The Journal of Arthroplasty xxx (2017) 1–6

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Incidence and Risk Factors of Postoperative Urinary Retention and Bladder Catheterization in Patients Undergoing Fast-Track Total Joint Arthroplasty: A Prospective Observational Study on 371 Patients

Ruben Scholten, MD [a], Keetie Kremers, NP [b], Sebastiaan A.W. van de Groes, MD, PhD [c], Diederik M. Somford, MD [d], Sander Koëter, MD, PhD [b, *]

[a] Department of Orthopaedics, Rijnstate Ziekenhuis, Arnhem, The Netherlands
[b] Department of Orthopaedics, Canisius-Wilhelmina Ziekenhuis, Nijmegen, The Netherlands
[c] Department of Orthopaedics, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands
[d] Department of Urology, Canisius-Wilhelmina Ziekenhuis, Nijmegen, The Netherlands

ARTICLE INFO

Article history:
Received 31 August 2017
Received in revised form
25 November 2017
Accepted 3 December 2017
Available online xxx

Keywords:
total joint arthroplasty
urinary retention
postvoid residual urine volume
fluid balance
total hip arthroplasty
total knee arthroplasty

ABSTRACT

Background: Postoperative urinary retention (POUR) appears to be a common complication in lower limb joint arthroplasty; however, reports on its incidence vary. There is no general consensus on its definition and there is no scientific evidence on treatment principles. We performed a prospective observational study to establish the incidence of POUR and its risk factors, including the preoperative postvoid residual urine volume and the perioperative fluid balance, in fast-track total joint arthroplasty (TJA). The preoperative residual urine volume and the perioperative fluid balance have not been studied in previous literature in the context of TJA and POUR.

Methods: Three hundred eighty-one patients who underwent TJA of the lower limb were observed on developing POUR according to our local treatment protocol. Data on possible risk factors for POUR were collected including the perioperative fluid balance and the preoperative residual urine volume.

Results: In total, 46.3% of patients were catheterized. A preoperative postvoid urine retention is a significant predictor of catheterization for postoperative residual urine ($P = .03$). Spinal anesthesia was correlated with urinary retention ($P = .01$). There was no cause-effect relationship between POUR and the perioperative fluid balance.

Conclusion: This study underlines POUR as a common complication in fast-track lower limb arthroplasty, with spinal anesthesia as a risk factor. A higher preoperative residual urine volume leads to higher postoperative residual volume, but not to a higher change in urinary retention. Increased perioperative fluid administration is not correlated with the incidence of POUR. Furthermore, there seems to be little rationale for monitoring residual urine volume both preoperatively and postoperatively.

Postoperative urinary retention (POUR) is the inability to voluntarily empty the bladder after anesthesia and surgery causing bladder overload [1,2]. The incidence of POUR in the general surgical population is around 3.8%, but may be higher after total joint arthroplasty (TJA) [3]. The reported incidences of POUR after elective TJA vary between 0% and 75% [4]. These differences can be explained by varying definitions of POUR (due to lack of consensus on bladder volume management and catheterization thresholds) and pluriform definitions on the subject [5]. The study populations and the TJA rehabilitation protocols varied among previous studies and clinical centers. Most studies are of older date, and few studies have assessed the incidence of POUR in a fast-track TJA treatment setting as proposed by Husted et al [1,5–7]. Since its introduction in the 1990s, the concept of multimodal perioperative care (fast-track surgery, enhanced recovery programs, and more recently day-care surgery) has gained

Conflict of interest and funding: All authors, their immediate families, and any research foundation with which they are affiliated did not receive any financial payments or other benefits from any commercial entity related to the subject of this article.

No author associated with this paper has disclosed any potential or pertinent conflicts which may be perceived to have impending conflict with this work. For full disclosure statements refer to https://doi.org/10.1016/j.arth.2017.12.001.

* Reprint requests: Sander Koëter, MD, PhD, Department of Orthopaedics, Canisius Wilhelmina Hospital, Postbus 9015, 6500 GS Nijmegen, The Netherlands.

https://doi.org/10.1016/j.arth.2017.12.001
0883-5403/

widespread acceptance and is now considered as a standard of care [8].

POUR is treated by intermittent or indwelling catheterization [4]. In some clinical centers it is a common practice to place an indwelling catheter prior to surgery for it to remain 24-48 hours postoperatively [4,9–11]. The latter is subject to debate, mainly because prolonged catheterization is associated with an increased risk of urinary tract infection (UTI) [12]. However, stagnant urine in POUR may cause UTI directly and this may lead to hematologic seeding of the implant [12–14]. Other unwanted effects of POUR include delayed hospital discharge leading to a longer length of stay (LOS) and increased hospital costs [15,16]. Furthermore, POUR frequently leads to outpatient consultation at urology departments, leading to an increased patient burden and healthcare costs. Several risk factors have been associated with POUR in TJA. These include the International Prostate Symptom Score (IPSS), spinal anesthesia, a history of nocturia, patient controlled analgesia, use of opioids, male gender, and administration of intrathecal morphine. Furthermore, patients who underwent total hip arthroplasty (THA) seem to be more at risk when compared to total knee arthroplasty (TKA) to develop POUR [4,5,17–20]. The perioperative fluid balance and the preoperative postvoid residual urine volume (hereafter PVRUV or residual urine) are suggested to be a risk factor for POUR [5,21]. But the latter 2 have never been prospectively analyzed in a POUR related study. We aimed to prospectively assess the incidence of POUR in fast-track elective TKA and THA and evaluate the cause-effect relationships between POUR and its possible previously mentioned risk factors.

Materials and Methods

The study was conducted at the Canisius Wilhelmina Hospital, a 653 bed public hospital in Nijmegen, the Netherlands (blinded for review purposes). All patients undergoing elective primary TKA or THA for osteoarthritis under general or spinal anesthesia between June 15, 2015 and February 28, 2016 were included in this study. All patients underwent THA and TKA according to the fast-track treatment/rehabilitation protocols suggested by Husted et al [7,22]. Preoperatively, all patients were started on paracetamol, gabapentin, and nonsteroidal anti-inflammatory drugs (unless contra-indicated by the patient's medication profile or a glomerular filtration rate <60 mL/min). In the postoperative period, a short-acting opioid (oxycodone) was added for breakthrough pain on the day of operation and the first postoperative day. Low-dose spinal anesthesia or general anesthesia was offered depending on the patient's preference. Perioperative analgesia was aided by intraoperative local infiltration analgesia in TKA patients [7]. Full weight-bearing mobilization was initiated on the day of operation, and expanded on the next postoperative days aiming at discharge to home once the patient was indecently mobile with the help of appropriate walking aids.

Exclusion criteria were preoperative intermittent catheterization, an indwelling catheter in situ. Oral informed consent was given by all patients.

We define POUR as the inability to void with a bladder volume greater than 400 mL, or as the presence of a PVRUV exceeding 150 mL, based on our local institutions protocol. In both cases patients received an in/out catheterization. The local protocol is displayed in Figure 1. If patients experienced persisting PVRUV or POUR problems according to our protocol, they were eventually discharged with instructions for intermittent catheterization or with an indwelling catheter. Urological follow-up was planned 2 weeks after discharge from the hospital for further evaluation of their voiding issues. If indicated at that point, oral medications were prescribed on this urological follow-up.

When patients arrived at the clinic on the day of surgery, their length, weight, and type of arthroplasty (TKA or THA) were noted, and IPSS scores were determined. All included patients were instructed to void preoperative (before being taken to the preanesthesia care unit), the corresponding residual urine volumes were determined using a bladder scan (CUBEscan BioCon 500).

During surgery the perioperative fluid balance was monitored and when the patients returned to the postanesthesia care unit their bladder volumes were assessed and treated according to the above-mentioned protocol. Postoperatively, the type of anesthesia, time of the first spontaneous micturition, and the postoperative time until mobilization was noted. Spontaneous micturition was awaited for 7 hours postoperatively according to the flow chart displayed in Figure 1.

The primary outcome measure is the incidence of one or more catheterizations for POUR. Secondary outcome measures were the percentage of patients only receiving interventions for a postoperative residual urine volume greater than 150 mL, the percentage of patients receiving catheterization for a POUR of >400 mL or >1000 mL, the number of catheterizations performed per patient and bladder volumes evacuated by bladder catheterization for both residual urine and POUR, the percentage of patients discharged with intermittent catheterization or an indwelling catheter, and the number of patients requiring urological intervention. The incidence of UTIs in catheterized and noncatheterized patients was compared using a chi-squared test.

The analyzed risk factors for developing POUR were preoperative IPSS, preoperative residual urine volume, postoperative time until mobilization, perioperative fluid balance, age, gender, type of arthroplasty, and body mass index (BMI).

Secondary outcome measures (including the LOS and the time [in hours] until the first spontaneous postoperative micturition) were compared between the catheterized and noncatheterized groups using the independent samples Student's t-test.

For assessment of possible cause-effect relationships between POUR and its possible previously mentioned risk factors, we used a multivariable logistic regression analysis. Data were analyzed using SPSS (version 23) and *P*-values lower than 0.05 were considered significant.

The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000.

Results

We included 381 patients. Seventy-five patients were unavailable for statistical analysis due to missing data (See Fig. 2). One hundred forty-two patients (46.3%, 95% confidence interval [CI] 40.0-51.8) required at least 1 catheterization, 65 (21%, 95% CI 16.9-26.1) patients required repeated catheterization, and 9 (2.9%, 95% CI 1.5-5.5) patients were discharged with instructions for intermittent catheterization or with an indwelling catheter in situ. Two (0.65%, 95% CI 0.18-2.59) patients required pharmacological intervention on urological follow-up. The percentage of patients requiring intermittent catheterization solely for urine retention (thus disregarding patients catheterized for residual urine) was 31.3% (95% CI 26.3-36.6). The percentage of patients only requiring intermittent catheterization for residual urine was 15% (95% CI 11.4-19.4).

Logistic regression analysis shows only the preoperative residual urine to be correlated with catheterization ($P = .01$), respectively. See Table 1 for more details on the logistic regression analysis. Repeated regression analysis while discarding residual urine as a catheterization indication shows spinal anesthesia as a significant predictor of urinary retention, and analysis with solely