
Bladder spasms following ambulatory urologic procedures

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Introduction: Bladder spasm are common complications following cystoscopic urologic procedures. This study aims to determine the incidence and risk factors for bladder spasm after ambulatory cystoscopic urologic procedures.

Materials and methods: Medical records of adult patients who underwent urologic procedures in our ambulatory center from May 1st, 2018 through December 30th, 2020, were reviewed. Bladder spasm was identified from the administration of antispasmodic therapy (e.g. oxybutynin) during anesthesia recovery. Multivariable analyses were performed to assess the association between bladder spasm and clinical factors.

Results: Included were 2,671 patients, of which 917 (34.3%) developed postoperative bladder spasm, yielding an incidence of 343 (95%CI 325-361) per

1,000 procedures. Risk factors associated with bladder spasm were younger adult age (< 60 years), longer (> 45 minutes) and more complex procedures. Compared to cystoscopy the risk of spasm following transurethral resection of the bladder tumor was OR 4.35 (95%CI 3.22, 5.87) and for transurethral resection of the prostate OR 3.25 (95% CI 2.24, 4.71). Spasm prophylaxis with belladonna and opium suppositories (B&O) was used in 1,158 patients and 384 (33.2%) developed spasms. The use of B&O was not associated with reduction of bladder spasm, OR 0.91 (95%CI 0.75, 1.1, $p = 0.318$). Postoperative outcomes did not differ between patients who did or did not develop spasms.

Conclusion: Bladder spasms are common following ambulatory urologic procedures, more so with more extensive procedures. Prophylaxis with B&O was not significantly associated with a lower rate of bladder spasms.

Key Words: urology, cystoscopy, ambulatory surgeries, bladder spasm

Introduction

Outpatient surgical practice has grown over recent decades to minimize hospital stay and economic and medical burden.¹ Pain, nausea and vomiting,

and urinary retention are common barriers for early discharge following procedures.² Postoperative detrusor muscle spasm or “bladder spasm” can result in substantial discomfort with symptoms including cramping sensation, pain, and urinary urgency. Bladder spasms are known to complicate cystoscopic urologic procedures,^{3,4} as well as the use of urinary catheters.⁵ However, the incidence of bladder spasms following ambulatory urologic procedures or risk factors related to this complication has not been fully investigated. Additionally, whether this complication can lead to adverse postoperative outcomes is not clear. Such data may allow for identification of higher risk patients, and guide use of preemptive and rescue therapies.

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In this study, our primary aims were to determine the incidence of bladder spasm following ambulatory cystoscopic procedures and determine patient and procedural factors which may be associated with increased risk. The secondary aim was to determine if bladder spasms were associated with worse outcomes including prolonged anesthesia recovery, unplanned hospital admission, emergency department admission within 48 hours after surgery.

Materials and methods

This study was approved by the Mayo Clinic Institutional Review Board (Protocol Number 21-002516), and consistent with the Minnesota Statute 144.295, the patients included have provided prior written authorization for research use of their medical records. This paper adheres to the STROBE guidelines.

Study setting

The setting was an outpatient surgical center located on the campus of a major academic institution.

Perioperative practice

In the Mayo Clinic Rochester, many of the urologic procedures are performed in a single outpatient surgical center. Certified registered nurse anesthetists provide anesthesia under the supervision of an anesthesiologist who is present throughout the procedure and assists with perioperative care. Most procedures are performed under general anesthesia with a laryngeal mask airway. Anesthesia maintenance is typically with propofol infusion, nitrous oxide and low percentage sevoflurane. Acetaminophen is administered preoperatively, and fentanyl used for opioid analgesia. At the discretion of the surgeon, a belladonna and opium (B&O) suppository may be placed during the procedure as prophylaxis against bladder spasms. Patients pass phase I and II anesthesia recovery under the direct care of a registered nurse and attending anesthesiologist. Patients who complain of crampy lower abdominal pain after procedures are treated for 'bladder spasms'. First line agent is 5 mg oral oxybutynin. For elderly patients, typically over age 65, 20 mg oral tiroprium can be substituted per the discretion of the anesthesiologist. For recalcitrant cases B&O suppository or 5 mg oral valium can be administered. After meeting discharge criteria, patients will be discharged either to home/self-care or admitted to the hospital if their medical condition warrants.

Study design and patient selection

This is a retrospective observational study of adult

patients who underwent cystoscopic urologic procedures from May 1st 2018 through December 30th, 2020 in our outpatient procedural center. We excluded all the procedures performed with approaches other than cystoscopy. Patients' electronic medical records were reviewed for demographic, preoperative, intraoperative, and postoperative variables using automated data collection software and manual confirmation. Patients were dichotomized into having bladder spasms or not based on the use of bladder antispasmodic medications (e.g., oxybutynin) during anesthesia recovery.

Data abstraction

Patient characteristics included age, sex, body mass index, comorbidities including cardiovascular disease, pulmonary disease, diabetes mellitus, central nervous system disease, cystitis, and home use of opioid analgesics, benzodiazepines, and antispasmodic medications. Anesthetic and surgical records were reviewed for the procedural duration, procedural type was categorized by complexity (cystoscopy, advanced cystoscopy [with biopsy or fulguration], ureteral stent placement or exchange, prostate procedure [e.g., laser prostate resection, transurethral resection of the prostate (TURP)], or transurethral resection of bladder tumor [TURBT]), placement of a B&O suppository, placement of a urinary catheter, anesthesia type (general anesthesia vs. monitored anesthesia care) and opioid dose (converted to intravenous morphine equivalents [IVMEQ]). The PACU course was abstracted for the duration of phase I recovery, rescue opioid and non-opioid analgesics, antispasmodic medications, pain scores, and need for catheterization. Maintenance of urinary catheter at time of PACU dismissal was noted. Following PACU discharge, hospital admission after procedure, emergency department visit or documented complaint of bladder spasms within 48 hours of the procedure was noted.

Statistical analysis

All patient and procedural data are presented as mean (\pm standard deviation) or median [interquartile range] for continuous variables and as a frequency number and percentage for categorical variables. Bladder spasm was considered as the primary outcome variable and all other procedural variables were considered as explanatory variables. Comparison between two groups with and without bladder spasm was performed using either Student's t-test or Wilcoxon rank-sum test for continuous variables and Chi-square for categorical variables. In addition to the univariate analysis,

TABLE 1. Characteristics potentially associated with bladder spasm

Characteristic	n	Bladder spasm # (%)	Chi-square p value	Multivariable logistic regression OR	95% CI	p value
Overall	2671	917 (34.3)	-	-	-	-
Age, years			<.001			.004
≤ 59	463	178 (38.4)		1.00	reference	
60 to 69	765	295 (38.6)		0.84	(0.64, 1.11)	
70 to 79	953	303 (31.8)		0.61	(0.46, 0.81)	
≥ 80	490	141 (28.8)		0.60	(0.34, 1.05)	
Sex			.002			.635
Female	583	168 (28.8)		1.00	reference	
Male	2088	749 (35.9)		1.06	(0.84, 1.33)	
Body mass index, kg/m ²			.821			.739
≤ 24.9	567	193 (34.0)		0.98	(0.77, 1.24)	
25.0 to 29.9	1000	344 (34.4)		1.00	reference	
30.0 to 34.9	685	243 (35.5)		0.99	(0.79, 1.24)	
≥ 35.0	419	137 (32.7)		0.87	(0.66, 1.13)	
Cystitis			.002			.499
No	1939	699 (36.1)		1.00	reference	
Yes	732	218 (29.8)		0.93	(0.75, 1.15)	
Home antispasmodic			.896			.298
No	2579	886 (34.4)		1.00	reference	
Yes	92	31 (33.7)		0.76	(0.45, 1.28)	
Neurogenic bladder			.018			.218
No	2626	909 (34.6)		1.00	reference	
Yes	45	8 (17.8)		0.60	(0.26, 1.35)	
Chronic pulmonary disease			.387			.462
No	2101	730 (34.8)		1.00	reference	
Yes	570	187 (32.8)		1.09	(0.66, 1.14)	
Cardiovascular disease			.001			.316
No	2090	751 (35.9)		1.00	reference	
Yes	581	166 (28.6)		0.87	(0.66, 1.14)	
Chronic kidney disease			.793			.592
No	2524	868 (34.4)		1.00	reference	
Yes	147	49 (33.3)		1.11	(0.75, 1.65)	
Neurologic disorder			.009			.608
No	2451	859 (35.1)		1.00	reference	
Yes	220	58 (26.4)		0.89	(0.57, 1.39)	
Diabetes			.085			.178
No	2042	719 (35.2)		1.00	reference	
Yes	629	198 (31.5)		0.86	(0.69, 1.07)	
Home opioids			.543			.274
No	2549	872 (34.2)		1.00	reference	
Yes	122	45 (36.7)		1.29	(0.82, 2.31)	
Home benzodiazepines			.098			.374
No	2442	827 (33.9)		1.00	reference	
Yes	229	90 (39.3)		1.15	(0.85, 1.56)	

TABLE 1 (Cont'd). Characteristics potentially associated with bladder spasm

Characteristic	n	Bladder spasm # (%)	Chi-square p value	Multivariable logistic regression OR	95% CI	p value
Procedure type			< .001			< .001
Cystoscopy	462	77 (16.7)		1.00	reference	
Advanced cystoscopy	868	206 (23.7)		1.70	(1.25, 2.32)	
Ureteral stent placement	317	111 (35.0)		1.71	(1.20, 2.44)	
Prostate procedure	270	141 (52.2)		3.25	(2.24, 4.71)	
TURBT	754	382 (50.7)		4.35	(3.22, 5.87)	
Duration of surgery, min			< .001			< .001
≤ 15	499	63 (12.6)		0.32	(0.23, 0.45)	
16 to 30	719	205 (28.5)		0.72	(0.56, 0.92)	
31 to 45	528	193 (36.6)		1.00	reference	
45 to 60	166	166 (48.7)		1.56	(1.17, 2.08)	
≥ 61	290	290 (49.7)		1.56	(0.21, 2.03)	
B&O suppository (prophylaxis)			.265			.318
No	1513	533 (35.2)		1.00	reference	
Yes	1158	384 (33.2)		0.91	(0.75, 1.10)	
Catheter placed during surgery		.735			.439	
No	894	303 (33.9)		1.00	reference	
Yes	1777	614 (34.6)		1.08	(0.89, 1.30)	
Type of anesthesia			.019			.796
General	2292	807 (35.2)		1.00	reference	
Monitored anesthesia care	379	110 (29.0)		0.93	(0.52, 1.65)	
Intraoperative opioid, IVME mg			.467			.435
≤ 5	796	260 (32.7)		1.00	reference	
6 to 10	1197	409 (34.2)		1.05	(0.85, 1.29)	
11 to 15	402	146 (36.3)		1.23	(0.93, 1.63)	
≥ 16	276	102 (37.0)		1.19	(0.86, 1.64)	

Data summarized as # (%) and results of multivariable logistic regression analysis model accounting for demographics and procedural characteristics with bladder spasm as odds ratios (OR) with corresponding 95% confidence intervals (CI). TURBT = transurethral resection of bladder tumor; B&O = belladonna and opium; IVME = intravenous morphine equivalents

we performed a multivariable logistic regression analysis model to assess the associations of patients' demographics and procedural characteristics with bladder spasm. Results were presented as odds ratios with corresponding 95% confidence intervals with p values < 0.05 considered significant. Statistical analyses were performed using either JMP Pro (JMP Pro version 13.0.0, Cary, NC, USA).

Results

During the study time frame, 2,671 patients underwent outpatient urologic interventions of whom 917 (34.3%) developed postoperative bladder spasm, yielding an incidence of 343 (95% confidence interval [CI] 325-361) per 1,000 procedures. Rescue medications

included oxybutynin (n = 814), trospium (n = 117), B&O suppository (n = 17), and valium (n = 16), and 47 patients received more than one rescue medication.

Table 1 summarizes clinical and procedural characteristics of patients who had or did not have bladder spasms, and provides multivariable analysis of risk factors potentially associated with bladder spasm. There was increased risk for bladder spasm in younger adult patients (with age less than 60), and longer procedures (> 45 minutes). The rate of bladder spasms varied by procedure type with highest rates found after TURBT (OR 4.35, 95%CI 3.22, 5.87) followed by prostate procedures OR 3.25, CI95% 2.24, 4.71), both compared to cystoscopy as reference group, Table 1. No other patient or comorbid conditions were associated with increased risk for spasms.

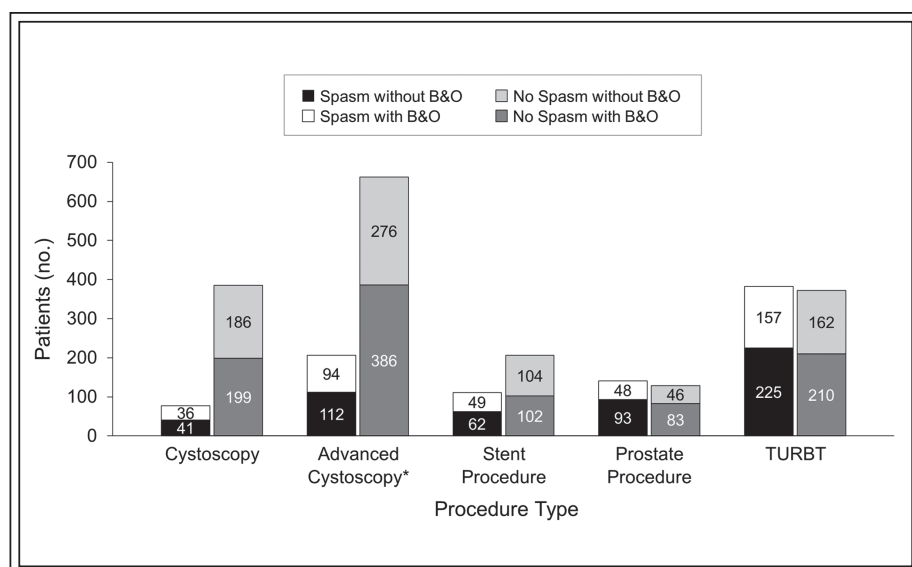


Figure 1. Number of patients who developed bladder spasms with or without belladonna and opium (B&O) suppositories following ambulatory cystoscopic urologic procedures.

*indicates cystoscopies with biopsy or fulguration.

Of the 2,671 patients, 1,513 did not received prophylactic treatment with B&O intraoperatively, and of these 533 (35.2%) had bladder spasms, and 1,159 received B&O and 614 (34.6%) reported bladder spasms,

spasms in younger adult patients and following longer procedures. Preventive intraoperative use of B&O was based on urologist assessment of risk (e.g. tumor size or location), but when the rate of spasms

rendering no significant protection associated with the use of B&O (OR 0.91, 95%CI 0.75, 1.1, $p = 0.318$). Figure 1 shows distribution of B&O administration across procedures and proportions of patients with and without spasms. The postanesthetic and postprocedural course were similar between patients who did or did not have bladder spasms, Table 2.

Discussion

The major observation from this cohort of patients undergoing ambulatory cystoscopic urologic procedures is that bladder spasms are common and occur in 34% of cases. There is increased risk for bladder

TABLE 2. Postoperative outcomes of patients who did or did not develop postoperative bladder spasms following ambulatory cystoscopic urologic procedures

	Non-bladder spasm (n = 1,754)	Bladder spasm (n = 917)	p values
Postanesthesia course			
Recovery duration, min	126.4 ± 49	126.2 ± 50	0.928
Maximum pain score	0 [0, 3]	0 [0, 3]	0.870
Catheter placement	21 (1.2%)	4 (0.4%)	0.050
Discharge with urinary catheter	857 (48.9%)	416 (45.4%)	0.087
Postoperative medications			
Acetaminophen	81 (4.6%)	47 (5.1%)	0.568
Opioid, IVME mg	0 [0, 0]	0 [0, 0]	0.212
Ketorolac	60 (3.4%)	28 (3.1%)	0.650
Ketamine	7 (0.4%)	8 (0.9%)	0.170
Discharge course within 48 postoperative hours			
Hospital admission	60 (3.4%)	37 (4%)	0.376
Emergency department visit	24 (1.4%)	17 (1.9%)	0.326
Bladder spasm	14 (0.8%)	11 (1.2%)	0.306

Data summarized as mean ± standard deviation, median [interquartile range], of n (%).

IVME = intravenous morphine equivalents.

in those who received it were compared to those who did not, its use was not associated with reduction of postoperative bladder spasms. Though symptoms of bladder spasms can be distressing, postoperative outcomes did not differ between patients who did or did not have this complication.

Several strategies have been studied to prevent and/or treat pain from bladder spasms and include neuraxial anesthesia, intravesical local anesthetic injection, transcutaneous electrical stimulation, narcotics, ketorolac, and acetaminophen, all have been shown to be effective in reducing the symptoms related to bladder spasm.⁶⁻¹⁰ One of the effective treatments for spasms is early removal of the urinary catheter when possible.⁵ Preoperative oral anticholinergics have also been used to reduce urinary catheter bladder discomfort.¹¹ In addition, a small prospective randomized control trial found that intravenous magnesium (50 mg/kg load followed by 15 mg/kg/hour) had a substantial reduction of urinary catheter bladder discomfort following TURBT.¹²

In our study we relied on the administration of select antispasmodic medications, and this treatment was the proxy for clinically significant bladder spasm. Bladder detrusor muscle is richly innervated with muscarinic receptors,¹³ and anticholinergic medications are well known to relax the bladder musculature.¹⁴ In our postanesthesia recovery room oxybutynin, trospium, or B&O suppository are most frequently treatment for postoperative bladder spasm. Methodologically similar study by Yates et al⁴ relied on antispasmodic medications as a proxy for bladder spasms, and their rate of spasm following transurethral procedures was 18%. In contrast, Gregg et al³ used documentation of spasm in the medical record to derive a rate of 3% following TURBT. It is difficult to retrospectively elucidate the cause for these large discrepancies of reported rates of bladder spasms.^{3,4} However, two very different approaches to define spasms have been used. Alternatively, the complexity of cases between outpatient centers may differ.

The primary factors associated with increased risk for bladder spasms were procedural related, with increased risk with longer procedures as well as type of procedure. In this series rate of spasms were more than 50% with TURP and TURBT. Yates et al⁴ similarly found that TURP and TURBT procedures had the highest rates of postoperative bladder spasms. In our series two-thirds of patients had a urinary catheter placed at the end of surgery, but surprisingly catheters were not associated with increased rate of spasm despite the fact that it is well-known that their presence increases the rate

of spasms.¹⁵ Interestingly, the only patient variable associated with increased risk was younger adult age. Chronic use of antispasmodics or analgesic medications were not associated with these complications. Prophylactic B&O suppositories were reported to reduce the rate of bladder spasms after ureteroscopic procedures,⁷ and they are prophylactically used in our practice inconsistently. However, the use of B&O suppositories was not associated with significant reduction of bladder spasms in our patient population.

The report of bladder spasm did not have a clinically meaningful impact on immediate postoperative course. Postanesthesia course between two groups were not different. Following discharge from the ambulatory surgical center, there was no difference in hospital admission, emergency room visits, or documentation of bladder spasm in the clinical notes.

Limitations and future research directions

The study has all the inherent limitations of a retrospective observational design. Importantly, other unaccounted factors could have contributed to the risk of bladder spasms. Specifically, though we included variables which could be associated with increased risk for bladder pain (history of cystitis) this information was not comprehensive on preoperative documentation. Further, nuances between procedures (e.g., tumor location to bladder base or trigone) which could influence spasm risk was not accounted for in the data. In addition, the severity of bladder spasm symptoms was not recorded, and based on our reliance on the use of medication as a proxy we were forced to dichotomize this outcome as yes or no. Even though outcomes between two groups appeared similar, we did not have measures of patient satisfaction, which presumably would be less in those experiencing bladder spasms.

Despite these limitations, the findings of this study raises several important questions. TURBT procedures were strongly associated with increased risk of spasms, occurring in approximately half of patients. Elucidating if anatomic differences of tumor location in the bladder affects spasm risk and/or severity would be useful in developing prospective trials to assess the impact of possible prophylactic therapies. Perioperative administration of magnesium to reduce bladder spasm risk is an intriguing prophylactic therapy,¹² as magnesium is well tolerated by most patients and thus suitable for ambulatory practice. Such an approach needs to be evaluated in the ambulatory setting.

Conclusion

Bladder spasms following ambulatory cystoscopy procedures are common and more prevalent following more extensive procedures. Prophylactic antispasmodics are not utilized routinely in our outpatient urological practice, but their use was not associated with a reduction of bladder spasm rate. Postoperative outcomes did not appear to be associated with this urological complication.

Disclosure

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