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Urinary Retention is Rare After Total Joint Arthroplasty When Using Opioid-Free Regional Anesthesia

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A B S T R A C T

Background: Postoperative urinary retention (POUR) is a relatively common complication after total joint arthroplasty (TJA). Based on the findings of a randomized, prospective study from our institution, we abandoned the routine use of indwelling urinary catheters in patients undergoing elective TJA using opioid-free spinal anesthesia. The aim of this study was to determine the incidence of and the risk factors for POUR in this patient population.
Patients and Methods: A total of 842 consecutive patients underwent TJA between January 2012 and September 2014 using opioid-free spinal anesthesia in whom indwelling urinary catheters were not used. *Postoperative urinary retention* was defined as the inability of a patient to void that necessitated the placement of either an indwelling urinary catheter or straight catheterization. Multivariate logistic regression analysis was used to determine risk factors for developing POUR.
Results: In this cohort, 79 patients (79/842; 9.3%) developed POUR. Independent risk factors for POUR were history of a benign prostatic hyperplasia ($P = .02$), renal disease ($P = .001$), longer operative time ($P = .003$), and age older than 67 years ($P = .02$). No patients in this cohort developed neurogenic bladder.
Conclusion: This study confirms that the routine use of indwelling urinary catheters for patients undergoing TJA using an opioid-free spinal anesthesia may not be warranted. Urinary catheters may be used selectively in patients at risk for subsequent urinary retention.

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Postoperative urinary retention (POUR) is a relatively common complication after many surgical procedures, including total joint arthroplasty (TJA) [1,2]. The incidence of POUR in patients undergoing TJA varies widely, between 0% and 75%. This vast difference in the incidence of POUR can be attributed to a multitude of factors, perhaps the most important one being the lack of a standard definition for POUR [3-7]. Other contributing factors include medical and surgical comorbidities, as well as type of anesthesia and analgesia [2,3].

Urinary infection can potentially lead to hematogenous seeding of a prosthetic joint with bacteria, resulting in periprosthetic joint infection (PJI) [8-11]. Postoperative bacteriuria has been reported to increase the risk of PJI in males by 3- to 6-fold [4,12-14]. Inappropriate management of POUR has the potential to cause bladder dysfunction, suprapubic discomfort, and urinary tract infections (UTIs). Typically, these complications are treated with postoperative catheterization, which has potential complications including catheter-associated UTIs. Given its potential preventability, hospital-acquired, catheter-associated UTI has been among the first complications selected for nonpayment by the Centers for Medicare and Medicaid Services [8].

Based on the findings of a prior prospective, randomized study conducted at our institution, we abandoned the use of routine indwelling catheters for patients undergoing TJA using opioid-free regional anesthesia [9]. However, we have not determined the incidence of POUR at our institution using this new protocol. Thus, the purpose of this study was to identify the rate of POUR in these TJA patients and also determine the independent risk factors for POUR.

Methods and Materials

After obtaining institutional review board approval and using our institutional prospective database, we identified 842 consecutive patients who underwent primary TJA between January 2012 and September 2014 without the use of an intraoperative indwelling urinary catheter. Patients who either underwent a revision TJA, received general anesthesia, or had an intraoperative urinary catheter inserted were excluded from this cohort.

Our cohort consisted of 287 men (34.1%) and 555 women (65.9%) with a mean age of 66.8 years (range, 32-95 years), average body mass index (BMI) of 29.4 kg/m^2 (range, 16.2-46.3 kg/m^2), and average Charlson comorbidity index score of 0.62 (range, 0-9). The cohort included 441 total hip arthroplasty (THA) (429 [93.7%] unilateral;

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12 [6.3%] bilateral) and 401 total knee arthroplasty (TKA) (359 [89.5%] unilateral; 42 [10.5%] bilateral).

All patients followed a uniform preoperative food, liquid, and pain management protocol by not consuming any solid food after 9:00 PM and no liquids after 12 AM the day before surgery, while also receiving acetaminophen/pregabalin/celecoxib or toradol on the day of surgery. Intraoperatively, all patients received the same uniform opioid-free spinal anesthesia with administration of 15 to 30 mg/kg of 0.5% bupivacaine before surgery. Postoperatively, patient-controlled analgesia was not prescribed, and acetaminophen, tramadol, and occasional oxycodone were given to mitigate postoperative pain.

Patients who could not void in the postoperative period and required placement of either an indwelling catheter or straight catheter were deemed to have developed POUR. Patients received a postoperative indwelling catheter after 2 attempts using straight catheterization to relieve POUR. Bladder ultrasounds were only performed on patients with symptomatic bladder distention; therefore, asymptomatic POUR may not have been recorded.

Information regarding any potential factor that could influence POUR was collected. Categorical variables were analyzed using χ^2 testing as well as multivariate logistic regression analysis. Risk factors for POUR included in the multivariate analysis included age, sex, BMI, smoking status, operative time, medications (nonsteroidal anti-inflammatory drugs [NSAIDs] and angiotensin-converting enzyme [ACE] inhibitors), preoperative creatinine laboratory results, diabetes mellitus, diabetes mellitus with end-stage organ disease, renal disease, history of benign prostate hypertrophy (BPH), and previous urological complications such as cystic kidney disease, kidney or ureter disorder, and kidney issues not otherwise specified. Factors with an associated P value of less than .05 were considered statistically significant.

Results

Of the 842 patients in this cohort, 79 patients (9.3%) (31/287 [10.8%] men, 48/555 women [8.6%]; $P = .31$) developed POUR. The significant independent risk factors contributing to POUR were a history of BPH ($P = .02$), renal disease ($P = .001$), older age (>67 years) ($P = .02$), and a longer operative time, with increments of 15 minutes in the operating room leading to higher risk of POUR ($P = .003$) (Table). The mean operative times for unilateral and bilateral TJA were 88.3 ± 21.7 and 167.0 ± 37.1 minutes ($P < .001$), respectively; however, no significant difference of POUR was apparent between bilateral and unilateral THA ($P = .53$) or bilateral and unilateral TKA ($P = .59$). Furthermore, current smokers ($P = .66$), former smokers ($P = .57$), preoperative NSAID use ($P = .81$), preoperative ACE inhibitor use ($P = .06$), diabetes mellitus ($P = .97$), diabetes mellitus with end-organ stage complications ($P = .64$), and estimated intraoperative blood loss ($P = .32$) were not found to be risk factors for POUR. In addition, those patients with POUR had higher average bladder scan volumes (666.23 mL; range, 34.0-2025.0 mL) compared with patients without POUR (400.10 mL; range, 0.0-1067.0; $P < .001$) (Figure).

Table
Risk Factors Associated With Pour After TJA Using Neuroaxial Anesthesia.

Risk Factor	Odds Ratio	95% CI	P
Renal disease	5.20	1.87-14.48	.002
Diabetes mellitus end-stage organ damage	2.86	0.06-130.7	.64
Preoperative ACE inhibitor use	2.20	0.97-4.98	.06
Male with BPH	2.63	1.14-6.01	.02
Estimated blood loss	1.36	0.34-5.39	.32
Operative time per every 15 min	1.24	1.10-1.40	<.001
Current smoker	1.19	0.64-2.20	.66
Age >67 y	1.04	1.01-1.07	.02
Former smoker	1.02	0.49-2.09	.57
Diabetes mellitus	0.98	0.97-1.01	.97
Preoperative NSAID use	0.002	0.001-0.02	.81

* Statistically significant.

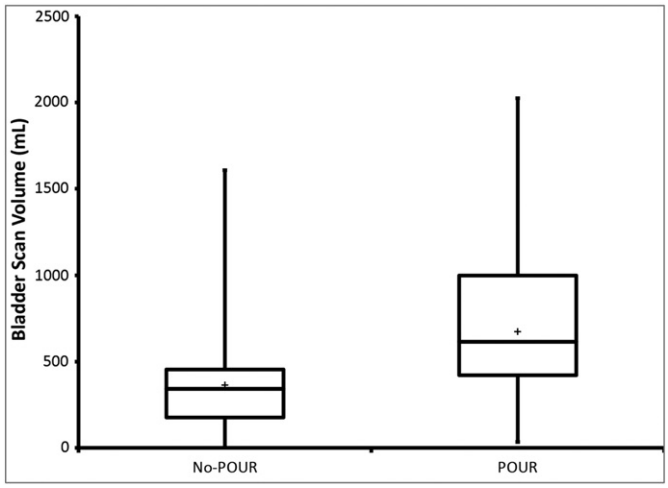

Figure. Bladder scan volumes of patients with POUR vs those without.

Discussion and Conclusion

It has been previously documented that administration of intrathecal opioids as part of regional anesthesia influences bladder function and can potentially increase urinary retention [4]. Kuipers et al [15] determined that intrathecal administration of opioids (morphine and sufentanil) decreased bladder function by causing suppression of detrusor contractility and decreased sensation of urge. Rawal et al reported that within 15 minutes of spinal epidural morphine injection, all individuals, respective of dose given, had marked relaxation of the detrusor, leading to urinary retention [16]. Further studies have proven the association between administration of intrathecal opioids and subsequent urinary retention [8,17]. In 1 study, the combination use of opioids and epidural local anesthetics was found to cause an 8% increase in the risk of POUR and urinary tract complications such as renal failure and cystitis [18].

In addition, intrathecal opioids are associated with a higher incidence of postoperative gastrointestinal adverse effects such as narcotic bowel syndrome, opioid-induced constipation, as well as nausea and vomiting [19,20], while providing marginal pain relief [21]. Recent basic science and clinical data suggest a paradoxical inverse relationship between opioid consumption and pain relief. Patients who receive opioids can actually become more sensitive to painful stimuli, resulting in hyperalgesia rather than analgesia, typically referred to as opioid-induced hyperalgesia [21]. In ambulatory surgical procedures, long-acting opioids have been noted as the primary reason for delayed recovery and discharge [21,22]. Given the combination effect of these postoperative issues in conjunction with the shift toward fast track and ambulatory elective joint surgery, we do not use intrathecal opioids with regional anesthesia.

Further justification exists for using regional anesthesia including reduced intraoperative blood loss [23], mortality, and morbidity [24], yet no increased risk for venous thromboembolic events while providing better pain relief and patient satisfaction [25-28].

While using regional anesthesia, a commonly held belief among anesthesiologists is that urinary catheters should be used in patients receiving regional anesthesia to prevent excessive bladder distention due to loss of sensation and bladder tone; however, this has never been substantiated. In addition, urinary catheters have been associated with patient discomfort, restricted patient mobility, catheter-associated UTI, and trauma to the urethra and bladder [8]. The potential for subsequent PJI in patients with UTI from the use of indwelling urinary catheters also concerns many orthopedic surgeons [1,29-31].

A randomized, prospective study from our institution was previously conducted to evaluate the need for urinary catheters in patients