Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com

Orthopedics

Ketamine Administration Prior Regional Anesthesia for Fractured Femur

Nidal Mousa AL- Soud*, Moath Kreshan, Mohamed Sulaiman AbuZaid, Bassam Abu-Khajil, Mohmoud Hammad AL-Maita
The Royal Medical Services- Amman, Jordan

Original Research Article

***Corresponding author**
Nidal Mousa AL- Soud

Article History
Received: 11.05.2018
Accepted: 21.05.2018
Published: 30.05.2018

DOI:
10.36347/sjams.2018.v06i05.052

Abstract: Femur fracture is a common, possibly overwhelming event for patients particularly geriatric with nearly 1.6 million hip fractures occurring yearly worldwide. Regional anesthesia compared to general anesthesia has many advantages in terms of decreased morbidity and mortality. This study will be conducted to explore the effect of administration a small dose of ketamine in avoiding pain at the fracture location when administered prior executing spinal anesthesia in the sitting position for patients suffering from femur bone fracture. This is a retrospective observational cross-sectional study. Data will be collected from patients' medical profiles and anesthesia sheet. It will be performed on patients including males and females, who were presented for elective orthopedic operations for different forms of fractured femur (fracture head, neck and shaft). All the operations that performed under spinal anesthesia in the sitting position by using bupivacaine 0.5% in a dose of 10-20 mg will be screened. Patients will be divided into two groups; group (1) the control group and group (2) the ketamine group. Seventy two patients were included in this study and divided patients into two equal groups. Group (1) the control group and group (2) the ketamine group. Patients who experienced pain at the fracture site in the ketamine group were 30%, while those in control group were 76.7%. *P* value 0.023. A small dose of ketamine before performing spinal anaesthesia in sitting position for patients having fracture femur has a valuable effect in reducing patient pain at the site of fracture. It facilitates the procedure, reducing its time, reducing the number of trials of spinal injection and requires no local infiltration at site of injection.
Keywords: Femur fracture, morbidity, anesthesia.

INTRODUCTION

The femoral neck is the weakest part of the femur. Fractures of the neck and trochanteric sections of the femur, the chief anatomic site of bone in the hip joint, are presently one of the greatest critical health care difficulties bothering different age groups [1]. Not only is the acute fracture associated with severe hip pain, and an incapability to stand or walk on the injured leg, but there may be major vascular injury to the head of femur eventually causing avascular necrosis and secondary osteoarthritis (OA) [2]. Over all, general anesthesia has been the "excellent choice" for orthopedic surgeons and patients once major hip surgery is being decided to be performed [3]. The development of new methods and catheters for continuous peripheral nerve blocks have made regional anesthesia more satisfying to patients and surgeons by achieving optimal analgesia [4]. Prior to 2007, most orthopedic surgeries for neck of femur fractures were done under general anesthesia. A change in the involvement of the Acute Pain Medicine Service in 2007 caused an alteration in intraoperative anesthetic management of geriatric, debilitated patients [5]. Regional anesthesia in comparison with general anesthesia has many benefits in lessening morbidity and mortality. The most imperative gains of regional anesthesia are the reduction in intraoperative blood loss and accordingly upgrade operating circumstances, the reduction in perioperative cardiac ischemic episodes, postoperative hypoxic incidents, arterial and venous thrombosis, and to provide proper postoperative pain control [6]. In order to choose the best drug schedule for postoperative analgesia while lessening side effects, some clinical studies have been intended to evaluate the worth of different drugs in various volumes, doses, and combinations [7, 8]. Then again, recent efforts were aimed to improve postoperative pain relief thru blocking pain pathways, particularly thru carrying out regional blocks. Different drug schedules have been applied for regional pain management through catheters, and amongst these procedures, administration of ketamine has been shown to decrease postoperative pain, particularly in combination with local anesthetics [9]. This study aimed to explore the effect of administration a small dose of ketamine in avoiding pain at the fracture location when administered prior executing spinal anesthesia in the sitting position for patients suffering from femur bone

fracture. The study will be performed in the Royal Rehabilitation Centre (RRC) at the Royal Medical Services (RMS) in Jordan/Amman.

PATIENTS AND METHODS

This is a retrospective observational cross-sectional study. The study was conducted in the Royal Rehabilitation Centre (RRC) at the Royal Medical Services (RMS) in Jordan/Amman. Ethical approval has been obtained from the IRB committees at the JRMS. Data were collected from patients' medical profiles and anesthesia sheet. All elective orthopedic operations done for different types of fractured femur (fracture head, neck and shaft) were considered to be source of data. Patients were divided into two groups; group (1) the control group and group (2) the ketamine group.

Inclusion criteria

• Patients of American Society of Anesthesiologists Classification (ASA) class I and II.
• Patients age 23 years and above.
• Patients sustained fracture femur less than 10 days duration.

Exclusion criteria

• Impacted fracture.
• Patients tolerated pain prior to operation.
• Patients who were administered opioid less than 8 hours prior to orthopedic operation.

All the surgeries that done by spinal anesthesia in the sitting position by administering bupivacaine (Marcaine®) 0.5% in a dose of 10-20 mg were screened. IV cannula gauge 20/22 was introduced and all patients were administered 750-1000 ml of NaCl 0.9% prior execution of spinal anesthesia. Oxygen 4L/ min thru nasal cannula was delivered. For the ketamine group (group 2) those 23 to > 70 years old were administered ketamine in a dose of 0.25mg/kg IV and those < 70 years old were administered ketamine in a dose of 0.15mg/ kg IV. Spinal anesthesia was done under aseptic technique using spinal needle G23 or G25 at the vertebral level (L3- L4) without local infiltration of the skin. 10-15mg of hyperbaric bupivacaine 0.5% was introduced into the sub-arachnoid space, and then the patients were placed back in the supine position. Severity of pain at the fracture location was measured by the (0-10) verbal descriptive scale as the following:

0 = no pain.
1 – 3 = mild pain.
4 – 6 = moderate pain.
7 – 9 = severe pain.

10 = very severe (worst imaginable pain).

DATA ANALYSIS

Data analysis was performed using SPSS software program version 22. Statistical significance will be considered at p- value <0.05.

RESULTS

Seventy two patients including males and females were enrolled in the study. All patients aged not less than 25 years was prescribed the last dose of analgesia 6 hours or more prior the start of operation as stated in the inclusion criteria (Figures 1, 2).

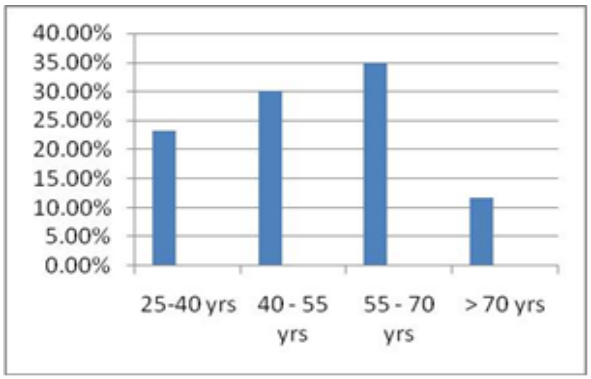

Fig-1: Distribution of age group

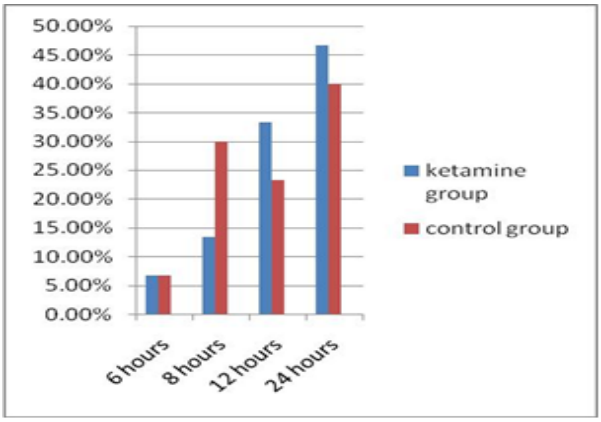

Fig-2: Distribution of last dose of Analgesia (P. value 0.398)

As illustrated in table 1, 68.4% of the patients in the control group suffered from pain at the fracture location whereas positioned for spinal anesthesia compared to 28% in the ketamine group, *P* value 0.003.

Table-1: Pain Experience at Fracture Site during Positioning

Group	Yes	No	Total
Ketamine group	(8) 22 %	(28) 78 %	(36) 100%
Control group	(27) 75 %	(9) 25 %	(36) 100%
Total	32	28	72

P. value 0.003

In Table (2), 8 patients in ketamine group suffered from pain, while in the control group 27 patients complained of pain, where 33.3% of them experienced mild pain, whereas 66.7% had experienced moderate pain, 21.7% had complained of mild pain, 47.8% had moderate pain, 26.2% had severe pain and 4.3% had very severe pain. *P* value 0. 04.

Only 13.3% of ketamine group experienced pain at site of spinal needle injection compared to 63.3% of the control group, *P* value 0.023 (Table 3).

Table-2: Severity of Pain

Group	Mild	Moderate	Severe	Very	Total
Ketamine Group	(4) 50 %	(4) 50 %	(0) 0.00%	(0) 0.00%	(8) 100%
Control group	(6) 22 %	(12) 44 %	(7) 26 %	(2) 8 %	(23) 100%
Total	10	16	7	2	35

P Value 0. 04.

Table-3: Pain at Site of Spinal Injection

Group	Yes	No	Total
Ketamine group	(6) 16.6%	(30) 83.4%	(36) 100%
Control group	(21) 58.3%	(15) 41.7%	(36) 100%
Total	27	45	72

P value 0.023

Additional time was spent in carrying out spinal block in the control group, in comparison with ketamine group. *P* value was 0.024. Most of the ketamine group patients were performed in < 5 min 66.7%, whereas only 26.7% in the control group took < 5 min. (Table 4).

Table-4: Time Consumed for Carrying Out Spinal Anesthesia

Group	< 5 min	5-10 min	10-15 min	Total
Ketamine group	(29) 80.5%	(7) 19.5%	(0) 0.00%	(36) 100%
Control group	(10) 27.7%	(24) 66.6%	(2) 5.7%	(36) 100%
Total	39	31	2	72

P value 0.024

Table--5: Vital Signs

Vital Sign		Ketamine Group	Control group	*P* value
Pulse rate	Normal	(12)	(11)	0.911
		33.3%	30.5%	
	Bradycardia	(7)	(6)	
		19.4%	16.6%	
	Tachycardia	(17)	(19)	
		47.2%	52.7%	
Blood pressure	Normal	(10)	(11)	0.298
		27.7	30.5%	
	Hypotension	(12)	(13)	
		33.3%	36.7%	
	Hypertension	(14)	(12)	
		40%	33.3%	
Oxygen saturation	Normal	(30)	(31)	0.489
		83.3%	86.1%	
	Desaturation	(6)	(5)	
		16.6%	13.8%	

Concerning the patients vital signs there were insignificant variations in pulse rate, blood pressure and oxygen saturation as illustrated in Table 5.

DISCUSSION

In the latest years, numerous researches have shown the valuable outcomes of femoral nerve block on acute postoperative pain control and rehabilitation programs after orthopedic surgeries. Surgeries for fracture femur such as external fixation, intramedullary nailing or placement of plates and screws were usually done under regional anesthesia particularly spinal anesthesia. As this kind of fractures is very painful, ideal situations for execution spinal anesthesia in the sitting positions are desirable. In the current research, we examined the analgesic effect of small doses of ketamine prior rendering the patient sitting for spinal anesthesia. Analgesic drugs in the majority of our patients were given before 24 hours (45.9%) and (32.9%) before 12 hours from performing the operation, by this result we excluded the contribution of other patterns of analgesia in this study as illustrated in Figure 1; this is consistent with a study performed by Urwin *et al*. [10] which showed that there were significant advantages for regional anesthesia in comparison with general anesthesia regarding one-month mortality and deep vein thrombosis (DVT). A Cochrane review [11] showed that regional anesthesia was associated with less mortality at one month. Ketamine which is a strong N-methyl-D-aspartate (NMDA) receptors antagonist and acts on sodium channels like a local anesthetic was used as an adjuvant for exploring the effect of administration a small dose in avoiding pain at the fracture location. Our clinical study showed that pain relief was enhanced within 48 hours after the addition of ketamine to bupivacaine; furthermore, this analgesia protocol resulted in less reported pain complaints in these patients, and patients in ketamine group was able move and perform voluntarily exercise due to complete pain control via pump infusion. In the ketamine group 78% did not experience pain while 25% in control group did not have pain. Patients suffered from pains at fracture location were 22% in ketamine group, 75% in control group (P=0.003) significant value as shown in table 1, and it is consistent with other researches performed by Wong *et al.* [12] and Abdel-ghaffar *et al*. [13] who stated that when considering the technique used to support positioning patients for spinal block, the most commonly used agent was ketamine. Concerning the severity of pain amongst patients in ketamine group, only 8 patients had moderate or mild pain, whereas there were no patients experienced severe or very severe pains. Severity of pain was measured by the verbal descriptor scale since it is a stress-free method for the patients to demonstrate the severity of pain

particularly for the elderly. In control group, those who expressed pain as mild 22%, moderate 44%, severe pain 26% and very severe 8% were only observed in this group as illustrated in table 2. Regarding the pain at the site of spinal injection 58.3% had pain in the control group compared to only 16.6% in ketamine group with a statistically significant P value (0.023) as illustrated in table 3.This result revealed that there is no necessity for local infiltration if ketamine in the analgesic dose was given prior spinal anesthesia. The time consumed for conducting spinal anesthesia was shorter in ketamine group; the procedure was done in less than 10 minutes in all patients of the group. In 80.5% the time consumed was less than 5 minutes, whereas 33.3% was performed in the period from 5-10 minutes and no procedure was done in more than 10 minutes. In the control group, 66.6% procedures were conducted in the period from 5-10 minutes 27.7% in less than 5 minutes and 5.7% performed in more than 15 minutes with a statistically significant P value (0.024) (Table 4).

This result suggests that appropriate position during conducting spinal anesthesia helps in dropping number of failed trials, decreasing time and resources.

Variations in the vital signs generated by ketamine such as tachycardia and hypertension, elevated systemic vascular resistance which are indirect cardio-vascular endings owing to central stimulation of the sympathetic nervous system and blockage of the re-uptake of noradrenaline were monitored pre- and post-positioning [14]. Fluctuations in pulse rate next to positioning the patient for spinal anesthesia in the ketamine group were found to be normal pulse rate in 33.3% in comparison to 30.5% in control group. Those who had tachycardia in ketamine group were 47.2% in comparison to 57.7% from control group. As for those who developed bradycardia were 19.4% in study group in comparison to 16.6% in control group, p = 0.911, this was an insignificant difference in alteration in the pulse rate within the two study groups, so this result implies that usage of a small dose of ketamine will not change the pulse rate significantly (Table 5). In regard to blood pressure; we considered the patient base line reading as normal, if it elevated by 20% or more it was considered as hypertension, and if it is decreased by 20% or more it was considered hypotension. The variations in blood pressure after positioning the patient for spinal anesthesia also were insignificant. Normal blood pressure values were 27.7% in ketamine group and 30.5% in control group. Elevation in blood pressure by more than 20% occurred in 40% in ketamine group and 33.3% in control group (Table 5). We found that more patients in the control group had hypotension and this was owed to the adverse effect of ketamine as it causes increase in blood pressure even at small dose [(15)] so it can stabilize the hemodynamic variability caused by spinal anesthesia. Oxygen saturation was considered as an indicator of appropriateness of ventilation and tissue hypoperfusion as noticed with hypotensive episodes was normal in all patients prepositioning. After positioning patients who had normal saturation in ketamine group were 83.3% in comparison to 86.1% in the control group, this may be owed to the sedation resulted by ketamine. P = 0.489 i.e no significant difference in saturation between the two groups (Table 5).

CONCLUSION

Regional anesthesia compared to general anesthesia takes the form of a spinal or epidural injection of local anesthetic to induce surgical anesthesia, which may improve outcomes by avoiding intubation and mechanical ventilation, significantly reducing blood loss, improving postoperative analgesia and decreased mortality. On the other hand, general anesthesia may induce potential complications, such as adverse reactions to drugs, increasing pulmonary complication rates, severe hypotension and postoperative nausea and vomiting. A small dose of ketamine prior conducting spinal anesthesia for patients suffering from fracture femur has a significant effect in decreasing patient pain at the location of fracture. It simplifies the procedure, decreasing its time, dropping the number of trials of spinal injection and needs no local infiltration at site of injection.

REFERENCES

1. Manninger J, Bosch U, Cserháti P, Fekete K, Kazár G, editors. Internal fixation of femoral neck fractures: an Atlas. Springer Science & Business Media; 2007 Oct 17.
2. Babhulkar S, Tanna DD. Proximal Femoral Fractures. JP Medical Ltd; 2013 Apr 30.
3. Baral BK, Shrestha RR, Tse J, Zuker D, Negron-Gonzalez M, Dauphinee K, Barsoum S, Ewah B, Robb P, Eryýlmaz HB, Memis D. AMBULATORY ANAESTHESIA. British Journal of Anaesthesia. 2012 Mar 1;108(suppl_2):ii1-36.
4. Indelli PF, Grant SA, Nielsen K, Vail TP. Regional anesthesia in hip surgery. Clinical Orthopaedics and Related Research®. 2005 Dec 1;441:250-5.
5. Le-Wendling L, Bihorac A, Baslanti TO, Lucas S, Sadasivan K, Wendling A, Heyman HJ, Boezaart A. Regional anesthesia as compared with general anesthesia for surgery in geriatric patients with hip fracture: does it decrease morbidity, mortality, and health care costs? Results of a single-centered study. Pain Medicine. 2012 Jul 1;13(7):948-56.
6. Abou-Setta AM, Beaupre LA, Rashiq S, Dryden DM, Hamm MP, Sadowski CA, Menon MR, Majumdar SR, Wilson DM, Karkhaneh M, Mousavi SS. Comparative effectiveness of pain management interventions for hip fracture: a systematic review. Annals of internal medicine. 2011 Aug 16;155(4):234-45.

7. Foss NB, Kristensen BB, Bundgaard M, Bak M, Heiring C, Virkelyst C, Hougaard S, Kehlet H. Fascia Iliaca Compartment Blockade for Acute Pain Control in Hip Fracture PatientsA Randomized, Placebo-controlled Trial. Anesthesiology: The Journal of the American Society of Anesthesiologists. 2007 Apr 1;106(4):773-8.
8. Luger TJ, Kammerlander C, Gosch M, Luger MF, Kammerlander-Knauer U, Roth T, Kreutziger J. Neuroaxial versus general anaesthesia in geriatric patients for hip fracture surgery: does it matter?. Osteoporosis international. 2010 Dec 1;21(4):555-72.
9. Fallatah SM. Successful management of complex regional pain syndrome type 1 using single injection interscalene brachial plexus block. Saudi journal of anaesthesia. 2014 Oct;8(4):559.
10. Urwin SC, Parker MJ, Griffiths R. General versus regional anaesthesia for hip fracture surgery: a meta-analysis of randomized trials. British journal of anaesthesia. 2000 Apr 1;84(4):450-5.
11. Parker MJ, Handoll HH, Griffiths R. Anaesthesia for hip fracture surgery in adults. Cochrane Database Syst Rev. 2004 Oct 18;4(4).
12. Wong CS, Lu CC, Cherng CH, Ho ST. Pre-emptive analgesia with ketamine, morphine and epidural lidocaine prior to total knee replacement. Canadian journal of anaesthesia. 1997 Jan 1;44(1):31-7.
13. Abdel-ghaffar ME, Abdulatif M, Al-ghamdi A, Mowafi H, Anwar A. Epidural Ketamine Reduces Postoperative Epidural PCA Consumption of Fentanyl/Bupivacaine. Survey of Anesthesiology. 1999 Feb 1;43(1):44-5.
14. Sandby-Thomas M, Sullivan G, Hall JE. A national survey into the peri-operative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur. Anaesthesia. 2008 Mar 1;63(3):250-8.
15. El-Tawil MM. The safety, benefits and effectiveness of different intravenous subanesthetic doses of ketamine when combined with small dose of midazolam before combined spinal epidural technique for Orthopedic Lower Extremity Surgery. AJAIC. 2005 Dec;8(4).