Original Article

Voiding Dysfunction following TVT Procedure

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Abstract: The aim of the study was to assess the incidence of abnormal voiding in patients who had undergone tension-free vaginal tape (TVT) placement. Women who had undergone a TVT sling procedure for stress or mixed incontinence more than 3 months previously reported their voiding habits (frequency, urgency, nocturia, urinary stream quality and incontinence) over the previous 3 days. A pelvic examination and ultrasound postvoid residual (PVR) were performed. Normal voiding was classified as a PVR <100 ml, frequency of six or fewer voids per day and two or fewer per night, and a urinary stream considered normal by the patient. Subjects were classified as either ‘normal’ (group 1) or ‘abnormal’ (group 2) voiders. Demographic factors, pre-operative urodynamic testing and concomitant surgical procedures were compared between groups. From September 1999 to November 2000, 59 women underwent a TVT procedure. Two were excluded from analysis [cervical malignancy (1), interstitial cystitis (1)]. There were no healing abnormalities and no patients displayed a positive empty bladder stress test. Forty-two (74%) women were included in group 1 and 15 (26%) in group 2. Urinary continence was reported by 49 (86%): 93% in group 1 and 67% in group 2. Factors highly correlated with postoperative voiding dysfunction included abnormal preoperative uroflow pattern and configuration \((P = 0.007)\), preoperative low peak flow rate \(<15\) ml/s \((P = 0.049)\), preoperative vault prolapse or enterocoele \((P = 0.001)\), concurrent vault suspension surgery \((P = 0.03)\) and postoperative urinary tract infection (UTI) \((P = 0.0006)\). Preoperative urinary retention (postvoid residual \(>100\) ml) or detrusor instability, age and body mass index differences were not statistically significant. Multivariate analysis revealed that preoperative abnormal uroflow and postoperative UTI were related to group 2 \((P = 0.02)\). Our conclusions were that the TVT sling procedure has success and voiding dysfunction rates similar to those of other proven anti-incontinence procedures. Various factors were shown to be associated with postoperative voiding difficulties. Tension-free placement of the tape may not prevent the development of post-operative voiding dysfunction.

Keywords: Genital prolapse; Slings; Tension-free vaginal tape; Urinary incontinence; Urodynamics; Voiding dysfunction

Introduction

Female stress urinary incontinence is an ancient problem. The actual mechanism for restoring continence and allowing proper voiding is not well understood. As such, the surgical treatment of stress urinary incontinence in women remains a controversial issue. No matter what technique is used, the inability to resume normal, spontaneous voiding after surgery is one of the most feared complications. Voiding dysfunction has been estimated to occur after 2.5%–24% of anti-incontinence procedures [1–5].

Recently, three different panels have concluded that retropubic colposuspension and suburethral slings are associated with the best long-term success rates [6,7]. Normal, physiologic and unobstructed voiding has been reported to occur more predictably after a retropubic operation than after a sling procedure [8]. Voiding dysfunction after a sling procedure has been seen as a drawback to this type of anti-incontinence surgery [9]. A new surgical technique for stress urinary incontinence,
the tension-free vaginal tape (TVT) procedure, was introduced as a simple means of restoring continence by supporting the midurethra without tension. Preliminary data demonstrate continence restoration rates similar to those of retropubic operations and traditional slings [10–12]. Because the procedure is tension free, postoperative voiding dysfunction should be lower than after traditional sling procedures.

The present study was performed to assess the incidence of abnormal voiding in patients who had undergone a TVT procedure for stress and mixed incontinence, and to identify risk factors associated with resultant dysfunctional voiding.

**Materials and Methods**

Between September 1999 and November 2000, 59 women underwent a TVT procedure for treatment of urinary incontinence with or without associated genital prolapse.

All women had undergone routine preoperative evaluation, including gynecologic history and physical examination. Urogynecologic evaluation included urinalysis, postvoid residual (PVR) measurement, assessment of bladder neck mobility by a Q-tip test, and multichannel urodynamics. All subjects had either pure stress incontinence or mixed incontinence with predominantly stress symptoms.

Uroflowmetry parameters were evaluated for outcome assessment. Normal uroflowmetry included normal configuration (continuous, uninterrupted flow) and pattern (bell-shaped, non-Valsalva curve).

The TVT procedure was performed using the technique described previously [13]. Owing to the need for other reconstructive procedures, most of the subjects underwent the operation under spinal anesthesia. Women returned to the clinic at least 3 months after the procedure. At each follow-up visit the patient completed a standardized history form regarding her voiding habits for the previous 3 days, including number of daily voids, the presence of urinary urgency, nocturia events and urinary stream quality. Urinary incontinence events over the previous week were reported. An ultrasound postvoid residual was measured, and a pelvic examination was also performed.

Normal voiding was classified as a PVR <100 ml, a frequency of six or fewer voids per day and two or fewer voids per night, and a urinary stream considered normal by the patient. Subjects were classified as either normal (group 1) or abnormal voiders (group 2), based on the above criteria. If a patient failed to meet one or more of the normal voiding criteria she was placed in group 2. Comparison between groups included demographic and urodynamic variables as well as the performance of concomitant reconstructive surgical procedures.

Statistical analysis of differences was performed using $\chi^2$ testing for categorical variables. Continuous variables were compared across groups with a $t$-test, and ordinal measures were compared with voiding using Wilcoxon’s rank-sum test. Finally, a multivariate model was fit using the factors preoperative abnormal uroflow, concurrent surgical procedure vault suspension, preoperative vaginal vault prolapse, preoperative urinary retention and postoperative urinary tract infection.

**Results**

All 59 women were available for re-evaluation at 3 months post procedure. Two were excluded from analysis [cervical malignancy (1), interstitial cystitis (1)]. Based on our criteria for normal voiding, 42 women (74%) comprised group 1 and 15 (26%) met the criteria for abnormal voiding (group 2).

Demographic factors were similar between groups (Table 1). Most of the patients were of advanced age (mean 65.8 years; 95% CI 62.0–69.6 in group 1; 72.1 years; 95% CI 65.6–78.7 in group 2).

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Preoperative irritative voiding symptoms, including urgency ($P = 0.01$) and nocturia ($P = 0.01$), were more common in group 2. Severity of preoperative stress incontinence was not correlated with postoperative voiding dysfunction.

Preoperative urodynamic parameters included in the statistical analysis were cystometric values, including the presence of detrusor instability, urethral pressure profilometry, and Valsalva leak-point pressure testing. Instrumented pressure voiding studies were not performed in all patients, and thus the results were not analyzed. Electronic voiding function analysis was limited to uroflowmetry parameters. Abnormal uroflow configuration and pattern were the only urodynamic parameters predictive of postoperative abnormal voiding (Table 2). In this series, severity of intrinsic sphincteric deficiency, as measured urodynamically, was not correlated with voiding dysfunction or persistence of stress incontinence.

The preoperative presence of vault prolapse and enterocele correlated with postoperative voiding dysfunction (Table 3). Both types of vault suspension surgery (sacrospinous fixation and LeFort colpopceleisis)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group 1 ($n = 42$)</th>
<th>Group 2 ($n = 15$)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs; mean)</td>
<td>65.8</td>
<td>72.1</td>
<td>NS</td>
</tr>
<tr>
<td>No. of vaginal deliveries (mean)</td>
<td>2.71</td>
<td>2.40</td>
<td>NS</td>
</tr>
<tr>
<td>Smoking</td>
<td>4.76%</td>
<td>6%</td>
<td>NS</td>
</tr>
<tr>
<td>BMI (lb/ft²) (mean)</td>
<td>5.45</td>
<td>6.36</td>
<td>NS</td>
</tr>
<tr>
<td>Diabetes</td>
<td>14.29%</td>
<td>20%</td>
<td>NS</td>
</tr>
<tr>
<td>HRT (local)</td>
<td>11.90%</td>
<td>13.33%</td>
<td>NS</td>
</tr>
<tr>
<td>HRT (systemic)</td>
<td>54.76%</td>
<td>53.33%</td>
<td>NS</td>
</tr>
<tr>
<td>Previous surgery</td>
<td>47.62%</td>
<td>66.67%</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS, not significant; HRT, hormone replacement therapy.