

## Voiding Dysfunction

# Are There Risk Factors for Persistent Urge Urinary Incontinence after the Transobturator Tape (TOT) Procedure in Mixed Urinary Incontinence?

Tae Wan Kim, Woong Na, Jong Bouk Lee

Department of Urology, National Medical Center, Seoul, Korea

**Purpose:** We wanted to identify factors predicting persistent urge urinary incontinence (UUI) after the transobturator tape (TOT) procedure in patients with mixed urinary incontinence (MUI).

**Materials and Methods:** Of 293 patients who underwent a TOT procedure from May 2007 to August 2010, 175 MUI patients had at least one 6-month follow-up visit. Preoperative evaluations including history taking, physical examination, urinalysis, urine culture, uroflowmetry, postvoid residual (PVR), urodynamic studies (UDS), and symptom questionnaire were performed. After the operation, surgical outcome and patient satisfaction were assessed by symptom questionnaire, uroflowmetry, PVR, and stress test. Statistical analysis was carried out to determine the possible factors influencing persistent UUI after the TOT procedure.

**Results:** Of 175 patients with MUI, 51 (29.1%) had persistent UUI after the TOT procedure. In a univariate analysis, age ( $p=0.012$ ) and previous anticholinergic use ( $p=0.040$ ) were found to be associated with persistent UUI. However, only age (adjusted odds ratio, 3.317; 95% confidence interval, 1.015-12.060;  $p=0.036$ ) was an independent risk factor in the multivariate analysis.

**Conclusions:** Our findings suggested that women who are older than 65 years may have an increased likelihood of persistent UUI after a TOT procedure. Clinicians should consider the possibility of persistent postoperative UUI in elderly women with mixed incontinence.

**Key Words:** Suburethral slings; Urinary urge incontinence

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### Article History:

received 20 April, 2011  
accepted 1 June, 2011

### Corresponding Author:

Jong Bouk Lee  
Department of Urology, National  
Medical Center, 18-79, Ulgiro 6-ga,  
Jung-gu, Seoul 100-799, Korea  
TEL: +82-2-2260-7252  
FAX: +82-2-2274-6601  
E-mail: nmcuru@hanmail.net

## INTRODUCTION

Mixed urinary incontinence (MUI) is defined as a disease co-occurring with both urge urinary incontinence (UUI), in which involuntary urine leakage takes place as the result of urgency, and stress urinary incontinence (SUI), in which involuntary urine leakage takes place as abdominal pressure increases as the result of coughing or sneezing [1]. As women age, the prevalence rate of MUI or UUI gets higher, and MUI accounts for 30% to 50% of all incontinence [2,3]. The midurethral sling has been a main method in the treatment of SUI since tension-free vaginal tape (TVT) surgery

was first introduced as a surgical treatment for that type of incontinence owing to its simpler and less invasive process. The transobturator tape (TOT) procedure, which was introduced to supplement defects in the TVT operation, has been widely used as well [4,5]. It is often reported that the TOT procedure has a high rate of success for SUI [4]. Although the success rate of operation for MUI varies according to the report, it is mostly reported as being lower than the success rate of surgery for SUI [6]. Also, there have been suggestions that surgical treatment for patients with MUI is not appropriate because of the possibility that UUI will continue despite surgery and that conservative treat-

ment should therefore be the primary treatment for mixed incontinence [7].

Interestingly, the mechanism through which the sling procedure improves urge incontinence is not fully known, but many studies have reported that the urgency symptoms of patients with MUI improve when the sling procedure is performed. Koonings et al suggested that the mechanism through which urinary urgency takes place in MUI is stimulation by urine leakage into the proximal urethra by increasing abdominal pressure [8]. Those authors suggested that urgency and UUI could be improved at the same time if urine leakage is stopped through surgery [8]. In addition, Rezapour et al suggested that surgical treatment can be applied even to MUI, while reporting that the success rate for MUI is up to 85% after the TVT operation [9]. Compared to SUI, however, the success rate of surgical treatment for MUI is not high enough to be satisfactory. There may be some difference in interpreting the result of operations, but almost all studies show that unlike the high success rate of operations for SUI, the success rate of operations for MUI and patient satisfaction are rather low and UUI continues after surgical treatment [10].

Because any kind of incontinence after surgery reduces patient satisfaction, persistent UUI after the sling procedure in MUI is the main cause for reducing the success rate of surgery for MUI and patient satisfaction in general [11]. Therefore, to identify risk factors for surgical failure in patients with MUI and to increase patient satisfaction after the operation, it may be clinically useful to find risk factors related to persistent postoperative UUI. Thus, we evaluated postoperative variables as well as the clinical characteristics of MUI patients who underwent the TOT procedure in an attempt to determine whether clinical factors had an effect on persistent UUI after the TOT procedure.

## MATERIALS AND METHODS

### 1. Materials

Of 293 women who underwent a TOT procedure from May 2007 to August 2010, 175 women with MUI were included in this study. The clinical records of those women were reviewed retrospectively. The study inclusion criteria were being a woman, having MUI, and undergoing postoperative follow-up of more than 6 months. The study exclusion criteria were the presence of any malignancy or urinary tract infection and postoperative follow-up of less than 6 months. To distinguish MUI and SUI, patients with SUI symptoms were asked, "Do you have a complaint of involuntary leakage accompanied by or immediately preceded by urgency?" through history taking and a symptom questionnaire. Patients reporting such a complaint were distinguished as MUI patients, and the cases having urgency without urge incontinence were not included as MUI patients.

### 2. Preoperative evaluation

The preoperative evaluation included history taking, physical examination, urinalysis, urine culture, uroflow-

metry, postvoid residual (PVR), and urodynamic study (UDS). Through the physical examination, we performed a stress test and a Q-tip test. UDS measures included maximal urethral closure pressure (MUCP), Valsalva leak point pressure (VLPP), and uninhibited detrusor contraction. Definitions of those corresponded to those of the International Continence Society (ICS) [1]. The subjective severity of incontinence was divided by Stamey grade [12]. The grade of cystocele was assessed according to Juma et al [13].

### 3. Operative technique

The TOT procedures were performed by the same surgeon as reported by Delorme et al [5]. To ensure tension-free placement, the tape was adjusted without tension with a right angle clamp. A Foley catheter was removed within 24 hours after surgery, and the patient was asked to self-void. When the postvoid residual was more than 100 ml or she could not void by herself, the patient was asked to try clean intermittent catheterization until the postvoid residual was less than 100 ml.

### 4. Follow-up

Follow-up visits were scheduled at 1 week, 6 weeks, 3 months, 6 months, and yearly. Follow-up evaluation included questionnaire assessment, stress test, uroflowmetry, and postvoid residual measurement. Success of SUI after the procedure was defined as the absence of any episodes of involuntary urine leakage during stressful activities and a stress test. Success of UUI after the procedure was defined as the absence of any episodes of involuntary urine leakage mixed with urgency, and all cases except success were considered as failures.

### 5. Statistical analysis

To determine the possible factors influencing the persistence of UUI after the TOT procedure, we used univariate logistic regression analysis. Of those variables, only statistically significant variables were included in the multivariate model. The multivariate logistic regression was used to determine the independent risk factors for persistent UUI after the TOT procedure. A value of  $p < 0.05$  was considered statistically significant. All statistical analyses were performed by using SPSS ver. 12.0 (SPSS Inc., Chicago, IL, USA).

## RESULTS

This study included 175 women with MUI who underwent TOT procedures. The preoperative parameters of the 175 women are summarized in Table 1. The women's mean age was  $55.4 \pm 9.8$  years; 139 patients (79.4%) were under 65 years old, and 36 patients (20.6%) were over 65 years old. The mean follow-up time was  $15.9 \pm 0.4$  months. The mean parity was  $2.7 \pm 1.3$ , and the mean symptom duration was  $4.86 \pm 4.15$  years. Postoperative maximal flow rate ( $Q_{max}$ ) and PVR were  $27.1 \pm 2.0$  ml/s and  $30.4 \pm 15.8$  ml, respectively.

**TABLE 1.** Patient characteristics

Variables	Mean or No. (%)
Age (yr)	55.4±9.8
< 65 (%)	139 (79.4)
≥ 65 (%)	36 (20.6)
Symptom grade (%)	
Grade I	28 (16.0)
Grade II	107 (61.1)
Grade III	40 (22.9)
Parity (no.)	2.7±1.3
Abortion (no.)	1.8±1.6
BMI (kg/m <sup>2</sup> )	25.7±0.5
Previous hysterectomy (%)	34 (19.4)
Previous anticholinergics use (%)	27 (15.4)
Degree of cystocele (%)	
None	89 (50.9)
Grade I	21 (12.0)
Grade II	58 (33.1)
Grade III	7 (4.0)
Duration of symptom (yr)	4.86±4.15
Usual pad apply (%)	88 (50.3)
Anesthesia (%)	
General	90 (51.4)
Spinal	68 (38.9)
Local	17 (9.7)
VLPP (cmH <sub>2</sub> O)	88.5±16.4
< 60 (%)	19 (10.9)
≥ 60 (%)	156 (89.1)
Maximal bladder capacity (ml)	365.3±40.2
MUCP (cmH <sub>2</sub> O)	59.2±2.1
Q-tip test (%)	
< 30°	27 (15.4)
30-59°	71 (40.6)
≥ 60°	77 (44.0)
Uninhibited detrusor contraction (%)	49 (28.0)
Preoperative maximal flow rate (ml/s)	28.2±1.9
Preoperative postvoid residual (ml)	26.5±13.4

OR: odds ratio, CI: confidence interval BMI: body mass index, VLPP: Valsalva leak point pressure, MUCP: maximal urethral closure pressure, UUI: urge urinary incontinence

Those variables had not significantly changed in relation to the preoperative Q<sub>max</sub> (28.2±1.9 ml/s) and PVR (26.5±13.4 ml). Postoperative urine retention occurred in 9 patients (5.1%), but all patients recovered within 3 days. Persistent SUI after the TOT procedure occurred in 16 patients (9.1%), and persistent UUI after the TOT procedure occurred in 51 patients (29.1%). In addition, absence of persistent UUI after the TOT procedure occurred in 124 patients (70.9%), and among the 124 patients, persistent urgency after the TOT procedure occurred in 25 patients (14.3%).

To determine the possible factors influencing the persistence of UUI after the TOT procedure, logistic regression analysis was performed. In the univariate analysis, old age and previous anticholinergics use were associated with persistence of UUI after the TOT procedure. Those two sig-

nificant variables were analyzed in the multivariate model to determine the independent risk factors for the persistence of UUI. In the multivariate model, only old age was a significant risk factor for the persistence of UUI, and elderly age (over 65 years old) was associated with a 3.3-fold risk for persistence of UUI after the TOT procedure compared with middle age (under 65 years old) (Table 2).

As shown in Table 2, there was no association between the presence of uninhibited detrusor contractions and persistent UUI after the TOT procedure. We conducted statistical analysis to verify the factors that affected persistent UUI after the TOT procedure in 49 patients who showed uninhibited detrusor contraction in the UDS, but found no significant factors.

## DISCUSSION

To date, data on factors predicting the persistence of urge incontinence or failure after the sling procedure in patients with MUI have been limited, and there are no consistent predictors of persistent UUI after the sling procedure in MUI. Segal et al reported that they found no factor to be related to surgical failure after the TVT operation [14]. Paick et al suggested that a low MUCP may be associated with persistent UUI after the TVT procedure in patients with MUI [15]. Jeong et al suggested that maximal cystometric capacity and involuntary detrusor contraction were important predictors of surgical failure in MUI [16]. Another study reported that women with stress-predominant MUI and without detrusor overactivity (DO) or with low pressure DO were more likely to be cured of their UUI after a midurethral sling procedure [5].

In comparison with studies related to the TVT procedure, detailed outcomes and clinical factors predicting the persistence of UUI after the TOT procedure have yet to be sufficiently reported. Furthermore, there is no significant difference in the surgical results between TVT and TOT, but because there is some difference in postoperative voiding symptoms and complications between the two procedures [17], there remains a possibility that factors related to UUI lasting continuously after both TOT and TVT procedures do not correspond to each other. As a result, in this study we attempted to determine whether the clinical characteristics and preoperative examination results of MUI patients can predict the risk of persistence of UUI after the TOT procedure. Unlike previous studies, we found that old age is a risk factor for persistent postoperative UUI.

In other studies, factors related to the UDS were mainly suggested as risk factors for persistent UUI after surgery. Because some cases have reported that symptoms of MUI patients are not really reproduced as they are in UDS, or that DO appears in the UDS but UUI symptoms do not appear [18], there is a possibility that the accuracy of finding a risk group through factors related to the urodynamic study may be low. On the other hand, if risk factors are assumed on the basis of age as suggested by this study, it is possible to explain the chance of surgical failure by select-

**TABLE 2.** Univariate and multivariate predictors of postoperative UUI in mixed incontinence

	OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age (yr)				
< 65 (%)	1.000		1.000	
≥ 65 (%)	3.904 (1.348-14.397)	0.012	3.317 (1.015-12.060)	0.036
Symptom grade (%)				
Grade I	1.000			
Grade II	0.974 (0.517-3.658)	0.429		
Grade III	0.961 (0.572-4.104)	0.517		
Parity (no.)	1.373 (0.875-2.083)	0.126		
Abortion (no.)	1.245 (0.799-1.781)	0.130		
BMI (kg/m <sup>2</sup> )	0.909 (0.782-1.094)	0.474		
Previous hysterectomy (%)	0.904 (0.903-1.017)	0.533		
Previous anticholinergics use (%)	3.975 (1.037-15.550)	0.040	2.813 (0.652-11.701)	0.113
Degree of cystocele (%)				
None	1.000			
Grade I	1.214 (0.572-3.218)	0.274		
Grade II	2.818 (0.473-12.371)	0.691		
Grade III	2.073 (0.474-10.362)	0.593		
Duration of symptom (yr)	1.543 (0.966-1.935)	0.495		
Usual pad apply (%)	1.723 (0.788-3.994)	0.131		
Anesthesia (%)				
General	1.000			
Spinal	0.891 (0.644-2.311)	0.653		
Local	0.633 (0.482-1.565)	0.421		
VLPP (cmH <sub>2</sub> O)				
< 60 (%)	1.000			
≥ 60 (%)	0.876 (0.763-1.983)	0.363		
Maximal bladder capacity (ml)	0.868 (0.713-1.105)	0.214		
MUCP (cmH <sub>2</sub> O)	1.005 (0.993-1.126)	0.526		
Q-tip test (%)				
< 30°	1.000			
30-59°	1.693 (0.942-2.017)	0.218		
≥ 60°	1.436 (0.926-2.316)	0.194		
Uninhibited detrusor contraction (%)	2.791 (1.008-7.047)	0.095		
Preoperative maximal flow rate (ml/s)	0.954 (0.938-1.120)	0.093		
Preoperative postvoid residual (ml)	0.987 (0.974-1.013)	0.214		

OR: odds ratio, CI: confidence interval BMI: body mass index, VLPP: Valsalva leak point pressure, MUCP: maximal urethral closure pressure, UUI: urge urinary incontinence

ing patients who are at risk of UUI easily and accurately without an invasive test like UDS, which will be clinically easier and more useful.

The following explains why the persistence of UUI after operation appears high for elderly women with MUI. First, older women often experience an outlet obstruction effect [19]. As a result, voiding problems, like incomplete emptying and overactive bladder symptoms, lead to DO, further leading to a possibility that UUI occurs more often [20,21]. Second, elderly women are more likely to suffer from severe intrinsic sphincter deficiency [22,23]. Such patients may not experience urgency because of severe stress incontinence. However, after a TOT operation, their urethral resistance can be reestablished, and their masked UUI is more likely to reoccur. Third, it is said that out of patients with MUI, those with urge-predominant MUI are more likely to have a surgical failure than are those with stress-

predominant MUI [24,25]. This study does not clarify which factor is more serious, stress or urge, but the younger the patients are, the more likely they are to have SUI, and the older the patients are, the higher the prevalence rate of MUI or UUI [2,26,27]. The failure rate of the operation will appear higher for patients of old ages, on the premise that there are lots of older patients with urge-predominant MUI. Fourth, because old women tend to have shorter functional urethras, smaller urethral mobility, and larger urethral rigidity, such characteristics can influence the effect of the tape after the operation and are more likely to worsen the surgical result, although it is not clear how the mechanism works [28].

We suggest that old age can function as a factor useful enough to predict the result of treatment for MUI patients who want the TOT procedure. Furthermore, explaining the possibility of persistent UUI to elderly women ahead of sur-

gery will lower their expectation for a successful operation, which can increase the patients' overall satisfaction. In addition, the possibility of postoperative complications with anesthesia is found to be higher in older patients [29,30]. It is essential to carefully choose the surgical treatment by comprehensively considering all the possibilities of surgical failures and nonsurgical complications if the patient is an elderly woman with MUI who has severe or multiple medical problems.

A limitation of this study is that the follow-up period was as short as only 6 months, and the study was not really prospective. To confirm our findings, we need to do additional research, including a large population and long-term follow-up. In addition, more studies on the effect mechanism of old age should be conducted.

## CONCLUSIONS

Our results suggest that elderly women (over 65 years old) have a higher possibility of persistence of UUI after the TOT procedure than do middle-aged women (under 65 years old). Therefore, elderly women with MUI should be sufficiently informed of the possibility of persistent UUI after the TOT procedure, which will lead to an increase in patient satisfaction after surgery.

## Conflicts of Interest

The authors have nothing to disclose.

## REFERENCES

- Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Neurourol Urodyn* 2002;21:167-78.
- Simeonova Z, Milsom I, Kullendorff AM, Molander U, Bengtsson C. The prevalence of urinary incontinence and its influence on the quality of life in women from an urban Swedish population. *Acta Obstet Gynecol Scand* 1999;78:546-51.
- Karram MM, Bhatia NN. Management of coexistent stress and urge urinary incontinence. *Obstet Gynecol* 1989;73:4-7.
- Tsivian A, Mogutin B, Kessler O, Korczak D, Levin S, Sidi AA. Tension-free vaginal tape procedure for the treatment of female stress urinary incontinence: long-term results. *J Urol* 2004;172:998-1000.
- Delorme E, Droupy S, de Tayrac R, Delmas V. Transobturator tape (Uratape): a new minimally-invasive procedure to treat female urinary incontinence. *Eur Urol* 2004;45:203-7.
- Kim JJ, Bae JH, Lee JG. Preoperative factors predicting the outcome of a midurethral sling operation for treating women with mixed incontinence. *Korean J Urol* 2008;49:1112-8.
- Artibani W. Difficult to manage patient populations--mixed symptomatology. *BJU Int* 2000;85(Suppl 3):53-4.
- Koonings P, Bergman A, Ballard CA. Combined detrusor instability and stress urinary incontinence: where is the primary pathology? *Gynecol Obstet Invest* 1988;26:250-6.
- Rezapour M, Ulmsten U. Tension-free vaginal tape (TVT) in women with recurrent stress urinary incontinence--a long-term follow up. *Int Urogynecol J Pelvic Floor Dysfunct* 2001;12(Suppl 2):S9-11.
- Jeffrey L, Deval B, Birsan A, Soriano D, Darai E. Objective and subjective cure rates after tension-free vaginal tape for treatment of urinary incontinence. *Urology* 2001;58:702-6.
- Mahajan ST, Elkadry EA, Kenton KS, Shott S, Brubaker L. Patient-centered surgical outcomes: the impact of goal achievement and urge incontinence on patient satisfaction one year after surgery. *Am J Obstet Gynecol* 2006;194:722-8.
- Stamey TA. Endoscopic suspension of the vesical neck for urinary incontinence in females. Report on 203 consecutive patients. *Ann Surg* 1980;192:465-71.
- Juma S, Little NA, Raz S. Evaluation of stress urinary incontinence. In: Buchsbaum HJ, Schmidt JD, editors. *Gynecologic and obstetric urology*. 3rd ed. Philadelphia: Saunders; 1993;251-63.
- Segal JL, Vassallo B, Kleeman S, Silva WA, Karram MM. Prevalence of persistent and de novo overactive bladder symptoms after the tension-free vaginal tape. *Obstet Gynecol* 2004;104:1263-9.
- Paick JS, Ku JH, Shin JW, Son H, Oh SJ, Kim SW. Tension-free vaginal tape procedure for urinary incontinence with low Valsalva leak point pressure. *J Urol* 2004;172:1370-3.
- Jeong SJ, Hwang IS, Kim SS, Lee ST, Min KE, Han BK, et al. Are risk factors for failure after mid-urethral sling operation different between patients with pure stress and those with mixed urinary incontinence in the short-term follow-up? *Korean J Urol* 2009;50:573-80.
- Zugor V, Labanaris AP, Rezaei-Jafari MR, Hammerer P, Dembowski J, Witt J, et al. TVT vs. TOT: a comparison in terms of continence results, complications and quality of life after a median follow-up of 48 months. *Int Urol Nephrol* 2010;42:915-20.
- Radley SC, Rosario DJ, Chapple CR, Farkas AG. Conventional and ambulatory urodynamic findings in women with symptoms suggestive of bladder overactivity. *J Urol* 2001;166:2253-8.
- Anger JT, Litwin MS, Wang Q, Pashos CL, Rodriguez LV. The effect of age on outcomes of sling surgery for urinary incontinence. *J Am Geriatr Soc* 2007;55:1927-31.
- Carr LK, Walsh PJ, Abraham VE, Webster GD. Favorable outcome of pubovaginal slings for geriatric women with stress incontinence. *J Urol* 1997;157:125-8.
- McGuire EJ. Identifying and managing stress incontinence in the elderly. *Geriatrics* 1990;45:44-6, 51-2.
- Pajoncini C, Costantini E, Guercini F, Bini V, Porena M. Clinical and urodynamic features of intrinsic sphincter deficiency. *Neurourol Urodyn* 2003;22:264-8.
- Horbach NS, Ostergard DR. Predicting intrinsic urethral sphincter dysfunction in women with stress urinary incontinence. *Obstet Gynecol* 1994;84:188-92.
- Scotti RJ, Angell G, Flora R, Greston WM. Antecedent history as a predictor of surgical cure of urgency symptoms in mixed incontinence. *Obstet Gynecol* 1998;91:51-4.
- Kulseng-Hanssen S, Husby H, Schiøtz HA. Follow-up of TVT operations in 1,113 women with mixed urinary incontinence at 7 and 38 months. *Int Urogynecol J Pelvic Floor Dysfunct* 2008;19:391-6.
- Hannestad YS, Rortveit G, Sandvik H, Hunskaar S. A community-based epidemiological survey of female urinary incontinence: the Norwegian EPINCONT study. *Epidemiology of Incontinence in the County of Nord-Trøndelag*. *J Clin Epidemiol* 2000;53:1150-7.
- Samuelsson E, Victor A, Tibblin G. A population study of urinary incontinence and nocturia among women aged 20-59 years. Prevalence, well-being and wish for treatment. *Acta Obstet Gynecol Scand* 1997;76:74-80.

28. Ku JH, Oh JG, Shin JW, Kim SW, Paick JS. Age is not a limiting factor for midurethral sling procedures in the elderly with urinary incontinence. *Gynecol Obstet Invest* 2006;61:194-9.
29. Gordon D, Gold R, Puzner D, Lessing JB, Groutz A. Tension-free vaginal tape in the elderly: is it a safe procedure? *Urology* 2005;65:479-82.
30. Verborgh C. Anaesthesia in patients with dementia. *Curr Opin Anaesthesiol* 2004;17:277-83.