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ملاحظات:
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A Comparative Study between Femoral Nerve Block and Intravenous Ketamine in Pain Management for Elderly Patients with Femur Fracture during Positioning before Spinal Anesthesia

Thesis

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List of Abbreviations

Abbr.	Full-term
5HT	*5 hydroxytryptamine*
AAG	*α -acid glycoprotein*
AAGBI	*Association of Anesthetists of Great Britain and Ireland*
ABC	*Airway, Breathing, Circulation*
AMPA	*Alpha-amino-3-hydroxy-5-methyl -4- isoxazolepropionic acid*
ASA	*American Society of Anesthesiologists*
CCK	*Cholecystokinin*
CGRP	*Calcitonin gene-related peptide*
CNS	*Central nervous system*
CPR	*Cardiopulmonary resuscitation*
CVS	*Cardiovascular system*
DAT	*Deep artery of the thigh*
DRG	*Dorsal root ganglion*
ECG	*Electrocardiogram*
FN	*Femoral nerve*
FNB	*Femoral nerve block*
FV	*Femoral vein*
GABA B	*Gamma-aminobutyric acid subtype B*
HCL	*Hydrochloride*
Hz	*Hertz*
IM	*Intramuscular*
IV	*Intravenous*
IQR	*Interqaurtile Range*
Las	*Local Anesthetics*
Mg2+	*Magnesium*
NK	*Neurokinin*
NMDA	*N-methyl-D aspartate*

NMDARs ..... *N methyl D aspartate receptors*
NSAIDs..... *Nonsteroidal anti-inflammatory drugs*
PABA ..... *Para aminobenzoic acid*
PACU..... *Post-Anesthesia Care Unit*
RSS..... *Ramsay Sedation Scores*
SD ..... *Standard deviation*
SPSS..... *Statistical Package for Social Science*
TENS..... *Transcutaneous Electrical Nerve Stimulation*
TRP..... *Transient receptor potential*
TRPV1 ..... *Vanilloid-type TRP 1*
VAS..... *Visual Analogue Scale*
VASC ..... *Voltage activated Na+ channel*

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Introduction

Patients with fractures are always scared of pain. The psychological, clinical, and behavioral impacts of pain are numerous. Many researches have been conducted to provide relief from this annoying experience during preoperative, intraoperative and postoperative periods **(Bajwa and Takrouri, 2014).**

Femur fracture commonly occurs following trauma in elderly patients and central neuraxial block especially spinal anesthesia is more preferred for providing anesthesia for such cases. Proper positioning during spinal anesthesia is a must for a successful procedure, but extreme pain and limb immobility are obstacles for an ideal position for this procedure **(Jadon et al., 2014).**

Femur fracture is extremely painful due to the rich nerve supply of the periosteal tissue from the femoral nerve. This makes pain control before any positioning crucial for perioperative management **(Forouzan et al., 2015).**

The good physiological effects supplied by the sympathetic blockade such as decreased blood loss, higher leg blood flow and greater early pain alleviation explain the superior end effects of spinal anesthesia compared to general anesthesia. This reduces cardiopulmonary and thromboembolic morbidity, but it may come at the expense of early

postoperative mobilization due to pain that occurs when spinal anesthesia resolves **(Basques et al., 2015).**

Various methods like intravenous (IV) fentanyl, ketamine, femoral nerve block (FNB) or fascia iliaca block with local anesthetic have been used to reduce the preoperative pain and improve these patients positioning. Results are conflicting regarding superiority of femoral nerve block over intravenous analgesia. Previous studies have shown the superiority of the FNB when compared to IV opioids **(Jadon et al., 2014), (Reddy and Rao, 2016), (George et al., 2020),** However, other studies have shown no benefit of FNB over IV opioids **(Sandby-Thomas et al., 2008), (lamaroon et al., 2010).**

Poor pain control in elderly patients can lead to delirium which is associated with delayed return of functional status, increased mortality, and poor functional outcomes post-operatively. Also opioid abuse within the elderly population increases susceptibility to illness, and impaired recovery **(Amin et al., 2017).**

Alternatives to opioids have been investigated to control pain in elderly hip fracture patients including various nerve blocks and systemic treatments such as methylprednisolone and nonsteroidal anti-inflammatory drugs (NSAIDs). FNB is safe and easy to perform in the elderly population, reduces opioid

consumption, and effective in pain management and delirium prevention **(Amin et al., 2017).**

Also, FNB provides pain control and shortens the time of functional recovery and the length of hospital stay without associated side effects when compared to epidural or IV analgesia **(Wang et al., 2017).**

Ketamine is an IV anesthetic, phencyclidine in nature that blocks N-methyl-D-aspartate (NMDA) receptors in the central nervous system (CNS). In low-dose form, it showed analgesic benefit in orthopedic surgery. Ketamine has potent analgesic and sedative effects among with cardiorespiratory stability which makes it beneficial for pain management in different clinical uses **(Bell and Kalso, 2018).**

Ketamine also has a role in managing postoperative pain, several systematic reviews have assured that ketamine has an opioid-sparing effect and reduces pain scores, it also reduces the frequency of postoperative nausea and vomiting. Ketamine does not demonstrate unwanted side-effects specifically hallucinations when used at lower doses **(Riddell et al., 2019).**

Aim of the Work

Aim of this study was to investigate the effect of Ultrasound guided FNB using 0.25% bupivacaine versus IV analgesic ketamine dose (0.25 mg/kg) in pain control for positioning before spinal anesthesia in patients undergoing surgery for fractured femur.

Chapter 1: Physiology of Pain

What Is Pain?

Pain is not only defined as a sensory modality but it is considered an experience. The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience with actual or potential tissue damage, or described in terms of such damage." The definition verifies the interplay between the objective, physiological sensory aspects of pain and its subjective, psychological and emotional components. The response to pain is variable among different individuals and in the same person at different times as well. The term *nociception* is derived from *noci* (Latin for harm or injury) and describes the responses to traumatic stimuli. All nociception can produce pain, but not all pain results from nociception. Many patients can experience pain without any noxious stimuli **(Stephan et al., 2011).**

Pain is classified into acute pain which is primarily due to nociception and chronic pain in which psychological and behavioral factors play a major role **(D'mello and Dickenson, 2008).**

Mechanism of acute pain

Acute pain is caused mainly by activation of peripheral nociceptors by noxious stimuli caused by traumatic injury for example (surgical stimulus). Acute pain can be also elicited by a