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The association between regional anesthesia and acute postoperative urinary retention in women undergoing outpatient midurethral sling procedures

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Abstract

Objective—To estimate the association between regional anesthesia and acute postoperative urinary retention in women undergoing outpatient midurethral sling procedures.

Study Design—We performed a retrospective cohort study of women undergoing outpatient midurethral sling procedures. Exposure was defined as the type of anesthesia, categorized as regional (spinal or combined spinal/epidural) or non-regional (general endotracheal, monitored anesthesia care with sedation, or local). Outcome, acute postoperative urinary retention, was defined as a failed voiding trial prior to discharge.

Results—A total of 131 women met our inclusion criteria. Forty-two (32%) women had regional anesthesia and 89 (68%) women had non-regional anesthesia. Overall, 48 (36.6%) women had acute postoperative urinary retention. Women who had regional anesthesia had an increased odds (Adjusted OR=4.4, 95% CI 1.9, 10.2) of acute postoperative urinary retention compared to women receiving non-regional anesthesia.

Conclusion—Regional anesthesia is a risk factor for acute postoperative urinary retention following outpatient midurethral slings.

Keywords

midurethral sling; urinary retention; spinal anesthesia

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Introduction

Urinary retention is a potential complication following midurethral sling placement for the treatment of stress urinary incontinence, and is estimated to occur in 2.8 to 39% of cases. (1–6) Risk factors for urinary retention may include previous incontinence surgery, weak or absent detrusor contractions during attempted voids on urodynamic testing, and high preoperative post-void residuals. (7) Other potential causes have been postulated to occur as a result of pelvic nerve denervation, hematoma formation, and tissue edema. (2) The type of anesthesia has also been identified by some authors to be a risk factor, but studies are conflicting. Duckett et al found that general anesthesia was predictive of early postoperative voiding dysfunction after TVT slings; however, Murphy et al concluded that general anesthesia was not associated with increased rates of urinary retention.

Although postoperative urinary retention is not a life threatening complication, the need for continuous bladder catheter drainage or intermittent self-catheterization can cause catheter related discomfort, urinary tract infections, slower return to daily activities, and decrease in satisfaction. (10,11) The objective of our study is to estimate the effect of regional compared to non-regional anesthesia on postoperative urinary retention in women undergoing placement of a midurethral sling in the ambulatory setting.

Methods

We performed a retrospective cohort study of all women undergoing outpatient placement of a midurethral sling between January 2005 and December 2007 identified using CPT codes. Women were excluded if they were admitted overnight following the procedure or underwent concomitant prolapse surgery to minimize potential confounding. Women with incomplete surgical data were also excluded. All slings were performed under the supervision of a fellowship-trained urogynecologist at a tertiary care center. This study was approved by the Institutional Review Board at Women and Infants' Hospital of Rhode Island.

We collected demographic and clinical information including post-void residuals (PVR) and maximum flow rate recorded on preoperative urodynamic testing. Surgical data including type of anesthesia, operative complications, estimated blood loss, total intravenous fluids were recorded. Postoperative data including trial of void (TOV) results (at discharge and at follow-up visits if needed), discharge pain scores on a visual analog scale (VAS) ranging from 0 to 10, days of subsequent continuous catheter draining if needed, treatment of urinary tract infections (UTIs) within the first 2 postoperative weeks, need for prolonged post-operative clean intermittent self-catheterization, and need for re-operation were recorded.

The primary exposure was defined as mode of anesthesia, categorized as regional or non-regional. Regional anesthesia included both spinal and combined spinal-epidurals. Non-regional anesthesia included general anesthesia by endotracheal (GETA) or laryngeal mask airway (LMA), monitored anesthesia care with sedation (MAC) and local analgesia with intravenous sedation.

All women who underwent outpatient midurethral slings had a routine retrograde TOV prior to discharge. Trial of voids were performed by post-operative anesthesia care unit nurses after anesthetic effects were clinically resolved and the patient was able to ambulate independently without difficulty. The bladder was filled retrograde with 300 mL of normal saline and the catheter removed. The patient was asked to void within 20 minutes of filling and voided volumes were recorded. Our primary outcome, acute post-operative urinary retention, was defined as voiding less than 200 mL. Acute urinary retention was then analyzed as a dichotomous variable. Following a failed TOV, a Foley catheter was

reinserted and women were asked to return to the office in 48–72 hours for a repeat TOV. Women who failed the repeat TOV again at follow-up were defined as having “prolonged urinary retention.”

Statistical analysis included descriptive statistics, chi-square, Fisher’s exact test, and two sample t-test, as appropriate. Multivariable logistic regression was used to estimate the association between regional anesthesia and acute post-operative urinary retention. Based on previous literature, the effects of potential confounders were explored including age, BMI, parity, and previous gynecologic surgery. (1,3,12) In addition, potential confounders based on bivariate analysis ($p < .10$) were also explored. These potential confounders were added to each model in a stepwise fashion. Variables with a p-value of less than .05 were included in the final model. All statistical analysis was performed using STATA 10.0 (StataCorp, College Station, TX).

Results

A total of 141 women underwent placement of a midurethral sling during the study period. Ten women were excluded due to incomplete data. Forty-two (32%) women had regional anesthesia and 89 (68%) women had non-regional anesthesia. Table 1 describes the demographic and clinical characteristics of each group. Women receiving regional anesthesia were older ($57.8 \text{ years} \pm 11.1$) compared to women receiving non-regional anesthesia ($51.0 \text{ years} \pm 10.5$) ($p < 0.01$), but were otherwise similar with respect to parity, previous pelvic or anti-incontinence procedures, preoperative urodynamic findings including PVR, and anticholinergic use. There were no intra-operative complications. Eighty-two (62.6%) women had mid-urethral slings via the retropubic route and 49 (37.4%) women via the transoburator route.

Forty-eight (36.6%) women had acute postoperative urinary retention. Women who received regional anesthesia had significantly higher rates of acute postoperative urinary retention compared to women who received non-regional modes (61.9% vs. 24.7%, $p < .001$) (Table 2). Women who midurethral slings via the retropubic approach also had higher rates of acute postoperative urinary retention compared to women who had the transobturator approach (43.9% vs. 24.5%, $p = .03$). On multivariable logistic regression, women who had regional anesthesia had an increased odds (Adjusted OR=4.4, 95% CI 1.9, 10.2) of acute postoperative urinary retention compared to women receiving non-regional anesthesia, after adjusting for midurethral sling route (obturator vs. retropubic) and age. Parity, body mass index (BMI), maximum flow rate on urodynamic testing, pre-operative PVR, total amount of intra-operative intravenous fluids, and estimated blood loss did not change the model and were excluded from the final model (Table 3).

We also examined the specific type of local anesthetic used in regional anesthesia. Forty-two women received regional anesthesia, but two charts were incomplete and excluded from the secondary analysis. Forty percent (16/40) of women received short-acting anesthetics for their spinal anesthesia and 60% (24/40) of women received long-acting anesthetics. There were no differences in the rates of acute postoperative retention between women who received short versus long-acting regional anesthetics (Table 4). Sixty-six women received general anesthesia. When different routes of general anesthesia were examined, a significantly higher proportion of women receiving endotracheal intubation (39.6%, 19/48) were discharged home with a catheter versus women receiving laryngeal mask airways (6%, 1/18) ($p < 0.01$) (Table 4). Twenty-three women underwent their surgical procedure with local anesthesia and intravenous sedation. Nine percent (2/23) of these women had acute postoperative urinary retention.

Of the 48 women with acute postoperative urinary retention, 11 women continued to demonstrate prolonged urinary retention following the repeat TOV 48 to 72 hours later. Eight of these women used intermittent self-catheterization for a range of 2 to 40 days. One woman ultimately underwent sling revision 22 days after the initial operation. One woman without acute postoperative urinary retention developed urinary retention after discharge on postoperative day 1; she received GETA. After continuous bladder catheter drainage for 3 days, she subsequently passed a repeat TOV. Twelve of the 48 (25%) women discharged home with Foley catheters were treated for UTIs. Only 2 of the 83 women (2.4%) discharged home without a catheter were treated for UTIs.

Postoperative VAS pain scores were ascertained prior to discharge home. Women receiving regional anesthesia reported a lower median pain score of 0 (range 0 to 6) versus a pain score of 2 (range 0 to 8) in women who received non-regional anesthesia, however these results were not statistically significant ($p=0.855$).

Discussion

Our study demonstrates that regional anesthesia is associated with a higher rate of acute postoperative urinary retention following placement of a midurethral sling compared to non-regional modes in an ambulatory setting. The choice of surgical anesthesia often involves a balanced discussion between a patient, anesthesiologist, and surgeon, and this information may help to inform patients' postoperative expectations.

Studies in the urologic and urogynecologic literature have been inconsistent concerning the role of anesthesia in acute postoperative urinary retention in anti-incontinence procedures in women. Kleeman et al. prospectively followed 90 women following surgery for prolapse or incontinence and found no differences in urinary retention rates between women receiving general, regional or local anesthesia. Murphy et al. conducted a retrospective cohort study of 173 women receiving tension-free vaginal tape placement, and concluded that anesthesia type did not predict post-operative voiding dysfunction; however, the authors included women who received regional and local anesthesia together in one group which may have decreased any effect of regional anesthesia on postoperative urinary retention. Duckett et al. performed a prospective cohort study of 500 women who underwent TVT placement and found that general anesthesia was predictive of early postoperative voiding dysfunction; however, only 6% of the patients received general anesthesia. Barron et al. performed a retrospective review of 119 patients undergoing outpatient TVT with or without concomitant surgeries who were discharged on the same day of surgery. They found no significant difference in need for catheterization among patients who received spinal anesthesia compared to general and local with sedation. In this study, 18% of the women received spinal anesthesia, 18% received local with sedation, and 64% received general anesthesia. In the above studies, regional anesthesia was not analyzed as the primary exposure.

The data on regional anesthesia and its effect on acute postoperative urinary retention is more consistent in other fields. Spinal anesthesia has been shown to increase rates of urinary retention in orthopaedic, podiatric, and hernia surgery. (13–15) Lamonerie et al. used ultrasonography to diagnose immediate postoperative urinary retention in the recovery room by following 177 patients in a Paris Hospital. Spinal anesthesia conferred the most risk of urinary retention followed by duration of surgery and age. Van Veen et al. performed a randomized trial of 100 patients undergoing inguinal hernia repair to either spinal or local anesthesia. They found significantly lower rates of postoperative urinary retention in patients receiving local anesthesia. Casati et al. randomized 120 patients undergoing arthroscopic knee surgery to intravenous anesthesia, spinal anesthesia, or local sciatic-femoral nerve block. The authors concluded that peripheral analgesia is preferable to spinal anesthesia to

minimize postoperative urinary retention. Kamphius et al. demonstrated a measurable interruption in the micturition reflex following spinal anesthesia. In this study, 20 men undergoing elective orthopaedic surgery on lower limbs had interval cystometry performed at capacity and compared detrusor function to ankle, knee, and hip motor function. They found that motor blockade following bupivacaine spinals lasted 148 ± 76 minutes compared to detrusor blockade of 462 ± 61 minutes. The authors also noted that the detrusor blockade continued until the spinal anesthetic regressed above the S3 nerve.

When we examined the difference between non-regional types of anesthesia, specifically GETA vs. LMA, we noted differences in the rates of acute post-operative urinary retention. One explanation for the higher rates of acute urinary retention in the GETA group may be explained by the use of anticholinergics (atropine and glycopyrrolate) during the reversal of anesthesia and prior to extubation. Glycopyrrolate is commonly used to dry oral secretions and reverse muscle relaxants prior to endotracheal extubation. Women undergoing non-regional anesthesia with LMA are generally not given anticholinergics at our institution. Glycopyrrolate has a half-life of 1.8 hours and has been associated with urinary retention following other outpatient procedures. (20)

Our study is limited by the retrospective design. It is possible that our results were influenced by selection bias, in which women who had regional anesthesia were at higher risk for retention. However, when we adjusted for known risk factors for retention including age, BMI, and previous gynecologic surgery, our findings did not change. Also, we were unable to assess the possibility of residual anesthetic affects in the immediate postoperative period at the time of the TOV. It is possible that detrusor blockade was still present at the time of the TOV despite the return of motor neurons that allowed ambulation. In addition, we do not have data regarding a woman's satisfaction with her choice of anesthesia or overall experience with or without short-term Foley catheter drainage. Although we were not able to assess patient satisfaction between regional and non-regional anesthesia, we were able record pain scores immediately prior to discharge home and found there was no difference between groups. Also, it is not our practice to routinely measure maximum detrusor pressure on all urodynamic testing and therefore do not have data regarding this potential risk factor for retention. Consistent with others (5,21,22) we found a low rate of long-term sequelae of acute postoperative urinary retention. Only one woman required repeat operative intervention for prolonged urinary retention.

In conclusion, regional anesthesia is associated with an increased risk of acute postoperative urinary retention following midurethral slings in the ambulatory setting. This risk should be considered and incorporated into patient counseling regarding postoperative expectations.

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Table 1

Clinical and demographic patient characteristics

	Non-regional Anesthesia (n =89)	Regional Anesthesia (n=42)	P-value
Age years(mean $\pm$ SD)	51.0 ($\pm$ 10.5)	57.8 ($\pm$ 11.1)	0.001
Parity (median, range)	2 (0, 6)	2 (0,4)	0.57
Race			0.46
White	74 (83.2%)	37 (88.1%)	
BMI * kg/m ² (mean, $\pm$ SD)	29.9 ($\pm$ 6.26)	30.3 ($\pm$ 6.9)	0.74
Postmenopausal (n, %)	42 (46.1%)	28 (66.7%)	0.028
Chronic lung disease (n, %)	15 (16.9%)	12 (28.6%)	0.12
Diabetes Mellitus (n, %)	3 (3.4%)	3 (7.1%)	0.38
Tobacco use (n, %)			
Current user	19 (21.4%)	7 (16.7%)	0.53
Past user	24 (27.0%)	11(26.2%)	0.92
Pre-operative anti-cholinergic use (n, %)	16 (18.0%)	10 (23.8%)	
Prior hysterectomy	22 (24.7%)	16 (38.1%)	0.11
Prior incontinence procedure (n, %)			0.88
Retropubic	5(5.6%)	2(4.8%)	
Mersilene	0	1(2.4%)	
Midurethral	2 (2.3%)	0	
URODYNAMIC DATA			
Pre-operative PVR ** (mL) (mean, $\pm$ SD)	28 ($\pm$ 33)	29 ($\pm$ 37)	0.81
First sensation (mL) (mean, $\pm$ SD)	147 ($\pm$ 85)	155 ($\pm$ 84)	0.59
Maximum cystometric capacity (mL) (mean, $\pm$ SD)	343 ($\pm$ 124)	373($\pm$ 131)	0.21
Maximum flow rate (mL/second) (mean, $\pm$ SD)	n=78 30 ($\pm$ 14)	n=36 26 ($\pm$ 13)	0.17

* BMI - Body Mass Index

** PVR - Post-void residual

SD-standard deviation

Table 2

Operative data and postoperative TOV results for non-regional versus regional anesthesia groups

	Non-regional Anesthesia (n=89)	Regional Anesthesia (n=42)	P-value
Retropubic (n, %)	53 (59.6%)	29 (69.1%)	NS (.294)
EBL* (cc, mean $\pm$ SD)	69 ($\pm$ 68)	76 ($\pm$ 105)	NS (.661)
IVF** (cc, mean $\pm$ SD)	1173 ($\pm$ 439)	1264 ($\pm$ 488)	NS (.289)
VAS*** pain score (median, range)	2 (0,8)	0 (0,6)	NS (.855)
Failed trial of void (n,%)	22 (24.7%)	26 (61.9%)	p <.001

* EBL-estimated blood loss

** IVF-intraoperative intravenous fluids

*** VAS-visual analog scale

SD-standard deviation

Table 3

Association between regional anesthesia and acute postoperative urinary retention, (N=131)^{*}

Variable	Adjusted Odds Ratio	95% Confidence Interval
Regional anesthesia ^{**}	4.4	1.9, 10.2
Retropubic route ^{***}	2.3	1.0, 5.3
Age	1.0	0.9, 1.1

^{*} Adjusted OR, 95% CI obtained from multivariable logistic regression model.

^{**} Compared to non-regional anesthesia

^{***} Compared to transobturator route

Table 4

Anesthetic subtypes and acute postoperative urinary retention following outpatient midurethral slings

Type of Anesthesia	Retention n/N (%)	P-value
Type of Regional* (N=40)		
Short-acting	10/16 (63%)	0.79
Long-acting	14/24 (58%)	
Type of General (N=66)		
Endotracheal	19/48 (40%)	<0.01
Laryngeal mask airway	1/18 (6%)	
Local with intravenous sedation	2/23 (9%)	-

*
2 charts were incomplete and excluded from analysis