Voiding Functions: The effect of TVT and TOT

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Abstract: **Objective:** To analyze the symptoms of voiding dysfunction and urodynamic changes subsequent to placing tension- free vaginal tape or transobturator tape. **Patients and Methods:** A retrospective cohort study that included women with urodynamic stress urinary incontinence, in whom we placed tension-free tapes and conducted a urodynamic study one year later. The study included 90 women: 37 had tension-free vaginal tape and 53 had transobturator tape and was carried out between January 2009 and August 2010. The means of the preoperative and postoperative urodynamic parameters were analyzed. **Results:** We noted an average decrease in the maximum flow rate of 9ml/sec in the tension-free vaginal tape group ($P = 0.002$) and 3 ml /sec in the transobturator tape group ($P < 0.001$). For the tension-free vaginal tape group, we noted an increase in maximum closure pressure of 21cm H2O (P=0.004), an increase in maximum urethral closure pressure on stress of 11 cm H2O ($P = 0.041$) and 30% increase in pressure transmission ratio (P<0.001). **Conclusion:** The most consistent change after minimally invasive surgeries for urodynamic stress incontinence was the decrease in maximum flow rate following TVT.
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Key Words: Stress urinary incontinence, suburethral tape, tension-free vaginal tape, transobturator tape, urodynamic.

1. Introduction

Since retropubic tension-free vaginal tape (TVT) was reported by Ulmsten and Petros1 and the transobturator tape (TOT) by Delorme2, they have become the first choice for surgical treatment of stress incontinence. Failures are as low as 5.7% for the transobturator and 7.8% for the retropubic procedures. Perioperative complications are only 0.8% for transobturator and 5.5% for retropubic procedures3. Trials with longer TVT follow-up extended over 11 years with a targeted cure of 90%4. In cases in which there is intrinsic sphincter deficiency, the retropubic approach is preferred because its failure rate is 21%, while it is about 45% for the transobturator approach5.

Few studies have evaluated urodynamic changes after insertion of tension-free tapes6-8. The main weakness is to their limited number and lack of uniformity of their results. The urodynamic follow-ups of those studies are 3-14 months.

The aim of this study is to analyze urodynamic parameters before surgery and one year after TVT or TOT in patients with urodynamic stress incontinence.

2. Patients and Methods

We identified a retrospective cohort of 90 cases, at Ain Shams University Maternity Hospital between January, 2009 and August, 2010. Those were women who met the following inclusion criteria: urodynamically proven stress urinary incontinence had TVT (n=37) or TOT (n=53) inserted and were subjected to a urodynamic study one year after the anti-incontinence surgery. We did not include women with incomplete records, those with a history of surgery of any kind to cure incontinence prior to the placement of the tension-free tapes, or who required cutting or mobilization of the tape after the year of study. Study variables in both groups, were age, body mass index, mean parity, number of vaginal deliveries, duration of incontinence, concurrent surgery, postoperative complications and postoperative voiding dysfunction. The urodynamic parameters were defined in accordance with the IUGA / ICS 2010 standardization of terminology9. We compared those parameters before surgery to verify if there were differences between the groups. We conducted the studies using MedTronic model Duet logic 8.5 multi-channel equipment with the Urolab Janus System IV and V programs (Houston, Texas, USA) using a double-lumen 7 Fr urethral catheter and rectal balloon catheter. Those tests were carried out on each patient prior to surgery and one year subsequently, in accordance with good urodynamic practice10.

Three urogynecologists performed the TVT and TOT surgery according to our hospital protocol under epidural anesthesia in accordance with the manufacturer's instructions (Gynecare, Somerville, New Jersey, USA).The patients were discharged from hospital one day after surgery without a urethral catheter.

The sample size was defined in terms of continence area, because this was the most significant change shown in the Hsiao et al. Study 6 that described a mean area of continence a year after the placement of the tension-free tape of 40.4 ± 33.4 cm

H2O. We aimed to ascertain a difference of 80% of this value before and after surgery in the groups studied. We thus estimated the effect size at 32.2, the standardized effect size (effect size / standard deviation) at 0.96 and with α 0.05 and β. We included 90 women, 37 for the TVT group and 53for the TOT group.

Statistical Analysis:

Was performed by SPSS version 15.0 computer database. In the analysis, the unpaired Student t-test, chi-square test and Fisher exact probability test were used where appropriate. Significance was set at *P* <0.05.

3. Results

Patient characteristics are shown in Table (1). There were no differences between groups studied. Concurrent surgical procedures in the TVT group comprised 1anterior colporrhaphy, 5 anterior and posterior colporrhaphies, 1 abdominal hysterectomy and 3 vaginal hysterectomies. The TOT group had 2 anterior colporrhaphies, 2 vaginalhysterectomies with anterior colporrhaphy, 3 anteriorand posterior colporrhaphies, 2 abdominal and 2 vaginal hysterectomies.

Table 1: Patient characteristics of the two groups. †

Variable	TVT (n =37)	TOT (n =53)	*P* value
Age (years)	42.6 ±8.9	43.7 ± 9.6	0.583
Body mass index	29.1 ±4.3	28.6 ± 5.5	0.645
Mean parity	4.1 ±0.3	4.2 ± 0.3	0.123
Vaginal deliveries	34 (91.9)	47 (88.7)	0.732
Duration of incontinence (months)	33.5 ±7.3	35.6 ±8.1	0.211
Concurrent surgery	10 (27)	11 (20.8)	0.614
Duration of follow-up (years)	3.2 ±1.1	3.3 ± 1.5	0.731

Abbreviations: TVT, Tension-free vaginal tape; TOT, Transobturator tape
† Values are given as mean ± SD or number (percentage).

Table (2) shows the operative characteristics of the2 studied groups. Operative time was shorter in the TOT group (18.1±6.5min) than in the TVT group (30.3± 10.7) with the difference is statistically significant (*P* <0.01). The TOT group did not show any case of bladder injury, retropubic hematoma, urinary retention or urinary tract infection.

Table 2: Operative characteristics of the two groups. †

Variable	TVT (n =37)	TOT (n =53)	*P* value
Operative time(min)	30.3 ±10.7	18.1 ±6.5	< 0.001*
Postoperative complications:			
Bladde rinjury	3 (8.1)	0 (0)	---
Retropubic hematoma	5 (13.5)	0 (0)	---
Urinary retention	6 (16.2)	0 (0)	---
Urinary tract infection	1 (2.7)	0 (0)	---
Tape erosion	2 (5.7)	1 (1.9)	0.566

Abbreviations: TVT, Tension-free vaginal tape; TOT, Transobturator tape
† Values are given as mean ± SD or number (percentage).
* Statistically significant difference

There were no significant differences between the two groups as regards postoperative voiding dysfunction including dysuria, frequency, de novo urgency, urge incontinence, sense of incomplete emptying or interrupted stream (Table 3).

In the TVT group, there was a decrease in the maximum flow rate (Qmax) of 9ml/sec(*P*=0.002), an increase in maximum closure pressure (MCP) of 21 cm H2O(*P*=0.004), an increase in maximum urethral Closure pressure (MUCP) on stress of 11cmH2O (*P*=0.041) and an increase of 30% in pressure transmission ratio (PTR) (*P* < 0.001) Table (4).

Table (5) shows the urodynamic changes before and after TOT. The only change with statistical significance in the TOT group was the decrease in the Qmax (*P* <0.001) of 3 ml / sec.

Table 3: Comparison of postoperative voiding dysfunction between the two groups. †

Variable	TVT (n =37)	TOT (n =53)	*P* value
Dysuria	8 (21.6)	11(20.8)	0.921
Frequency	8 (21.6)	11(20.8)	0.921
De novo urgency	6 (16.2)	8 (15.1)	0.885
Urge incontinence	3 (8.1)	3 (5.7)	0.687
Sense of incomplete emptying	2 (5.4)	3 (5.7)	0.959
Interrupted stream	1 (2.7)	3 (5.7)	0.641

Abbreviations: TVT, Tension-free vaginal tape; TOT, Transobturator tape
† Values are given as number (percentage)

Table 4: Urodynamic changes before and after TVT. †

Variable	Before TVT	After TVT	*P* value
Qmax (ml / sec)	29.8 ±11.7	20.8 ±10.1	0.002*
Residual urine(ml)	47.9 ±38.4	32.8 ±27.4	0.088
MCC (ml)	366.3 ±109.1	354 ±114.7	0.682
MCP (cm HO)	36.2 ±26.1	57.5 ±33.1	0.004*
MUCP on stress (cm HO)	-51.6 ±23.6	-40.26 ±21.6	0.041*
FUL(cm)	2.3 ±0.6	2.4 ±0.4	0.715
PTR	28.1 ±11.9	58.1 ±19.5	< 0.001*

Abbreviations: TVT, Tension-free vaginal tape; Q, maximum flow rate; MCC, Maximum cystometric capacity; MCP, Maximum closure pressure;
MUCP, Maximum urethral closure pressure; FUL, Functional urethral length; PTR, Pressure transmissionratio
† Values are given as mean ± SD
* Statistically significantdifference

Table 5: Urodynamic changes before and after TOT.†

Variable	Before TOT	After TOT	*P* value
Qmax (ml / sec)	27.4 ±5.2	24.3 ±5.4	< 0.001*
Residual urine(ml)	27.6 ±17.7	23 ±9.8	0.123
MCC (ml)	406.5 ±65.2	410.3 ±69.1	0.661
MCP (cm H2O)	85.8 ±11.1	87.2 ±15.8	0.536
MUCP on stress (cm H2O)	-39.2 ±17.2	-42.5 ±16.2	0.127
FUL(cm)	2.6 ±0.1	2.7 ±0.2	0.651
PTR	53.6 ±14.5	55.9 ±15.1	0.164

Abbreviations: TOT, -Transobturator tape; Q , maximum flow rate; MCC, Maximum cystometric capacity; MCP, Maximum closure pressure; MUCP, Maximum urethral closure pressure; FUL, Functional urethral length; PTR, Pressure transmissionratio
† Values are given as mean ± SD
* Statistically significant difference

4. Discussion

This present study shows a decrease in the Q max of 9 ml/sec in the TVT group and of 3ml/sec in the TOT group. The TVT group also shows an increase in MCP of 21cm H2O, an increase on stress in MUCP of 11cm H2O and 30% increase in PTR changes in the urodynamic parameters after surgery with tension-free tapes have been described, such as the decrease in the Q max 6,11. On the contrary, another study conducted in Taiwan reports no changes between TOT and TVT for maximum and mean flow rates prior to and after surgery, with minor variations of 1second7. Another group described an increase of 40.4 cmH2O in the MCP after TVT placement 6.

Previous studies did not report changes in MUCP on stress. Moreover, we evaluated parameters that had not been evaluated in other studies6,7, such as maximum cystometric capacity (MCC), PTR.

Prior to the anti-incontinence surgery, we observed differences in some of the urodynamic parameters between groups: MCP, MUCP on stress and PTR. The TVT group had a lower MUCP on stress due to the cut off value of 42 cm H O, below which the placement of the TVT is preferred due to the decrease in the success rate of the transobturator approach as reported by Miller *et al.*12.

The decrease in Q max was described in a previous study for both types of approaches7 and is an expected modification due to the mechanism of action of the tension-free tapes. However, this decrease is not clinically significant, as it is not associated with impaired emptying. One parameter in which there could also be variations is the increase in functional urethral length(FUL) noted in both groups although it did not reach statistical significance. It is possible that if we had a larger sample size, this change may have been confirmed.

As regards cystometry, no urodynamic changes have been reported in the literature except for resolution of 40% to 50% of hyperactive detrusors following the placement of tension-free tapes[13-16]. We were not able to analyze this data, as we only selected patients with a diagnosis of urodynamic stress incontinence. There were no changes in bladder sensation subsequent to the placing of the tension free tapes.

Conclusion

Our results provide evidence that the parameter that changes after placing tension-free tapes and that take place during the emptying phase was principally the Qmax. It is also apparent that the bladder sensations remain unchanged after these tapes were placed. We can conclude on the other hand, the limitations of this study include its retrospective nature and a rather small sample size.

References

1. Ulmsten U, Petros P. Intravaginal slingplasty (IVS): An Ambulatory surgical procedure for treatment of female urinary incontinence. Scand J Urol Nephrol 1995;29(1):75-82.
2. Delorme E. Transobturator urethral suspension: Mini-invasive procedure in the treatment of stress urinary incontinence in women. Prog Urol 2001 Dec;11(6):1306-13.
3. Sung VW, Schleinitz MD, Rardin CR, Ward RM, Myers DL. Comparison of retropubic vs transobturator approach to midurethral slings: A systematic review and meta-analysis. Am J Obstet Gynecol 2007;197(1):3-11.
4. 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 Pelv Floor Dysfunct 2008; 19(8):1043-7.
5. Schierlitz L, Dwyer PL, Rosamilia A, *et al.* Effectiveness of tension-free vaginal tape compared with transobturator tape in women with stress urinary incontinence and intrinsic sphincter deficiency: A randomized controlled trial. Obstet Gynecol 2008; 112(6):1253-61.
6. Hsiao SM, Chang TC, Chen CH,Lin HH. Sequential comparisons of postoperative urodynamic changes between retropubic and transobturator midurethral tape procedures. World J Urol 2008; 26(6):643-8.
7. Barry C, Lim YN, Muller R, et al. Amulti-centre, randomized clinical control trial comparing the retropubic (RP) approach versus the transobturator approach (TO) for tension-free, suburethral sling treatment of urodynamic stress incontinence: The TORP study. Int Urogynecol J Pelv Floor Dysfunct 2008; 19(2):171-8.
8. Sun MJ, Chang NE, Chen GD, TsaiHD. Comparison of suprapubic versus transobturator surgical treatments of female stress urinary incontinence. Taiwan J Obstet Gynecol 2008;47(2):175-9.
9. Haylen BT, De Ridder D, Freeman RM, *et al.* International urogynecological association (IUGA)/International Continence Society(ICS) joint report on the terminology for female pelvic floor dysfunction. Neurourol Urodyn 2010;29(1):4-20.
10. Schfer W, Abrams P, Liao L, *et al.* Good urodynamic practices: Uroflowmetry, filling cystometry and pressure-flow studies. Neurourol Urodyn 2002;21(3):261-74.
11. Quintero F, Gorbea V, Escobar L, Rodríguez S, Campos L, Solano R. Evaluation of urodynamic parameters following the placement of tension-free tape [Evaluación de parámetro surodinámicos 2011;35(4):208-12.
12. Miller JJR, Botros SM, Akl MN, et al. Is transobturator tape as effective as tension-free vaginal tape in patients with borderline maximum urethral closure pressure? Am J Obstet Gynecol 2006;195(6):1799-804.
13. Choe JH, Choo MS, Lee KS. The impact of tension-free vaginal tape on overactive bladder symptoms in women with stress urinary incontinence: Significance of detrusor overactivity. J Urol 2008;179(1):214-9.
14. Botros SM, Miller JJR, Goldberg RP, et al. Detrusor overactivity and urge urinary incontinence following transobturator versus midurethral slings. Neurourol Urodyn 2007;26(1):42-5.
15. Duckett JRA, Basu M. The predictive value of preoperative pressure-flow studies in there solution of detrusor over activity and overactive bladder after tension-free vaginal tape insertion. BJU Int 2007; 99(6):1439-42.
16. Gamble TL, Botros SM, Beaumont JL, et al. Predictors of persistent detrusor overactivity after transvaginal sling procedures. Am J Obstet Gynecol 2008;199(6):696.e1-696.e7.

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