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Low dose intrathecal morphine for total knee replacement

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Abstract

Aims

This retrospective single centre study aims to gauge the complication rate associated with the use of intrathecal morphine in a specialist elective orthopaedic centre. We aim to assess the need for critical care level care in patients receiving intrathecal morphine for elective total knee replacement.

Methods

This is a retrospective, descriptive, single-centre study of patients undergoing elective total knee arthroplasty during July and August 2024. The target sample size was 100 patients. Data collected included patient age, gender, and intrathecal morphine dose. Complications considered related to intrathecal morphine were documented up to twenty-four hours post administration.

Results

All patients given intrathecal morphine undergoing elective total knee replacement were included. Age ranged from 48-83 years of age. Patient physical status ranged from ASA 1-3. Intrathecal morphine dose ranged between 50-200micrograms. Complications recorded included pruritic of 1 case (1%), urinary retention requiring catheterisation 15 (15%), Low SpO_2 1 (1%), and post-operative nausea and vomiting 4 (4%). 22 patients (22%) experienced one of these complications. 15 (68%) of those were males requiring urinary catheterisation.

Discussion

This chart review shows that intrathecal morphine is safely administered at our specialist referral centre. Doses used are low (no more than 200mcg) and the cohort of patients is varied. Overall complication rate is low, and no patients required transfer to an intensive care unit. This work shows that patients receiving intrathecal morphine can be safely managed at ward level.

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Introduction

Intrathecal morphine (ITM) is a common method for providing post-operative analgesia and has been in use since 1979[1]. Over time doses have decreased significantly to <300mcg. This change in dosage is responsible for the reduction in side-effects and complications[2]. Overall, ITM is associated with an increase of side-effects such as nausea, vomiting, pruritis, and urinary retention. Doses below 300mcg are not associated with an increase in respiratory depression[3]. Doses above 100mcg are associated with increased incidence of nausea and vomiting[4], while any ITM dose is associated with an increase of urinary retention in men[8]. PROSPECT guidelines for total knee arthroplasty suggests a maximum dose of 100mcg where appropriate[5].

Cappagh National Orthopaedic Hospital (NOHC) is a specialist orthopaedic referral centre providing elective services only. There is limited medical back-up and no other surgical specialities on site. A high dependency unit (HDU) is available. There is no intensive care unit (ICU) on the hospital grounds and any patient requiring a higher level of care needs to be transferred to out.

Guidelines published by the American Society of Anaesthesiology (ASA) in 2016 recommended that patients receiving ITM are monitored for a minimum of 24 hours post administration[6]. This is focused on the detection of respiratory depression by measuring oxygen saturation, carbon dioxide levels and level of sedation. In practice this results in patients being sent to post-operative care units (PACU), high dependency units or even intensive care units for continuous monitoring. In our centre we routinely send patients back to the regular surgical ward from PACU following ITM administration. Patient safety with this is ensured by appropriate staff training for the monitoring of patients who have received ITM. We are reassured by evidence showing that the risk of respiratory depression after low dose ITM is no greater than with placebo groups[2]. With this study we aim to show that patients receiving ITM can be safely managed at ward level without requiring critical care services.

Methods

Our specialist orthopaedic centre carries out approximately one thousand total knee replacements (TKR) per annum. We chose 10% (100 cases) as a sample size to reflect practice. Data was collected over a six week period during July and August 2024. All patients undergoing TKR who received ITM were recruited. From these charts, patient age, gender, ITM dose, and any complication experienced in the 24hours post-operatively were collated. Data was then analysed using Microsoft Excel© for trends/patterns. The on-site ethics committee were

consulted regarding the need for ethical approval for this study. Ethical approval was not required as this was a retrospective chart review with no change to patient care.

Results

Patient Demographics:

One hundred patients were recruited in this retrospective chart review. No patient undergoing elective TKR receiving ITM was excluded. Patient recruiting stopped when 100 patients were enrolled. Ages ranged from 40 years of age to 83 years of age. Fifty-four were female.

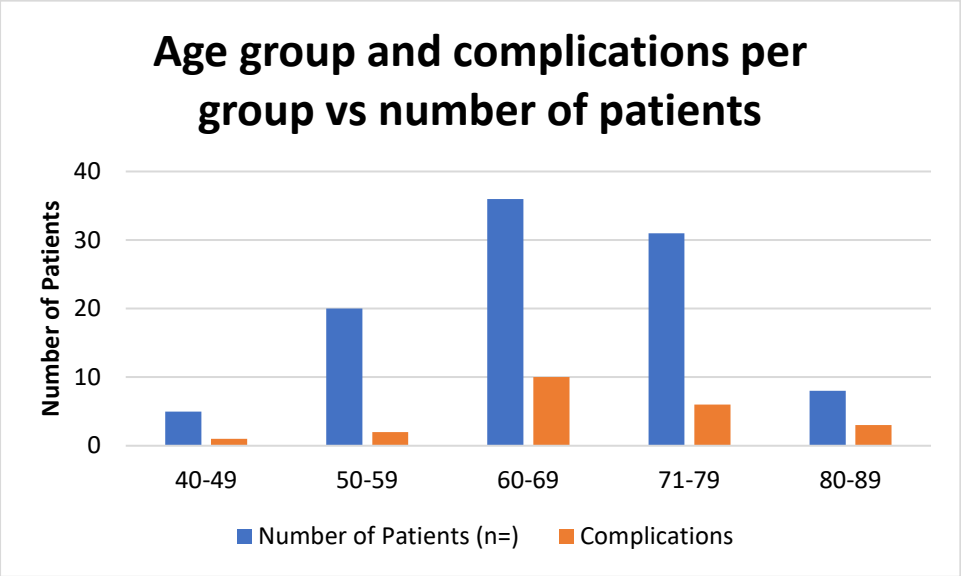

Figure 1:Age group and complications per group vs number of patients.

IT Morphine dose:

Intrathecal morphine dosage ranged from 50mcg to 200mcg. Only one patient, a female aged 80-89, received 50mcg of ITM. Eighty-four patients received 100mcg, 42 males and 42 females. Of these 84 patients, 20 (24%) experienced complications. Two patients received 150mcg, one male and one female. Thirteen patients received 200mcg, three males and ten females. One patient from each of the 150mcg and 200mcg experienced a complication. The one patient who received 50mcg did not experience any complications.

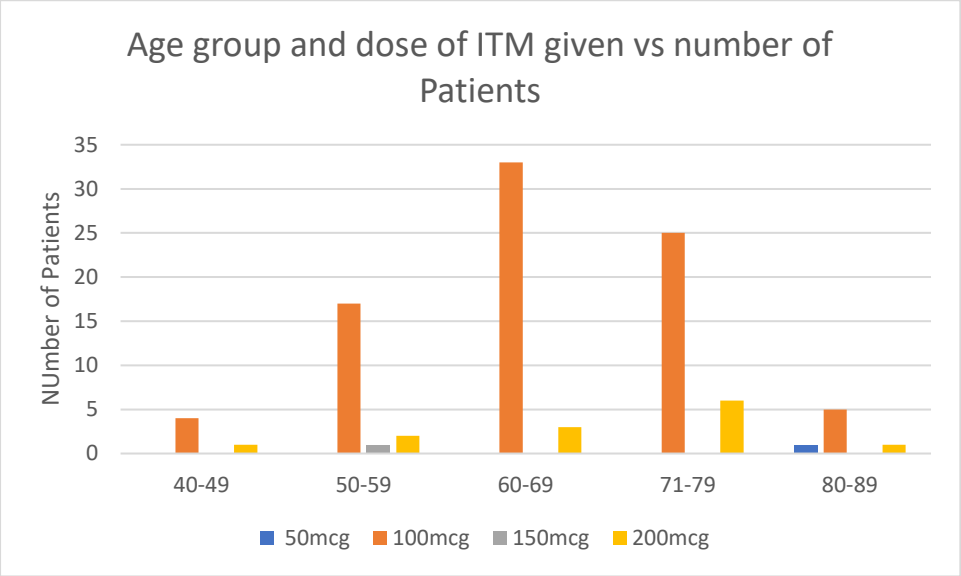

Figure 2: Age group and dose of ITM given vs number of Patients.

Complications:

Complications recorded within 24 hours of ITM administration included ICU admission, urinary retention requiring catheterisation, pruritis, Low SpO_2 (<94%), and post-operative nausea and vomiting (PONV). Incidence of any complication was 22%. No patient required critical care level intervention. The most common complication was urinary retention, with an overall complication rate of 15%, of which males accounted for 100%. Incidence rate of PONV was 5%. Incidence of both pruritis and low SpO2 were 1%.

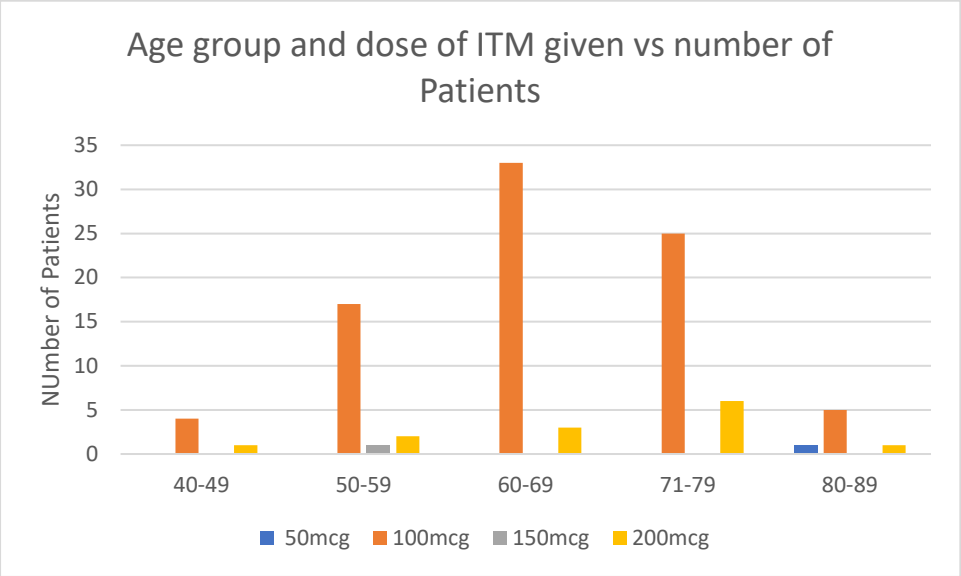

Figure 2: Age group and dose of ITM given vs number of Patients.

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Discussion

This retrospective study demonstrates that ITM use in our centre has some complications, but none that required escalation of care to HDU or ICU level. It has also provided insight as to the most common complications of ITM, most common age groups affected, and complications differences between males and females.

The dose of ITM use varied from 50mcg to 200mcg. The vast majority (84%) of patients in this study received 100mcg of ITM. This falls within guidelines recommended by PROSPECT group[5]. Those who received 200mcg still fall within the accepted "analgesic ceiling" of 300mcg that provides maximum analgesia with minimum side-effects[7]. ITM was given in combination with a spinal anaesthetic block (SAB) in all patients, and all patients also received sedation. Multimodal analgesia was used for post-operative pain management, including oral opioids and NSAIDs.

Overall complication rate for this study was 22%. The most common complication was urinary retention requiring catheterisation with 15 incidences. This was exclusive to male patients and accounts for 68% of all complications. Previous studies such as Fernandez et al.[8], discuss the incidence rates of urinary retention after lower limb primary arthroplasty. In this study, 60% of males receiving spinal anaesthetic and ITM experienced urinary retention requiring catheterisation. From our results, fifteen cases of urinary retention over a group of forty-six male patients gives an incidences rate of 33%. Of these patients, only one received 200mcg of ITM, with the other fourteen receiving 100mcg. Therefore, the incidence rate for male patients who have received 100mcg of ITM is 31.1%. This is lower than the incidence rate for 100mcg dose discussed by Hassett et al.[9] at 50%, although this study used a mixed sex group. The overall incidence for urinary retention across our mixed population is 15%, well below the incidence rate discussed by Hassett et al.[9]. All except one of the men requiring urinary catheterisation were in the 60-69 age group or older. This is most likely due to increased incidence of bladder dysfunction and benign prostatic hyperplasia in this population[10].

The youngest patient included in this review was 40, and the oldest was 83. The 60-69 age group accounted for 36% of all patients, more than any other age group. This cohort endured the most complications, with over one in three patients experiencing adverse effects. Notably, all the women who experienced adverse effects were in the 60-69 age group. Four of these were mild cases of PONV, which resolved with a single anti-emetic dose. The fourth case was a drop in oxygen saturations on room air to 86%, successfully treated with 3L.min^{-1} of oxygen via nasal prongs. Both PONV and respiratory depression are known side effects of ITM as discussed by *Gehling and Tryba*[3]. None of these incidents warranted HDU or ICU transfer.

Notably, the oldest patient included in our review was an 83 year old female patient who received 200mcg of ITM without any issues.

Of the 22 recorded complications, 17 of these were recorded in the male population. Only 5 female patients experienced complications Four of the five complications recorded in the female population were PONV. Only one male patient experienced PONV. The other female complication was one case of low SpO_2 .

One limitation of this study would be that other drugs taken by patients that could also cause these complications (e.g anticholinergics) were not recorded. Data collected from patient charts was limited, meaning other medical features (e.g BMI, pre-existing respiratory disease or benign prostatic hyperplasia) were not recorded. If this information was collected in a repeat study it may provide further insight into patients who are more at risk of complications.

In conclusion, we have demonstrated that ITM is a safe option with low risk of post-operative complications requiring HDU or higher level of care. It is well established as an effective method for post-operative analgesia in total knee arthroplasty. Overall complication rates are low. The most common complication seen in males is urinary retention which can be managed at ward level. The most common complication seen in females is PONV which is medically managed at ward level. With adequate staff training patients receiving low dose ITM for elective TKR can be safely managed on the surgical ward. Further work is needed to assess the effect of other medications on complication outcomes.

Declarations of Conflicts of Interest:
None declared.

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