



بسم الله الرحمن الرحيم

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Impact of Intrathecal Dexmedetomidine versus Intrathecal Fentanyl as Adjuvants to Bupivacaine on Post Spinal Urinary Retention in Knee Joint Arthroscopic Surgeries

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

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List of Abbreviations

Abb.	Full term
IV	Intravenous
LA	Local anaesthetic
LAST.....	Local anesthetic toxicity
PACU.....	Postanesthesia care unit
POUR	Postoperative urinary retention
UTIs.....	Urinary tract infections
VAS.....	Visual analogue scale

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ABSTRACT

Background: Patients undergoing orthopedic surgery are prone to developing postoperative urinary retention (POUR). They have an estimated relative risk of 8% to 55% higher than other surgical patients. This inability to void increases patient's risk of urinary tract infections (UTIs) and bacteremia, and can lead to chronic voiding difficulties due to bladder architecture alterations. A great degree of variability exists among studies describing the prevalence and risk factors of postoperative urinary retention and its management strategies.

Objective: To compare the effects of Dexmedetomidine or Fentanyl added to intrathecal bupivacaine in knee arthroscopic procedures in terms of the occurrence of postoperative urinary retention.

Patients and Methods: This prospective randomized clinical study was conducted at tertiary care hospital at Ain Shams University hospitals from September 2021 till Mars 2022 and performed on a total of 70 patients who assigned for knee joints orthoscopic surgery.

Results: The current study results revealed that the incidence of postoperative urine retention in dexmedetomidine group was 5.7% while was 28.6% in Fentanyl group, the difference was statistically significant. however, the need to postoperative urinary catheterization was statistically non-significantly among the two groups. The current study results revealed that the Time to achieve maximum block was significantly shorter in dexmedetomidine group and the duration of motor block statistically was significantly longer in dexmedetomidine group.

Conclusion: On the basis of current evidence, when compared to fentanyl, our study revealed that intrathecal dexmedetomidine, as adjuvant to local anesthetics for intrathecal injection, can statistically significantly prolong the duration of sensory and motor block, as well as the pain free period, meanwhile significantly reducing the incidence of urinary retention. Intrathecal dexmedetomidine seems to be an attractive alternative as an adjuvant to spinal bupivacaine in surgical procedures, especially those requiring long time. It has excellent quality of postoperative analgesia with minimal side effects.

Keywords: Urinary tract infections, dexmedetomidine, fentanyl, bupivacaine

INTRODUCTION

Lower limb surgeries could be performed under local, neuroaxial and general anesthesia, but neuroaxial block is the preferred method. Spinal block has rapid onset, deep block, lower risk of infection and is cost effective. Intrathecal adjuncts are routinely added to local anaesthetic (LA) agents to enhance block duration and postoperative analgesia without the need to increase the dosage of LA for various surgeries. Using a lower volume of LA reduces the risk of LA systemic toxicity, cardiorespiratory instability, total spinal anaesthesia, delayed ambulation and prolonged hospital stay (*Mostafa et al., 2020*).

Dexmedetomidine is routinely used for sedation and as an adjunct to reduce anaesthetic and opioid requirements during general and regional anaesthesia in both adult and paediatric populations. An alternative is intrathecal fentanyl which is also added to other local anesthetics to increase anesthesia and analgesia. It has improved spinal anesthesia and reduced the anesthetic drug related side effects. Dexmedetomidine and fentanyl have been used in different surgeries to provide superior analgesia and to improve the duration of the block (*Liu et al., 2018*).

Patients undergoing orthopaedic surgery are prone to developing postoperative urinary retention (POUR). They have an estimated relative risk of 8% to 55% higher than other surgical patients. This inability to void increases patient's risk

of urinary tract infections (UTIs) and bacteraemia, and can lead to chronic voiding difficulties due to bladder architecture alterations. A great degree of variability exists among studies describing the prevalence and risk factors of POUR and its management strategies (*Sung et al., 2015*).

Ultrasound has been shown to provide an accurate assessment of urinary bladder volume and a guide to the management of POUR. Recommendations for urinary catheterization in the perioperative setting vary widely, influenced by many factors, including surgical factors, type of anaesthesia, comorbidities, local policies, and personal preferences. Although both intrathecal fentanyl and intrathecal dexmedetomidine are increasingly used, published data comparing POUR incidence with one modality over the other are lacking (*Hollman et al., 2015*).

AIM OF THE WORK

In this study, we aim to compare the effects of Dexmedetomidine or Fentanyl added to intrathecal bupivacaine in knee arthroscopic procedures, in terms of the occurrence of post-operative urinary retention.

REVIEW OF LITERATURE

Neuroaxial Anesthesia

Spinal Anesthesia

The administration of spinal anesthesia requires appropriate positioning and understanding of neuraxial anatomy. The goal is to deliver appropriately dosed anesthetic into the intrathecal (subarachnoid) space (**Broadbent et al., 2000**).

The spine comprises seven cervical, 12 thoracics, five lumbar, and five fused sacral vertebral bones. The different vertebral bones earn their names based on their relative positions and structural differences. The vertebrae are stacked end to end with articulating joints and ligaments, and a hollow space running through them called the spinal canal. This canal houses the spinal cord. The spinal nerves exit the spinal canal via lateral spaces formed between pedicles from adjacent vertebrae (**Saifuddin et al., 1998**).

Some common complications are (**Hartmann et al., 2002**):

- Backache (more common with epidural anesthesia)
- Urinary Retention
- Postdural puncture headache (as high as 25% in some studies). A non-cutting needle should be utilized for patients

with high risk for PDPH, and the smallest gauge needle available is the recommendation for all patients

- Nausea and vomiting
- Hypotension
- Low-frequency hearing loss
- Total spinal anesthesia (most feared complication)
- Neurological injury
- Spinal hematoma
- Arachnoiditis
- Transient neurological syndrome (especially with lidocaine)

Local Anesthetics

Commonly used **local anesthetics** in clinical practice include the following:

Amino Amides: Mepivacaine, lidocaine, etidocaine, bupivacaine, levobupivacaine and Ropivacaine.

Amino Esters: Procaine, cocaine, chlorprocaine, tetracaine and benzocaine.

Because of the variable pharmacodynamics, pharmacokinetics, and toxicity profile of the various local anesthesia agents, the

intended procedure will dictate the agent used (*Shah et al., 2018*).

Local anesthetics block voltage-gated sodium channels, which prevents sodium influx into the cell and blocks impulse transmission. **Local anesthetics** are also class I antiarrhythmic drugs due to the blockade of cardiac sodium channels, with lidocaine being the class IB prototype. They selectively block channels that are frequently depolarizing (as occurs in tachyarrhythmias) and, therefore, slow transmission (*Borgeat and Aguirre, 2010*).

Two subclasses of **local anesthetics** categorize according to the location where metabolism occurs. The amino amides such as bupivacaine, ropivacaine, and lidocaine, are hydrolyzed in the liver, whereas plasma cholinesterases metabolize the amino-esters such as procaine, chlorprocaine, and tetracaine (*Wolfe and Spillars, 2018*).

Amino amides are stable in solution, whereas the amino esters are unstable. Allergic or hypersensitivity reactions are more likely to occur with amino esters than amino amides (*Zaric and Pace, 2009*).

Bupivacaine is a potent local anesthetic with unique characteristics from the amide group of local anesthetics, first discovered in 1957. Local anesthetics are used in regional