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# Predictive factors for voiding dysfunction after transobturator slings

*Fatores preditivos para disfunção miccional após cirurgia de sling transobturador*

## Original Article

### Keywords

Urologic surgical procedures/methods  
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### Palavras-chave

Procedimento cirúrgicos urológicos/métodos  
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Complicações pós-operatórias

### Abstract

**PURPOSE:** To identify the predictive factors for voiding dysfunction after transobturator slings. **METHODS:** We retrospectively reviewed the records of all patients who underwent a transobturator sling between March 2003 and December 2008. A total of 514 women had available data with at least a six-week follow-up. Patients' demographics, preoperative symptoms, urodynamic testing including multichannel voiding studies and surgical variables were tabulated. Voiding dysfunction was defined by a catheterized or ultrasonographic postvoid residual greater than 100 cc ( $\geq$ six weeks after the procedure) associated with any complaints of abnormal voiding. Univariate logistic regression analysis was performed with respect to postoperative voiding dysfunction. **RESULTS:** The patient population had a mean age of  $58.5 \pm 12.9$  years. Thirty-three out of 514 patients (6.4%) had postoperative voiding dysfunction according to our definition, and 4 (0.78%) required sling transection. No differences were observed between normal and dysfunctional voiders in age, associated prolapse surgery, preoperative postvoid residual, preoperative urinary flow rate, prior pelvic surgery, and menopausal status. Valsalva efforts during the preoperative pressure flow study was the only predictive factor for postoperative voiding dysfunction, 72.4% dysfunctional versus 27.6% normal ( $p < 0.001$ ). **CONCLUSION:** Preoperative Valsalva maneuver during the micturition could identify those at risk for voiding dysfunction after transobturator sling, and it should be noted during preoperative counseling.

### Resumo

**OBJETIVO:** Identificar fatores preditivos para disfunção miccional após a cirurgia de *sling* transobturador. **MÉTODOS:** Foram revisados, retrospectivamente, os protocolos de todas as pacientes que foram submetidas à cirurgia de *sling* transobturador. Entre março de 2003 e dezembro de 2008, 514 mulheres apresentavam dados disponíveis com ao menos seis semanas de seguimento. Foram avaliados os dados demográficos, os sintomas pré-operatórios, o estudo urodinâmico e as variáveis cirúrgicas. A disfunção miccional foi definida como o resíduo pós-miccional (verificado por sondagem vesical ou ecografia) superior a 100 mL ( $\geq$ seis semanas após procedimento cirúrgico), que foi associado à queixa de micção anormal. Realizou-se análise por regressão logística univariada com relação à disfunção miccional pós-operatória. **RESULTADOS:** A população de pacientes tinha uma média de idade de  $58,5 \pm 12,9$  anos. Trinta e três das 514 (6,4%) participantes apresentavam disfunção miccional pós-operatória de acordo com a nossa definição e 4 (0,78%) necessitaram secção do *sling*. Não houve diferenças com relação à cirurgia para prolapso associada, ao resíduo pós-miccional pré-operatório, à urofluxometria pré-operatória, à cirurgia pélvica prévia e ao estado menopausal entre aquelas que apresentaram disfunção miccional quando comparadas às outras. A identificação da manobra de Valsalva durante o estudo miccional pré-operatório foi o único fator preditivo para disfunção miccional pós-operatória, 72,4% no grupo com disfunção versus 27,6% nas normais ( $p < 0,001$ ). **CONCLUSÃO:** A manobra de Valsalva pré-operatória durante a micção pôde identificar as mulheres que apresentavam maior risco para disfunção miccional após cirurgia de *sling* transobturador, e deve ser levada em consideração no aconselhamento pré-operatório das mesmas.

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## Introduction

Recently, suburethral slings have become the most widely performed surgical procedures for the treatment of stress urinary incontinence. The transobturator (TOT) approach was described in 2001 and has been shown to be a safe surgery with low morbidity and favorable outcomes<sup>1-5</sup>.

Voiding dysfunction after incontinence surgery is a potential complication of all stress incontinence procedures. There are considerable differences in its definitions in the literature; however, most of them use the association of any subjective complaint of abnormal voiding with an objective measure of urinary retention, such as high postvoid residual. Mid-urethral slings are sometimes associated with voiding dysfunction, which can negatively affect a patient's quality of life and satisfaction<sup>3-7</sup>.

Postoperative voiding dysfunction is one of the most frequent complications that require surgical management after sling procedures, and the incidence of reported dysfunction seems to increase with a higher follow-up period<sup>8</sup>.

Identifying preoperative predictive factors for voiding dysfunction is important to advise patients about their individual risks of this complication. Other studies have associated voiding dysfunction after anti-incontinence surgery with increased age, irritable bladder symptoms, pelvic organ prolapse, previous incontinence and/or prolapse surgery, and urodynamic finding of reduced peak voiding flow rates. Very little data is available specifically addressing predictive factors for voiding dysfunction after TOT slings<sup>6,7,9-13</sup>.

The TOT approach is often chosen over the tension-free transvaginal tape (TVT) due to lower rates of postoperative voiding dysfunction, therefore it would be useful to stratify which patients would not do well after TOT slings<sup>14,15</sup>.

The aim of this study was to identify predictive factors for voiding dysfunction after TOT slings.

## Methods

We retrospectively reviewed the records of all patients who underwent a TOT tape sling at Cleveland Clinic Florida between March 2003 and December 2008. We included people with at least a six-week postoperative follow-up. Institutional Review Board approval was obtained prior to the beginning of study.

Patients were identified from a clinical database and comprised those who underwent a TOT sling performed alone or in association with reconstructive procedures. All subjects completed a routine questionnaire at all visits, including voiding and incontinence symptoms. Demographics, preoperative symptoms, urodynamics including multichannel voiding studies and surgical

variables were analyzed. Urodynamic testing was interpreted by a fellowship-trained urogynecologist, and the voiding curve patterns were reported using standardized terminology: normal, interrupted, low flow, and Valsalva. This terminology refers to pressure-flow graph of urodynamics, in which these micturition aspects can be identified.

TOT slings were performed using a Monarc kit (Americas Medical Systems, Minnetonka, Minnesota, USA) according to the previously described technique by a single attending surgeon who has significant surgical experience with this device<sup>14</sup>.

Only women with complete clinical data were included. Postvoid residual (PVR) was measured (catheterized or ultrasonographically) 6 weeks after surgery. The PVR greater than 100 cc ( $\geq 6$  weeks after the procedure) associated with any complaint of abnormal voiding was defined as voiding dysfunction. Data were reviewed up to six months after surgery.

Since we were looking for postoperative voiding dysfunction after TOT slings, we excluded all patients with a preoperative PVR higher than 100 cc. Those diagnosed with voiding dysfunction were offered intermittent self-catheterization and/or physiotherapy. Pharmacotherapy was added at six weeks, and sling transection was offered if they were still symptomatic in the third month in the postoperative period.

All data was anonymous and analyzed using the SPSS software, version 17.0 (SPSS, Chicago, IL). Univariate logistic regression analysis was performed with respect to postoperative voiding dysfunction and possible predictive factors. Descriptive analysis was carried out using frequencies, means, and standard deviations. For comparison between groups, we used the following tests:  $\chi^2$  or Fisher's exact for categorical variables and Student's *t* for independent samples to verify differences between averages. Associations were considered statistically significant if the p-value was lower than 0.05.

## Results

The patient population had a mean age of  $58.5 \pm 12.9$  years (range 23.8 to 92.9). They had, on average, complaints of urinary incontinence 5.1 years before treatment and a mean of 2.4 previous vaginal deliveries. Preoperative characteristics of the patients are described in Table 1.

Between March 2003 and December 2008, 514 women were included and had available data with at least a six-week follow-up. We identified 33 out of 514 patients (6.4%) with voiding dysfunction according to our definition.

No differences were noticed between normal and dysfunctional voiders in age, pre-operative PVR, and

concomitant prolapse surgery regardless of the treated compartment. Urinary flow rate, prior surgeries and menopausal status were also not predictive of voiding dysfunction in this analysis. Valsalva effort during the preoperative pressure flow study was the only predictive factor for voiding dysfunction. Only 2.4% of patients who did not perform Valsalva maneuver had dysfunctional voiding, while 16.7% of those who did had voiding dysfunction ( $p < 0.05$ ), as seen in Tables 2 and 3. All women who had a postoperative PVR greater than 100 cc complained of abnormal voiding.

**Table 1.** Demographical and clinical characteristics in the study group

Variables	Total %
Diabetes	9.2
Smokers Diabetes	7.0
Postmenopausal status	69.2
Sexually active	62.3
Hormonal therapy	23.4
Associated prolapse surgery	77.2
Previous incontinence surgery Concomitant	15.0

**Table 2.** Risk of voiding dysfunction after transobturator slings, all patients according to the univariate analysis in categorical variables (n=514)

Variables	Voiding dysfunction (%)	Odds Ratio	95%CI	p-value*
<b>Valsalva maneuver</b>	6.4**			
Yes	16.7	6.8	3.1-14.9	<0.001
No	2.4			
<b>Prior incontinence surgeries</b>	6.4**			
Yes	6.9	0.9	0.3-2.7	0.5
No	7.4			
<b>Menopausal status</b>	6.4**			
Pre	4.4	0.5	0.2-2.2	0.3
Post	7.9			
<b>Concomitant prolapse surgery</b>	6.4**			
Yes	5.1	0.7	0.3-2.1	0.4
No	7.3			
<b>Previous hysterectomy</b>	6.4**			
Vaginal	5.6	1.1	0.2-3.1	0.5
Abdominal	6.1			
<b>Diabetes</b>	6.4**			
Yes	7.5	1.4	0.2-2.3	0.3
No	5.5			

\*p-value calculated by Pearson's  $\chi^2$  test; \*\*global risk of voiding dysfunction (33/514 patients); CI: confidence interval.

**Table 3.** Voiding dysfunction (numeric variables according to univariate analysis)

Variables	Voiding dysfunction		p-value*
	Yes (mean±SD)	No (mean±SD)	
Age	61.1±15.7	58.3±12.7	0.3
Years UI complaint	4.7±5.2	5.1±6.4	0.7
Uroflow time	54.2±25.9	54.6±33.7	0.9
Uroflow peak	15.6±5.9	16.6±6.3	0.3
Uroflow mean	7.8±5.0	8.6±4.3	0.3
Capacity	406.5±39.7	396.9±30.1	0.6

\*p-value calculated by Student's *t*-test for independent samples; SD: standard deviation; UI: urinary incontinence.

None of the enrolled subjects demonstrated elevated detrusor pressure during the preoperative pressure flow studies. We did not uniformly carry out voiding studies postoperatively, therefore we cannot report on voiding parameters in normal *versus* abnormal voiders postoperatively.

In the voiding dysfunction group, 45.5% (15/33) of the patients improved with Kegel exercises, bladder retraining and self-catheterization by a mean of 16.3 weeks postoperatively. None of the participants underwent sling loosening attempts during the early postoperative phase. A total of 42.4% (14/33) got better using pharmacotherapy (baclofen and benzodiazepines), and 12.1% (4/33) had voiding dysfunction requiring midline transection of the tape in the third month postoperatively. All patients reported normalized voiding and none reported recurrent stress incontinence in the short-term follow-up.

## Discussion

Voiding dysfunction after TOT sling procedures is an uncommon complication of this surgery. In our study, the rate was 6.4%, according to our definition. The majority had transient dysfunction, which improved with behavioral or drug therapy (87.9%). Our data allows surgeons to counsel patients that even if they develop dysfunctional voiding after a TOT procedure, there is a low risk of requiring subsequent surgery for tape transection (0.8%). These results confirm previous papers that described voiding dysfunction after TOT sling with the need of sling revision surgery as a rare complication<sup>12,15-17</sup>.

Even though it is rare, voiding dysfunction is the second most common complication that requires surgical intervention according to a study about complications of suburethral slings (the most common was overactive bladder and the third mesh exposure)<sup>8</sup>. This justifies the necessity of predictive factors to provide adequate information to the patient who is a candidate for TOT sling procedures. The most usual surgery performed to address a complication following suburethral sling is the tape incision. It is highly successful in improving voiding dysfunction, but stress incontinence may recur in more than 60% of those patients<sup>18</sup>.

The role of preoperative urodynamic testing is a topic of intense discussion in the Urogynecologic literature. Several papers have indicated that urodynamics may not have value in predicting voiding dysfunction after incontinence surgery, and frequently it would change the surgical plan<sup>19-21</sup>. Other researchers have proven the value of urodynamic findings, such as low peak voiding flow rate and detrusor pressure, as predictive factors for the development of voiding dysfunction<sup>7,9,10,13</sup>.

We have identified the presence of Valsalva maneuver during the preoperative pressure flow study as a predictive factor for voiding dysfunction postoperative development. It is the first time this factor is described as predictive of such a complication. According to our data, patients who perform a Valsalva maneuver during preoperative voiding studies have a nearly seven fold increased odds of developing voiding dysfunction compared to those who do not during micturition (Odds Ratio=6.8), as seen in Table 2.

We did not analyze detrusor pressure during maximum flow rate because it was not available in our records for most patients. This could be another important variable for future studies<sup>9</sup>.

It is not clear what role the conservative therapy had in solving voiding dysfunction in those who did not need to undergo sling transection. A conservational trial should be required to determine whether gradual recovery would occur in a given time alone.

The limitations of our study include that it is retrospective, within a single center, and we were not able to include all patients due to missing data points. These factors should be improved in future research about this topic.

Based on the present results, our hypothesis is that women who use a Valsalva maneuver to void may have suboptimal detrusor function, which could lead to the development of voiding dysfunction due to the increased urethral resistance following suburethral sling surgery.

Identifying risk factors associated with postoperative voiding dysfunction can be crucial when choosing a surgical approach for patients with stress incontinence. The urodynamic finding of Valsalva maneuver during the micturition is routinely assessed, readily available and, according to our study, it could identify women at risk for voiding dysfunction after TOT slings. This factor should be noted and considered in the preoperative counseling of patients.

## Author Contributions

L Schreiner: Project development, Data analysis, Manuscript writing.

TV Peterson: Manuscript writing, Data analysis.

D Karp: Manuscript writing.

GW Davila: Project development, Data analysis, Manuscript writing.

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