# *Parameters affecting urologic complications after major joint replacement surgery*

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***Introduction and objectives:*** *Peri-operative bladder management after major arthroplasty procedures remains controversial. The purpose of this study was to assess the risk of urological complications in those patients undergoing hip or knee joint replacement. As well, we identified those factors that may affect the likelihood of developing complications.*

***Methods:*** *Two hundred and twenty-one consecutive patients receiving a total knee or hip arthroplasty were reviewed. The outcomes measured were prolonged urinary retention, as well as urinary tract infections and the development of a septic prosthesis. Statistical significance of any predisposing factors identified was determined using a two-tailed Fisher exact test.*

***Results:*** *Urological complications in the cohort were common at 47%, with patients having hip arthroplasty being at higher risk ($p < 0.03$). Despite this there was a low incidence of documented infections. Increased rates of urinary retention were identified in those who received intrathecal narcotics ($p < 0.02$), as well as those who suffered from hypertension ($p < 0.05$). Gender and anesthetic techniques (general or regional) did not affect the rate of complications. There was a decrease in urological complications when bladder management included peri-operative catheterization rather than expectant management.*

***Conclusions:*** *Bladder management is a significant problem for patients after hip and knee arthroplasty as urinary retention was identified in almost half of the patients. Parameters that may identify those with higher risks include patients with hypertension and those who receive intrathecal narcotics. In high-risk patients, the practice of utilizing a catheter peri-operatively may decrease the risk of multiple post-operative catheterizations without increasing the rate of infections.*

**Key Words:** urinary retention, UTI, catheter, joint replacement

## Introduction

Urinary retention is a common complication after hip or knee arthroplasty, and a common source of urological consultation, given reported rates as high as 89%.[1-7] Other than patient comfort, avoidance of multiple catheterizations is desirable to limit bacteremia, given an incidence of up to 14% in some series.[8] Subsequent deep sepsis could be a disastrous complication of a total joint arthroplasty, with a high cost associated to both the patient and the health care system. The incidence of deep sepsis for a primary procedure for hip or knee replacement ranges from 0.5% to 2%,[9-11] but has been described to increase as

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high as 6.2% in those patients in urinary retention.[12,13]

There is uncertainty regarding those factors that may predispose patients to urological complications after orthopedic surgery. A number of small retrospective and prospective series have not consistently demonstrated any surgical, anesthetic or patient factors that would predict for urinary retention, other than, perhaps, the administration of peri-operative alpha-blockers.[2-7] Furthermore, there is controversy regarding preferred bladder management of these patients commonly at high risk of urinary retention peri-operatively. Leaving an indwelling catheter placed intra-operatively for a short duration has been demonstrated to be beneficial compared to intermittent catheterization with respect to retention and infection rates.[5,6] However, others have found no significant differences or superior results with an intermittent catheterization protocol.[14,15]

The purpose of this study is to update the risk or urological complications after a contemporary series of lower limb joint replacements, and to define parameters affecting this risk in a large consecutive cohort of patients.

## Methods

This was a retrospective study of patients undergoing hip or knee replacement surgery at an academic centre from April to August 2002. A medical chart search identified all patients receiving joint replacement, including those undergoing a partial or revision procedure. Two hundred and twenty-one patients were originally identified. Five patients were excluded from the study due to incomplete hospital records for adequate assessment of their complication risks. The results for 10 patients were excluded from the assessment of urinary retention risk, as they did not receive a trial of voiding prior to discharge from the acute care hospital, although their results were included to determine risks of other complications, including infection.

The primary urological outcomes measured included urinary retention, defined as any patient unable to void satisfactorily post-operatively and requiring catheterization. Patient complications were also further defined as extended catheterization if there was the requirement for any bladder drainage for greater than 72 hours. This group included those patients with prolonged urinary retention as well as any patients unable to attempt a trial of voiding or requiring close ongoing monitoring post-operatively. Other urological outcomes included urinary tract infections, any new onset of significant lower urinary tract symptoms post-operatively and the need for subsequent urological interventions. The charts 1-year following the operation were examined to assess any subsequent urological complications, interventions or re-admissions. The incidence of a septic prosthesis within 1 year of surgery was reviewed.

The patient charts were examined for any factors that may predispose to the development of urological complications. These factors included age, gender, comorbidities, and surgical parameters including the type of operation, procedure length, and type of anesthetic used. During the chart review it was apparent that the there was significant variation in peri-operative bladder management depending on surgeon preference and an apparent change in clinical protocol. Therefore, type of peri-operative bladder management was investigated to determine its affect on urological complications.

### *Calculations and statistical analyses*

Statistical analyses were performed using the StatView® statistical software package (Abacus Concepts, Inc., Berkley, CA). Statistical significance was determined by Fischer exact or Chi-squared test. All statistical tests were two-sided and differences were considered statistically significant at $p < 0.05$.

## Results

The overall urological complication rate as previously defined was 47% (102/216 patients: Figure 1). The most common complication was urinary retention, occurring in 73 of 206 patients (35%). Nineteen percent of patients required extended catheterization greater than 72 hours post-operatively. Although there were a number of patients with an acute worsening of lower urinary tract symptoms post-operatively, few required further urological assessment and none required surgical intervention. The rate of documented urinary tract infection requiring management was low at 4.6% (4 of 216 patients).

Gender and procedure length did not predispose patients to the development of complications. As expected, there was a statistically significant increase in the mean age of those patients who suffered from any urological complication (73.9 versus 66.5, $p < 0.0001$), specifically those who suffered a urinary infection (79.6 versus 69.19, $p < 0.01$), and those who required extended catheterization (77.3 versus 67.9, $p < 0.0001$).

Analysis of patient's comorbidities revealed that patients with a significant history of hypertension

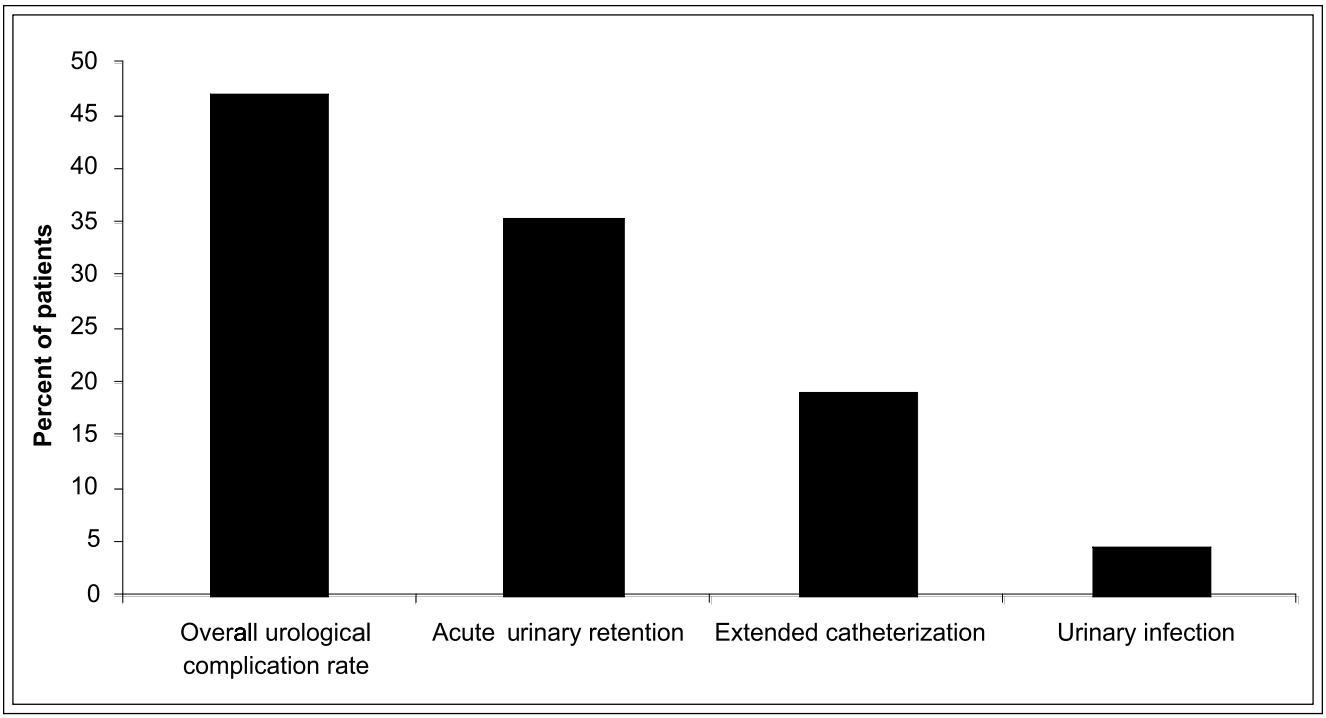


**Figure 1.** Percentage of urological complications in patients after lower limb joint replacement.

experienced higher rates of urinary retention compared to normotensive patients (46/109 [42.2%] versus 27/97 [27.8%]: $p < 0.05$). Patients with a history of diabetes appeared to have higher rate of urinary tract infections (4/34 [11.8%] versus 6/182 [3.3%]: $p = 0.054$) and the need for extended catheterization (11/34 [32.4%] versus 30/182 [16.5%]: $p = 0.053$), although these trends were not statistically significant. Interestingly, there was no significant difference in acute retention rates post-operatively in diabetic patients, Figure 2a.

The risk of these urological complications were similar regardless of the type of anesthetic delivered (general versus regional), although patients who received intrathecal morphine as a component of their spinal anesthetic had higher rates of urinary retention than those who did not (40/88 [45.5%] versus 33/117 [28.2%]: $p < 0.02$), Figure 2a. Although there was no significant difference in the acute urinary retention rates, those undergoing hip surgery had a higher incidence of overall complications and, specifically, the need of extended catheterizations (28/109 [25.7%] versus 12/106 [11.3%]: $p < 0.01$) compared to those undergoing knee surgery. There was no increased incidence of infection identified between the two surgical groups.

Type of peri-operative bladder management was a significant factor in the study with those prospectively managed with a peri-operative urinary catheterization (< 48 hours post-operatively) having fewer overall complications (7/36 [19.4%] versus 68/142 [47.9%]: $p < 0.003$) and, in particular, less acute urinary retention events (6/35 [17.1%] versus 62/140 [44.3%]: $p < 0.004$) than those managed expectantly, Figure 2b. Of the 142 patients whose bladder function was managed expectantly, 55 (39%) required multiple catheterizations or prolonged catheterizations post-operatively. There was no difference in the urinary infection rate between patients managed expectantly or with a peri-operative urethral catheter. Because of clinical factors, including significant patient immobility and comorbidity, 24 patients were managed peri-operatively with an indwelling catheter for longer than the 48-hour period. Although there was a trend again to less episodes of failed spontaneous voiding in this group (11.8% versus 44.3%, $p < 0.01$), there was also a trend to a higher incidence of urinary tract infections (16.7% versus 3.5%, $p < 0.03$), especially for those with an indwelling catheter greater than 72 hours.

Only four of the 221 patients (1.85%) reviewed developed a septic prosthesis. Two of these patients received a catheter during their hospital stay. None of the patients who developed a septic joint required prolonged catheterization or developed a UTI in the post-operative period.

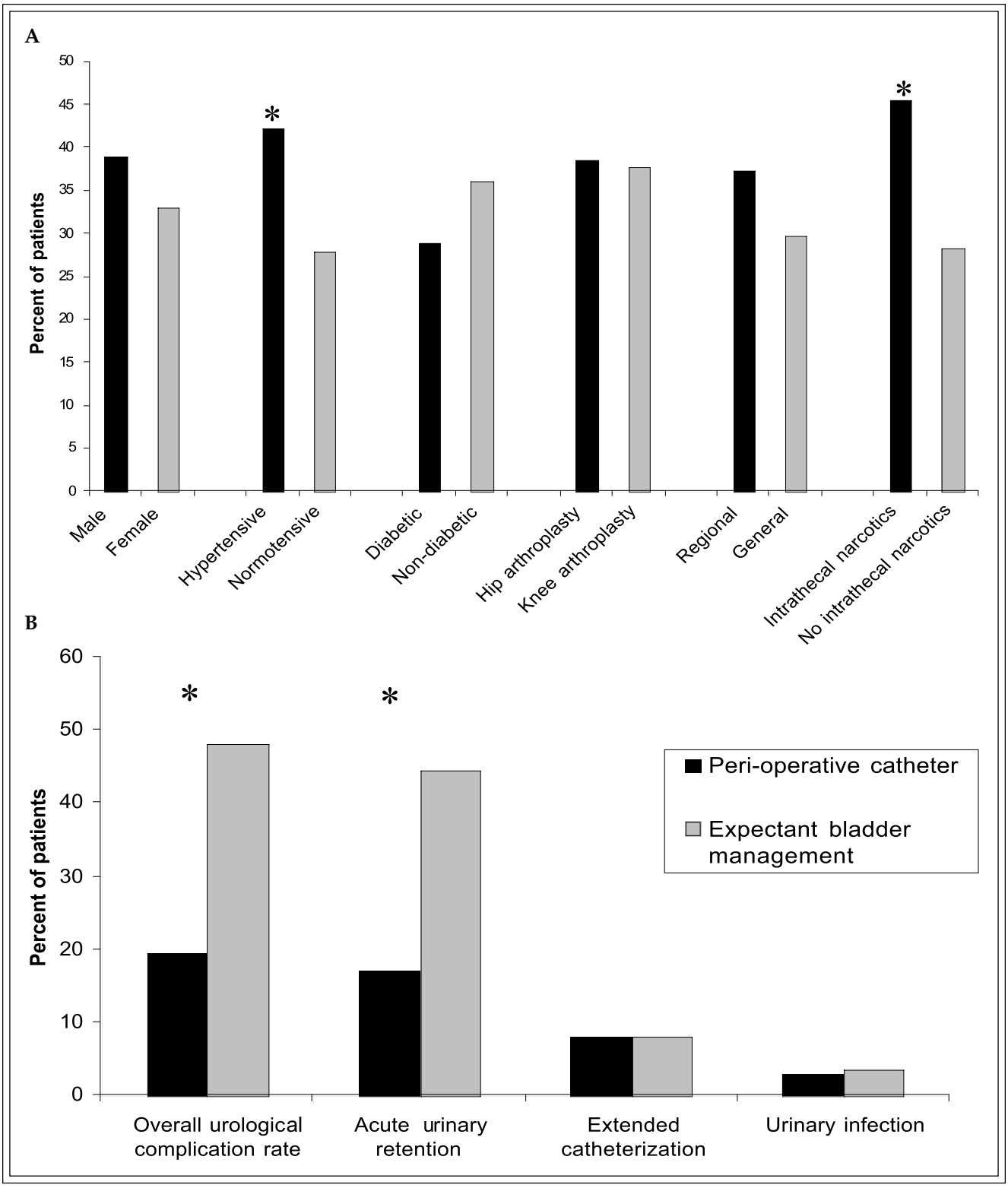


**Figure 2a.** Parameters affecting urological complications after joint arthroplasty. Patient and operative factors effect on acute urinary retention are presented.
**Figure 2b.** Outcomes classified by peri-operative bladder management are presented. Asterisks demonstrate statistical significance based on two-tailed Fischer's exact test.

## Discussion

The major findings of this retrospective review show a significant incidence of urological complications after a contemporary series of lower limb joint replacements at 47%. The most frequent of these is acute urinary retention that was generally limited in duration with no patients requiring subsequent urological intervention. However, 19% of patients did require ongoing catheterization of their bladder greater than 3 days after surgery, presumably increasing the risk of subsequent infective complications. There was only a 4.6% incidence of documented urinary tract infections within 3 months of surgery, likely reflecting the routine use of peri-operative prophylactic antibiotics that have sensitivity for typical uropathogens. The incidence of septic prosthesis was 1.8%, which is consistent with previous reports.[9-11]

Previous studies have demonstrated variable associations linking pre-operative conditions to post-operative urinary retention after hip or knee arthroplasty. In one of the largest retrospective studies, Oishi et al reported no correlation between urinary retention and prior disease states or urinary symptoms in 95 patients having a primary total hip arthroplasty.[3] Other small studies appear to confirm the lack of predictability of post-operative urinary complications, other than the use of alpha-blockers.[5,7] However, two small prospective studies appeared to suggest that urinary retention events could be predicted by uroflow studies,[2,4] although this is not a routine or practical investigation in an orthopedic clinic.

Our study confirms the difficulty in predicting those at risk of urological complications after major joint replacement surgery. Although there appeared to be higher risk of complications in older patients undergoing hip compared to knee replacement, there was no predictive value in gender, length of operation or type of anesthetic used (general versus regional). We did demonstrate that the use of intrathecal narcotics in the regional technique did however predict for a higher risk of post-operative urinary retention, which is consistent with previous reports.[16] Furthermore, there were some interesting trends to higher rates of urological complications based on patient comorbid diseases. Patients with a history of medically treated hypertension did seem to predict for an increased risk of urinary retention post-operatively (42% versus 28%, $p < 0.05$). Although there is little evidence offered to suggest a direct relationship between hypertension and urinary retention or conditions such as benign prostatic hyperplasia, common use of beta-blockers in this population may explain our present findings.[17,18] Lack of more robust data in this cohort, such as time and dose exposure to the anti-hypertensive medications, makes any further inferences problematic. Interestingly, the association between diabetes and urological complications was found not to be statistically significant, although the trends to higher rates of urinary tract infections (11.8% versus 3.3%; $p = 0.054$) and the need for extended catheterization (32.4% versus 16.5%; $p = 0.053$) may have been significant with a larger sample size.

Our data suggests that the placement of a peri-operative urethral catheter may lead to significantly fewer urological complications when compared to those managed with spontaneous voiding with intermittent catheterization ($p < 0.003$). Although both appear to be valid options of bladder management in this patient population, nearly half of the patients whose bladder was managed expectantly in the peri-operative period required subsequent catheterizations on the ward, with 39% of those requiring multiple or prolonged catheterization. There was no significant difference in infectious outcomes between the two groups. There did appear to be a significantly increased risk of infection if the peri-operative catheter was placed for greater than 72 hours. These results appear to concur with previous reports on peri-operative bladder management in this patient population.[1,3,14] It is important however to reiterate that the decision to place a catheter in the one cohort of patient's peri-operatively was not randomized, but based on surgeon preference and a change of clinical protocol during the study period. Other factors, which are not identified in this retrospective review, may have acted as a selection bias affecting the urological complications in this group of patients.

## Conclusions

Urological complications, specifically urinary retention, are a common occurrence in patients undergoing lower limb joint replacement procedures. This large, contemporary, retrospective study demonstrated that age, history of hypertension and use of intrathecal narcotics all predicted for a higher rate of complications. In patients at high risk for urological complications, the use of an indwelling catheter placed intra-operatively and removed within 48 hours appeared to be associated with a decreased incidence of subsequent urinary retention without increasing the overall risk of urinary infections. These results may aid in urologists recommendations of peri-operative bladder management for our orthopedic colleagues. □

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