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ORIGINAL ARTICLE

Concurrent midurethral sling excision or lysis at the time of repeat sling for treatment of recurrent or persistent stress urinary incontinence

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Abstract
Introduction and hypothesis Limited evidence guides operative technique in primary midurethral sling (MUS) lysis or excision at the time of repeat sling placement for persistent or recurrent stress urinary incontinence (SUI). Our objective is to compare subjective improvement in patients undergoing repeat MUS placement with and without concurrent primary sling lysis or removal.
Methods This was a retrospective cohort study with a prospective survey of patients who underwent two MUS placements for SUI at a single institution from January 1996 to December 2015. After patient identification, the electronic record was queried for demographic and perioperative data. Subjects then completed the Urogenital Distress Index, (UDI-6), Incontinence Severity Index (ISI), and the Incontinence Impact Questionnaire (IIQ-7). Subjects were also asked if they would choose to undergo repeat MUS surgery again.
Results Sixty-one patients were included. 17 out of 61 (28%) underwent concomitant primary sling lysis or excision, and 44 out of 61 (72%) did not. Fifty-seven percent ($n = 35$) completed the survey. Of the respondents, the median ISI score was 4 (1–8), with no difference between groups; 14 out of 35 (40%) reported the presence of bothersome urge incontinence, 11 out of 35 (31%) reported bothersome stress urinary incontinence, and 8 out of 35 (23%) reported symptoms of voiding dysfunction, with no difference between groups. 57% of patients (20 out of 35) would undergo repeat MUS placement again.
Conclusions In a small cohort, concurrent excision of the primary sling at the time of repeat MUS did not improve subjective outcomes. Many patients reported urinary urgency and voiding symptoms, and only about half of patients would choose to undergo the surgery again if given the choice.

Keywords Midurethral sling · Stress urinary incontinence · Recurrent stress urinary incontinence · Midurethral sling excision · Midurethral sling revision

Introduction

Synthetic midurethral slings (MUS) are considered the gold standard surgical treatment for stress urinary incontinence (SUI), as cure rates after MUS placement are generally high, with long-term cure rates of 43–92% [1, 2].

Recurrent SUI refers to the recurrence of symptoms after an asymptomatic period following surgery, whereas persistent SUI refers to symptoms that remain, despite the performance of an anti-incontinence procedure [3]. Reoperation rates for persistent or recurrent SUI after any surgical intervention for SUI range from 3.7 to 10% [4–6]. Repeat synthetic MUS is often the first-choice treatment for recurrent or persistent SUI after a failed sling [7–9]. Although there are limited data examining success after repeat MUS, reported cure rates are high, ranging from 62 to 100% [10, 11].

Surgical practices vary in the technique used to place the second MUS. Some providers leave the primary sling intact, whereas others excise a portion or all of the primary sling at

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the time of repeat sling placement. In one study examining SUI outcomes after repeat MUS with the primary sling left intact, patients had subjective SUI cure rates of 71% with a retropubic approach and 48% with a transobturator approach [8]. In another retrospective analysis of repeat MUS in 80 patients, with heterogeneity in surgical technique used, the overall subjective cure rate was 62%. There are currently limited data to suggest a significant difference in patient satisfaction when a primary sling is lysed or excised versus being left intact at the time of repeat MUS placement [7]. With this lack of data to guide surgical practice in repeat MUS placement, the objective of this study is to compare subjective improvement in patients undergoing repeat MUS placement with and without concurrent primary sling excision.

Materials and methods

This was an IRB-approved retrospective cohort study with a prospective survey component; data were gathered via chart review with subsequent patient telephone interview. Eligible patients were identified via a search of the medical billing records from January 1996 through December 2015 using current procedural terminology (CPT) codes 57288 (sling operation for stress incontinence) and 57287 (sling revision/removal).

Eligible subjects were those who had undergone two MUS placements during the study time frame. All slings were placed by urogynecologists at our institution. The primary MUS procedure was either performed in isolation for the indication of stress or mixed urinary incontinence, or with concurrent pelvic organ prolapse procedures. The second surgery included placement of repeat synthetic MUS, with or without primary sling excision. Patients undergoing revision of the primary sling alone, without repeat MUS, were excluded. Subjects were excluded if they did not have both slings placed at our institution. Operative reports were reviewed to confirm subject eligibility.

Once subjects were identified, the electronic medical record was queried for demographic and peri-operative data. Pre-operative data recorded included patient characteristics and results of pre-operative urodynamic testing. Operative reports were used to collect intra-operative data, including type of sling placed (retropubic versus transobturator) and whether the first sling was left intact, lysed, or partially or fully excised at the time of repeat MUS placement. Complete excision was defined as removal of the sling from the lateral-most portion of the mesh arms under the bony pelvis bilaterally. Concomitant procedures and any intraoperative complications during the repeat sling surgery were also recorded. Post-operative data, including reports of post-operative incontinence and voiding symptoms, were gathered from the last date of follow-up in the urogynecology office.

Subjects identified in the retrospective portion of the study were then sent a letter describing the study, and an opt-out system was used to obtain consent for the follow-up survey. Subjects were then contacted by telephone. All patients who agreed to participate were given the opportunity to complete the follow-up survey via telephone or paper copy. If patients were unavailable via telephone, three total attempts were made. The follow-up survey included three validated questionnaires for continence and quality-of-life outcomes: Urogenital Distress Index (UDI-6), Incontinence Severity Index (ISI), and Incontinence Impact Questionnaire (IIQ-7) [12–14]. Subjects were also asked if, given their current knowledge, they would have chosen to undergo repeat MUS surgery.

Descriptive statistics were reported for all groups as n/N (%) with 95% confidence intervals for categorical variables and as mean ± SD and median (range) for all continuous variables. As the number of respondents was small, patients with partial and complete sling excisions were analyzed together and compared with patients whose primary sling was left intact, and nonparametric statistics were used to compare the questionnaire scores of those subjects who responded. Pearson's Chi-squared test was used to compare categorical data, and the Wilcoxon rank-sum test was used to compare continuous data. All tests were two-sided and were considered significant at $p \leq 0.05$. JMP® 12.0 (SAS Institute, Cary, NC, USA) was used for all statistical analyses [15].

Results

During the study period, 61 subjects underwent primary sling placement for stress urinary incontinence followed by a secondary MUS surgery for recurrent or persistent SUI. Of the 61 subjects, 17 out of 61 (28%, 95% confidence interval [CI; 18, 40]) underwent concomitant primary sling excision, and 44 out of 61 (72%, 95%CI [60, 82]) underwent repeat MUS with the primary sling left intact. The primary sling was left intact in 1 patient after excision was abandoned owing difficult dissection, and 2 patients in whom it had been planned to leave the primary sling intact underwent partial excision for proper repeat sling placement. All other patients underwent the planned surgical procedure. Of the 17 subjects who underwent excision, 1 underwent simple lysis at the time of repeat sling placement, 10 underwent complete excision of the primary sling (9 of which were for an indication such as urge urinary incontinence [UUI], voiding dysfunction [VD], erosion, or pain), and 6 underwent partial excision of the sling (3 of which were for an indication such as erosion or elevated detrusor pressure). Median time to follow-up for all subjects was 104 days (range, 29–3,735); no follow-up $n = 4$).

Of all eligible subjects, 35 out of 61 (57%, 95%CI [45, 69]) responded to the survey portion of the study. Table 1 displays

Table 1 Patient characteristics for respondents and nonrespondents

	All subjects ($N = 61$)	Respondents ($n = 35$)	Nonrespondents ($n = 26$)	p
Primary sling excised	28 (17)	31 (11)	23 (6)	0.47
Age (years)	61 (±12)	61 (±10)	61 (±14)	0.91
BMI (kg/m^2)	28 (20–51)	29.5 (20–50)	26 (20–51)	0.03*
Current tobacco use	8 (5)	6 (2)	12 (3)	0.38
Parity >2	36 (22)	31 (11)	42 (11)	0.12
POP surgery before or at the time of primary sling	54 (33)	54 (19)	54 (14)	0.97
POP surgery at the time of repeat sling	28 (17)	23 (8)	35 (9)	0.31
Months between sling surgeries	27 (1–134)	23 (1–132)	27 (1–134)	0.30
Months from repeat sling to phone interview	67 (11–149)	67 (11–149)	N/A	N/A
Mean LPP before repeat sling (cm H_2O), $n = 26$	85 (±30)	82 (±27)	90 (±36)	0.62

Data presented as % (n), mean (±SD), median (range)

Demographic and clinical data of respondents and nonrespondents were compared

Pearson's Chi-squared test was used to compare categorical data, and the Wilcoxon rank-sum test was used to compare continuous data

BMI body mass index, *POP* pelvic organ prolapse, *LPP* leak point pressure

*p significant ≤0.05

patient characteristics for all patients in addition to those who responded to the survey, and those who did not. The mean age of all subjects was 61 (±10) years. Respondents and nonrespondents were demographically similar, with the exception of BMI: median 29.5 (20–50) kg/m^2 vs 26 (20–51) kg/m^2 $p = 0.03$.

The primary sling approach was retropubic in 26 out of 61 (43%, 95%CI [31, 55]) patients, transobturator in 33 out of 61 (54%, 95%CI [41, 66]) patients, and a mini-sling in 2 out of 61 (3%, 95%CI [1, 11]) patients. The repeat sling approach was retropubic in 49 out of 061 (80%, 95%CI [69, 88]) patients, transobturator in 10 out of 61 (16%, 95%CI [9, 28]) patients, and single-incision in 2 out of 61 (3%, 95%CI [1, 11]) patients. The median time between the primary sling and secondary sling placement was 27 (1–134) months for all patients; and there was no difference in median time to second sling placement between respondents and nonrespondents. Urodynamic data were available for 26 patients before their secondary sling placement; there were no differences in urodynamic parameters between those patients who responded to the survey and those who did not. Preoperative UDS was performed in 37 subjects, 7 of whom were noted to have pre-operative DO.

Table 2 displays patient characteristics for all respondents by surgical technique (sling excision [$n = 11$] vs no excision [$n = 24$]). There were no statistical differences between the groups. The median time from repeat sling placement to phone interview for all respondents was 23 (1–132) months. Median time from repeat sling placement to phone interview was shorter in patients with the primary sling excised compared with those in whom their sling was left intact, but this time difference was not statistically significant (data not shown).

Table 3 displays patient-reported subjective outcomes by surgical technique for the 35 survey respondents. Respondents were considered to have UUI, stress urinary incontinence (SUI), or voiding dysfunction (VD) if responses to the UDI-6 were "moderately or greatly bothered" by the presence of leakage related to the feeling of urgency, leakage related to physical activity, or difficulty emptying the bladder respectively. Of all respondents, 14 out of 35 (40%, 95%CI [26, 56]) reported the presence of bothersome urge incontinence: 9 out of 24 (38%, 95%CI [21, 57]) primary sling intact vs 5 out of 11 (45%, 95%CI [21, 72]) primary sling excised, $p = 0.66$. Of all respondents, 11 out of 35 (31% 95%CI [19, 48]) reported bothersome SUI: 7 out of 24 (29%, 95%CI [15, 49] primary sling intact vs 4 out of 11 (36%, 95%CI [15, 65]) primary sling excised, $p = 0.67$. Eight out of 35 (23%, 95%CI [12, 39]) patients reported the presence of symptoms of voiding dysfunction: 5 out of 24 (21%, 95%CI [9, 40]) primary sling intact vs 3 out of 11 (27%, 95%CI [10, 57]) primary sling excised, $p = 0.67$. The median ISI score for all respondents was 4 (1–8), and there was no difference between the groups. Of the respondents complaining of post-operative UUI, 6 out of 14 had pre-operative UDS-proven DO, and 3 out of 14 did not display DO on pre-operative UDS. Preoperative UDS was not available for the remaining respondents. When all groups were analyzed by type of sling (retropubic vs transobturator), there were no significant differences in the incidence of UUI, SUI, or VD. Of all respondents,

Table 2 Patient characteristics for all respondents by surgical technique

	Respondents (n = 35)	Primary sling intact (n = 24)	Primary sling excised (n = 11)	p
Age (years)	61 (±10)	60 (±10)	63 (±10)	0.48
BMI (kg/m^2)	29.5 (20–45)	30 (20–45)	29 (21–41)	0.36
Current tobacco use	6 (2)	8 (2)	0 (0)	0.31
Parity >2	31 (11)	29 (7)	36 (4)	0.59
POP surgery before or at the time of primary sling	54 (19)	50 (12)	64 (7)	0.45
POP surgery at the time of repeat sling	23 (8)	21 (5)	27 (3)	0.68
Months between sling surgeries	23 (1–132)	30 (2–132)	7 (1–101)	0.14
Months from repeat sling to phone interview	67 (11–149)	70 (15–133)	47 (11–149)	0.16
UDS proven DO before repeat sling (available for n = 37)	20 (7)	21 (5)	18 (2)	0.48
Mean LPP before repeat sling (cm H_2O), n = 26	82 (±27)	80 (±27)	91 (±29)	0.52

Data presented as % (n), mean (±SD), median (range)

Demographic and clinical data of all respondents with the primary sling left intact were compared with those in whom it was excised

20 out of 35 (57%, 95%CI [41, 72]) answered that, with the information they now have, they would choose to undergo a repeat sling placement for the management of recurrent or persistent SUI; 15 out of 24 (63%, 95%CI [43, 79] primary sling intact vs 5 out of 11 (45%, 95%CI [21, 72]) primary sling excised, $p = 0.47$. Subjects who responded that they would not choose to undergo a repeat sling placement were not more likely to complain of bothersome urinary symptoms (UUI, SUI, VD) compared with those who would choose repeat sling placement (data not shown).

Discussion

In this retrospective analysis, we found that 40% of women undergoing repeat MUS for recurrent or persistent SUI experience bothersome UUI, 30% SUI, and 20% VD. There were no differences in reported symptoms in women who underwent concurrent sling excision at the time of repeat sling placement compared with those women in whom the primary sling was left intact. We also found no difference in patient satisfaction between those groups.

The subjective recurrent SUI cure rate of 70% in our cohort of women undergoing repeat MUS is consistent with cure rates of 48–74% described in the literature [7–9, 11]. However, in our cohort, the absence of SUI symptoms alone was not solely sufficient for some women to report overall satisfaction with their repeat sling procedure. Forty percent of patients reported some degree of bothersome UUI, whereas 20% reported voiding dysfunction. It is possible that these symptoms may have caused some patients to feel dissatisfaction with their sling procedure. De novo urgency and UUI are

Table 3 Subjective outcomes for all respondents by surgical technique

	All respondents (n = 35)	Primary sling intact (n = 24)	Primary sling excised (n = 11)	p
Urge incontinence	40 (14)	38 (9)	45 (5)	0.72
Stress incontinence	31 (11)	29 (7)	36 (4)	0.71
Voiding dysfunction	23 (8)	21 (5)	27 (3)	0.69
UDI-6	38 (±22)	35 (±20)	44 (±26)	0.36
ISI	4 (1–8)	4 (1–8)	4 (2–8)	0.81
IIQ-SF	22 (±25)	21 (±27)	23 (±22)	0.52
Patient would undergo repeat sling again procedure	57 (20)	63 (15)	45 (5)	0.47

Data presented as % (n), mean (±SD), median (range)

Subjective outcomes of all respondents with the primary sling left intact were compared with those in whom it was excised. Because of the small sample size, patients in whom the sling was excised and those in whom it was lysed were combined, and Pearson's Chi-squared test and Wilcoxon rank-sum tests were used to analyze categorical and continuous data respectively

not uncommon after repeat MUS, with reported rates of 6–30% and 22% respectively [9, 11, 15, 16]. In a retrospective analysis, Verbrugghe et al. found an unpredictable course of post-operative urgency and UUI after repeat MUS. In their cohort of 80 patients undergoing repeat MUS, 15 developed postoperative de novo urgency, and 11 patients developed de novo urgency incontinence [9].

To our knowledge, patient-reported VD has not been evaluated after repeat MUS; however, immediate urinary retention after repeat MUS has been reported to range from 10 to 14% [9, 15, 16]. The 2015 Cochrane Review on mid-urethral sling operations for SUI in women reported a 5% incidence of D after primary MUS placement [2]. In our cohort, we found that 1 in 5 patients who underwent repeat MUS described some degree of bother from voiding symptoms. Although this finding relies on self-reported outcomes from patients at varying time points from initial to repeat MUS placement, it does highlight an unreported outcome associated with repeat MUS placement that should be further investigated.

There are very limited data on outcomes following concurrent sling excision versus leaving the primary sling intact at the time of repeat MUS surgery. It is unclear if one technique is advantageous over the other. Some providers excise the primary sling with the rationale that the new sling may be positioned in an optimal location along the mid-urethra. Those in whom the primary sling is left intact may be concerned that concurrent excision without any other indications may be associated with undue morbidity, including increased operative time and blood loss, in addition to possible urethral injury. In our cohort of patients, we found no difference in operative complications or urinary and voiding symptoms in women who underwent concurrent excision compared with those who did not. It remains unclear if concurrent excision is necessary at the time of second sling placement.

To our knowledge, this study is the first to compare subjective outcomes of repeat MUS by technique of repeat sling placement. The major strength of this study was our ability to capture patients who had undergone both of their sling procedures at the same institution, ensuring reliable data. Other strengths include its prospective component and the use of validated questionnaires to assess patient symptoms. Limitations of this study include those inherent to any retrospective analysis. In addition, the prospective portion of the study was limited by our response rate of 57%. Although we did not find any significant differences between subjects who responded to the survey and those who did not, we do not have data for the 43% nonrespondent patients. Because our cohort was small, we are unable to generalize our findings to all patients undergoing repeat MUS surgery, and we cannot draw definitive conclusions based on these findings.

Additionally, owing to the small sample size, we combined analysis for patients undergoing partial and complete primary sling excision, which may have had an impact on the data. For example, a recent study of outcomes after MUS revision found that patients who underwent sling excision were more likely to have recurrent SUI symptoms than those who underwent simple lysis [17]. Including women who underwent primary sling excision with sling complications (UUI, VD, erosion, pain) may have included patients who underwent repeat surgery for the concurrent indication of primary sling complication. However, we limited this potential confounder by including only women with the primary diagnosis of SUI at the time of repeat MUS placement. Despite these limitations, our study provides an overview of the long-term experience of a tertiary care referral center in patients undergoing repeat MUS, and helps to augment our understanding of outcomes following these procedures.

Repeat MUS is the most commonly performed surgery for the treatment of persistent or recurrent SUI after primary MUS placement. In a small cohort of patients, concurrent excision of the primary sling at time of repeat MUS placement did not improve subjective patient-reported outcomes. Reported rates of UUI and VD were significant after repeat MUS, and only about half of patients would choose to undergo the surgery again to treat their incontinence.

Compliance with ethical standards

Conflicts of interest None.

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