Predictors of early postoperative voiding dysfunction and other complications following a midurethral sling

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BACKGROUND: The rates reported for postoperative urinary retention following midurethral sling procedures are highly variable. Determining which patients have a higher likelihood of failing a voiding trial will help with preoperative counseling prior to a midurethral sling.

OBJECTIVE: The objective of the study was to identify preoperative predictors for failed voiding trial following an isolated midurethral sling.

STUDY DESIGN: A retrospective, multicenter, case-control study was performed by including all isolated midurethral sling procedures performed between Jan. 1, 2010 to June 30, 2015, at 6 academic centers. We collected demographics, medical and surgical histories, voiding symptoms, urodynamic evaluation, and intraoperative data from the medical record. We excluded patients not eligible for attempted voiding trial after surgery (eg, bladder perforation requiring catheterization). Cases failed a postoperative voiding trial and were discharged with an indwelling catheter or taught intermittent self-catheterization; controls passed a voiding trial. We also recorded any adverse events such as urinary tract infection or voiding dysfunction up to 6 weeks after surgery. Bivariate analyses were completed using Mann-Whitney and Pearson χ^2 tests as appropriate. Multivariable stepwise logistic regression was used to determine predictors of failing a voiding trial.

RESULTS: A total of 464 patients had an isolated sling (70.9% retropubic, 28.4% transobturator, 0.6% single incision); 101 (21.8%) failed the initial voiding trial. At follow-up visits, 90.4% passed a second voiding trial, and 38.5% of the remainder passed on the third attempt. For the bivariate analyses, prior prolapse or incontinence surgery was similar in cases vs controls (31% vs 28%, $P = .610$) as were age, race, body mass index, and operative time. Significantly more of the cases (32%) than controls (22%) had a Charlson comorbidity index score of 1 or greater ($P = .039$). Overactive bladder symptoms of urgency, frequency, and urgency incontinence were similar in both groups as was detrusor overactivity in those with a urodynamic evaluation (29% vs 22%, $P = .136$), but nocturia was reported more in the cases (50% vs 38%, $P = .046$). Mean (SD) bladder capacity was similar in both groups (406 [148] mL vs 388 [122] mL, $P = .542$) as was maximum flow rate with uroflowmetry and pressure flow studies. Cases were significantly more likely to have a voiding type other than detrusor contraction: 37% vs 25%, $P = .027$, odds ratio, 1.79 (95% confidence interval, 1.07–3.00). There was no difference in voiding trial failures between retropubic and transobturator routes (23.1% vs 18.9%, $P = .329$). Within 6 weeks of surgery, the frequency of urinary tract infection in cases was greater than controls (20% vs 6%, $P < .001$; odds ratio, 3.51 [95% confidence interval, 1.82–6.75]). After passing a repeat voiding trial, cases were more likely to present with acute urinary retention (10% vs 3%, $P = .003$; odds ratio, 4.00 [95% confidence interval, 1.61–9.92]). For multivariable analyses, increasing Charlson comorbidity index increased the risk of a voiding trial failure; apart from this, we did not identify other demographic information among the patients who did not undergo urodynamic evaluation that reliably forecasted a voiding trial failure.

CONCLUSION: The majority of women will pass a voiding trial on the first attempt after an isolated midurethral sling. Current medical comorbidities are predictive of a voiding trial failure, whereas other demographic/examination findings are not. Patients failing the initial voiding trial are at an increased risk of postoperative urinary tract infection or developing acute retention after passing a subsequent voiding trial.

Key words: early postoperative complications, midurethral sling, voiding dysfunction

Midurethral sling surgeries are the main treatment for women with stress urinary incontinence.[1] Although highly effective procedures, one important adverse event not infrequently associated with the midurethral sling operation is postoperative voiding dysfunction, necessitating short-term bladder drainage and, rarely, reoperation.[2] Reports of short-term postoperative urinary retention following midurethral sling are highly variable, ranging from 7.8% to 84%.[3-9]

Immediate postoperative voiding dysfunction is influenced by multiple factors including the criteria used in postoperative voiding trials, concomitant procedures, patient characteristics, and surgical techniques.[3-9] Prolonged bladder drainage after acute urinary retention may be performed via an indwelling Foley or clean intermittent catheterization, which have been associated with increased urinary tract infections, greater health care costs, and substantially decreased patient satisfaction.[10,11] Thus, reducing the rates of postoperative voiding dysfunction and catheter use should be a priority.

Identification of risk factors associated with increased immediate postoperative voiding dysfunction would allow for improved patient counseling and preparation regarding potential discharge with a urinary catheter and may lead to practice changes.

There is currently no universally accepted protocol for performing voiding trials following midurethral sling procedures for stress urinary incontinence. In 2002, Kleeman et al[3] described a postoperative voiding test that

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consisted of retrograde filling the bladder with 300 mL of sterile water or to subjective maximum bladder capacity. If the postvoid residual was ≤50% of the instilled bladder volume within 30 minutes of filling, the catheter was left out.[3]

Several modifications of this voiding trial have been adopted in randomized control trials and described in gynecology textbooks.[9,12,13] Multiple studies previously described relationships between failed postoperative voiding trials and baseline patient clinical factors. Wheeler et al[6] identified that a baseline maximum flow rate on uroflowmetry of <15 mL/s predicted a higher risk of failed postoperative voiding trial.

Flow rate as a predictor of postoperative voiding trial failure was also corroborated by Hong et al,[4] Park et al,[14] and Kim et al.[15] Barron et al[16] identified Valsalva leak point pressure >60 cm H_2O as a risk factor for a failed voiding trial. A history of prior incontinence or prolapse surgery and increasing age were found to increase the risk for delayed voiding by Mutone et al.[17] Furthermore, increased preoperative postvoid residual on pressure flow studies was also correlated with a greater likelihood of having a postoperative voiding trial fail.[18]

Thus, past studies have found different variables that influence immediate postoperative voiding failure. The authors of this study sought to reexamine the relationships of perioperative characteristics and undesired outcomes in patients who have undergone a midurethral sling procedure. In particular, we aimed to identify predictors of postoperative voiding dysfunction and other complications in a large, diverse group of women utilizing their clinical characteristics and, when available, preoperative urodynamic studies.

Materials and Methods

Following institutional review board approval at each participating site, a retrospective multicenter case-control study was performed at 6 academic centers through the Society of Gynecologic Surgeons' Fellows' Pelvic Research Network. Women aged 18 years and older who had undergone an isolated retropubic midurethral sling, transobturator sling, or single-incision/minisling from Jan. 1, 2010, to June 30, 2015, with a recorded same-day postoperative voiding trial were identified. We excluded intraoperative procedures in which a day-of-surgery voiding trial would not be medically appropriate (ie, suprapubic tube placement, intraoperative complications) and patients undergoing concomitant pelvic reconstructive procedures or other antiincontinence procedures.

Patient demographics, medical and surgical histories including prior antiincontinence or pelvic reconstructive procedures, preoperative overactive bladder symptoms, preoperative complaints of voiding dysfunction, and a patient-reported history of recurrent urinary tract infection were collected from the electronic medical record. The Charlson comorbidity index was utilized to quantify the severity of patients' comorbidities.

If available, results of preoperative multichannel urodynamics with uroflowmetry, cystometrics, pressure flow studies, and urethral pressure profilometry data were collected. This information included uninstrumented uroflowmetry maximum flow rate, postvoid residual, and voiding pattern; cystometric bladder capacity, presence of detrusor overactivity, or urodynamic stress incontinence, Valsalva and cough leak point pressures; maximum urethral closure pressure; and a pressure-flow study's maximum flow rate, maximum detrusor pressure, postvoid residual, and voiding type (detrusor-void vs Valsalva or mixed-type void).

If multichannel urodynamic studies were not performed during a patient's preoperative evaluation, simple cystometric data including postvoid residual, observed detrusor overactivity, bladder capacity, and the presence of stress urinary incontinence were collected. If no multichannel urodynamic or simple cystometric data were available, bladder capacity and postvoid residual were obtained from a preoperative voiding diary and office visit notes.

Intraoperative data including type of midurethral sling, estimated blood loss, type of anesthesia, anesthesia time, and surgical time were recorded. Postoperative follow-up information was obtained from the medical record up to 6 weeks after surgery, and any adverse events such as urinary tract infection or voiding dysfunction were collected.

Cases were defined as patients in who a postoperative voiding trial failed and were discharged with an indwelling catheter or taught intermittent self-catheterization. Controls were defined as patients who passed a voiding trial. Postoperative voiding trials were performed using an individual site's standard voiding trial procedure, including criteria for voiding trial success and failure. At all clinical sites but one, the procedure for a postoperative voiding trial was a retrograde fill to 300 mL sterile water (or patient tolerance) with success defined as voiding at least two thirds of the instilled volume (or postvoid residual less than 100 mL). The remaining site permitted time for a spontaneous void after surgery, with a successful trial similarly defined as a postvoid residual less than 100 mL. The criteria for indwelling catheter removal or discontinuation of self-catheterization were left to the discretion of each institution.

The Society of Gynecologic Surgeons' Fellows' Pelvic Research Network academic sites were recruited with the goal of both identifying approximately 90−100 cases and achieving geographic diversity for the greatest generalizability. It is generally accepted that 5−10 patient cases are needed to identify each predictor; because we used a multivariable model (ie, for each degree of freedom),[1,2] including approximately 100 cases would be sufficient for the evaluation of up to 10 predictors of a short-term postoperative voiding trial failure in the multivariable model.

Bivariate analyses were completed using Mann-Whitney and Pearson χ^2 or Fisher-Freeman-Halton tests as appropriate. Odds ratios and 95% confidence intervals were calculated. Variables were then considered jointly in a multivariable backward stepwise logistic regression model to determine predictors of failing a voiding trial.

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