video urodynamic study (VUDS) capable of confirming the presence and position of urethral stricture were included. The clinical efficacy was evaluated by International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) questionnaire, maximum flow rate (Qmax), and postvoid residual (PVR) urine. ICIQ-SF, Qmax, and PVR were measured presurgery, on postoperative 2-week, and 1-month postsurgery.

Results: There were total 19 patients with an average age of 61.37 ± 11.28 years (range 39-84) with SUI and urethral stricture. ICIQ-SF scores were decreased significantly at one month postoperatively compared with the preoperative [5.0 (0.0, 7.0) vs. 14.0 (13.0, 15.0), $p < 0.001$]. Qmax was increased dramatically compared with the preoperative [21.3 (14.0, 28.4) vs. 13.0 (8.7, 18.0), $p < 0.001$], and PVR was decreased remarkably than the preoperative [0.0 (0.0, 0.0) vs. 0.0 (0.0, 60.0), $p = 0.018$]. Of 19 patients primarily managed with MUS and UD, two patients experienced recurrence requiring repetitive dilation till sling excision surgery was conducted, and improvement was evident in one patient after repeating UD.

Conclusion: The overall incidence of SUI combined with urethral stricture in women is low. With a success rate of 89.5%, MUS and UD were effective therapies for the co-existence of SUI with urethral stricture, and repeated UD can be performed safely if necessary in long-term follow-up.

Key Words: Stress urinary incontinence, Urethral stricture, Mid-urethral sling, Urethral dilatation.

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INTRODUCTION

Stress urinary incontinence (SUI) is defined as involuntary leakage of urine with coughing or sneezing or physical exertion.¹ The prevalence of SUI ranges from 1.5-39%.² Surgical intervention is the most effective therapy for female SUI. The primary categories of mid-urethral sling (MUS) are retropubic tension-free vaginal tape (TVT), tension-free vaginal tape-obturator (TVT-O), and single incision sling.³

Female urethral stricture disease is a rare condition that causes lower urinary tract symptoms (LUTS) which can have a serious impact on quality of life. Investigators have found that the incidence of urethral stricture ranges from 4-13%.⁴

Urethral stricture may present with symptoms such as frequency, dysuria, hesitancy, incomplete emptying, and recurrent urinary tract infections. The analysis of data from retrospective studies of patients with urethral stricture showed a mean success rate of 49% and significant improvements in Qmax and PVR with intermittent urethral dilatation.⁵

SUI in combination with urethral stricture is an extremely rare disorder. Patients potentially present with symptoms of urinary incontinence, possibly with complaints of dysuria, frequency, weak stream, and recurrent urinary tract infections. A multitude of procedures has been reported to handle SUI, including MUS,³ and open retropubic colposuspension,⁶ whereas procedures to manage urethral stricture include urethral dilatation (UD),⁷ urethroplasty,⁸ and temporary bulbar urethral stent placement after internal urethrotomy.⁹ The outcome after MUS and UD surgery is largely unknown and the most appropriate operation for SUI combined with urethral stricture remains to be clarified.

The aim of this study was to evaluate the clinical efficacy of MUS and UD in patients with SUI combined with urethral stricture by comparing preoperative and postoperative ICIQ-SF, Qmax, and PVR.

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METHODOLOGY

This was a retrospective study of patients diagnosed with SUI and urethral stricture who underwent MUS and UD between January 2017 and 2022 at Beijing Chao-Yang Hospital. The diagnosis was based on comprehensive history, clinical presentation, physical examination, uroflowmetry, PVR measurement, and video-urodynamic study (VUDS). Incontinence severity was measured using an Ingelman-Sundberg scale.¹⁰ Inclusion criteria were the patients with Qmax <15ml/s or PVR >50ml, and VUDS capable of confirming the presence and position of urethral stricture.^{11,12} Exclusion criteria were Qmax >15ml/s, VUDS demonstrates bladder neck obstruction, and coexistence of urethral diverticulum or pelvic organ prolapse.

All the procedures were completed by the same surgical group. The patient was placed in the lithotomy position and the buttocks reached the edge of the operating table. The operative field was cleaned with a standard antiseptic agent and draped with multiple drapes, taking care to keep the groin folds within the operative field. Metal urethral dilators were applied with oxybuprocaine hydrochloride gel, and the urethra was started to dilate using a 28F urethral dilator, which was left in the urethra for two minutes per time, and the urethral dilator was successively increased by 4F until it was dilated to 42F (Figure 1). Finally, the 42F urethral dilator was left in the urethra for 10 minutes and a 20 or 22 Fr Foley catheter was placed into the bladder after UD. Then, retropubic TVT procedures were performed using the vaginal approach, following the technique described by Ulmsten and the manufacturer. The TVT-O procedures were performed using the vaginal approach, from inside to outside, as described by Jean de Leval.^{13,14}



Figure 1: Different sizes of metal urethral dilators.

Uroflowmetry and PVR were performed 24 hours after the procedure. The objective criteria of cure were defined as Qmax >15ml/s or PVR <50 mL. Patients who met the cure criteria could be discharged. Patients with the Qmax <15ml/s or PVR >50ml were still receiving UD, but they could be discharged once the Qmax >15ml/s or PVR <50ml. Patients were reviewed

at two weeks postoperatively and UD was performed in the outpatient clinic, with the evaluation of urinary symptoms according to the ICIQ-SF questionnaire pre- and post-operatively. The patients' uroflowmetry and PVR were also measured if Qmax <15ml/s or PVR >50ml, UD was repeated at an interval of one month with assessment of uroflowmetry, PVR and completion of the ICIQ-SF questionnaire. Nineteen patients were evaluated by telephone at three months postoperatively. Pre- and postoperative data of ICIQ-SF scores, Qmax, and PVR were compared for each patient.

All statistical analyses were carried out with SPSS statistical software version 26.0 (IBM, Chicago, IL, USA). The normality test was performed for continuous variables, which were normally distributed when Shapiro-Wilk showed that the p >0.05, and non-normally distributed when the p <0.05. Normal distributions of continuous variables were expressed as means ± standard deviations (SD). Whereas, non-normally distributed continuous variables were reported as median with interquartile range (Q1, Q3) and compared by Wilcoxon-signed-rank test. Categorical variables were presented as frequencies and percentages. A p <0.05 was considered statistically significant.

RESULTS

Nineteen patients with objective evidence of SUI and urethral stricture were enrolled in this study. The average age and body mass index (BMI) were 61.37 ± 11.28 years and 25.72 ± 3.91 kg/m², respectively. The clinical characteristics of the patients are displayed in Table I.

Table I: Clinical characteristics of 19 patients with SUI and urethral stricture.

Characteristics	n	%
Mean age (years)		
<60	6	31.6
≥60	13	68.4
BMI (kg/m ²)		
<25	10	52.6
≥25	9	47.4
No. of births		
1	11	57.9
2	5	26.3
≥3	3	15.8
Smoking status		
No	19	100
Yes	0	0.0
Diabetes	1	5.3
Hypertension	5	26.3
Ingelman-Sundberg scale		
I	10	52.6
II	7	36.8
III	2	10.5
Operation		
TVT-O	14	73.7
TVT	5	26.3
Times of UD		
1-3	16	84.2
4-6	3	15.8

No., Number; BMI, Body mass index; TVT-O, Transobturator tension-free vaginal tape; TVT, Retropubic tension-free vaginal tape; UD, Urethral dilatation.

The comparison of preoperative and postoperative ICIQ-SF scores, Qmax, and PVR data is listed in Table II. Qmax increased significantly at one month postoperatively compared with the preoperative [21.30 (14.00, 28.40) ml/s vs. 13.00 (8.70, 18.00) ml/s, $p = 0.001$], and PVR decreased markedly [0.00 (0.00, 0.00) ml vs. 0.00 (0.00, 60.00) ml, $p = 0.018$]. The preoperative ICIQ-SF scores were higher than the postoperative, and the difference was statistically significant ($p < 0.001$).

During follow-up, 16 patients (84.2%) were considered to have successfully improved after MUS and UD. Moreover, three patients (15.8%) experienced no improvement after one month postoperatively. These patients performed several UD at the outpatient clinic, one patient had significant amelioration of symptoms after two times of UD, and PVR decreased from 120ml to 0ml. One patient received five times UD with Qmax increasing from 3.5ml/s to 7.5ml/s and PVR decreasing from 100ml to 10ml, but without significant alleviation, the patient underwent sling release at six months postoperatively. Another patient received three times UD, Qmax decreased from 10.5ml/s to 7.5ml/s, and PVR was 0ml. The patient did not want to be dilated further, so she underwent resection of the sling.

Table II: Comparison of ICIQ-SF, Qmax, and PVR pre- and postoperative.

Variables	Preoperative	Postoperative	p-value
Qmax (ml/s)	13.00 (8.70,18.00)	21.30 (14.00,28.40)	0.001
PVR (ml)	0.00 (0.00,60.00)	0.00 (0.00,0.00)	0.018
ICIQ-SF	14.00 (13.00,15.00)	5.00 (0.00,7.00)	<0.001

Qmax, Maximum uroflow rate; PVR, Postvoid residual urine volume; ICIQ-SF, International Consultation on Incontinence Questionnaire-Short Form. Data were presented as M (Q1, Q3) and compared by Wilcoxon-Signed-Rank's test.

DISCUSSION

SUI is a prevalent problem in women and affects about 50% of adult women. As this condition worsens with age, it can dramatically affect the quality of life for elderly females.¹⁵ Serati *et al.* reported that TVT-O was a high-efficacy and safe operation for the management of SUI, the 13-year subjective cure rate was 95% and long-term complications were low.¹⁶ In this study, 14 patients underwent TVT-O and five patients received TVT. Their urinary incontinence symptoms improved noticeably and no recurrence was identified during the follow-up period.

The aetiology of urethral stricture in females is unknown and uncommon. Some aetiologies include iatrogenic, urethritis, idiopathic, and trauma.¹⁷ Urethral stricture disease accounts for about 18% of women with bladder outlet obstruction (BOO).¹⁸ In the experience of this research, BOO was considered when Qmax was <15ml/s or PVR >50ml.¹¹ Further VUDS was then conducted in these patients, in which the urethral morphology was visualised by simultaneous x-ray fluoroscopy, and the presence of urethral stricture could be identified when urinary flow weakened or interrupted at the distal urethra.

The symptoms of SUI and urethral stricture contradict one another. It is necessary to first identify the cause of the dysuria before anti-incontinence surgery can be performed. In the present study, 19 patients had VUDS proved that the dysuria was

caused by urethral stricture, and it was clear that the urethral stenosis was located at the distal urethra. Treatment options included UD, urethrotomy¹⁹ and urethroplasty.⁸ Romman *et al.* reported that UD was effective for the treatment of urethral stricture, and the success rate was 51% after one UD with no additional or repeat procedures thereafter.²⁰ In this study, 89.5% (17/19) of women showed no recurrence of stricture after the procedure, with a significant improvement in Qmax and a significant reduction in PVR.

MUS has become popular as the most effective surgical treatment for female SUI, while the incidence of urinary retention was 2.2-16% with 1.5-7.8% of patients requiring long-term self-catheterisation.²¹ Previous studies have reported a 2.8-14% incidence of postoperative urinary retention or obstructive voiding symptoms after the procedure.²² However, consensus on the management of post-operative voiding dysfunction is still lacking. Regarding this dilemma, a study showed that seven women (3%) had urinary retention after surgery, and five of them were successfully treated using a Foley catheter.²³ Another study reported that 22 (5.6%) patients developed postoperative voiding dysfunction, and 72% of them returned to normal voiding function with self-catheterisation. The authors demonstrated that self-catheterisation was a suitable and effective method for managing voiding dysfunction and avoided the risk of further surgery, including the recurrence of SUI.²⁴ Furthermore, Ross *et al.* have reported that 60% of patients experienced obstruction after urethral sling surgery, and sling excision can be successfully performed with promising results.²⁵

In this research, 19 patients with both SUI and urethral stricture underwent MUS and UD, simultaneously. For patients with insignificant improvement, Qmax <15ml/s or PVR >50ml, the authors proposed to perform the first UD two weeks after surgery, followed by dilatation at an interval of one month. This research observed 15.8% of patients with voiding dysfunction, of which one patient was successfully relieved by repeated UD and no further subjective complaints of BOO. Another two patients underwent sling release after repeated UD without alleviation. Notoriously, there is no consensus on guidelines for the management of SUI combined with urethral stricture disease due to the lack of large, randomised, controlled trials investigating this field. Although previously published studies showed a decreased success rate of patients receiving repeat dilations. In this practice, patients received UD in conjunction with MUS, followed by UD two weeks after the procedure and again one month after surgery, if necessary. Majority i.e. 84.2% of women were following the treatment and did not require re-dilatation on follow-up. Consequently, when voiding dysfunction after MUS and UD are clinically present, sling release should not be performed immediately, but UD should be attempted first, and good results of this minimally invasive and convenient therapy be expected.

However, there are some limitations to this study. First, the present study was a single-centric investigation with a limited duration of follow-up. Second, the prevalence of SUI in combination with urethral stricture was low and the number of eligible

patients was rare. Lastly, this study was a non-randomised trial and the data were analysed retrospectively. Although the number of patients studied was small, the data indicated that the treatment is simple, rapid and effective. The authors will obtain more cases and longer follow-up results in future works.

CONCLUSION

SUI combined with urethral stricture is a very rare condition; therefore, there are no standard treatment guidelines. Incontinence was treated or improved in 100% of patients following UD and MUS, and stricture was resolved in 89.5% of patients. Sling release should be avoided as it may lead to worse continence outcomes in patients with postsurgical voiding dysfunction. The results of performing repeated UD may be expected and can be performed safely if necessary.

ETHICAL APPROVAL:

The study was approved by the Institutional Review Committee of the Beijing Chao-Yang Hospital, Beijing, China.

PATIENTS' CONSENT:

Informed consent was obtained from the patients.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

YQ: Writing original draft, conceptualisation, and methodology.

PQ: Data curation and visualisation.

XG: Supervision, writing, reviewing, and editing.

BW: Follow-up and investigation of the patients.

All authors approved the final version of the manuscript to be published.

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