

Abstract

The aim of this study was to preoperatively identify the urethral motion profile (UMP) in stress urinary incontinence (SUI) patients and analyze the correlation between postoperative tape position and success. Prospective cohort study data from December 2019 to January 2023 was acquired. Patients treated with SIMS for SUI were consecutive. Pre-operative and 3-6 months post-operative clinical examinations included stress tests, pelvic floor ultrasound (PFUS), tape position and mobility evaluations, and incontinence questionnaires. This research included data from 9 women who had SIMS for SUI. Three of these patients' post-operative had positive stress tests (Group F) and six had negative stress tests (matched in age and weight) as the control group. Group F exhibited higher pre-operative uroflowmetry Qmax and Qave. Group F showed considerably poorer mobility in UMP Points 1-4 and all UMP points. Post-operative sonography showed that Group F had more peripheral sling placement compared to Group C. In conclusion, pre-operative UMP screening may reveal sling failures.

Introduction

Despite SUI being a prevalent condition, its pathophysiology remains unclear. Hence, the occurrences of post-anti-incontinence procedure failures pose a challenging conundrum to elucidate. Interestingly, the location at which the sub-urethral slings are inserted has undergone changes over time: starting from 0.5 cm away from the external urethral orifice (EUO), then moving to 1 cm away from the EUO, then following the '1/3 rule' from the EUO, and currently at the midpoint of the length of the urethra. However, some authors propose an even closer insertion point to the internal urethral orifice (IUO) for the sling [1]. The UMP is a sonographic modality utilized for the evaluation of urethral mobility. The urethra is divided into six equidistant points from the bladder neck to the EUO, and their mobility is calculated with measurements at rest and at maximum Valsalva maneuver. Increased UMP appears to be associated with SUI [2]. The assessment of the positioning of the sling in relation to the UMP and the distances from the EUO and the IUO is a topic that has not been extensively researched. The objective of this study was to preoperatively determine the UMP in patients with SUI, and subsequently examine the correlation between the postoperative tape position and the achievement of a successful outcome.

Methods and Materials

Data from a prospective cohort study that was conducted from December 2019 to January 2023 were acquired. Consecutive patients who underwent SIMS treatment for SUI were included in the study. The individuals exhibited symptoms of SUI, and they were initially assessed in an outpatient clinic [medical history, Pelvic Organ Prolapse Quantification (POP-Q), cough stress test, urodynamic examination, and PFUS with a focus on the UMP]. Patients with pelvic organ prolapse and a history of prior incontinence surgery were excluded. The patients underwent an evaluation 3-6 months after the surgical procedure, which involved a clinical examination consisting of a stress test, PFUS to assess the position and mobility of the tape, and incontinence questionnaires (PGI-I, PGI-S, ICIQ-SF). Statistical analysis was performed using Microsoft EXCEL for data processing.

Table 1. Baseline Characteristics, demographics & Urodynamics

Baseline Characteristics, demographics & Urodynamics		
Baseline Characteristics	Failed Sling	Successful Sling
Total Number of patients, N	3	6
Mean age, (SD) years	69.0 (14.4)	67.5 (12.1)
BMI, (SD) kg/m ²	31.0 (2.2)	30.3 (3.9)
Parity, (SD) N	2.7 (0.6)	2.5 (0.8)
Weight of Heavier baby	3700 (529)	3600 (499)
Menopause	100.0 %	100.0%
Urodynamic results		
SUI, N - %	3 (100%)	6 (100%)
MUI, N - %	1 (33%)	1 (16.7%)
Mean Stress test (SD),N cough	1.0 (0.0)	1.3 (0.5)
Mean VLPP (SD)	58.3 (20.2)	62.8 (24.3)
Mean MCC (SD), ml	447 (162)	520 (167)
Mean F/F Qmax, (SD)	29.3 (27.2)	17.2 (10.3)
Mean F/F Qave, (SD)	15.7 (15.2)	7 (4.3)

SD=Standard Deviation; BMI=Body Mass Index; SUI=Stress Urinary Incontinence; MUI=Mixed Urinary Incontinence; VLPP=Valsalva Leak Point Pressure; MCC=Maximum Cystometric Capacity; F/F=Free flow.

Results

Data from nine female patients who underwent a single-incision mid-urethral sling procedure for SUI was used for the purpose of this study. Three of these patients exhibited positive stress test results (indicating a failed procedure / Group F), while an additional 6 patients with negative stress test results (matched based on age and weight) were designated as the control group (Group C). The demographic characteristics are illustrated in Table 1. Group F had higher pre-operative Qmax and Qave at uroflowmetry. Regarding pre-operative sonographic parameters, Group F had significantly lower mobility in Points 1-4 in the UMP, and overall lower mobility in all UMP points. The post-operative sonographic evaluation revealed that the positioning of the sling was marginally peripheral in Group F compared to Group C (20.9 to 20.2mm in relation to bladder neck and sling placement at 2.5 compared to 2.7 quadrant).

Urethral Motion Profile

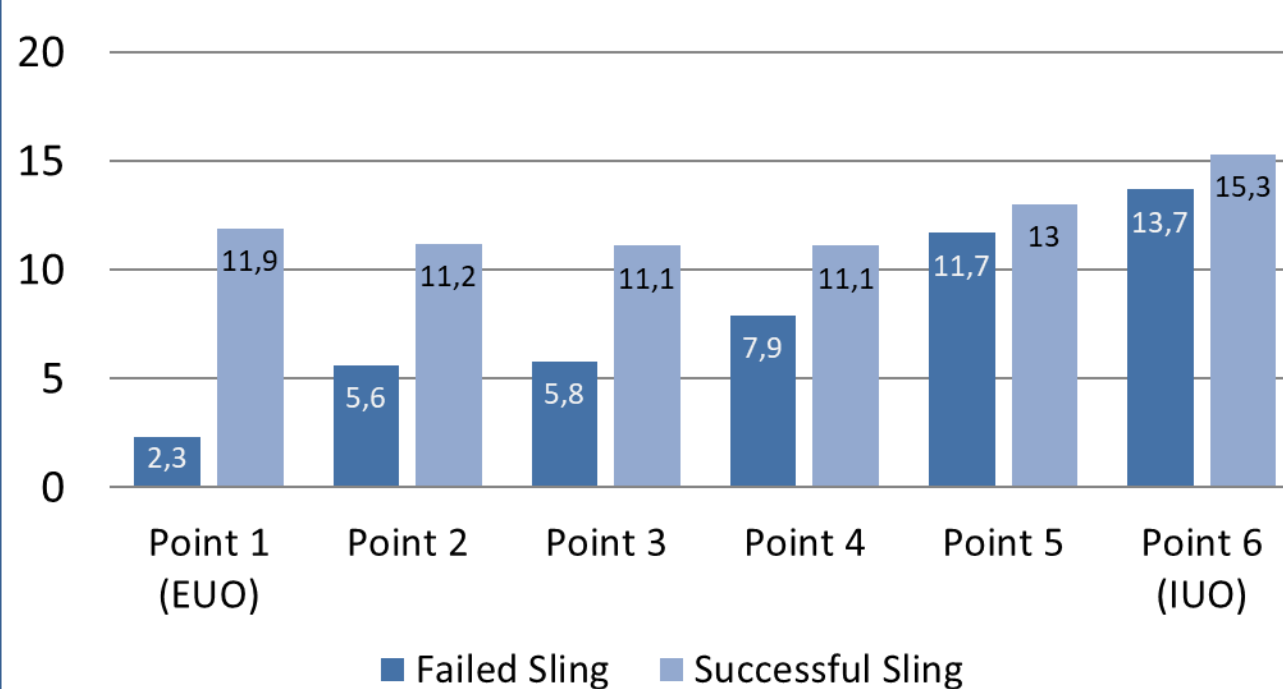


Chart 1. Urethral Motion Profile.

Table 2. Sonographic parameters

Sonographic parameters		
Baseline Characteristics	Failed Sling	Successful Sling
Urethral length (mm)	33.4 (2.3)	31.6 (3.2)
Urethral Motion Profile		
Point 1 (EUO)	2.3 (1.3)	11.9 (4.2)
Point 2	5.6 (4.9)	11.2 (4.8)
Point 3	5.8 (4.9)	11.1 (4.7)
Point 4	7.9 (5.7)	11.1 (5.4)
Point 5	11.7 (4.5)	13.0 (6.1)
Point 6 (IUO)	13.7 (5.7)	15.3 (7.2)
Sling position		
Distance of sling from IUO (mm)	20.9 (4.9)	20.2 (3.9)
Distance of sling from EUO (mm)	13.1 (3.4)	15.0 (4.9)
Place of Sling (1 st – 5 th quarter)	2.5 (0.7)	2.7 (1.1)

EUO= External Urethral Orifice; IUO= Internal Urethral Orifice

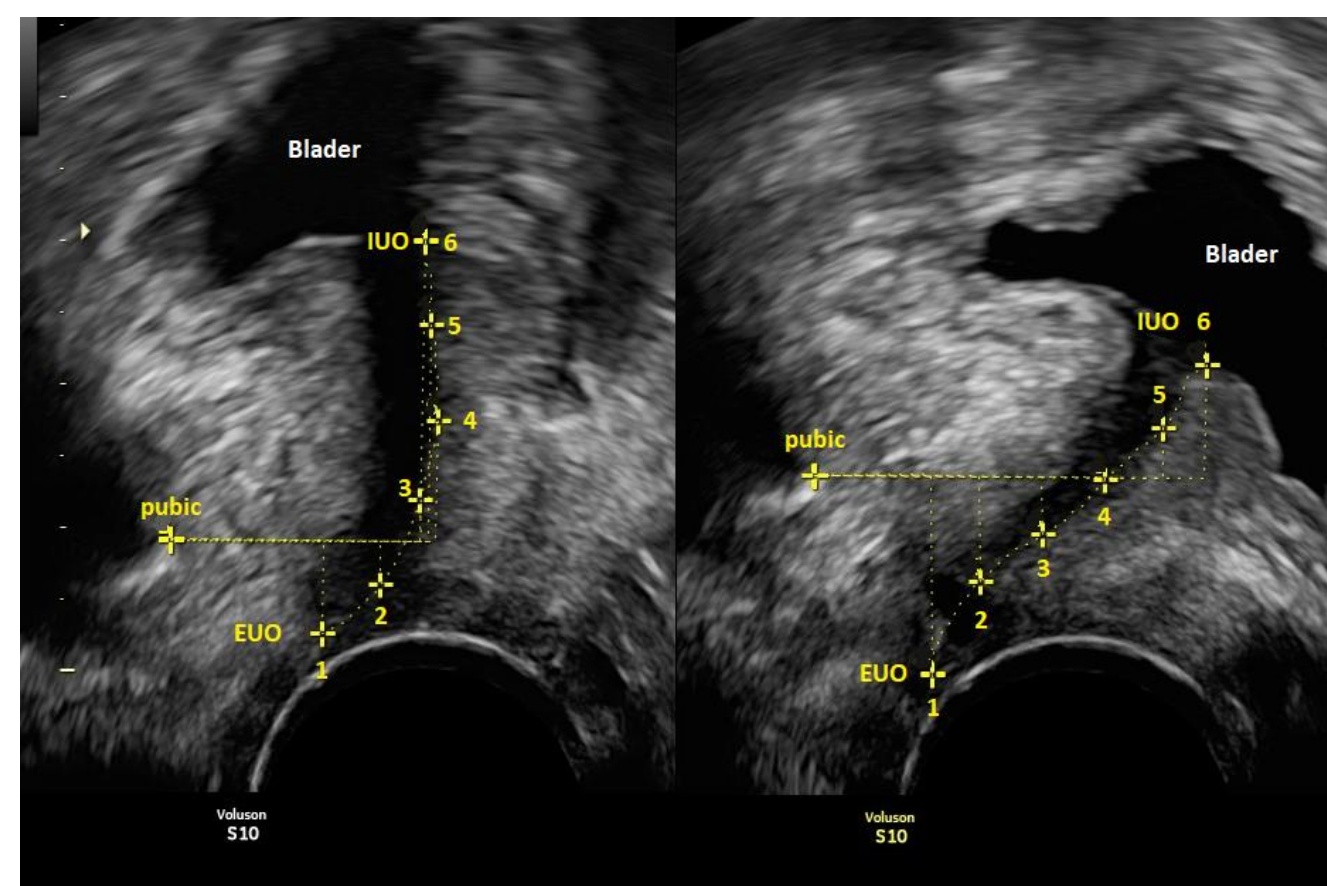


Figure 1. Urethral Motion Profile

Discussion

Unsuccessful slings were found to be correlated with higher Qmax and decreased UMP. This aligns with the widely accepted concept that slings have shown higher success rates in women with urethras exhibiting good mobility as opposed to women with limited mobility urethras. Ultrasound possesses the benefits of being a non-invasive modality that can be examined using advanced technology instruments to facilitate in-depth analysis.

Conclusions

The sonographic evaluation of urethral mobility is a relatively unexplored field in medical research. The pre-operative assessment of the UMP could indicate potential sling failures.

References

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