

## LONG-TERM EFFECTIVENESS AND COMPLICATIONS OF MID-URETHRAL SLINGS: CLINICAL CASE

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**Keywords:** urinary incontinence, complications, TVT operations.

### Summary

Approximately 50% of all women suffer from urinary incontinence at least once in their lifetime. A majority of these women experience a type of urinary incontinence that is called stress urinary incontinence. Women of all ages are susceptible to this disease, however, it mostly affects older and overweight women. Even though this is not a life-threatening disease, it is important to find the most effective treatment methods to lessen the social and psychological damage that is associated with this disease. Stress urinary incontinence is treated conservatively, however, if the treatment is not successful, surgical options can be utilized. In the last few decades, surgical methods for stress urinary incontinence have changed dramatically. Burch colposuspension has long been a gold standard for surgical stress urinary incontinence treatment, however, its popularity has started to drop. Instead, mid-urethral slings have become the more mainstream option. Mid-urethral sling operations are not only less invasive and cause fewer complications, but are also more effective at treating stress urinary incontinence. Aim: To analyse the newest publications that review the long-term effectiveness and complications of mid-urethral slings and to also present a clinical case.

Methods: A scientific literature review was conducted utilizing the following databases: Pubmed, ScienceDirect, UpToDate. Keywords for the search were urinary stress incontinence, Burch colposuspension, mid-urethral sling, tension-free vaginal tape. The most relevant scientific articles and scientific publications on the topic were selected. This article presents a generalized analysis of the scientific literature on the topic "Long-term effectiveness and complications of mid-urethral slings: clinical case and literature review".

Results: Mid-urethral sling operations are an effective treatment option for stress urinary incontinence in women.

Mid-urethral sling operations have lower complication risk than popular alternatives. According to the literature analysed in the study, there is no significant difference in effectiveness and complication rates between retropubic and transobturator mid-urethral slings. However, these are both quite not old treatments methods and so far there is not enough data to make a definitive conclusion.

### Introduction

Stress urinary incontinence is a medical condition associated with involuntary leakage of urine during times of increased intraabdominal pressure. Approximately 50% of all women suffer from urinary incontinence at least once in their lifetime. Most of these women experience a type of urinary incontinence that is called stress urinary incontinence. Women of all ages are susceptible to this disease, however, it mostly affects older and overweight women. Of all women between ages 15 and 64, 10 to 55% suffer from stress urinary incontinence and even though it is not a life-threatening disease, it negatively affects their life quality. Under regular conditions, these women don't feel any symptoms, however, when the intraabdominal pressure increases, women cannot voluntarily contain their urine. Intraabdominal pressure can increase for various reasons, such as coughing, sneezing, laughing, while lifting heavy objects, or simply changing their body position (1,2). Treatment of stress urinary incontinence begins with conservative measures. Pelvic muscle training and weight loss have been observed to have the biggest positive effect. Meanwhile, pharmacological treatment is not used as widely, while there isn't enough data to suggest its effectiveness (3). When the desired treatment result is not reached conservatively, women can also be treated surgically. Burch colposuspension has long been regarded as a "gold standard" for surgical stress urinary incontinence treatment. Open method for this surgery has been described as back as the year 1961 and later, to decrease the number of complications, shorten hospital stays and improve aesthetic image, the laparoscopic method has also been presented. Despite that, the popularity of Burch colposuspension has

started to decrease about 20 years ago when it was replaced with minimally invasive mid-urethral sling operations (4,5).

**Aim:** To analyse the newest publications that review the long-term effectiveness and complications of mid-urethral slings and to also present a clinical case.

### Stress urinary incontinence severity grade

Every patient's diagnostic and treatment measures should be chosen based on the severity of their symptoms. Urinary incontinence severity grade can be decided based on various methods, such as, standardized pad test. Pads are weighted before application and after 24 hours of use and then it gets calculated how much urine has involuntarily leaked. Based on the amount of urine in the pad, the severity can be measured in 3 grades: 1 or mild, when the amount of urine is less than 10 grams per day, 2 or moderate when there is between 11 and 50 grams of urine found. When the patient involuntarily urinates more than 50 grams per day it is recognised as 3 grade or severe urinary incontinence (6). There are more methods, by which severity of urinary incontinence can be measured. During the history, the severity of stress incontinence is often classified according to Ingelmann-Sundberg (Table 1). Clinically the severity can be measured by using stress or cough tests with a full bladder (Table 2) (7).

### Mid-urethral slings

In the last 2 decades, mid-urethral sling operations have changed the way stress urinary incontinence is treated. Currently, mid-urethral slings are the most popular methods

when treating stress urinary incontinence. In mid-urethral sling operations, tape is placed beneath the urethra without tension. There are two main ways of carrying out these operations, either by inserting a tape behind the pubic bone through the abdomen or through the groin (Figure 1). The slings can be made from macroporous, microporous or submicronic synthetic mesh. Slings can also be made from autologous materials, for example, *fascia lata* or *fascia rectus abdominis*. When the intraabdominal pressure increases, for example, when the patient coughs or sneezes, the tape compresses the urethra and prevents urine from leaking (2).

### Retropubic mid-urethral sling

Retropubic mid-urethral slings, also known as, tension-free vaginal tape (TVT) were first presented in 1996. The effectiveness of this method is proved scientifically: it is calculated that in 16 years' time tension-free vaginal tape has a success rate of 70-90% with a very low complications rate (8). It is usually a first-choice method in treating patients, whose conservative treatment was not successful. TVT is also a beneficial operation when long-term results are in mind. In most research, 10 years after the surgery, 80-85% of women are healed objectively and 70-85% feel healed, when valued subjectively. Only 5% of women stated, that the operation didn't have a positive effect on their life quality. These are very good results when compared to the previous

**Table 1.** Grading of stress urinary incontinence according Ingelmann-Sundberg.

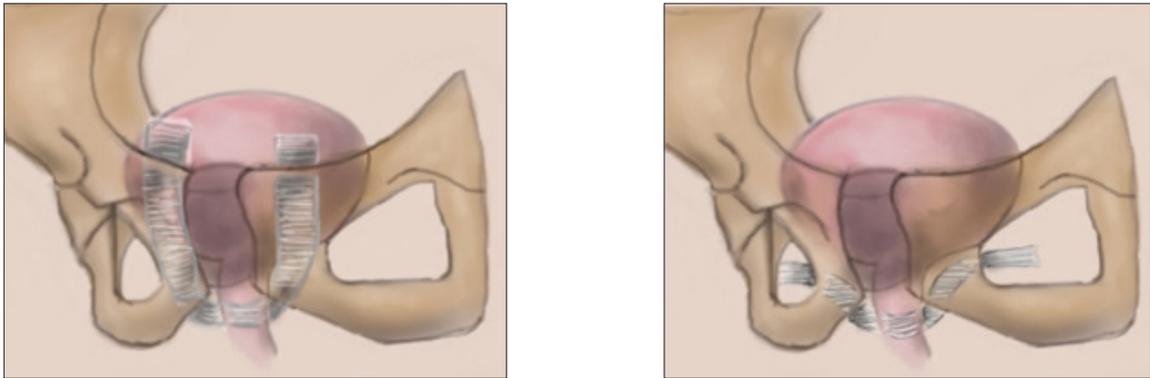
Severity	Definition
Stress urinary incontinence grade I	Urine loss during coughing, laughing or sneezing
Stress urinary incontinence grade II	Urine loss during lifting, running or climbing stairs
Stress urinary incontinence grade III	Urine loss without physical activity

**Table 2.** Grading of stress urinary incontinence according to a coughing test conducted on a full bladder.

Severity	Definition
Stress urinary incontinence grade O	No urine loss found
Stress urinary incontinence grade I	Urine droplets while standing
Stress urinary incontinence grade I	Urine loss in a stream while standing
Stress urinary incontinence grade III	Urine loss in a stream while lying down

**Table 3.** Mesh erosion complication risk factors. OR – odds ratio CI – confidence interval, p is considered significant when  $p \leq 0,05$ , POP – pelvic organ prolapse.

	Wald	OR (95% CI)	p
Age between 50 and 60	4,61	0.15 (0.03–0.85)	<b>0,032</b>
Age > 60	9,52	0.03 (0.003–0.28)	<b>0,020</b>
BMI > 30 kg/m <sup>2</sup>	0,17	0.90 (0.17–4.77)	0,890
Menopausal status	0,71	1.95 (0.45–8.53)	0,390
Diabetes mellitus	11,03	16.65 (3.17–87.55)	<b>0,001</b>
Current smoking	8,731	5.07 (1.73–14.86)	<b>0,030</b>
Sexual activity	3,99	7.10 (1.38–36.61)	0,069
Previous POP operations	4,15	0.07 (0.01–0.90)	<b>0,042</b>
Preoperative POP degree $\geq 2$	1,44	0.341 (0.06–1.98)	0,231
Incision length > 2 cm	20,94	0.08 (0.03–0.24)	<b>&lt;0,001</b>
Recurrent incision for postoperative complications	4,65	0.143 (0.024–0.84)	<b>0,031</b>
Anti-incontinence and concomitant cystocele surgery	0,453	0.58 (0.12–2.82)	0,501
Operative blood loss > 500 ml	3,79	0.18 (0.03–1.01)	0,051
Duration of surgery	0,014	1.09 (0.25–4.76)	0,904



**Figure 1.** Different positions of mid-urethral slings. Left – retropubic approach, right – transobturator approach.

“gold standard” that was Burch colposuspension. 6 years after Burch colposuspension good urinary function was seen in only 63% of patients and this number was even smaller when evaluating patients later. After 14 years only 44% of patients were considered to have a good urinary function (9,10).

From 2012 and 2016 there was clinical research performed in Denmark in which patients, that had TVT surgery performed on them between 2012-2016, were examined. 15,2% of patients had 1 or more complications. The only complication that arose during the surgery was bladder perforation – it happened to 2% of patients. The most common post-surgical complication was voiding dysfunction, which was experienced by 10,3% of patients. 1,1% of patients suffered from erosion of vaginal mucosa and all of them needed a second surgery to resolve the complication. There were also other post-operative complications found, such as infection, haematoma, bleeding, pain and persistent stress urinary incontinence, however, all of these complications were rare and were seen in less than 1% of patients (11).

#### **Transobturator mid-urethral sling**

Transobturator mid-urethral sling operation was first presented in 2001 by Delorme. Its main point of this technique was to avoid a blind insertion of a needle into the retroperitoneum and perforation of the bladder. At first, the sling was inserted by using an outside-in technique. Later a new variation was presented by De Leval that used an outside-in approach. During Delorme inside-out approach (TOT), the sling is inserted through the skin in the groin area and placed beneath the urethra and between the two obturator foramina. With an inside-out (TVT-O) approach the sling is passed percutaneously through the obturator foramina. Just like retropubic mid-urethral slings, transobturator slings show better effectiveness and less complications than Burch colposuspension (12). The most common complication during transobturator sling operations is perforation of the

vaginal wall. In the study that was conducted in the state of Oklahoma. Among 106 women that were treated using this technique, vaginal wall perforation presented in less than 3% of cases, all of which were noticed and treated instantly, during the same procedure. During the same trial, it was identified that 6 months after the surgery 91,5% of patients didn't feel any urinary incontinence symptoms, 7,5% felt minimal symptoms and just 1 patient out of 106 didn't see a positive effect on her condition. Other common TOT and TVT-O complications include urgency symptoms, feeling of incomplete urination, nocturia, and overly frequent urination, however, most of these complications resolve themselves during the first 6 months after surgery. Haematoma, infection and groin pain were also observed as complications after transobturator sling surgery (1,13).

#### **Effectiveness and complication rate of mid-urethral slings**

There were no significant differences when comparing subjective and objective outcomes between TVT, TOT and TVT-O operations, however, there were a few publications that found tension-free vaginal tape to show fewer promi-



**Figure 2.** Stone, together with a part of the mesh, was removed using a resection loop.

sing results. Even though the type of complication differs between these methods, overall complication rates, including post-surgical infection, are similar. Retropubic slings had a bigger rate of bladder perforation, bleeding and suprapubic pain, while transobturator sling more often required a second surgery, groin pain was also more common among transobturator sling patients. After TVT sling erosion or extrusion was also observed more frequently. All of these methods significantly improve the quality of women's sexual life, with the main reason being a less frequent or complete absence of urinary leakage during intercourse (1,14,15). One of the clinical trials that were carried out in 2015 and in which 597 patients were a part of didn't observe any significant differences in the effectiveness between retropubic and transobturator approaches. De novo urgency incontinence rate was similar in both groups 2 years after the surgery. Patients after retropubic operation more often required reoperation following urinary dysfunction that presented after the operation, urinary tract infections were also more common in this group. Meanwhile, patients after TOT and TVT-O experienced more neurological disorders in groin and leg areas (16). The growing popularity of mid-urethral slings also means a more common use of synthetic meshes. That means, that the number of complications, such as mesh erosion, infection, retraction or pelvic pain, associated with synthetic meshes also increases. According to some publications, mesh erosion rates can be as high as 7,3%. Because of this reason, natural meshes were created, however, the success rates, when using natural meshes, were much lower than using synthetic ones. This complication can occur during both retropubic and transobturator mid-urethral sling operations. A higher risk of mesh erosion is observed among older, smoking and sexually active women. Previous surgical interventions for pelvic organ prolapse or urinary incontinence also increase the risk of developing this complication. More risk factors for mesh erosion are presented in table 3 (17).

### Clinical case

A female patient, aged 49 was directed by a family doctor to a specialist because of a recurrent stress urinary incontinence. During diagnostic evaluation sphincter urethrae insufficiency was also diagnosed. Because of that, it was decided for the patient to undergo TVT surgery using an original technique described by Ulmsten and Petros. The operation went through smoothly, with minimal blood loss. After the procedure, the patient received 4 hours of vaginal packing for 4 hours and a Foley catheter was inserted. The next day Foley catheter was removed. On the 3<sup>rd</sup> hospitalisation day patient with wellbeing was discharged home. 2 years later, during a prophylactic visit, the patient complained of pain in the left lower abdominal region. Objectively an insignificant

chronic urinary tract infection. There were no significant findings during gynaecological echoscopic examinations. Bacteriological urine analysis also showed no signs of active bacterial infection. It was decided to do a cystoscopy, during which a typical image of TVT sling erosion was seen. On the sling itself, urinary tract stones were also observed. It was decided to remove the complication by performing transurethral bipolar bladder resection, to remove urinary stone and a part of synthetic mesh (Fig. 2). After the operation, the patient felt good and was discharged the next day. After 6 months cystoscopy was performed on the patient and no pathological changes in the bladder were observed.

### Conclusions

After analyzing of literature publication it can be stated, that mid-urethral slings are effective surgical treatment options for women suffering from stress urinary incontinence, especially, in comparison to older methods, such as Burch colposuspension. These minimally-invasive methods have also lower complication rates. Based on current data, there is no significant difference between retropubic and transobturator approaches, when it comes to effectiveness and complication rates, however, there is still some doubt about their long term complications. It is very important to continue the comparative analysis of previously mentioned methods because these methods were only presented in 1996, the data considering long term effectiveness and complication rates is still lacking.

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**POŠLAPLINIŲ RAIŠČIŲ ILGALAIKIS  
EFEKTYVUMAS IR KOMPLIKACIJOS:  
KLINIKINIS ATVEJIS IR LITERATŪROS APŽVALGA  
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Raktažodžiai: šlapimo nelaikymas, komplikacijos, TVT operacijos.

Santrauka

Apie 50 proc. moterų per savo gyvenimą patiria šlapimo nelaikymą. Didžiausią atvejų skaičių sudaro įtampos šlapimo nelaikymas. Šia liga sergama bet kuriame amžiuje, tačiau labiausiai ji paliečia vyresnio amžiaus bei antsvorio turinčias moteris. Nepaisant to, kad tai nėra gyvybei pavojinga liga, svarbu išsiaiškinti efektyviausius gydymo metodus, kad moterys patirtų kuo mažesnę socialinę ir psichologinę žalą, susijusią su šia patologija. Įtampos šlapimo nelaikymas gydomas konservatyviomis priemonėmis, tačiau nepavykus pasiekti gero gydymo rezultato, gali būti taikomas ir chirurginis gydymas. Per kelis pastaruosius dešimtmečius chirurginis įtampos šlapimo nelaikymo gydymas labai pasikeitė. Anksčiau aukso standartu laikytos Burch'o kolposuspensijos populiarumas mažėjo, o vietoj jos pradėtos atlikti pošlaplinių raiščių operacijos. Šio metodo operacijos yra ne tik mažiau invazyvios bei sukeliančios mažiau komplikacijų, bet ir efektyvesnės, gydant įtampos šlapimo nelaikymą.

Tikslas – išanalizuoti naujausias mokslines publikacijas, apžvelgiančias pošlaplinių raiščių ilgalaikį efektyvumą ir komplikacijas bei pristatyti klinikinį atvejį.

Metodai. Literatūros šaltinių paieška buvo vykdoma Pubmed, ScienceDirect, UpToDate duomenų bazėse. Paieškai buvo naudojami žodžiai anglų kalba: urinary stress incontinence, burch colposuspension, mid urethral sling, tension free vaginal tape (lietuviškai - įtampos šlapimo nelaikymas, Burch'o kolposuspensija, pošlapliniai raiščiai, retropubinis pošlaplinis raištis). Straipsnio rašymo metu buvo atrinkti aktualiausi, publikacijai svarbiausi ir temą atskleidžiantys moksliniai straipsniai bei mokslinės publikacijos. Šiame straipsnyje pateikiama apibendrinta mokslinės literatūros analizė tema „Pošlaplinių raiščių ilgalaikis efektyvumas ir komplikacijos: klinikinis atvejis ir literatūros apžvalga.“

Išvados. Išanalizavus literatūros šaltinius galima teigti, kad pošlaplinių raiščių operacijos yra efektyvi priemonė, gydant įtampos šlapimo nelaikymu sergančias moteris. Šios operacijos pasižymi mažesne komplikacijų rizika. Remiantis literatūros šaltiniais galima teigti, kad tarp retropubinių ir transobturatorinių pošlaplinių raiščių reikšmingo efektyvumo bei komplikacijų dažnio skirtumo nėra, tačiau, tai yra ganėtinai neseni gydymo metodai, todėl trūksta duomenų pošlaplinių raiščių ilgalaikiam efektyvumui ir komplikacijų dažniui įvertinti.

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