



## General Anesthesia: To catheterize or Not? A Prospective Randomized Controlled Study of Patients Undergoing Total Knee Arthroplasty



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### ARTICLE INFO

#### Article history:

Received 11 June 2014

Accepted 23 September 2014

#### Keywords:

postoperative urinary retention

total knee arthroplasty

general analgesia

urinary tract infection

risk factors

### ABSTRACT

This study was to investigate whether urinary catheterization could be avoided for patients undergoing total knee arthroplasty (TKA) under general anesthesia with saphenous nerve block. 314 patients from a single surgical team were randomized to receive either an indwelling urinary catheter or no urinary catheter before the surgery. The results revealed that the prevalence of postoperative urinary retention (POUR) was quite low in both groups (5.7% vs 6.4%,  $P = 1$ ). Additionally, the prevalence of urinary tract infection was significantly higher in patients using an indwelling catheter (5.1% vs 0.6%,  $P = 0.036$ ). We also identified age, male gender, ASA grade, benign prostatic hypertrophy, intraoperative intravenous fluid and duration of surgery as the risk factors for POUR in these patients.

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Postoperative urinary retention (POUR) is a common complication following many surgical procedures, especially total joint arthroplasty [1]. Though some researchers developed different pharmacological approaches to avoiding POUR, the results seem inconclusive or controversial [2], which leaves indwelling or intermittent urinary catheterization as the only option for prevention and treatment of POUR. However, both POUR and bladder catheterization can increase the risk of urinary tract infection (UTI), which can lead to hematogenous bacteremia [3–5], seeding of the implant, and subsequent joint infection following total knee arthroplasty (TKA). In addition, POUR and its sequelae may prevent early mobilization, prolong the hospitalization and increase re-admission rates [6].

Urinary catheters are usually used for longer surgical procedures to allow monitoring urinary output and guiding fluid resuscitation. And also they are widely used in the surgeries performed under neuraxial anesthesia, which is considered to result in loss of the ability to sense bladder distention and subsequent to neurogenic bladder problems [1]. However, with the development of blood saving and anesthetic techniques, the intraoperative blood loss in TKA is extremely reduced, making the intraoperative fluid control less important [7]. In addition, the introduction of fast-track clinical pathways and the need to accelerate hospital discharges have also cast questions on the preoperative urinary catheterization.

Source of Funding: This research was funded by the China Health Ministry Program (201302007).

The Conflict of Interest statement associated with this article can be found at <http://dx.doi.org/10.1016/j.arth.2014.09.028>.

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<http://dx.doi.org/10.1016/j.arth.2014.09.028>

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Currently, there is no standard protocol for the implementation and maintenance of indwelling catheters for total knee arthroplasty. At many centers, including ours, preoperative indwelling catheterization is a routine practice for patients undergoing TKA. The aim of this study was therefore to investigate whether urinary catheterization could be avoided for all patients undergoing TKA under general anesthesia with saphenous nerve block. The hypothesis of the current prospective study was that rates of POUR would be low for patients with and without a urinary catheter.

### Materials and Methods

This prospective, randomized controlled study was approved by the Institutional Review Board of our center (No. 201302009).

#### Enrollment and Screening

All patients, aged 18 years and older, who were scheduled for a primary TKA for end-stage osteoarthritis were approached for participation in the study. Exclusion criteria included revisions, bilateral procedures, surgical history of urinary system, UTI and systematical conditions (renal disease, renal failure, chronic renal insufficiency, or an indwelling catheter at the time of surgery) needing intraoperative monitoring urine output. Patients taking medication for a diagnosis of benign prostatic hypertrophy were included in the study.

All patients followed a uniform preoperative food and liquid intake protocol. Solid food intake was forbidden after 10:00 P.M. on the day prior to surgery. No liquid was taken in after 12:00 A.M. on the evening prior to surgery. No patient was permitted to consume any food or liquid on the surgical day until the completion of the procedure. Before the

surgery, patients were given intravenous crystal liquid of 500 mL–1000 mL based on the operation sequence.

Recruited patients were randomized to receive either an indwelling urinary catheter (control group) or no urinary catheter (study group) before the surgery. Randomization was performed under the sole knowledge of research personnel with the use of sealed envelopes in a 1:1 ratio opened just prior to surgery. The patients and the surgeons were blinded to the selection group until anesthesia or sedation. All the surgeries were performed by one surgical team, composed of four senior orthopedic surgeons, and conducted under general anesthesia with saphenous nerve block (20 mL of ropivacaine 0.5%). TKA was performed in the standard way, using a midline skin incision, a standard medial parapatellar approach and a measured resection technique. A tourniquet was applied to all the patients from both groups with a strategy of inflating before the incision and deflating after the closure of the incision controlled at 100 mmHg above systolic pressure. Intraoperative intravenous liquid was controlled under 1500 mL. Cement knee system was used in all patients.

*Perioperative Course*

After the surgery, patients were first transferred to the anesthesia recovery unit for a 1-h period of postoperative care, then to the in-patients unit. All patients were evaluated and began walking on the day of the surgery. A knee brace was used in all patients to protect the surgical side. Partial weight bear was permitted. Physical therapy three times per day supervised by a physiotherapist was initiated on the surgical day and lasted until hospital discharge. Fluid therapy was discontinued on the postoperative day 1.

Perioperative pain management was the same between the two groups; all patients started to receive Celebrex (200 mg every twelve hours) on the day of admission, then changed to Diclofenac (50 mg

every twelve hours) after the surgery and continued throughout the hospital stay. No postoperative narcotic analgesia was utilized.

The control group was managed following the standard postoperative TKA protocol at our center, which involves removing the indwelling catheter within 24 h postoperatively. Once the catheter was removed, patients were encouraged to drink water and void. Also, symptoms of POUR and UTI were monitored. In the study group, patients were monitored for POUR based on the symptoms and bladder ultrasound scans performed by senior nursing staff. Patients who didn't void within four hours and had a urinary volume >400 mL confirmed by ultrasound were managed with a one-time catheterization. If the urinary volume was less than 400 mL measured by ultrasound, the bladder scan was repeated in two hours. Straight catheterization was tolerated for up to two times prior to the placement of an indwelling catheter (Fig. 1).

In the control group, bladder scanning was started at six hours after removing the catheter if no spontaneous voiding happened. A one-time catheterization was managed for the patients with a urine volume of more than 400 mL. Patients requiring catheterization were considered to have POUR. Also, a one-time catheterization was repeated twice before an indwelling catheter was placed. In both groups, bladder ultrasound scanning was also performed in patients with suprapubic discomfort and the inability to void. A urine sample for urinalysis and culture was routinely obtained from the patients with symptoms suggesting UTI and patients experiencing POUR. UTI was diagnosed based on the international guidelines [8] as follows: pyrexia or body temperature of 38 °C, urinary tract symptoms (dysuria, increased frequency of urination, urinary urgency, suprapubic pain and burning on micturition) and positive urine culture (>10<sup>7</sup> bacterial colonies of microorganism forming units per liter).

*Data Analysis*

All detailed data were collected and recorded by an independent secretary for later analysis. The data we used to analyze included

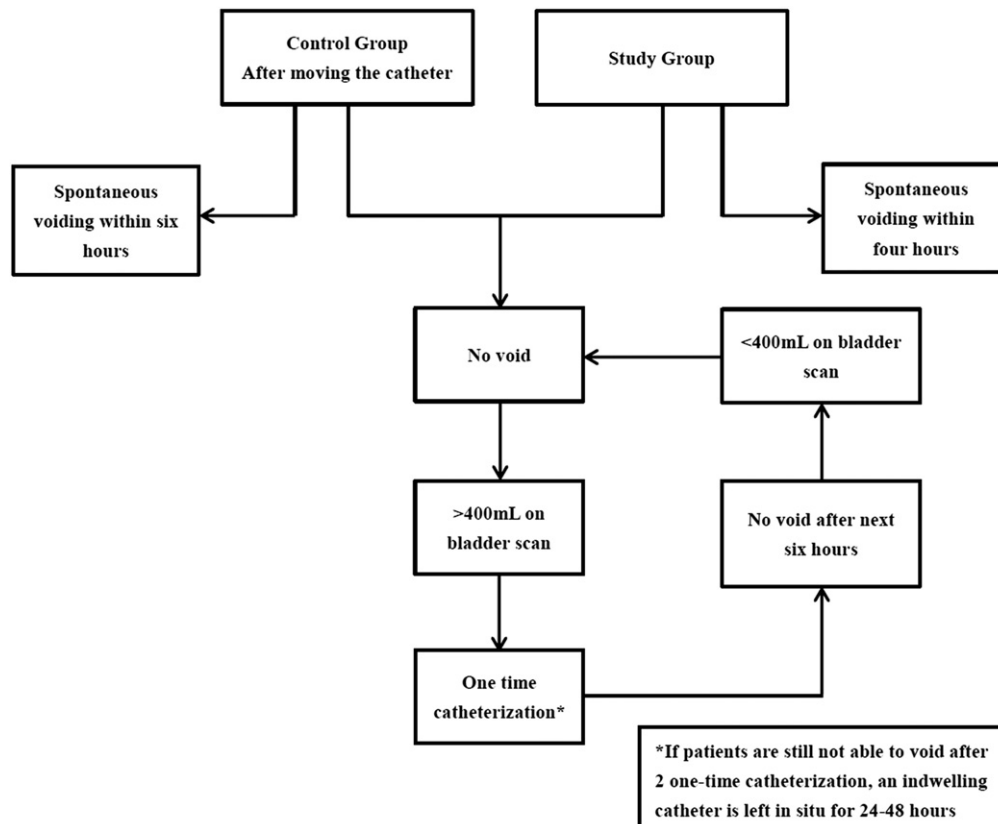


Fig. 1. Flowchart of the urinary retention protocol for both groups.

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