



The short-term efficacy of trans-obturator tape procedure and its effect on the quality of life in women with stress urinary incontinence

● Tonguç ARSLAN¹, ● Gökhan GÖYNÜMER², ● Neşe YÜCEL³

¹Department of Obstetrics and Gynecology, VKV Koç University Hospital, İstanbul, Türkiye

²Department of Obstetrics and Gynecology, Düzce University Faculty of Medicine, Düzce, Türkiye

³Clinic of Obstetrics and Gynecology, Adana Hospital, Adana, Türkiye

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ABSTRACT

Objectives: Demonstrating the efficacy of trans-obturator tape (TOT) procedure for treatment of stress urinary incontinence (SUI) and its effects on patient's quality of life.

Materials and Methods: We analyzed the data of 108 patients (63 SUI; 45 MUI) who underwent the TOT procedure between January 2006 and January 2009. Preoperative and postoperative evaluations included physical examination, Q-tip test, stress test, pad use, bladder capacity, PVR, POP-Q score and QoL questionnaires (IIQ-7 and UDI-6). Three different tapes were used and two different approaches (68 outside-in, 40 inside-out) were performed.

Results: Patients were between 30 and 81 years old. One-year minimum follow-up (median, 22 months) was available for all patients. Postoperative Q-tip test results, pad use, number of voiding during the day and night, and QoL-Q scores were significantly lower ($p < 0.01$). There was no significant difference in between groups regarding device or approach related complications ($p > 0.05$). The device type, the technique performed, BMI, concomitant surgery did not significantly affect the success rates ($p > 0.05$). The overall success rate of the TOT procedure was 87.9% after one year.

Conclusion: TOT is an easy procedure with compatible effectiveness in short and medium term relative to other treatments in the literature, and could substantially eliminate the great vessel, bladder, and bowel injuries. It seems to be effective for both SUI and MUI patients, and could be useful at obese cases, as well. Both trans-obturator access routes are equally safe. Concomitant pelvic surgery does not seem to have an impact on success rates.

Keywords: Mid-urethral slings; trans-obturator tape; urinary stress incontinence

Address for Correspondence: Tonguç Arslan, Department of Obstetrics and Gynecology, VKV Koç University Hospital, İstanbul, Türkiye

E-mail: godrtonguc@yahoo.co.uk **ORCID ID:** orcid.org/0000-0002-2772-3933

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INTRODUCTION

Urinary incontinence (UI) is a common condition that causes a significant decline in the physical activity, sexual function, and psychological well-being of women.¹ The prevalence of UI in women is reported at 13.1%, with stress urinary incontinence (SUI) (6.4%) as the most common type (48.9%).² SUI is the involuntary leakage of urine arising with effort or physical exertion, or on sneezing or coughing.³ Loss of support of the urethra and bladder neck, and deficiency of intrinsic urethral sphincter are the two recognized pathophysiologic mechanisms of the condition.⁴⁻⁶ First described retropubically by Petros and Ulmsten,⁶ tension-free mid-urethral slings became the mainstream surgical treatment of SUI. Mid-urethral tapes seem to provide urethral support or closure during increases in abdominal pressure.^{7,8} In the early 2000's Delorme⁹ and de Leval¹⁰ developed the transobturator route which is pronounced as an easier and safer technique that does virtually not require cystoscopy.

This study aimed to evaluate the short and medium-term effectiveness, complications, and effects on the quality of life of the transobturator route.

MATERIALS AND METHODS

This was a retrospective study based on the UI evaluation forms of 130 patients who underwent TOT between January 2006 and January 2009 in our Clinic within the Department of Obstetrics and Gynecology of Göztepe Training and Research Hospital. The hospital's ethics committee approved the study, and all the patients were given written informed consent. The manufacturers of the meshes used in the trial did not give any funding for the research or did not provide the products.

Surgical indications in our series consisted of SUI and stress-predominant MUI. The diagnosis of SUI was confirmed with a provocative stress test assessed under lithotomy position with a full bladder. A Q-tip test was used to evaluate the bladder neck mobility. Bladder neck mobility was considered positive when the angle change of the cotton swab placed in the internal urethral meatus was greater than 30° between straining and resting, and there was 200 mL of urine in the bladder. Pad use, urethral mobility, bladder capacity, residual urine, and POP-Q score were the other components of the preoperative evaluation after relevant history and gynecologic examination. Preoperative and postoperative filling cystometry tests were performed after full urinalysis and urine culture tests' results were seen as normal. In the presence of infection, cystometry was postponed until after treatment. Bladder sensation parameters (first desire to void, normal desire to void, and maximum cystometric capacity)

were recorded. Preoperative urodynamics was not required in cases where typical pure SUI was considered. Urodynamics was requested in patients with complex complaints, or previous incontinence/pelvic floor surgery. In the evaluation of patients' symptoms, the Incontinence Impact Questionnaire (IIQ-7) and the Urogenital Distress Inventory (UDI-6) tests, validated for Turkish-speaking societies, were used.

Surgical interventions were performed based on the techniques described by Emmanuel Delorme (outside-in) and Jean de Leval (inside-out) depending on the tool used. All surgeons were experienced in TVT and vaginal surgery. Three different instruments and tapes were used in the study, including two different transobturator approaches (outside-in, inside-out). Obturator IVS Tunneller (IVS04™) and I-STOP devices were applied outside-in, and Gynecare TVT™ Obturator System (TVT-O) was applied inside-out. All three meshes had a monofilament and macropore structure. Cystoscopy has rarely been performed. The duration of hospitalization, the period of urinary catheterization, and the method of anesthesia varied depending on the surgeons' preference. Women were excluded if they had residual urine volume equal to or greater than 100 mL, previous pelvic irradiation, neurological conditions such as multiple sclerosis, and a history of genital or abdominal cancer or a pelvic mass.

Perioperative complications (vaginal injuries, bladder injury, bleeding requiring transfusion, hematoma), early postoperative complications (leg pain, fever, urinary retention, vaginitis, urinary tract infection), and late complications (*de novo* urge, mesh erosion, straining to urinate, dyspareunia) were recorded. Early postoperative complications were defined and recorded as complications in the first 15 days, and late complications were defined as complications after the 15th postoperative day. Patients were discharged when the postoperative residual urine was below 100 mL. Postoperative follow-up information was recorded after 1 year and 3 years.

The effectiveness of the TOT procedure was defined as follows: Those who had a negative post-operative stress test, residual urine less than 100 mL, and those who described full continence were considered "cured". Those whose incontinence frequency decreased but still described leakage were decided "partial recovery". Patients who reported no change after the operation, whose incontinence worsened, or who underwent reoperation in the first year due to incontinence were judged as "failure".

Statistical Analysis

For the assessment of the findings obtained in this research, the NCSS 2007 & PASS 2008 Statistical Software (Utah, USA) program

was used for statistical analysis. In addition to descriptive statistical methods (mean, standard deviation), Student's t-test was used to compare the parameters with normal distribution between two groups to check quantitative data. A paired Samples t-test was used for preoperative/postoperative comparisons of parameters showing normal distribution, and the Wilcoxon signed-rank test was used in the comparisons with parameters showing abnormal distribution. The chi-square test and McNemar's test were used to compare qualitative data. The results were presented using a 95% confidence interval, and a p -value <0.05 was described as statistically significant.

RESULTS

The study was conducted retrospectively on the data of 130 patients who underwent the TOT procedure between January 2006 and January 2009. Ten patients who did not reach the first year of surgery and 12 patients who were lost to follow-up were not evaluated. The remaining 108 women whose data was analyzed had a mean age of 48.81 ± 8.45 . The mean follow-up time was 22.62 ± 7.67 months (range 12-39 months). The baseline data of the patients is presented in Table 1. Among 108 women 48 had descensus uteri ($n=40$, 30.7% POP-Q Stage I; $n=8$, 7.4% POP-Q Stage II), 80 had cystocele ($n=45$, 41.7% POP-Q Stage I; $n=30$, 27.8% POP-Q Stage II; $n=5$, 4.6% POP-Q Stage III), and 67 had rectocele ($n=44$, 40.7% POP-Q Stage I; $n=19$, 17.6% POP-Q Stage II; $n=4$ 3.7% POP-Q Stage III).

Most of the women ($n=63$, 58.3%) were operated on with a diagnosis of pure SUI, while the rest ($n=45$, 41.7%) had an indication of MUI. Obturator IVS Tunneller (IVS04™) was used in 40.7%, Gynecare TVT Obturator (TVT-O) in 37.0% and I-STOP in 22.2% of the patients. Mean operation time was 25.08 ± 9.021 minutes (range 10-60 minutes). 69.4% of the patients received general anesthesia, and regional anesthesia was applied to 30.6%. In 80.5% of the patients, no intervention other than TOT was needed. Concomitant surgeries were performed in 21 (19.4%) patients: 8 (7.4%) had a colporrhaphy anterior, 8 (7.4%) had a colporrhaphy posterior, 4 (3.7%) patients had colporrhaphy anteroposterior, and one patient had sacrospinous fixation. The mean duration of urinary catheter maintenance and postoperative stay at the hospital was 1.08 ± 0.939 days (range 0-6 days) and 2.14 ± 1.363 days (range 1-7 days), respectively.

Q-tip test was used as an objective test to evaluate patients before and after the procedure. Compared to the Q-tip test result in the preoperative period (mean=60.23), the decrease seen in the postoperative period (mean=26.90) is statistically highly significant ($p<0.001$). The percentage of patients using pads decreased from preoperative ($n=74$) 68.5% to ($n=19$) 17.6%

postoperatively ($p<0.001$). There was a statistically significant relationship between the Q-tip test results measured in the clinic and the pad use reported by the patients.

The frequency of urination during the day and night was compared before and after the surgery.

The decreases observed in daytime and nocturnal urine counts during the postoperative period compared to the preoperative period were statistically highly significant ($p<0.01$).

The mean value of post-void residue was 19.31 ± 26.52 mL preoperatively, and 20.98 ± 18.02 mL postoperatively. The mean value of bladder capacity was 453.65 ± 90.50 mL preoperatively and 455.70 ± 94.33 mL postoperatively. There was no statistical significance between preoperative and postoperative values for both measurements.

Comparisons regarding quality of life are presented in Table 2 and Table 3. All results showed that the quality of life increased significantly in the postoperative period.

According to the UDI-6 test, the decrease seen in the score obtained during the postoperative period from the first 2

Table 1. Descriptive characteristics of 108 patients at baseline.

	n=108	%
Age (years), mean \pm SD (range)	48/81 \pm 8.8 (30-81)	
BMI (kg/m ²)		
<25	25	23.1%
25-30	44	40.7%
30-35	26	24.1%
>35	13	12.0%
Gravidity, median (range)	5.0 (1-15)	
Parity, median (range)	3.0 (1-10)	
Postmenopausal	53	49.1%
Diabetes		
Yes	15	13.8%
No	93	86.1%
Previous surgery		
Abdominal hysterectomy	10	9.25%
Vaginal hysterectomy + kelly plication	4	3.70%
Vaginal hysterectomy + TOT	1	0.92%
Hysteropexy	1	0.92%
Medication, n (%)		
Diuretics	10	9.25%
Ca ²⁺ channel blockers	8	7.40%
Alpha adrenergic blocker	1	0.92%
Beta adrenergic agonist	2	1.85%
Corticosteroids	4	3.70%
Stress urinary incontinence	63	58.3%
Mixed urinary incontinence	45	41.7%

questions investigating the urge component, from 3rd and 4th questions which investigate the stress component, and from the 5th and 6th questions which investigate the obstructive component was highly statistically significant compared to the preoperative period ($p < 0.01$). Compared to the preoperative period, the decrease observed in IIQ-7 questionnaire scores in the postoperative period was statistically highly significant ($p < 0.01$).

No serious complications occurred during the operations (Table 4). All 8 vaginal perforations occurred with the outside-in technique. Seventeen women had leg pain in the early postoperative period, and the complaints disappeared completely in the short-term follow-up. Nine of these 17 women were operated with the outside-in technique, and the rest with the inside-out technique. Patients' hemoglobin levels dropped significantly after the procedures ($p < 0.01$).

All vaginal tape erosions (n=6) were noticed between 6th and 10th month after the procedures. Vaginal perforation or erosion was not observed in patients who had previously undergone cystocele surgery, Kelly plication, or TOT. While two of the patients with vaginal erosion had no complaints, three had foul-smelling vaginal discharge, and one had a complaint of "dryness" during sexual intercourse. Three women with vaginal erosion had type 2 diabetes mellitus. Three women who had vaginal perforation during the operation also presented with erosion at follow-up. These patients were treated by resecting the band in the erosion area, and by secondary mucosal repair. No abscess was seen. The entire mesh did not need to be removed. Continence was preserved in all patients after resection of the tape. Dyspareunia and straining to urinate occurred in one patient after resection of the tape and secondary vaginal suturing. No erosion was observed in the 3 patients who described dyspareunia. Finally, one patient who was operated on with an indication of MUI was considered a failure at the 3rd month postoperative examination, and TVT was applied.

Complication rates showed no statistically significant difference between the techniques and the devices applied ($p > 0.05$) (Table 5). There is no statistically significant difference demonstrated in the success rates depending on the technique, the device applied, body mass index, and concomitant surgery ($p > 0.05$) (Table 6). The success rate of operations in which IVS-O devices were used showed no statistically significant difference between incontinence types (SUI vs. MUI) ($p > 0.05$). There is a statistically significant difference in the success rates of operations using TVT-O device according to the type of incontinence ($p < 0.05$). After the operations performed with TVT-O devices, the cure rate in women with SUI (80%) was significantly higher than the cure rate in women with MUI (40%) (Table 7). The success rate

after procedures with I-Stop devices also showed no statistically significant difference between SUI and MUI patients ($p > 0.05$).

DISCUSSION

In the joint report on the terminology for female pelvic floor dysfunction, SUI is defined as an involuntary loss of urine on effort or physical exertion, or on sneezing or coughing, and it was emphasized to base the diagnosis on the correlation between a woman's symptoms, signs, and any relevant investigations.³

Table 2. Preoperative and postoperative UDI-6 evaluation

		Mean ± SD	Median	p
UDI-6 (Q1-Q2)	Preop	3.44±1.65	4	0.001**
	Postop	1.48±1.58	1	
UDI-6 (Q1-Q2)	Preop	3.44±2.00	3	0.001**
	Postop	0.56±1.22	0	
UDI-6 (Q1-Q2)	Preop	1.26±1.52	1	0.001**
	Postop	0.60±0.97	0	

** : Wilcoxon sign test was used $p < 0.01$; SD: Standard deviation; UDI-6: Urogenital distress inventory

Table 3. Preoperative and postoperative IIQ-7 and UDI-6 evaluations

		Mean ± SD	Median	p
IIQ-7	Preop	9.46±4.80	9	0.001**
	Postop	2.20±3.67	1	
UDI-6	Preop	8.47±3.62	8	0.001**
	Postop	2.55±2.89	2	

** : Wilcoxon sign test was used $p < 0.01$; UDI-6: Urogenital distress inventory; SD: Standard deviation; IIQ-7: Incontinence impact questionnaire

Table 4. Rates of complications

	n (%)	
Perioperative complications	Bladder injury	-
	Vaginal perforation	8 (7.4%)
	Hematoma	-
	Hemorrhage	-
Early postoperative complications	Urinary tract infections	3 (2.7%)
	Urinary retention	2 (1.8%)
	Vaginitis	-
	Leg pain	17 (15.7%)
	Fever	1 (0.9%)
Late postoperative complications	de novo urge	3 (2.8%)
	Dyspareunia	3 (2.8%)
	Vaginal erosion	6 (5.6%)
	Straining to urinate	5 (4.6%)
	Fever	1 (0.9%)

In addition to being a general health problem, SUI could be considered a social problem that causes a decrease in quality of life as a result of depression, bone fractures, and sexual dysfunction.¹¹ Increasing life expectancy in the last century brings the desire to improve women's physical, emotional, and social well-being. Towards this expectation, surgeons have introduced more than 200 different procedures for the permanent treatment of SUI, but very few have high effectiveness.

Sling procedures are one of the effective solutions. Most of them can be performed under local/regional anesthesia, in shorter operation times, with minimal dissection, and do not even require hospitalization. Retropubic TVT which was first introduced and widely accepted due to its simplicity, is comparable in long-term effectiveness with the gold standard Burch colposuspension.^{12,13}

Table 5. Postoperative complication rates of different devices and techniques

		Complication		p
		Yes	No	
		n (%)	n (%)	
Device	IVS-O	8 (18.2%)	36 (81.8%)	0.926
	TVT-O	6 (15.0%)	34 (85.0%)	
	I-stop	4 (16.7%)	20 (83.3%)	
Technique	Outside-in	12 (17.6%)	56 (82.4%)	0.722
	Inside-out	6 (15.0%)	34 (85.0%)	

chi-squared test was used

Table 6. Rates of success

		Success				p
		Cure	Improvement	Failure	Recurrence	
		n (%)				
Device	IVS-O	30 (68.2%)	10 (22.7%)	4 (9.1%)	-	0.306
	TVT-O	24 (60.0%)	8 (20.0%)	5 (12.5%)	3 (7.5%)	
	I-stop	19 (79.2%)	4 (16.7%)	-	1 (4.2%)	
Technique	Outside-in	49 (72.1%)	14 (20.6%)	4 (5.9%)	56 (82.4%)	0.227
	Inside-out	24 (60.0%)	8 (20.0%)	5 (12.5%)	34 (85.0%)	
BMI	<25	16 (64.0%)	8 (20.0%)	5 (12.5%)	3 (7.5%)	0.729
	25-30	32 (72.7%)	4 (16.7%)	-	1 (4.2%)	
	30-35	17 (65.4%)	6 (23.1%)	1 (3.8%)	2 (7.7%)	
	>35	8 (61.5%)	3 (23.1%)	1 (7.7%)	1 (7.7%)	
Concomitant surgery	Yes	13 (61.9%)	6 (28.6%)	1 (4.8%)	1 (4.8%)	0.691
	No	60 (69.0%)	16 (18.4%)	8 (9.2%)	3 (3.4%)	

chi-squared test was used; BMI: Body mass index

Table 7. Rates of success according to incontinence types

Device	Type of incontinence	Success				p
		Cure	Improvement	Failure	Recurrence	
		n (%)				
IVS-O	Stress UI	21 (72.4%)	6 (20.7%)	2 (6.9%)	-	0.661
	Mixed UI	9 (60.0%)	4 (26.7%)	2 (13.3%)	-	
TVT-O	Stress UI	16 (80.0%)	3 (15.0%)	-	1 (5.0%)	0.037*
	Mixed UI	8 (40.0%)	5 (25.0%)	5 (25.5%)	2 (10.0%)	
I-Stop	Stress UI	13 (92.9%)	1 (7.1%)	-	-	0.134
	Mixed UI	6 (60.0%)	3 (30.0%)	-	1 (10.0%)	

*: chi-squared test was used $p < 0.05$

The transobturator route, developed by Delorme to reduce the accompanying morbidity of the retropubic route, enabled anti-incontinence surgery to become widespread. The transobturator approach has two important advantages: Avoiding the Retzius area and working in limited proximity to the peritoneal cavity. Although vaginal meshes have serious complications such as erosion of the vagina, urethra, or bladder, injuries of the bladder, bowel, and vessels, infection, hematoma, and nerve damage, they appeared to be rare or identified in the literature rarely.^{1,14,15} As a result, mid-urethral slings soon approved superior, the new gold standard.¹⁶

A Cochrane review in 2017 assessing mid-urethral slings revealed that the transobturator route has a lower risk of complications.¹ In this study, the most common complication was groin pain (1.6%). Bladder perforation and pelvic hematoma rates were 0.4% and 0.5% respectively. Both complications were not observed in our study. In our opinion bladder and urethra injuries, previously reported as more common in the outside-in approach, can be minimized with the controlled guidance of the index finger that meets the device in the vaginal incision.^{17,18} On the other hand, the rate of perioperative vaginal perforation (7.4%) in our study was nearly the same as reported in the literature (7.39%).¹ Vaginal perforation was reported to happen less with the inside-out technique. All the cases in our research were observed in surgeries performed with the outside-in approach in the first year. This could be primarily attributed to the learning curve of the technique and the effort to stay away from the bladder and urethra.

Not reported in de Leval's¹⁰ series, the vaginal tape erosion rate was published between 0.4% and 4.5%.^{19,20} In our research, tape erosion was observed in 6 (5.6%) women. Outside-in route was performed in 5 of these patients. In a study conducted in our country with a 4-year follow-up, surgical technique and multifilament mesh erosion were compared, and it was determined that erosion was more frequently encountered in cases where the pubocervicovaginal fascia was not closed properly.²¹ Kroon and Smith²² stated that the material from which the mesh was made, as well as the weave type, could be one of the factors affecting success. In our series, vaginal erosion was observed more frequently in cases performed with the outside-in technique. This might be associated with the wider opening of the vaginal incision to manipulate the index finger employed in this technique.

Another issue that is particularly emphasized in the literature is the relationship between mesh erosion and diabetes mellitus. It has been found that diabetes increases the risk of erosion by 8.3 times.²³ Similarly, half of our cases in which erosion developed

had diabetes mellitus. Since many factors play a role in the formation of mesh erosion, clearly stating the risks to all patients especially if they are diabetic is important, and will be protective for both sides.

Leg pain is significantly a more common complaint in women who underwent TOT than TVT.¹ It is assumed that there were 163 more cases per 1000 in the TOT group. The median duration was 8 weeks showing most groin pain resolves in a short period with anti-inflammatory treatment.^{18,24,25} In rare cases that do not resolve, steroids and local anesthetics were shown to be useful after excluding mesh erosion and abscess.²⁶ In all the cases with leg pain in our study, the complaints were observed to regress in the short-term follow-up.

Women with *de novo* urgency observed in the TOT series showed a rate of approximately 8%, and there was no statistically significant difference compared to TVT in both short and long-term data.^{1,27} It is stated that *de novo* complaints decrease to a minimum in one year.^{19,24} The lower rate in the transobturator route might be associated with the horizontal placement of the tape between the ischiopubic rami and urethra, as well as the possibility leaving it under less tension compared to TVT. In the operations during the tape placement, we used Mayo scissors between the tape and urethra to ensure a tension-free installation. However, the rate of *de novo* urgency (2.8%) in our study was quite low compared to the literature.

Transient urinary retention and straining to urinate, the other two complications of voiding dysfunction, were detected at a rate of 1.8% and 4.6%, respectively. The amount of the post-void residual urine of these patients was measured under 100 mL. No patient required long-term indwelling catheterization or readjustment of the mesh. These results are similar to the data demonstrating a long-term follow-up after the TOT procedure.²⁷ The success of the conservative management of complications can be attributed to the appropriate indication given in line with residue measurement at the preoperative period and urodynamic confirmation of patients with complicated symptoms.

In our study, we found no statistical difference in complication rates between all three devices and two techniques. In his research comparing outside-in and inside-out techniques, DeBodinance¹⁸ declared that both methods are equally safe and that trying to make one technique superior to the other would be short-sighted. Petri et al.²⁸ stated that the most common cause of complications was inadequate surgical technique, and pointed out that appropriate training and performing a sufficient number of procedures would help to reduce complication rates significantly.

The main goal of our study was to demonstrate TOT effectiveness and its effect on quality of life. Although objective methods

such as stress tests, pad tests, and urodynamics can be used to evaluate the effectiveness of UI, the primary goal of the clinician should be the patient's satisfaction. In this context, classification as dry or wet - partial recovery/failure -, presence of preoperative and postoperative pad use, and QoL questionnaires are the most frequently used subjective parameters. When compared to the data of QoL questionnaires, stress test data may overestimate the results in studies. On the other hand, the diversity of subjective measures proposed in the studies and the lack of standardized parameters used in defining success make it difficult to evaluate the related data in the literature.²⁹

In our study, we considered stress test and pad use as objective criteria, and the patient's descriptions of healing, partial recovery, and failure with the QoL questionnaires (IIQ-7 and UDI-6) as subjective criteria. Urodynamic examinations were not included in these criteria because they were only requested for specific indications. Highly significant results were found in favor of the TOT procedure in all effectiveness measurements in our analysis. Again, there was a statistically significant relationship between the improvement in Q-tip test results and the decrease in the need for pad use. In our research, cure, partial recovery, failure, and recurrence rates at the end of one year were 67.5%, 20.3%, 8.3%, and 3.7%, respectively. When partial recovery is included in the definition of success, the efficiency of TOT can be stated as 87.9%. These rates are similar in many studies and are equal to TVT in the short term.^{17-19,24} There was no significant difference in success rates between all three instruments and two techniques.

Another factor that should be considered is the concomitant pelvic floor surgery. Incontinence operations are often expected to be accompanied by prolapse surgeries, and their proportion in the study population should be specified. While this rate was 56% in Tamussino et al.'s¹⁷ series of 2543 cases, Krauth et al.²⁴ stated it as 8.3%. In our study, additional prolapse surgery was observed at a rate of 19.4%, and it did not change the effectiveness of TOT.

Formerly publications emphasized the negative impact of obesity which is thought to play a role in the etiology of mid-urethral sling success. However, recent literature showed no change in cure rates, especially in the subjective success rates of overweight or obese women.³⁰ Our research found that the efficiency of TOT did not change among women of a different body-mass index.

When the effectiveness rates were compared for SUI and MUI according to the device type, a statistical difference was found between the results obtained with TVT-O applied with the

inside-out technique. It was observed that the success rates in patients who underwent TVT-O with SUI indication decreased significantly in the patient group in which the UUI component was added. However, some publications in the literature report that the TOT procedure is also very effective on lower urinary tract symptoms.^{18,31} In our study this decrease specific to TVT-O unlike other devices and techniques was not considered remarkable due to the abundance of variables that could affect the results.

In the literature, in the prospective 3-year follow-up of 91 patients who underwent TVT-O with a clinical and urodynamic diagnosis of SUI, cure and partial recovery rates were reported as 88.4% and 9.3%, respectively, and these rates were similar to those in the first year.¹⁹ Finally, in our series, 8 patients completed the 3-year follow-up period, and it was observed that the success rates of these patients did not change compared to the 1st year.

The data come from a heterogeneous study group, its retrospective design and the number of patients lost to follow-up are the potential weaknesses of our study. Besides, the individual practice of the surgeon determined the type of anesthesia, duration of hospitalization, and duration of the urinary catheter. The series also includes each surgeon's learning curve. However, this situation further increases the value of the results regarding the easy and safe applicability of the transobturator technique.

CONCLUSION

The transobturator approach through mid-urethral slings stands out as a minimally invasive procedure that is equally effective as other methods in the literature in the short and medium term, and can eliminate vascular, bladder, and bowel injuries. It is easy to learn with a short operating time and does not require cystoscopy. Inside-out and outside-out techniques have no advantage over each other. The presence of additional surgery does not affect the results. Women experience a significant improvement in the quality of life after surgery indicated by either SUI or MUI. The finding that the effectiveness is independent of body-mass index draws attention to the fact that it may also benefit obese patients. Nevertheless, it requires more research to publish the data of longer follow-up time to determine the effectiveness in time and to identify the long-term adverse events. Good quality trials with standardized subjective and objective outcome measures are essential to provide robust evidence.

ETHICS

Ethics Committee Approval: The study was approved by the Ethics Committee of the Göztepe Training and Research Hospital.

Informed Consent: All the patients were given written informed consent.

Contributions

Surgical and Medical Practices: N.Y., T.A.; Concept: N.Y., G.G.; Design: G.G.; Data Collection or Processing: T.A.; Analysis or Interpretation: T.A.; Literature Search: T.A.; Writing: T.A.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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REFERENCES

1. Ford AA, Rogerson L, Cody JD, Ogah J. Mid-urethral sling operations for stress urinary incontinence in women. *Cochrane Database Syst Rev.* 2015; CD006375.
2. Irwin DE, Milsom I, Hunskaar S, et al. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. *Eur Urol.* 2006; 50: 1306-14; discussion 1314-5.
3. Haylen BT, de Ridder D, Freeman RM, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecol J.* 2010; 21: 5-26.
4. DeLancey JO. Structural support of the urethra as it relates to stress urinary incontinence: the hammock hypothesis. *Am J Obstet Gynecol.* 1994; 170: 713-23.
5. Blaivas JG, Olsson CA. Stress-incontinence - classification and surgical approach. *J Urol.* 1988; 139: 727-31.
6. Petros PE, Ulmsten UI. An integral theory of female urinary incontinence. Experimental and clinical considerations. *Acta Obstet Gynecol Scand Suppl.* 1990; 153: 7-31.
7. Ulmsten U, Petros P. Intravaginal slingplasty (IVS): an ambulatory surgical procedure for treatment of female urinary incontinence. *Scand J Urol Nephrol.* 1995; 29: 75-82.
8. Dietz HP, Wilson PD. The 'iris effect': how two-dimensional and three-dimensional ultrasound can help us understand anti-incontinence procedures. *Ultrasound Obstet Gynecol.* 2004; 23: 267-71.
9. Delorme E. [Transobturator urethral suspension: a mini-invasive procedure in the treatment of stress urinary incontinence in women]. *Prog Urol.* 2001; 11: 1306-13.
10. de Leval J. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. *Eur Urol.* 2003; 44: 724-30.
11. Itil IM. Midurethral synthetic slings: A social revolution. *Int J Gynaecol Obstet.* 2008; 103: 197-8.
12. Ward KL, Hilton P; UK and Ireland TVT Trial Group. Tension-free vaginal tape versus colposuspension for primary urodynamic stress incontinence: 5-year follow up. *BJOG.* 2008; 115: 226-33.
13. Lapitan MC, Cody JD. Open retropubic colposuspension for urinary incontinence in women. *Cochrane Database Syst Rev.* 2012; CD002912.
14. Nilsson CG, Palva K, Rezapour M, Falconer C. Eleven years prospective follow-up of the tension-free vaginal tape procedure for treatment of stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct.* 2008; 19: 1043-7.
15. Medicines and Healthcare Products Regulatory Agency (MHRA). A summary of the evidence on the benefits and risks of vaginal mesh implants [report]. London: Medicines and Healthcare Products Regulatory Agency (MHRA), 28 October 2014.
16. Fusco F, Abdel-Fattah M, Chapple CR, et al. Updated Systematic Review and Meta-analysis of the Comparative Data on Colposuspensions, Pubovaginal Slings, and Midurethral Tapes in the Surgical Treatment of Female Stress Urinary Incontinence. *Eur Urol.* 2017; 72: 567-91.
17. Tamussino K, Hanzal E, Kölle D, et al. Transobturator tapes for stress urinary incontinence: Results of the Austrian registry. *Am J Obstet Gynecol.* 2007; 197: 634.e1-5.
18. Debodinance P. Trans-obturator urethral sling for the surgical correction of female stress urinary incontinence: outside-in (Monarc) versus inside-out (TVT-O). Are the two ways reassuring? *Eur J Obstet Gynecol Reprod Biol.* 2007; 133: 232-8.
19. Waltregny D, Gaspar Y, Reul O, et al. TVT-O for the treatment of female stress urinary incontinence: results of a prospective study after a 3-year minimum follow-up. *Eur Urol.* 2008; 53: 401-8.
20. Tammaa A, Aigmüller T, Hanzal E, et al. Retropubic versus transobturator tension-free vaginal tape (TVT vs TVT-O): Five-year results of the Austrian randomized trial. *Neurourol Urodyn.* 2018; 37: 331-8.
21. Sivaslioglu AA, Unlubilgin E, Dölen I. The multifilament polypropylene tape erosion trouble: tape structure vs surgical technique. Which one is the cause? *Int Urogynecol J Pelvic Floor Dysfunct.* 2008; 19: 417-20.
22. Kroon ND, Smith KM. Tension-free vaginal tape: what it's made of can matter! *Int Urogynecol J Pelvic Floor Dysfunct.* 2008; 19: 103-6.
23. Chen HY, Ho M, Hung YC, Huang LC. Analysis of risk factors associated with vaginal erosion after synthetic sling procedures for stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct.* 2008; 19: 117-21.

24. Krauth JS, Rasoamiaramanana H, Barletta H, J et al. Sub-urethral tape treatment of female urinary incontinence--morbidity assessment of the transobturator route and a new tape (I-STOP): a multi-center experiment involving 604 cases. *Eur Urol*. 2005; 47: 102-7.
25. Latthe PM, Foon R, Toozs-Hobson P. Transobturator and retropubic tape procedures in stress urinary incontinence: a systematic review and meta-analysis of effectiveness and complications. *BJOG*. 2007; 114: 522-31.
26. Roth TM. Management of persistent groin pain after trans obturator slings. *Int Urogynecol J Pelvic Floor Dysfunct*. 2007; 18: 1371-3.
27. Farag F, Osman NI, Pang KH, et al. Complications of Synthetic Midurethral Slings: Is There a Relevant Discrepancy Between Observational Data and Clinical Trials? *Eur Urol Focus*. 2023; S2405-4569(23)00244-4.
28. Petri E, Niemeyer R, Martan A, et al. Reasons for and treatment of surgical complications with alloplastic slings. *Int Urogynecol J Pelvic Floor Dysfunct*. 2006; 17: 3-13.
29. Rapp DE, Kobashi KC. Outcomes following sling surgery: importance of the definition of success. *J Urol*. 2008; 180: 998-1002.
30. Xia Z, Qian J, Chen Y, Liao B, Luo D. Does body mass index influence the outcome of mid-urethral sling procedures for stress urinary incontinence? *Int Urogynecol J*. 2017; 28: 817-22.
31. Tahseen S, Reid P. Effect of trans obturator tape on overactive bladder symptoms and urge urinary incontinence in women with mixed urinary incontinence. *Obstet Gynecol* 2009; 113: 617-23.