Effect of Preoperative Flow Rate on Postoperative Retention and Voiding Difficulty After Transobturator Tape Operation

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Purpose: Controversy exists over the preoperative risk factors for postoperative urinary retention after the midurethral sling procedure for stress urinary incontinence (SUI). We intended to analyze the effect of preoperative flow rate on postoperative urinary retention after the transobturator tape (TOT) operation.

Materials and Methods: A total of 322 patients who underwent TOT from June 2006 to May 2012 were included in this retrospective study. All patients were preoperatively investigated for urinary symptoms and underwent preoperative urodynamic studies including urine flow rate. Postoperative urinary retention, voiding difficulty, and uroflowmetry were checked. Urinary retention was defined as the need for additional catheterization longer than 1 day. Patients were divided by preoperative peak flow rate (Qmax) of 15 mL/s (low Qmax group and normal Qmax group).

Results: There were 3 cases of postoperative urinary retention (0.9%) and 52 cases of voiding difficulty (16.1%). The low Qmax group included 40 patients (12.4%) and the normal Qmax group included 282 patients (87.5%). Between the two groups, there were no significant differences in age, previous pelvic surgery history, or past medical history. The low Qmax group had higher scores for voided volume and detrusor pressure at Qmax. However, there was no significant difference in postoperative voiding difficulty between the two groups. Furthermore, three patients who experienced postoperative retention showed high flow rates preoperatively.

Conclusions: Our results suggest that voiding difficulty in the group with low preoperative flow was tolerable and the treatment success rate was comparable to that in patients in the normal flow group. According to our analysis, patients with a low flow rate preoperatively can be safely treated with TOT for SUI.

Keywords: Transobturator tape; Urinary stress incontinence; Voiding dysfunction

INTRODUCTION

In the treatment of female stress urinary incontinence (SUI), midurethral sling operations brought the latest technical advances. Tension-free vaginal tape (TVT) and transobturator tape (TOT) are simpler and more effective than previous anti-incontinence operations. Therefore, midurethral sling operations became the most popular procedures and showed exponential growth in cases. This operation is still evolving in materials and technique [1]. Theoretically, the midurethral sling involves a suburethral support mechanism [2,3]. Despite generally low complication rates, postoperative voiding dysfunction can be a problematic complication [4]. Inevitably, this procedure produces dynamic urethral compression during the voiding phase [1]. In previous studies in the literature, voiding dysfunction after midurethral sling operations was reported to occur in approximately 2% to 15% of patients [5]. SUI is a disease that is closely related to the quality of life; therefore, postoperative urinary retention has a profound impact on patient satisfaction [6].

Several studies have investigated predictive factors of
urinary retention after midurethral slings. Patient age, medical history, and voiding parameters including urodynamic study parameters are risk factors of postoperative urinary retention [7-9]. Generally, preoperative urodynamic study is not regularly recommended for routine evaluation of SUI. Clinically available dynamic voiding parameters are peak flow rate (Qmax) and postvoid residual (PVR) [10]. In cases with a low preoperative urinary flow rate, there is the possibility of postoperative retention. Therefore, some urologists may be reluctant to operate on patients with a low preoperative flow rate. In previous reports in the literature, however, there has been controversy over the influence of the preoperative flow rate on postoperative urinary retention [8,11].

In this study, we assessed whether patients with a low preoperative urinary flow rate could be safely managed by the TOT procedure without significant postoperative retention. Furthermore, we tried to analyze the urodynamic characteristics of patients with a lower preoperative flow rate.

MATERIALS AND METHODS

A retrospective study was performed of 329 consecutive patients who underwent the TOT procedure for SUI between June 2006 and May 2012. Seven patients who underwent reoperations for SUI were excluded from the analysis. Patients underwent preoperative evaluation of variables expected to be correlation factors for postoperative urinary retention. The preoperative examinations comprised a medical history, physical examination, urinalysis, Qmax, and PVR measurement. The urine leakage test was executed with the 1-hour pad test after intake of 500 mL of water. The Q-tip test was done to validate urethral hypermobility. The urodynamic study included maximal urethral closing pressure, cystometrogram, pressure-flow study, and measurement of abdominal leakage point pressure. For the measurement of abdominal leak point, Valsalva leak point pressure was recorded at a bladder volume of 200 mL. All definitions followed those of the International Continence Society [12].

Generally, the TOT procedure was performed under spinal anesthesia in most patients with the Monarc Subfascial Hammock System (American Medical Systems, Minnetonka, MN, USA). The general surgery procedure was performed as described by Mellier et al. [13]. Tape tension was adjusted by using long Mayo scissors or a right angle clamp by cautiously considering the patient's urethra and detrusor state. After a 16-Fr Foley catheter was indwelled, the vagina was packed with petrolatum gauze to prevent mucosal bleeding. The day after the operation, the Foley catheter and vaginal dressing were removed and the patient's voiding state was checked before discharge. Uroflowmetry with PVR was checked at the second voiding after Foley catheter removal. During follow-up, routine checkup of uroflowmetry and PVR were performed at 1 week and 1 month postoperatively.

Postoperative urinary retention was defined as the need for urethral catheterization more than 1 day after removal of the Foley catheter. Retention cases included bladder overload of more than 500 mL and failure to void even with voiding desire. The patients with postoperative retention underwent intermittent urethral catheterization or Foley catheter reinserter and their voiding state was then checked the next day. Voiding difficulty was determined when the PVR was more than one third of voided volume or more than 150 mL. Surgical cure was defined as the absence of any complaint of urinary leakage in usual activities and a state that did not need further treatment. Patient satisfaction was surveyed by categorization as full satisfaction, satisfaction, so-so, dissatisfaction, and extreme dissatisfaction. Postoperative urgency was checked by patient report.

In the statistical analysis, the patients were divided into two groups by a preoperative peak flow rate of 15 mL/s. The patients with preoperative Qmax lower than 15 mL/s were assigned to the low Qmax group; the other patients were assigned to the normal Qmax group. The two groups were compared by use of Pearson's chi-square test and t-test for differences in categorical and continuous variables, respectively. The patients' baseline and perioperative characteristics were compared between the two groups. Statistical analysis was performed with IBM SPSS ver. 19.0 (IBM Co., Armonk, NY, USA). Statistical significance was defined as p < 0.05.

RESULTS

The patients’ mean age, body mass index (BMI; in kg/m²), and incidence rate of previous pelvic surgery were 53.3 years, 25.2 kg/m², and 36.5%, respectively. General patient characteristics are presented in Table 1. Within 24 hours of the operation, 84% of the women achieved normal voiding and 16% of the women were assumed to have postoperative voiding difficulty. Only three patients (0.9%) showed retention and required additional catheterization for bladder emptying. Of the three retention cases, no patients were assigned to the low Qmax group. In these retention cases, the maximal catheter indwelling duration

| Parameter                              | Value  |
|----------------------------------------|--------|
| Age (y)                                | 53.3±7.2|
| Pelvic operation history               | 49 (15.1) |
| Urgency                                | 118 (36.5) |
| Peak flow rate (mL/s)                  | 29.7±7.8 |
| Voided volume (mL)                     | 310±162 |
| Postresidual urine volume (mL)         | 39.1±69.0 |
| Maximal urethral closing pressure (cm H2O) | 72.6±30.1 |
| Valsalva leak point pressure (cm H2O)  | 88.0±20.3 |
| Detrusor pressure at peak flow (cm H2O)| 26.8±14.7 |

Values are presented as mean±standard deviation or number (%).
was not more than 3 days after the operation. No cases required reoperation for tape cutting or urethrolysis.

The 40 patients (12.4%) who had preoperative Qmax lower than 15 mL/s (low Qmax group) were compared with the 282 patients (87.5%) who had preoperative Qmax of 15 mL/s or more (normal Qmax group). Between the two groups, there were no significant differences in age, previous pelvic surgery history, or past medical history. In postoperative parameters, hospital stay and catheter indwelling duration were not significantly different. The low Qmax group had a smaller voided volume (p=0.001) and higher scores for detrusor pressure at peak flow rate (PdetQmax, p=0.008) (Table 2). The bladder outlet obstruction index (PdetQmax−2Qmax) was statistically different between the two groups; however, the outlet obstruction pattern was not significantly different. The bladder contractility index (PdetQmax+5Qmax) showed no significant difference in this study.

Immediate postoperative Qmax decreased significantly in the normal Qmax group but increased in the low Qmax group. At postoperative 1 month, Qmax reached preoperative status in the normal Qmax group and remained steady in the low Qmax group. However, the difference in mean Qmax between the two groups did not taper. According to the cutoff value of Qmax for female bladder outlet obstruction, the percentage of patients showing a postoperative flow rate below 12 mL/s was higher in the low Qmax group (p=0.024) [14]. Postoperative urgency was not significantly different between the two groups. At more than 6 months after the operation, the cure rate and general satisfaction rate were 83.6% and 91.5% in the normal Qmax group and 71.8% and 78.5% in the low Qmax group, respectively (Table 3).

**DISCUSSION**

The integral theory and hammock hypothesis provide good insight into the pathophysiology of female SUI. Despite the
TABLE 3. Comparisons of postoperative voiding symptoms and operative results surveyed at 6 months

| Parameter         | Qmax > 15 | Qmax < 15 | p-value |
|-------------------|-----------|-----------|---------|
| Voids difficulty   | 46 (16.9) | 6 (15.0)  | 0.969   |
| Peak flow rate < 12 mL/s (yes/no) | 42 (15.4) | 18 (45.0) | 0.024   |
| Retention (yes/no) | 3 (1.0)   | 0 (0)     | 1.000   |
| Urgency           | 56 (20.5) | 18 (45.0) | 0.803   |
| Satisfaction rate | 221 (91.5)| 22 (78.5) | 0.225   |
| Cure rate          | 204 (83.6)| 23 (71.8) | 0.109   |

Values are presented as number (%).

hammock theory, however, many surgeons observe postoperative urinary retention after anti-incontinence surgery [2]. Conventional anti-incontinence surgery such as Burch colposuspension and pubovaginal sling show significant postoperative retention rates of close to 20% [15,16]. With the midurethral sling operation, postoperative urinary retention rates have decreased [17]. Postoperative retention rates were 2.3% to 19.5% in TVT and 2.0% to 5.4% in TOT [1]. In a comparison between TVT and TOT, TTV showed a slightly higher retention rate than TOT but with no difference in the cure rate [18]. Retention rates in our data (0.9%) were significantly low compared with previous results, whereas in one study the retention rate was similar [19]. However, concerning voiding difficulty, our data showed considerable differences with other studies [20].

There is no standard definition of postoperative voiding dysfunction in anti-incontinence surgery [11]. With various definitions of postoperative retention, it is difficult to compare the data from various studies. However, postoperative retention is generally managed by intermittent catheterization or urethral catheter indwelling. In the present study, the definition of retention was restricted to the need for postoperative catheterization for 1 day.

After anti-incontinence surgery, several components are assumed to affect transient and chronic urinary retention. Clinical characteristics such as increasing age and high BMI are conventionally associated with retention risk [7]. Ulmsten et al. [21] insisted that surgical techniques such as minimal dissection, trauma, and proper positioning of the tape are essential for the prevention of urinary retention. Sander et al. [22] reported that the midurethral sling operation increased urethral resistance during the voiding phase postoperatively. This obstruction affects the urinary flow rate; however, urodynamic obstruction is rare. In the aspect of urethral resistance after the operation, the type of operation such as colposuspension, TVT, and TOT can be a determinant of postoperative retention [9,18]. In our study, postoperative urinary flow rates generally decreased and were gradually restored. However, in the low Qmax group, postoperative Qmax increased. This increase in flow could be interpreted as a minimal increase of urethral resistance.

Some investigators have shown that detrusor contractility is important in postoperative voiding. Kawashima et al. [23] insisted that preoperative detrusor contractility is significantly correlated with postoperative retention. This study implies that patients with lower detrusor pressure have a higher risk of retention. However, Kawashima et al. [23] indicated special parameters (detrusor pressure X average flow rate) as a predictor. Still other studies evoke debate on the effect of detrusor pressure on postoperative retention. Sander et al. [22] found that both pre- and postoperative detrusor pressure were the same in 1 year. Those authors insisted that urethral resistance was more important than detrusor pressure. In our study, detrusor pressure was higher in the low Qmax group; however, the bladder obstruction pattern and bladder contractility did not differ. Furthermore, urethral resistance was not significantly different between the groups. With our data, it is difficult to interpret the impact of detrusor contractility.

Some studies claim that the preoperative flow rate is correlated with postoperative voiding dysfunction [7,24]. Dawson reported that values below the 10th percentile have a strong association with voiding dysfunction [25]. However, other studies insist that the preoperative flow rate has no relation with postoperative retention [26,27]. Mostafa et al. [11] concluded that there were no urodynamics parameters that were predictive of postoperative retention in patients who underwent TOT. Lemack et al. [28] also showed that parameters of urolflowmetry and urodynamics were not predictive of postoperative retention in a colposuspension and pubovaginal sling cohort. In our study, the preoperative urinary flow rate had no correlation with postoperative retention.

Patient satisfaction after midurethral sling surgery is associated with postoperative improvement of incontinence and distress of micturition [14]. There were no statistical differences in the cure rate and the general satisfaction rate in our study. However, a disparity in patient number would result in statistical insignificance. It is possible that the actual cure rate and the satisfaction rate were lower in the low Qmax group than in the normal Qmax group.

It is important to understand patient voiding status such as detrusor contractility and urethral resistance [21]. If patients have intrinsic sphincter deficiency, a higher urethral resistance profile, or neuropathic bladder, tape placement should be cautiously adjusted [28,29]. Surgeons
should consider the patient’s micturition state to determine the minute tension of the sling [30]. Therefore, the reason for the lower rate of retention in the low Qmax group in our study might be lower tension adjustment compared with the normal Qmax group.

Our study had some limitations. There were few urinary retention cases compared with other studies. This point may imply that our cohort consisted of unintended selected cases. It was presumed that patients with severe comorbidity or adverse voiding parameters would be excluded during the decision to operate. Therefore, a small number of low Qmax cases could influence the statistical analysis. Second, there were not many voiding symptoms. Preoperative incontinence grade (e.g., Stamey grade) was not included in the analysis. Several questionnaires for surveying voiding symptoms (e.g., overactive bladder questionnaire, International Consultation on Incontinence Modular Questionnaire) were not used. Furthermore, postoperative urodynamic data were not represented. Objective data on postoperative detrusor pressure and urethral resistance can provide urologists with the patients’ postoperative voiding status. Finally, clinical data were insufficient, such as types of anesthesia, concomitant surgery, and patient comorbidities.

CONCLUSIONS

There are still controversies concerning the influence of preoperative urodynamic parameters on urinary retention after midurethral sling operations. In particular, the effect of the preoperative Qmax on postoperative retention is still in debate. In the present study, patients with a low Qmax did not experience voiding dysfunction more frequently than did patients with a normal flow rate. A cautious TOT procedure can be securely performed in patients with a low preoperative flow rate.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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