

# Functional outcomes of polypropylene midurethral sling resection for treatment of mesh exposure/extrusion: Does it lead to a relapse of incontinence?

Czynnościowe efekty usunięcia polipropylenowej taśmy podcewkowej z powodu jej odstonięcia/wystawiania: czy prowadzi to do nawrotu nietrzymania moczu?

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## Abstract

**Objectives:** The Burch colposuspension, which was regarded as the gold standard treatment for stress urinary incontinence for several years, has been replaced by minimally invasive sling devices. Although these procedures are simple and minimally invasive, they are associated with complications such as infection, mesh erosion, chronic pain, and de novo detrusor overactivity, which may necessitate surgical resection or tape removal. The aim of the study was to assess urinary function outcomes including continence, after partial resection of suburethral tapes.

**Material and methods:** Patients were admitted for resection of tape due to extrusion/exposure, between 2011 and 2014. Patients were evaluated with physical examination, transvaginal ultrasound, cough stress test, 24-hour bladder diary, Incontinence Impact Questionnaire-7 form and Urogenital Distress Inventory-6 form.

**Results:** Minimum follow-up time was 2 months after treatment of the tape complication (mean 20, range 2 to 38). Recurrence of incontinence after partial tape resection was observed in 9% (3/32) cases. In two patients due to stress urinary incontinence recurrence repeat anti-incontinence surgery was necessary. Although one patient had suffered from incontinence after resection of tape, she did not desire operation.

**Conclusions:** The results of this study indicated that preservation of the anti-incontinence effects of slings might not be dependent on the intactness of the sling. Recurrence of incontinence after partial tape resection is uncommon and in the majority of cases this stress incontinence is minimally and does not require repeat operation.

Key words: **midurethral slings / resection of suburethral tape / urinary stress incontinence /**

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## Streszczenie

**Cel:** Operacja Burcha uważana dotąd za złoty standard w leczeniu wysiłkowego nietrzymania moczu, została zastąpiona przez małoinwazyjne zabiegi slingowe. Choć procedury te są proste i małoinwazyjne, to wiążą się z powikłaniami, takimi jak: zakażenie, erozja taśmy, przewlekły ból, pęcherz nadreaktywny, które mogą wymagać chirurgicznego wycięcia lub usunięcia taśmy. Celem badania była ocena trzymywania moczu po częściowej resekcji taśmy podcewkowej.

**Materiał i metoda:** Do analizy włączono pacjentki, które pomiędzy 2011 a 2014 rokiem zostały przyjęte do szpitala celem usunięcia taśmy z powodu jej obnażenia lub wystawiania.

U pacjentek wykonano badanie fizykalne, USG przezpochwowe, test kaszlowy, 24-godzinny dzienniczek mikcyjny oraz kwestionariusze: Incontinence Impact Questionnaire-7 i Urogenital Distress Inventory-6.

**Wyniki:** Najkrótszy czas obserwacji po operacji naprawczej z powodu powikłań wynosił 2 miesiące (średnio 20, zakres 2 do 38). Nawrót nietrzymania moczu po częściowym usunięciu taśmy obserwowano w 9% przypadków (3/32). U dwóch pacjentek z powodu nawrotu nietrzymania moczu konieczna była ponowna chirurgiczna interwencja. Jedna pacjentka mimo nawrotu dolegliwości po usunięciu taśmy, nie zdecydowała się na ponowną operację.

**Wnioski:** Wyniki naszego badania pokazują, że utrzymywanie się efektu założenia taśmy w postaci trzymywania moczu, nawet po jej usunięciu, może nie być uzależnione od nienaruszalności taśmy. Nawrót nietrzymania moczu po częściowym usunięciu taśmy występuje rzadko, jest minimalny i w większości przypadków nie wymaga ponownej operacji.

Słowa kluczowe: **taśma podcewkowa / usunięcie taśmy podcewkowej / wysiłkowe nietrzymanie moczu /**

## Introduction

Female urinary incontinence is highly prevalent worldwide. Approximately half of these cases are classified as stress urinary incontinence (SUI) [1, 2]. The Burch colposuspension, which was regarded as the gold standard treatment for this condition for several years, has been replaced by minimally invasive sling devices such as the tension-free transvaginal tape (TVT), transobturator tape (TOT), and mini-sling in recent years [3-5]. Although these procedures are simple and minimally invasive, they are associated with complications such as infection, mesh erosion, chronic pain and de novo detrusor overactivity, which may necessitate surgical resection or tape removal [6, 7].

Slings are used to provide urethral support, which is otherwise a function of the pubourethral ligaments. The suburethral support provided depends on the biomechanical characteristics of the sling as well as its capacity for inducing a reaction that produces fibrotic support, the primary element of long-term support [8]. In previous studies, histologic specimens of suburethral tissues from women with slings demonstrated an increased percentage of the area with type III collagen fibers and a decreased percentage of the area with type I collagen fibers [8,9]. This suggested that the anti-incontinence mechanism is associated with these histologic changes of inflammation and collagen remodeling resulting from the use of a polypropylene sling, regardless of whether the sling is intact or not. Some studies have demonstrated that continence was preserved even after cutting or removal of the sling in 80% of the patients based on the effects of histological changes [10,11]. However, current data on the outcome of surgical tape resection are limited. This study aimed to assess urinary function outcomes, including continence, after partial resection of suburethral tape to treat its exposure/extrusion.

## Material and methods

This retrospective study was conducted at Tepecik Education and Research Hospital, İzmir, Turkey and included patients admitted for resection of vaginal tape due to extrusion/exposure. The study was approved by our institutional ethics board. We retrospectively reviewed the medical records of women who underwent resection of vaginal tape between January 2011 and January 2014 and collected data including the patient age, body mass index, medical history, scores on the Urogenital Distress Inventory-6 (UDI-6) form and Incontinence Impact Questionnaire-7 (IIQ-7) form before resection, date and type of suburethral tape insertion, resection procedure and the complications experienced. The exclusion criteria were entire sling removal, repeat tape resection, concomitant surgery such as colporrhaphy and presence of incontinence before tape resection. In addition, patients with incomplete operative notes and incomplete preoperative assessments were excluded.

Patients were contacted via phone and invited to participate in the study. They were evaluated with physical examination, transvaginally ultrasound, cough stress test, 24-hour bladder diary, Incontinence Impact Questionnaire-7 form and Urogenital Distress Inventory-6 form. Valid Turkish versions of IIQ-7 and UDI-6 were used.

Statistical analyses were performed with the SPSS 18.0 package (IBM, Chicago, IL). Comparisons between preoperative and postoperative symptoms, including the IIQ-7 and UDI-6 scores, were performed with the Wilcoxon matched pairs test. Logistic regression analysis was performed to calculate the risk ratios.  $P < 0.05$  was considered statistically significant. Descriptive statistics were used to characterize the patient population.

Emrah Töz et al. *Functional outcomes of polypropylene midurethral sling resection for treatment of mesh exposure/extrusion: Does it lead to a relapse of incontinence?***Table I.** Clinical and demographic characteristics of the patients who underwent resection of vaginal tape and controls.

Characteristics	Study group (n=45)	Control group (n=892)	p - value
Age (years)	49.90±8.96 (30-74)	51.69±8.35 (34-72)	0.232
Body mass index (kg/m <sup>2</sup> )	29.06±3.21 (21-38)	28.75±3.12 (23-36)	0.469
Parity	3.16±1.43 (2-6)	3.44±1.70 (1-7)	0.142
Smoking status	8 (1.7%)	178 (19.9%)	0.070
Diabetes mellitus	11 (24.4%)	148 (16.5%)	0.039
Postmenopausal status	23 (51.1%)	481 (53.9%)	0.181
Previous POP surgery	8 (17.7%)	42 (4.7%)	<0.001

Data are shown as mean; Standard deviation (range) or n (%)

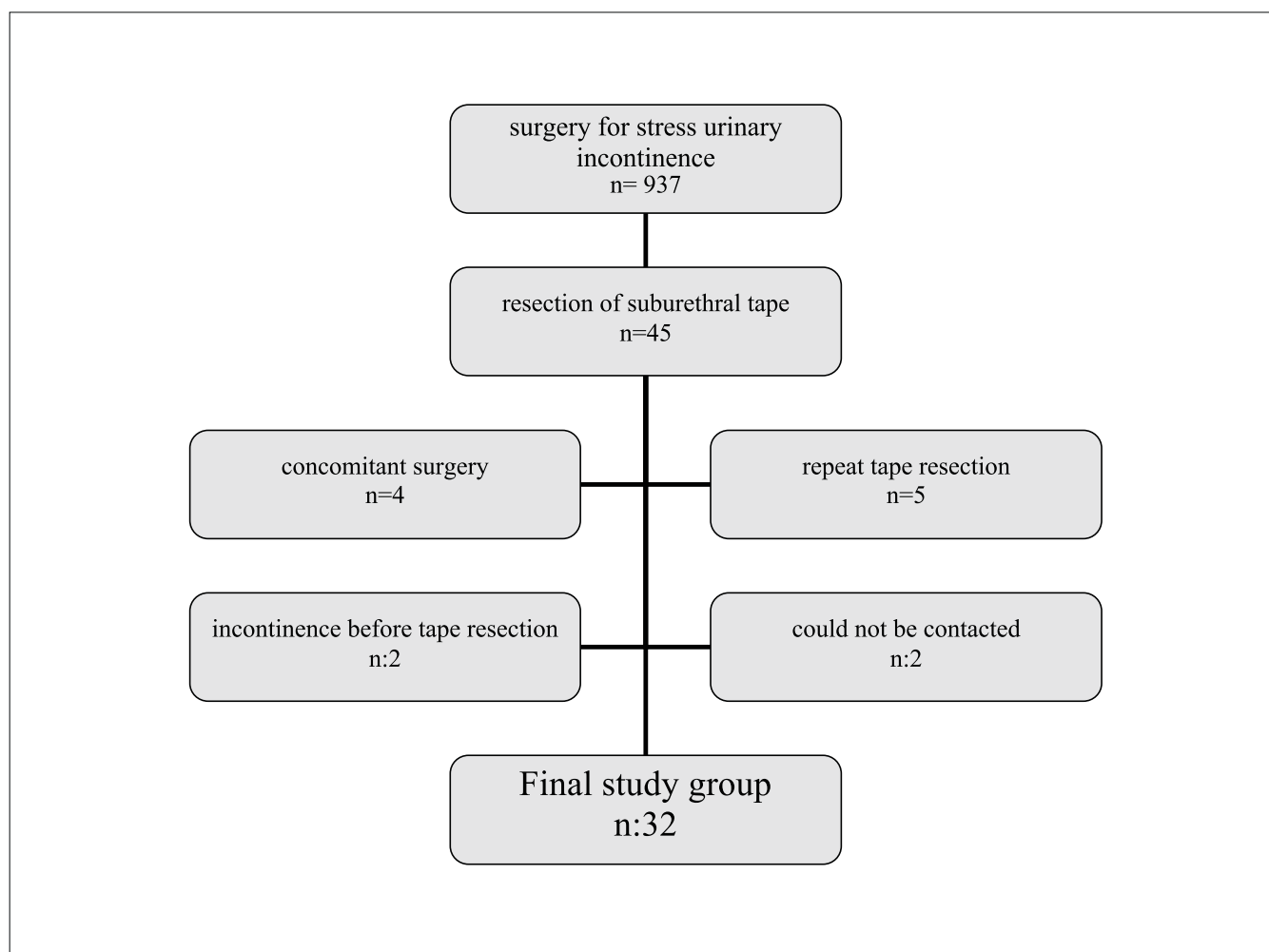
**Table II.** Characteristics of patients who underwent resection surgery.

Age at incontinence surgery	Parity	Time between tape placement and resection	Follow-up
53	2	2 months	<b>2 months<sup>a</sup></b>
58	5	7 months	6 months
45	3	16 months	7 months
48	4	<b>10 days<sup>a</sup></b>	7 months
52	2	3 months	8 months
44	1	2 months	10 months
42	2	2 months	<b>2 months<sup>a</sup></b>
50	2	2 months	11 months
51	5	<b>36 months<sup>b</sup></b>	12 months
49	3	3 months	12 months
46	3	2 months	13 months
54	4	6 months	13 months
45	2	13 months	16 months
51	4	7 months	16 months
54	2	1 month	13 months
44	3	5 months	16 months
30	2	1 month	13 months
51	4	9 months	27 months
61	6	1 month	16 months
46	1	4 months	29 months
48	2	2 months	29 months
43	3	4 months	47 months
55	6	2 months	31 months
42	4	5 months	31 months
35	3	3 months	31 months
55	3	1 month	33 months
72	2	22 months	35 months
54	2	4 months	36 months
52	4	2 months	<b>38 months<sup>b</sup></b>
56	6	6 months	<b>38 months<sup>b</sup></b>
74	4	3 months	<b>38 months<sup>b</sup></b>
62	1	15 months	<b>2 months<sup>a</sup></b>

**a** – the shortest time; **b** – the longest time

**Table III.** IIQ-7 and UDI-6 scores before and after resection procedure.

	Before resection (mean ±SD)	After resection (mean ±SD)	P - value
<b>IIQ-t scores</b>	16.3±8.4	12.4±9.7	=0.614
<b>UDI-6 scores</b>	12±9.3	14.3±11.8	=0.592



**Figure 1.** Flowchart of the study.

## Results

A total of 937 surgeries were performed for treatment of stress urinary incontinence with synthetic meshes (MINI SLING OPHIRA® Promedon, Argentina) between 2011 and 2014. Of these, 45 patients had undergone resection of suburethral tape. The cumulative incidence of sling revision was determined to be 4.8 % (45/937) at the 3-year follow-up. The characteristics of the patients who underwent resection of vaginal tape and controls are shown in Table I.

The mean age of patients who underwent resection of vaginal tape was 49.90 ± 8.96 (range, 30 to 74 years) and the mean parity was 3.16 ± 1.43.

Early exposure of the mesh was detected at 10<sup>th</sup> day (Table II). We thought that it was due to improper vaginal closure that causes early wound dehiscence. According to multivariate analysis, the only important predictors of mesh erosion were previous POP surgery and diabetes mellitus. Previous POP surgery and diabetes mellitus increased the risk of mesh erosion 2.41 fold (p< 0.01, 95% confidence interval [CI] 1.62–3.68) and 1.29 fold (p=0.03, 95% CI 1.14-1.36), respectively.

The type 1 (monofilament, macroporous) tape was used in all patients. The time interval between the tape insertion and onset of complications varied from 10 days to 3 years. Four patients were excluded due to concomitant surgery, 5 were excluded because of

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repeat tape resection and 2 for incontinence before tape resection. The remaining patients could not be contacted after the resection. Thirty-two patients were included in the final analysis (Figure 1).

The sling was not removed entirely in any of the patients because none of them were explored due to infection or pain. There were no urethral or bladder injuries complicating the excision of tape. Severe urinary incontinence was determined in 2 patients after tape resection. These patients were subsequently treated with the Burch technique because they both had previous unsuccessful POP surgery and the third attempt of vaginal route of repair was thought to be dangerous. No recurrence or postoperative complications were observed after Burch colposuspension.

The minimum follow-up time was 2 months after the treatment of the tape complication (mean, 20 months; range, 2–38 months). The cough test was negative in 29 patients who reported no leakage related to physical activity, coughing, or sneezing.

A subjective assessment was performed in those women using IIQ-7 and UDI-6 questionnaires. Question #3 of the UDI-6 demonstrated a sensitivity of 84.8% and a specificity of 63.4% for predicting SUI (12-14).

On a scale of 0–100, the postoperative scores for IIQ-7 and UDI-6 were  $12.4 \pm 9.7$  and  $14.3 \pm 11.8$ , respectively (Table III). The results show that the resection of tape had no effect on the patient's quality of life associated with stress urinary incontinence. Subjective cure was considered in women who had no further continence surgery and who responded "not at all" to the question on "leakage related to physical activity, coughing or sneezing (UDI-6 Question # 3)".

Only 1 patient with a positive cough test responded "moderately" to Question # 3 on the UDI-6 form. Objective assessment was performed using the cough stress test. Similar objective and subjective cure rates [91% (29/32)] were found during the mean follow-up period of 20 months.

As a result, recurrence of incontinence after tape resection was observed in 9% (3/32) of the cases during the mean follow-up period of 20 months. Two out of three patients had previous POP surgery as a risk factor but other patient had no risk factor. Because of the small number of the patients, no statistical analysis could be performed. However, previous POP surgery seems to be a risk factor for recurrence of incontinence after partial tape resection.

In two patients due to SUI recurrence repeat anti-incontinence surgery was necessary. Although 1 patient suffered from incontinence after tape resection, she did not wish to undergo surgery.

## Discussion

Initially, suburethral slings were created from grafts taken from the patients. Currently, synthetic mesh slings are used most often for anti-incontinence procedures performed for SUI [15]. These slings are simple and minimally invasive, and they have demonstrated a high success rate [16]. However, postoperative complications including tape extrusion/exposure have been reported. Large multicenter studies have reported transvaginal mesh extrusion/exposure rates of 1%–3.7% [17-20].

The incidence of complications was slightly higher in our study (4.8%). In some cases, these complications pose a significant therapeutic challenge for surgeons and can necessitate

complete or partial resection. Preservation of continence after sling resection is an additional problem, and recurrence of urinary incontinence cannot be predicted after tape resection.

In this study, we have reported the functional outcomes of surgical resection of the suburethral sling. All of the patients in our series were managed by transvaginal tape resection. We evaluated 32 patients and found that 91% (29/32) of the patients were continent even after partial tape resection.

Our findings are consistent with those of the existing literature. Chi et al. [9] showed that the medians of the leak point pressures were similar between the intact and cut sling groups in rats. They demonstrated histologic changes such as chronic inflammation, localized edema, and differential collagen remodeling, which might have contributed to the preservation of the anti-incontinence mechanism after the polypropylene slings were cut. Jérôme et al. [21] followed 32 patients who had undergone removal of suburethral tape for chronic pelvic and perineal pain, and severe urinary leakage had been experienced only by 1 patient (3%) in their study.

Other previous studies have reported a higher risk of recurrent SUI. Misrai et al. [22] reviewed the data of 75 women who had the sling surgically removed and reported that 18 women (24%) had recurrent incontinence after partial resection. In our study, we determined the incidence of incontinence to be 9% (3/32) after tape resection.

We think that these different recurrence rates are due to different operative techniques. In our study, we removed only the extruded sling without extensive dissection because the anti-incontinence mechanism of slings, which is also derived from inflammation and fibrosis after implantation of polypropylene slings, is thought to be secondary to compression of the urethra during conditions of increased intra-abdominal pressure [23, 24]. Fibrosis, which is considered an indicator of good suburethral support, substitutes for weakened natural ligaments. Therefore, extensive dissection causes fibrotic tissue damage and may lead to recurrent SUI. The recent literature suggests that extrusion and obstructive symptoms should be managed by complete removal of the tape with or without a repeat sling procedure [11, 21]. However, we believe that complete removal of the sling is needed only in cases of tape infection. Removal of the extruded sling alone is typical due to concern regarding unnecessary dissection when the sling is not infected. We believe that extensive dissection leads to a higher risk for recurrence of SUI. A complete sling removal may therefore lead to recurrent SUI more frequently than partial resection. In the present study, all patients had erosion into the vagina only, and the incidence of incontinence was 9% (3/32) after tape resection.

## Conclusions

The results of this study indicate that preservation of the anti-incontinence effects of slings might not be dependent on the intactness of the sling. Chronic inflammation and collagen remodeling are also important factors.

We recommend removal of the extruded sling with minimal dissection as an effective first-line treatment in cases of erosion limited to the vagina. If extensive dissection is not performed, recurrence of incontinence after tape resection is uncommon, and in the majority of cases this stress incontinence is minimal and does not require a repeat operation.

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#### Authors' contribution:

1. Emrah Töz – concept, analysis and interpretation of data, corresponding author.
2. Çağdaş Şahin – study design, concept, assumptions.
3. Nesin Apaydın – article draft, revised article critically, acquisition of data.
4. Aykut Özcan – acquisition of data, article draft.
5. Cüneyt E. Taner – concept, study design, revised article critically.

#### Authors' statement

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