The incidence of postoperative urinary retention in patients undergoing elective hip and knee arthroplasty

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ABSTRACT

INTRODUCTION Postoperative urinary retention requiring urethral catheterisation increases the risk of joint sepsis following arthroplasty. Spinal anaesthesia with opiate administration is used widely in lower limb arthroplasty. We sought to establish whether the choice of opiate agent had any effect on the incidence of postoperative retention and therefore the risk of joint sepsis.

METHODS A total of 445 consecutive patients who underwent primary elective lower limb arthroplasty were reviewed retrospectively. Patients had general anaesthesia and femoral nerve block (GA+FNB), spinal anaesthesia and intrathecal fentanyl (SA+ITF) or spinal anaesthesia and intrathecal morphine (SA+ITM).

RESULTS Urinary retention was observed in 14% of male and 2% of female patients with GA+FNB, 9% of male and 3% of female patients with SA+ITF, and 60% of male ($p=0.0005$) and 5% of female patients with SA+ITM. Men who experienced retention were older (68 vs 64 years, $p=0.013$) and had longer inpatient stays (6.7 vs 4.6 days, $p=0.043$). Fewer patients in the SA+ITM group required breakthrough analgesia (28% vs 58%, $p=0.004$).

CONCLUSIONS The use of ITM in men significantly increases the incidence of urinary retention requiring urethral catheterisation and subsequently increases the risk of deep joint sepsis. Its use should be rationalised against the intended benefits and alternatives sought where possible.

KEYWORDS

Urinary retention – Arthroplasty – Urethral catheterisation

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Postoperative urinary retention (referred to as ‘retention’ from here onwards) is a troublesome postoperative complication because of its association with urinary tract infection and the subsequent increased risk of deep joint sepsis.¹ Retention is commonly treated with urethral catheterisation, which can itself induce bacteraemia and further increase the risk of deep joint sepsis.^{1–5} Previous studies report an incidence of deep sepsis following primary total hip replacement (THR) of <2%⁴ rising to as much as 6.2%^{1,5} with postoperative urethral catheterisation.

The reported incidence of retention following lower limb arthroplasty varies widely, from 10.7%⁶ to 84%,⁷ presumably as a result of heterogeneity in the study population, choice of anaesthetic techniques and difference in criteria used to diagnose retention. As a consequence, a number of studies have tried to better define the risk factors for retention by addressing the surgical factors^{5,8–11} and individual patient factors^{5,8,10,12} associated with retention. To date, there is compelling evidence that male sex, increasing age and

epidural opioids pose independent risk factors for the development of retention.^{8,10–15} However, there is limited and contradictory evidence addressing the link between intrathecal morphine (ITM) and the development of retention following lower limb arthroplasty.

Studies report both an increased incidence of retention with ITM^{14–17} and no significant difference^{18,19} when compared with other analgesic techniques. Some studies assessing the side effects of ITM do not include retention in their outcomes, often owing to the practice of intraoperative urethral catheterisation.^{20–22} There are two meta-analyses on this subject.^{19,23} Neither found a statistically significant increase in the incidence of retention with ITM use. As such, the link between ITM and the development of retention remains controversial.²⁴ Despite this controversy, ITM is used commonly in orthopaedics as well as other surgical specialties, driven in part by its purported superior analgesic profile.^{15,20,21} The principle aim of this work was to address this controversy by assessing the incidence of retention among

patients undergoing elective primary lower limb arthroplasty with ITM as well as two other commonly used anaesthetic/analgesic regimes as comparators.

Methods

All patients ($n=445$) who underwent primary elective hip or knee arthroplasty at the elective orthopaedic unit of a university hospital between 1 April 2010 and 31 March 2011 were reviewed retrospectively. Patient data were analysed in one of three groups depending on the type of anaesthetic/intraoperative analgesic regime: general anaesthesia with femoral nerve block (GA+FNB), spinal anaesthesia with intrathecal fentanyl (SA+ITF) and spinal anaesthesia with ITM (SA+ITM).

Our local research ethics committee judged our work to be quality improvement by service evaluation and it was therefore exempt from formal ethical approval. The data recorded for each patient included age, sex, surgical procedure, co-morbidities, ASA (American Society of Anesthesiologists) grade, length of inpatient stay (LOS), postoperative analgesic requirements, postoperative urinary catheterisation and residual volume. The primary endpoint was development of retention. Secondary endpoints were LOS and requirement for breakthrough analgesia.

Postoperative urinary retention was defined as the absence of spontaneous voiding within seven hours of anaesthetic induction coupled with patient symptoms and a residual volume of >400 ml at the time of urethral catheterisation. Male patients were catheterised on the ward by the on-call junior doctor. Female patients were catheterised on the ward by female nursing staff on the instruction of the on-call doctor. Patients were excluded from the study if they had a long-term urinary catheter, if they underwent intraoperative catheterisation, if they had a residual volume of <400 ml at the time of urethral catheterisation and if they had inadequate documentation with which to evaluate eligibility.

Patients who had GA+FNB were administered a FNB consisting of 20ml 0.25% levobupivacaine after anaesthetic induction. Patients given SA+ITF had 10–15mg heavy bupivacaine SA with 15–25µg ITF. SA+ITM patients received 10–15mg heavy bupivacaine SA with 200µg preservative free ITM.

All patients underwent similar postoperative management on a dedicated elective orthopaedic ward. All patients were encouraged to eat and drink normally, and supplemental intravenous fluids were given to patients with inadequate oral intake. Patients were mobilised from postoperative day 1 with daily physiotherapy assessment. The standard postoperative analgesic regime consisted of 10–20mg slow release morphine sulphate tablets orally every 12 hours along with 1g of paracetamol orally every 6 hours and 400mg of Ibuprofen orally every 8 hours. Breakthrough pain was managed with 10–20mg of oral morphine liquid given 2–4 hourly.

A chi-squared test was used for the significance analysis of retention and analgesic requirement. An unpaired t-test was used for the significance analysis of age and LOS. A p -value of <0.05 was considered to be statistically significant.

Results

A total of 445 patient notes were reviewed. Twenty-five did not meet the entry criteria and were excluded. This left 420 patients. Table 1 shows the mean patient age, the distribution of surgical procedures and the incidence of retention. There was no statistically significant difference between the age of patients in each group ($p>0.05$). No significant differences were found in the distribution of preoperative co-morbidities (eg benign prostatic hypertrophy, hypertension, diabetes) between the study groups ($p>0.05$). The mean ASA grade was similar in each group (GA+FNB: 1.8, SA+ITF: 1.9, SA+ITM: 1.7; $p>0.08$). The reasons for patient allocation to one type of anaesthesia over another were explored and it was found that the main reason was the preference of the anaesthetist rather than patient related factors.

Sixty per cent of male patients who had SA+ITM experienced retention compared with 14% who had GA+FNB ($p=0.0005$) and 9% who had ITF ($p=0.0002$). The men who experienced retention were on average four years older than those who did not (68 vs 64 years respectively, $p=0.013$). The type of surgery was not found to affect the incidence of urinary retention in male patients with SA+ITM (59.6% THR vs 59.8% total knee replacement [TKR]). A low incidence of retention was observed among female patients with 5% for SA+ITM, 2% for GA+FNB and 3% for SA+ITF patients.

Table 1 Details of patient groups

	Men ($n=200$)			Women ($n=220$)		
	GA+FNB ($n=73$)	SA+ITF ($n=66$)	SA+ITM ($n=61$)	GA+FNB ($n=79$)	SA+ITF ($n=77$)	SA+ITM ($n=64$)
Mean age (range)	64.4 (50–83)	65.6 (38–94)	65.3 (51–87)	66.9 (43–84)	69.3 (52–87)	69.8 (41–84)
Number of patients per surgical procedure	THR 21 TKR 52	THR 28 TKR 38	THR 24 TKR 37	THR 29 TKR 50	THR 37 TKR 40	THR 39 TKR 25
Retention	14%	9%	60%	2%	3%	5%
GA = general anaesthesia; FNB = femoral nerve block; SA = spinal anaesthesia; ITF = intrathecal fentanyl; ITM = intrathecal morphine; THR = total hip replacement; TKR = total knee replacement						

The need for breakthrough analgesia during the first 24 hours following surgery was assessed. Fewer men in the SA+ITM group (28%) required breakthrough analgesia additional to the baseline analgesic regime within the first 24 hours than those who had GA+FNB (50%, $p=0.04$) and ITF (58%, $p=0.004$). Among women, there was a trend towards a reduction in the number of patients requiring breakthrough analgesia, with 36% in the SA+ITM group compared with 56% in the GA+FNB group ($p=0.07$) and 40% in the ITF group ($p=0.8$), although these differences were not found to be statistically significant.

The mean LOS was analysed to determine whether the type of surgical procedure affected the LOS and to assess whether retention was associated with an increased LOS. Among all male patients without retention, there was no significant difference in the mean LOS between THR and TKR patients (4.7 vs 4.5 days, $p=0.6$), nor did the type of anaesthetic/analgesic regime significantly affect LOS. Male patients with retention had an mean LOS of 6.7 days compared with 4.6 days for those without retention ($p=0.043$). Results for the female groups combined were similar, with an average LOS of 6.1 days for THR/TKR combined with no retention and no significant difference in LOS between anaesthetic/analgesic regimes. The number of female patients who experienced retention was too small to extract any meaningful conclusions.

Discussion

The development of retention in orthopaedic patients undergoing elective primary lower limb arthroplasty is predominantly a male problem. Sixty per cent of SA+ITM men experienced retention and this represents a more than four-fold increase in the risk of retention compared with the other anaesthetic/analgesic regimes studied, with increasing age identified as a significant risk factor. No significant difference was found in the incidence of retention among the female groups studied.

In our study, the incidence of retention for men given SA+ITM is higher than those reported previously for ITM use in elective orthopaedic patients undergoing primary arthroplasty. Souron *et al* carried out a single blind randomised controlled trial (RCT) comparing the use of ITM with psoas compartment block in patients undergoing primary hip arthroplasty.¹⁴ In a mixed sex group of 26 patients (12 male, 14 female), there was retention in 37% of cases with ITM and 11.5% with psoas block. Similarly, Mendieta Sánchez *et al* reported 35.7% retention in a sample of 15 patients undergoing THR assigned randomly to have ITM compared with no cases of retention in a further 15 patients who had SA alone.¹⁵ Hassett *et al* described results of a double blind RCT in which mixed sex groups of 20 patients were assigned to have one of three ITM doses (100µg, 200µg or 300µg) and found the incidence of retention to be 50%, 30% and 35% respectively.¹⁶ Lastly, Izard *et al* reported the outcomes of a retrospective study of 221 patients undergoing hip or knee arthroplasty and found rates of retention to be 47% in mixed sex groups.¹⁷

The above studies report the incidence of retention from mixed sex groups. Our results suggest that such analysis underestimates the link between ITM and retention in male orthopaedic patients by a factor directly proportional to the ratio of male to female patients in the study group, and this may account for the heterogeneity in the previous figures quoted. Our results are consistent with those published in a large retrospective study by Griesdale *et al*, who performed a multivariate logistic regression analysis to identify risk factors for retention.²⁵ They found increased rates of retention in men and those receiving ITM.

Increasing age was identified as a significant secondary risk factor for retention among men. This is consistent with previous studies,^{10,12,15} which report age beyond 70 years as a reliable predictor of retention, and likely reflects the increased incidence of bladder dysfunction and benign prostatic hypertrophy with increasing age.²⁶

The decreased breakthrough analgesia use among our patients who had SA+ITM is consistent with studies that report superior analgesic efficacy of intrathecal opioids over other analgesic techniques.^{14,20,21} This benefit should be rationalised against the increased risk of retention observed in this group.

Patients with retention had an increased LOS compared with those without retention. This association was also observed in a 2011 study that examined the use of timely bladder ultrasonography detection of retention to avoid elective preoperative urethral catheterisation in orthopaedic patients.¹¹

The main limitation of our study is the retrospective nature of the analysis. Future randomised, double blind studies would be better placed to address this area. Our analysis of postoperative analgesia use could have been enhanced with visual analogue scale scores for pain but this was not the main focus of this study.

Conclusions

Our data highlight a strong association between ITM use and the development of retention among older male patients. This poses a significant risk to the development of joint sepsis and should be rationalised against the intended benefits of ITM use (ie an increased postoperative analgesic profile and a reduced requirement for breakthrough analgesia). Techniques to identify at-risk patients²⁷ and reduce the risk of joint sepsis, particularly in older male patients undergoing arthroplasty with ITM, should be explored (eg intraoperative urethral catheterisation with antibiotic cover).

Indeed, with pressure on healthcare systems to optimise the postoperative phase of patient care and to reduce the LOS following elective procedures, future studies may focus on reducing the incidence of retention as part of existing enhanced recovery protocols.

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