



Could the postoperative residual of urine predict the outcome of TVTOMidurethral sling procedure in female patients?



P. Bakas^{a,*}, A. Betta^a, E. Papadakis^a, E. Liapis^b, N. Klimis^b, E. Deligeoroglou^a

^a2nd Department of Obstetrics and Gynecology, Aretaieio Hospital, University of Athens, Greece

^bMitera Maternity Hospital, Athens, Greece

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ABSTRACT

Objective: To assess if the amount of postoperative postvoid residual of urine that is within the normal range (less than 100 mls) could predict the outcome of TVT0 (Tension -free vaginal tape obturator) procedure.

Study design: Second Department of Obstetrics and Gynecology, Aretaieio Hospital, University of Athens, Greece. Patients that had been submitted to TVT0 procedure between 2013 and 2017 were reviewed and outcome was assessed. The follow up assessment included cough stress test, the Patient Satisfaction Questionnaire (PSQ), the Urinary Distress Inventory-6 (UDI-6) and the Patient Global Impression of Improvement (PGI-I) questionnaire.

Results: The mean follow-up was 3.7 years (+1.35 years). Forty eight patients (40.3%) had only a TVT0 procedure. Forty three patients (36.1%) had a TVT0 procedure combined with anterior colporrhaphy. Twenty eight patients (23.6%) underwent a TVT0 procedure and anterior colporrhaphy and posterior colpoperineorrhaphy. According to cough stress test 88% patients (105/119) were cured having a negative cough stress test. Using logistic regression analysis it was found that patient's age ($p=0.78$), postoperative postvoid residual of urine ($=0.24$) or day of catheter removal ($p=0.22$) had no statistically significant correlation with the medium term outcome of TVT0 procedure. Also, regression analysis shows that patients' Body Mass Index (BMI) has negative correlation to the postoperative outcome.

Conclusion(s): PVR < 50 mls appears to be related with successful medium term outcome after TVT0 procedure. Also, patients' (BMI) has negative correlation to the postoperative outcome.

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Introduction

Urinary incontinence is a common symptom experienced by significant number of adult women and its weighted prevalence in women is about 15.7% (95% CI, 13.2%–18.2%) [1]. The cumulative risk for stress urinary incontinence (SUI) surgery has been estimated to 13.6% (95%CI 13.5, 13.7) and that for pelvic organ prolapse surgery to 12.6% by the age of 80 years old [2]. Many affected women do not consult their doctor about this troublesome symptom perhaps based on the belief that they cannot be helped [3].

SUI occurs mostly because of anatomic failure of urethral support [4]. Consequently, reconstruction of the supportive tissues under the urethra plays a major role in SUI treatment. The first midurethral sling (MUS) was introduced by Ulmsten et al. in 1996 [5].

Both routes of midurethral tape placement, the retropubic tension-free vaginal tape and the transobturator tape (in-out or out-in) maintain high efficacy in medium and long term with low complications rates [6–8]. The success of a MUS seems to be related with a) increased Pdet@Qmax ratio, b) increased bladder outlet obstruction [9], repeat voiding [10] and the failure of a MUS appears to be related with a) previous continence surgery, b) increased pad weight, c) decreased urethral mobility, d) urge score, e) type of the sling [10], f) max Qtip < 30° [11].

The synthetic midurethral slings (SMUS) are considered to be tension-free [12] but they are associated with an up to 10% incidence of postoperative voiding difficulties [13] which could be attributed to some degree of obstruction of the urethra during bladder emptying process. According to the current literature, immediate postoperative voiding dysfunction is associated with [1] Qmax < 30 mls/sec [14], age > 65 years old, Valsava voiding [15] and [4] increased Charlson comorbidity index [16].

Synthetic midurethral slings are considered to be tension-free and they should perform their anti-incontinence action by functional kinking of the urethra [12] and therefore without any

* Corresponding author at: Obstetrics and Gynecology, Vas. Sofias Av. 124a, Athens, PC: 11526, Greece.

E-mail address: p_bakas@yahoo.com (P. Bakas).

significant amount of postoperative postvoid residual of urine (PVR).

The initial hypothesis of the present study was if increased (but within normal limits) PVR is related with a tighter TVTO and therefore better chances for a successful surgical outcome. Also, objective of the study was to be investigated even if a PVR < 50 mls can be related with successful procedures and continent women.

Materials and methods

The present study was performed in the Urogynecology unit of the 2nd Department of Obstetrics and Gynecology of Aretaieio University Hospital. Purpose of the present study was to assess if there is an association between the postoperative postvoid residual volume (PVR) of urine and the outcome of TVTO procedure in the midterm.

Inclusion criteria were the presence of pure urodynamic stress urinary incontinence (USUI), preoperative PVR less than 50 mls and for patients without significant pelvic floor prolapse and a PVR less than 50 mls after reduction of the prolapse with the use of a pessary ring in patients with significant prolapse, BMI less than 30kg/m², cystocele or rectocele no greater than grade 2 according to POP-Q classification and appropriate fitness for the operation. Exclusion criteria were the history of previous surgery in the anterior vaginal wall and the presence of mixed incontinence.

The operating theater records and patient's files were checked to identify patient's meeting the inclusion and exclusion criteria and operated from January 2013 to December 2017. One hundred and twenty eight patients were identified but 9 patients could not either attend or localised and therefore participated in the study 119 women diagnosed with pure USUI that underwent TVTOMid-urethral sling placement.

Preoperative assessment of the patients included a full history, a gynaecological examination, urinalysis, a frequency-volume chart completed for 2–3 days and a completed preoperatively UDI-6 questionnaire. Preoperative urodynamic investigations included filling and voiding cystometry, and uroflow. All patients were contacted through telephone call and were asked to come for follow up examination.

The hospital ethics committee approval was obtained and all women gave their informed consent preoperatively. Also, the Declaration of Helsinki was followed in the present study.

Age, body mass index, parity and concomitant surgeries of the pelvic floor were taken into consideration. Patient's characteristics are summarized in Table 1.

All patients were operated under epidural anesthesia and the procedure was conducted by the same two experienced gynecological surgeons. Some patients had surgery for pelvic floor prolapse at the same time, such as anterior/and or posterior colporrhaphy.

A standardized technique was followed for the TVTO insertion [9]. Intraoperative cough stress test (CST) was performed by filling up the bladder at 300–350 mls. All patients had a postoperative residual of urine test the first postoperative day in order to

Table 1
Patient characteristics.

Age	62.3 + 10.9 (mean + SD)
Body mass index (BMI)	26.7 + 3.9 (mean + SD)
Menopausal status	
Premenopausal	14 (11.8%)
Postmenopausal	105 (88.2%)
Smoking	15 (12.6%)
Parity	2.1 + 0.4 (mean + SD)
TVTO only procedure	48 (40.3%)
Anterior colporrhaphy	28 (23.5%)
Posterior Colpoperineorrhaphy	43 (36.1%)

estimate the postvoiding residual. A postvoid residual of less than 100 ml was considered satisfactory.

Follow-up assessment included gynaecological examination, urinalysis, the cough stress test, the UDI-6 questionnaire [17], the patient satisfaction questionnaire (PSQ) [18] and the PGI-I questionnaire [19].

The cough stress test was performed with the patient in lithotomy and standing position and with a comfortably filled bladder as it was reported by the patient. The patient was instructed to cough forcefully 1–4 times with direct visualization of the urethral meatus for the presence of urine leakage. Leakage of urine from the urethral meatus that was simultaneous to the cough (s) was considered a positive test. Absence of urine leakage after 4 forceful coughs was considered a negative test.

The questionnaires were completed at the time of follow up visit. The interview was taken by the same two final year trainees in Obstetrics and Gynecology. UDI-6 questionnaire has been previously validated [17].

Objective cure was defined as no urine leakage during cough stress test.

Subjective cure was defined as no stress urinary incontinence reported by the patient answer to PSQ [18], and PGI-I [19] questionnaires.

Subjective improvement and failure was defined according to the findings of PSQ and PGI-I questionnaires as it was stated by the patients.

Statistical analysis was performed using Medical software version 18.5. Kolmogorov-Smirnov test was used for detection of data distribution and Logistic regression analysis for examination of different parameters. Student's *t*-test was used for comparison of means of parameters with normal distribution. A *p* < 0.05 was considered statistically significant.

Results

The mean follow-up was 3.7 years (+1.35 years). There were no severe intraoperative complications.

Forty eight patients (40.3%) had only a TVTO procedure. Forty three patients (36.1%) had a TVTO procedure combined with anterior colporrhaphy. Twenty eight patients (23.6%) underwent a TVTO procedure and anterior colporrhaphy and posterior colporrhaphy.

According to cough stress test 88% patients (105/119) were cured having a negative cough stress test.

PSQ and PGI-I questionnaire findings are presented in Table 2.

The preoperative UDI-6 questionnaire score was 31.2 and the score at follow up was 9.4 showing a statistically significant improvement of patient's symptoms severity.

The patients preoperative Qmax was 24.9 + 8.3 mls/sec, the Pdet at Qmax was 17.3 + 7.1 cm H₂O and MCC was 453 + 78 mls.

Table 2

Subjective outcome of TVTO procedure based on Patient Satisfaction Questionnaire and PGI-I in patients with USUI at a mean follow up of 3.7 years.

	TVTO (n = 48)	TVTO + anteriorcolporrhaphy (n = 71)
Subjective (PSQ)		
Cure	77.1% (37/48)	80.3% (57/71)
Improvement	12.5% (6/48)	11.3% (8/71)
Failure	10.4% (5/48)	8.4% (6/71)
Subjective (PGI_I)		
Cure	79.1% (38/48)	81.7% (58/71)
Improvement	12.5% (6/48)	9.8% (7/71)
Failure	8.4% (4/48)	8.5% (6/71)

TVTO + anterior colporrhaphy group includes also patients with posterior colporrhaphy or vaginal hysterectomy.

Table 3
Preoperative and postoperative postvoid residual (PVR).

Preoperative PVR (Mean) (119 patients)	Postoperative PVR (Total mean) (119 patients)	Postoperative PVR (105 Cured patients) (Mean)	Postoperative PVR (14 Not Cured Patients) (mean)
23.4 + 9.5	52.9 + 33.8 mls	53.9 + 33.1	49.6 + 48.4
P <0.01		>0.05	

Using logistic regression analysis it was found that patient's age ($p = 0.78$), postvoid residual of urine ($= 0.24$) or day of catheter removal ($p = 0.22$) had no statistically significant correlation with the outcome of TVTO procedure. The patient's BMI had a marginally negative relation to the outcome of TVTO procedure ($p = 0.045$).

There was a statistically significant difference between preoperative and postoperative mean PVR but in all cases PVR was less than 100 mls (<0.05) (Table 3). Furthermore, There was not statistically significant difference in the postvoid residual of urine between cured and not cured patients according to cough stress test (Table 3).

Patients preoperative maximum cystometric capacity, BMI and patient's age were assessed using regression analysis but no relation was found with PVR (Table 4).

Regarding the obstructive symptoms, according to the UDI-6 questionnaire eighty six patients (72.3%) did not experience any difficulty in emptying their bladder. Thirty three patients (27.7%) complained of slightly obstructive symptoms. There were no patients complaining of severe obstructive symptoms. Moreover, 108 patients (90.7%) had a successful postoperative voiding trial test (PVR<100 ml) on first postoperative day. Ten patients had an unsuccessful postoperative voiding trial test (PVR > 100). In all these patients, foley catheter remained for one more day and the voiding trial test was repeated. In ten out of eleven patients a successful voiding trial test was achieved the next day and they were discharged from hospital without foley catheter. However, one patient had a second unsuccessful postvoiding trial test and was discharged from hospital with foley catheter due to urinary retention. She was evaluated again 10 days later and she had a normal postvoid residual. There was no patient that required sling release because of long-term bladder outlet obstruction.

Comment

Surgical treatment of SUI aims ideally at complete restoration of urinary continence without morbidity. After anti-incontinence surgery a postoperative residual less than 100 mls has been generally considered normal [20] but in non-operated female patients 80–85% of them have a residual of urine less than 50 mls

and 95% less than 100 mls [21,22]. Also, it has been suggested that in normal female population the upper limit of normal for residual urine volume (taken at the 90th centile) is 10 ml [23]. Therefore, there is a significant discrepancy of normal residual of urine between normal female population and postoperative residual of urine after anti-incontinence surgery. This discrepancy could be attributed to the obstructive effect of anti-incontinence surgery to the urethra. It has been proposed that midurethral slings provide continence by urethral kinking [12], but they are associated with an up to 10% incidence of postoperative voiding difficulties [13] which could be attributed to some degree of postoperative urethral obstruction. The findings of the present study support that there is no statistically significant association between the objective and subjective outcome of the TVTO procedure and the postoperative residual of urine ($p > 0.05$). It has been suggested that successful outcomes of sling procedures are associated with higher voiding pressures relative to preoperative baseline values. However, concomitant changes in other urodynamic voiding parameters were not significantly associated with the procedure outcome [9]. Furthermore, it has been found that women who require a repeat voiding trial following MUS surgery have greater objective success at 1 year postoperatively when compared to those who are self-voiding at the time of discharge [10]. The aforementioned findings probably support that some degree of urethral obstruction after a MUS procedure provides higher probability of a successful outcome. There are no other similar studies to examine the association between residual of urine and the outcome of TVTO or other anti-incontinence procedure (to the best of our knowledge). This finding supports the mechanism of kinking in the function of MUS as anti-incontinence procedure [12] and it could be possibly extrapolated to other MUS anti-incontinence procedures. Subsequently, the objective and subjective outcome of TVTO procedure is independent of post void residual and patients with minimal or no residual of urine could expect excellent results. Therefore, it could be suggested that the midterm successful outcome of TVTO procedure is independent of degree of urethral obstruction. It is further supported by the finding that there is no statistically significant difference between mean PVR of patients cured from their urodynamic stress urinary incontinence (USUI) and those not cured from USUI (Table 3). In addition, there was no association with the outcome of TVTO procedure and the day of Foley catheter removal or the patient's age. The patient's BMI was negatively related to the outcome of TVTO procedure but this finding had a marginal statistical significance ($p = 0.045$) probably due to the fact that patients with a BMI more than 30 kgrs/m² were excluded from the study. This finding is similar with the findings of other studies [24]. In addition, it has been suggested that lower body mass index (BMI) is among the factors that are associated with delayed voiding along with patient's age ≥ 65 years ($p < 0.05$), presence of Valsalva voiding ($p < 0.01$) [15].

Table 4
Correlation between preoperative urodynamic and POP-Q staging with amount of postoperative PVR and midterm outcome of TVTO procedure.(means + SD).

	Successful outcome		P	Unsuccessful outcome		P
	PVR<50mls	PVR 50-100 mls		PVR<50mls	PVR 50-100 mls	
Age (years)	62.8 + 10.1	62.7 + 10.4	>.05	59.8 + 13.4	63.8 + 13.1	>0.05
BMI (kgrs/m ²)	26.8 + 3.7	26.7 + 3.5	>0.05	30.0 + 6.6	31.3 + 5.5	>0.05
PVR (mls)	31.25 + 20.2	77.9 + 24.8	<0.05	22.6 + 16.6	80.1 + 13.4	<0.05
MCC (mls)	455.1 + 76.2	423.7 + 87.7	>0.05	431.2 + 91.8	480 + 37.4	>0.05
Qmax (ml/sec)	23.7 + 6.4	23.9 + 6.9	>0.05	24.7 + 8.6	24.2 + 6.1	>0.05
Pdet@Qmax cm H ₂ O	19.6 + 5.2	20.4 + 5.0	>0.05	21.2 + 7.2	22.8 + 3.9	>0.05
POP-Q stage I (number)	19	18	>0.05	5	6	>0.05
POP-Q stage II (number)	38	30	>0.05	1	2	>0.05

Also, there is a significant improvement of patient's symptoms severity from a score of 31.2 preoperatively to 9.4 postoperatively as it can be assessed by UDI-6 questionnaire.

In conclusion, the findings of the present study support that the patient's BMI was negatively related to the outcome of TVTO procedure but this finding had a marginal statistical significance ($p=0.045$). Also, there is no statistically significant association between the objective and subjective outcome of the TVTO procedure and the postoperative residual of urine. Therefore, the outcome of TVTO procedure is independent of post void residual and patients with minimal or no residual of urine could expect very good results.

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