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Research Article

Fascia iliaca block versus intravenous dexmedetomidine and ketamine for positioning fracture femur patients during spinal anesthesia: Randomized comparative study A running head: FIB versus dexmedetomidine-ketamine for femur fracture positioning.

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Abstract

Background: Patients suffering from femur fractures experience excruciating agony, making it difficult to position them for spinal anesthesia. **Aim**: To evaluate the efficacy of intravenous dexmedetomidine-ketamine versus ultrasound-guided fascia iliaca block (FIB) in reducing positional pain in patients undergoing spinal anesthesia for femur fractures respectively. **Method**: This prospective randomized study included sixty-six patients, ages forty to eighty years subjected to femur fracture surgery. patients were randomly assigned to one of two groups. One group received intravenous doses of dexmedetomidine (0.25 µg/kg) and ketamine (0.2 mg/kg). the other one was given a fascia iliaca block with 0.5 ml/kg of 0.25% bupivacaine. We evaluated the behavioral pain scale as a primary outcome and the patient's posture, anesthetist satisfaction, patient satisfaction and incidence of any side effects as a secondary outcome. **Results**: FIB group demonstrated significantly lower pain scores (p0.039), better positioning quality (p0.029), and higher anesthetist (p0.028) and patient satisfaction (p0.038) than dexmedetomidine-ketamine group. Dexmedetomidine-ketamine group showed significantly lower heart rates than FIB group and experienced more systemic side effects, while FIB group only reported three cases of hematoma. **Conclusion**: While both methods demonstrated efficacy, fascia iliaca block offered superior pain control, positioning quality, satisfaction measures, and no systemic side effects compared to intravenous ketamine- dexmedetomidine for positioning fracture femur patients during spinal anesthesia.

Keywords: Fascia iliaca block, Dexmedetomidine, Ketamine, Femur fracture, Spinal anesthesia, Positioning.

Introduction

Femur fractures are common orthopedic emergencies associated with significant morbidity, especially in elderly patients. These fractures typically require surgical intervention, with spinal anesthesia often preferred due to its advantages over general anesthesia(1). However, positioning patients with femur fractures for spinal anesthesia presents a significant challenge, as it can cause severe pain and hemodynamic instability (2).

To address this challenge, various pain management strategies have been explored. Two approaches that have gained attention are the fascia iliaca block (FIB) and the combination of intravenous dexmedetomidine and ketamine. Each method offers unique

benefits and potential drawbacks, making the choice between them a subject of ongoing research.

As a regional anesthetic procedure, the fascia iliaca block anesthetized the femoral, lateral femoral cutaneous, and obturator nerves by injecting local anesthetic between the iliacus and psoas muscles. FIB has gained popularity due to its ease of performance, high success rate, and low risk of complications compared to other regional techniques. Studies have demonstrated its efficacy in providing pain relief for patients with femur fractures and facilitating positioning for spinal anesthesia [(3).]

On the other hand, the combination of intravenous dexmedetomidine and ketamine represents a systemic approach to pain management and patient sedation. Dexmedetomidine, a selective α2-adrenergic agonist, provides sedation, anxiolysis, and analgesia without significant respiratory depression. Ketamine, an NMDA receptor antagonist, offers analgesic and dissociative properties. The combination has shown effectiveness in various clinical scenarios, providing sedation and analgesia with stable hemodynamics [(4).]

The choice between FIB and intravenous dexmedetomidine-ketamine involves considering several factors. FIB offers targeted regional analgesia with no systemic effects but requires technical skill and ultrasound. Intravenous dexmedetomidine and ketamine provide systemic effects that may benefit overall patient comfort but may be associated with systemic side effects [(5)].

Aim of the work

Our study aims to compare the efficacy of ultrasound guided fascia iliaca block versus intravenous dexmedetomidine with ketamine in preventing positional pain during spinal anesthesia in fracture femur patients.

Patients and methods

Following the receipt of written informed consent from patients of both genders, ages forty to eighty years, who are ASA class I to II patients undergoing femur fracture fixation between December 2022 and December 2023, and the approval of the institutional ethical committee. The purpose of this prospective, randomized comparative study was to evaluate the efficacy of intravenous dexmedetomidine and ketamine against fascia iliaca block for the positioning of patients with fractured femurs during spinal anesthesia.

Exclusion criteria:

1- Patient refusal
2- Failed block
3- Bleeding diathesis or history of anticoagulant use.
4- Impaired cognition or dementia
5- Infection of the skin at the site of needle punctures area
6- multiple fractures
7- Addiction
8- Allergy to drug used

Patients' groups:

After getting approval and written informed consent, the patients were randomly allocated into two groups (33 patients in each group), according to computer generated table.

Group A "intravenous dexmedetomidine and ketamine ". Patients received intravenous injection of dexmedetomidine 0.25mic/Kg and ketamine 0.2 mg/kg.

Group B "fascia iliaca block group". Patients received ultrasound guided FI block using bupivacaine in dose 0.5 ml./kg bupivacaine 0.25%.

Preoperative management:

Thorough patient history was taken to rule out any potential medical conditions, therapeutic anticoagulants, chemical allergies, or addiction issues, and a full physical examination was performed to check for any abnormalities in the patient's central nervous system, chest, heart, and abdomen.

Checking the area around the block for signs of infection or abnormalities, Full blood count, coagulation profile, liver, renal function, electrolyte, and random blood sugar testing were all part of the comprehensive laboratory evaluation.

Anesthetic management.

As soon as they entered the operating room, every patient connected to non-invasive arterial blood pressure, pulse oximetry, and five-lead ECG checked. A 20-gauge IV cannula was then inserted, and the patients were given a fluid loading with 250 cc of 0.9% normal saline.

Group A intravenous dexmedetomidine and ketamine "

The patients received intravenous injection of dexmedetomidine 0.25mic/Kg and ketamine 0.2 mg/kg, then the patient was placed in a seated position, sterilization was completed, and spinal anesthesia was administered using a 25-gauge needle at the level L3-4 or L4-5 interspace using the midline approach after free flow of CSF was obtained. Following spinal anesthesia, the patient's hemodynamics were stabilized before any surgical incisions were made.

Group (B): Fascia iliaca block group "FICB"

Before the surgical procedure, a high frequency (6-14 MHz) linear probe is placed transversely in the supine position under sterile conditions to identify the femoral artery at the inguinal crease, the iliopsoas muscle with fascia iliaca covering it, and the hyperechoic femoral nerve, which is typically seen lying between the iliopsoas and fascia iliaca at a depth of 2-4 cm, lateral to the femoral artery. (figure 1)

The probe angled both cranially and caudally to provide the best possible images of the fascia iliaca and femoral nerve. Moving the probe laterally reveals the Anterior Superior Iliac Spine (ASIS), and the triangular-shaped sartorius muscle. Following skin disinfection and local anesthetic (LA) infiltration, an in-plane technique is used to insert blunt-ended needle(gauge18G), with the goal of positioning the needle tip beneath the fascia iliaca around the lateral third of a line between the ASIS and pubic tubercle.

Before injecting 1-2 ml of local anesthetic, aspiration is carried out. Proper needle insertion is verified by the fascia iliaca separating from the iliopsoas muscle, with LA extending medially towards the femoral nerve (FN) and laterally towards the iliac crest. To give the best possible dissemination, volume dose is 0.5 ml/kg bupivacaine 0.25% used with caution to prevent to exceed toxic dose of the LA.

Parameters assessed:

Primary outcome:

Our primary outcome was Behavioral pain scale which assess Pain scores during sitting position (0 = calm, 1 = facial grimacing, 2 = moaning, 3 = screaming, and 4 = unable to proceed because of restlessness or agitation).

Secondary outcomes:

A. Quality of patient's position (zero = poor hip flexion, one = satisfactory hip flexion, two = good hip flexion, and three = optimal hip flexion) was used to describe the quality of posture

B. Anesthetist satisfaction (0= poor, 1= good, 2= very good, 3= excellent)

C. Patient satisfaction (0= poor, 1=good, 2= very good, 3= excellent)

D. Heart rate was recorded at basal line 10 minutes before spinal anesthesia and every 5 minutes to 10 minutes after spinal anesthesia.

E. Respiratory rate and SpO_2 were recorded at basal line 10 minutes before spinal anesthesia and every 5 minutes till 10 minutes after spinal anesthesia.

F.Systolic and diastolic blood pressure were recorded at basal line 10 minutes before spinal anesthesia and every 5 minutes to 10 minutes after spinal anesthesia.

G. Incidence of any side effects in the form of respiratory depression, hypoxia, hematoma.

Sample size calculation:

The sample size for this study was estimated from a previous study result where a mean difference of pain score between the two studied groups was 1.8 with 2.45 standard deviation. Considering the 95% confidence level, 80% power and assumed equality between two groups, a sample size of 30 per group was required.

In order to prevent drop out deviation from the normal 33patients per group required

Statistical analysis

The data was analyzed using the statistical package software IBM SPSS version 25. For quantitative data, the results were presented as the mean plus or minus the standard deviation, while for qualitative data, the results were presented as the frequency and percentage. Quantitative data was compared between the two groups using an Independent Samples T test, and within each group, quantitative data was compared between two times using a Paired Samples T test. In contrast, the qualitative data was compared between the two groups using a chi-square test. A significant P value is less than 0.05.

Results

The study included sixty-six patients; FIB and dexmedetomidine-ketamine patients were split into two equal parallel groups at random, each with thirty-three patients. Three patients were excluded from FIB group (one patient failed block, other had multiple fracture and the last had coagulopathy), while three patients excluded from dexmedetomidine-ketamine group (two patients had dementia and the other had multiple fracture). Statistical analysis was done finally on 60 patients, 30 patients in each group. Figure (2) outlines the study flow chart.

We did not find any statistically significant differences between the two groups (dexmedetomidine-ketamine group and FIB group) in terms of age, weight, gender distribution, and American Society of Anesthesiologists (ASA) physical status classification. This suggests that the two groups were well-matched in terms of demographic and baseline characteristics, which is important for reducing potential confounding factors and ensuring the validity of the study's findings (Table 1).

At baseline, there was no significant difference in heart rate between the two groups, after that dexmedetomidine-ketamine group had a significantly lower heart rate compared to FIB group.

Regarding the systolic and diastolic blood pressure data between the studied groups at different time points (figure 3), Our results show some significant differences between dexmedetomidine-ketamine group and FIB group in systolic blood pressure measurements while diastolic blood pressure showed insignificant differences between the two groups. At the pre-operative time point after drug administration and 10 minutes before spinal anesthesia, dexmedetomidine-ketamine group showed a significant decrease in diastolic blood pressure compared to baseline, while FIB group did not exhibit a significant change (figure 4 and 5).

Systolic blood pressure in FIB group was significantly lower than baseline after 5 minutes post-spinal anesthesia, in contrast to dexmedetomidine-ketamine group which show non-significant change. At the same time, diastolic blood pressure decreased significantly in both groups. Systolic and diastolic blood pressures in both groups decreased significantly after 10 minutes following spinal anesthesia.

Our results regarding the respiratory rate data between the studied groups at two time points show no significant difference between dexmedetomidine-ketamine group and FIB group. However, there was a significant increase in respiratory rate within dexmedetomidine-ketamine group from 5 minutes to 10 minutes after spinal anesthesia, while no significant change was observed within FIB group. The results indicate no significant difference in SpO2 values between the two groups at any time point figure (6).

The results show a statistically significant difference between the two groups, with dexmedetomidine-ketamine group having a higher mean behavioral pain scale (BPS) score compared to FIB group. Regarding the mean scores for the "Quality of Patient Position" during spinal anesthesia, quality of patient position, anesthetist satisfaction, and patient satisfaction for dexmedetomidine-ketamine group and FIB group. The results show a statistically significant difference between the two groups, with FIB group having a higher mean score compared to dexmedetomidine-ketamine group (table 2).

The results indicate that the two groups experienced different types and frequencies of side effects. In the dexmedetomidine and ketamine group, the most common side effects were drowsiness, hypoxia, and respiratory depression. On the other hand, in the fascia iliaca block group, the only observed side effect was hematoma, while no cases of drowsiness, hypoxia, or respiratory depression were reported. In contrast, the fascia iliaca block, being a regional anesthesia technique, is generally associated with no systemic side effects compared to intravenous medications. On the other hand, the risk of hematoma formation, as observed in the fascia iliaca block group (Table 3).

Table 1: Demographic data of studied groups

Variables	Group A (i.v dexmedetomidine-ketamine)	Group B (FIB)	P value
	N=30	N=30	
Age (years): mean ± SD	59.2±15.2	53.0±12.2	*0.089*
Weight (Kg): mean ± SD	70.6±7.3	75.6±11.5	*0.052*
Gender: n (%) **Females** **Males**	 15(50%) 15(50%)	 11(36.7%) 19(63.3%)	*0.297*
ASA: n (%) **I** **II**	 13(43.3%) 17(56.7%)	 9(30%) 21(70%)	*0.284*

- ***Independent Samples T test for quantitative data between the two groups***
- ***Chi square test for qualitative data between the two groups.***
- ***Significant level at P value < 0.05***

Table 2: Behavioral pain scale, quality of patient position, anesthetist satisfaction, and patient satisfaction between studied groups

Variables	Group A (i.v dexmedetomidine-ketamine)	Group B(FIBC)	P value
	N=30	N=30	
Behavioral pain scale	2.3±0.7	0.89±0.2	***0.039****
Quality of patient position	0.98±0.2	2.1±0.6	***0.029****
Anesthetist satisfaction	0.96±0.2	2.2±0.6	***0.028****
Patient satisfaction	0.97±0.3	2.1±0.5	***0.038****

- ***Independent Samples T test for quantitative data between the two groups***
- ***Significant level at P value < 0.05***

Table 3: Side effects between studied groups

Complications	Group A (i.v dexmedetomidine-ketamine)	Group B(FIBC)	P value
	N=30	N=30	
No **Drowsy** **Hematoma** **Hypoxia** **Respiratory depression**	22(73.3%) 4(13.3%) 0(0%) 3(10%) 1(3.3%)	27(90%) 0(0%) 3(10%) 0(0%) 0(0%)	**0.021***

- ***Chi square test for qualitative data between the two groups.***
- ***Significant level at P value < 0.05***

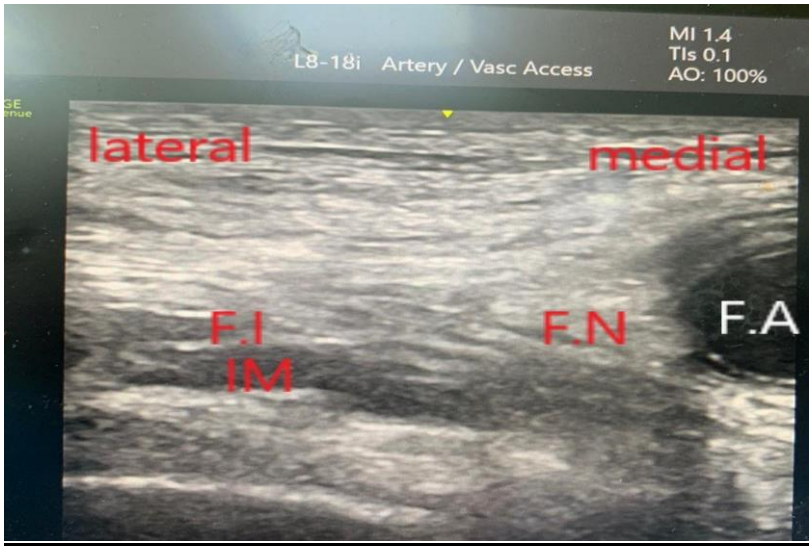

Figure (1): outlines of fascia iliaca compartment
FA (femoral artery) FN (femoral nerve)
FI (fascia iliaca) IM (iliacus muscle)

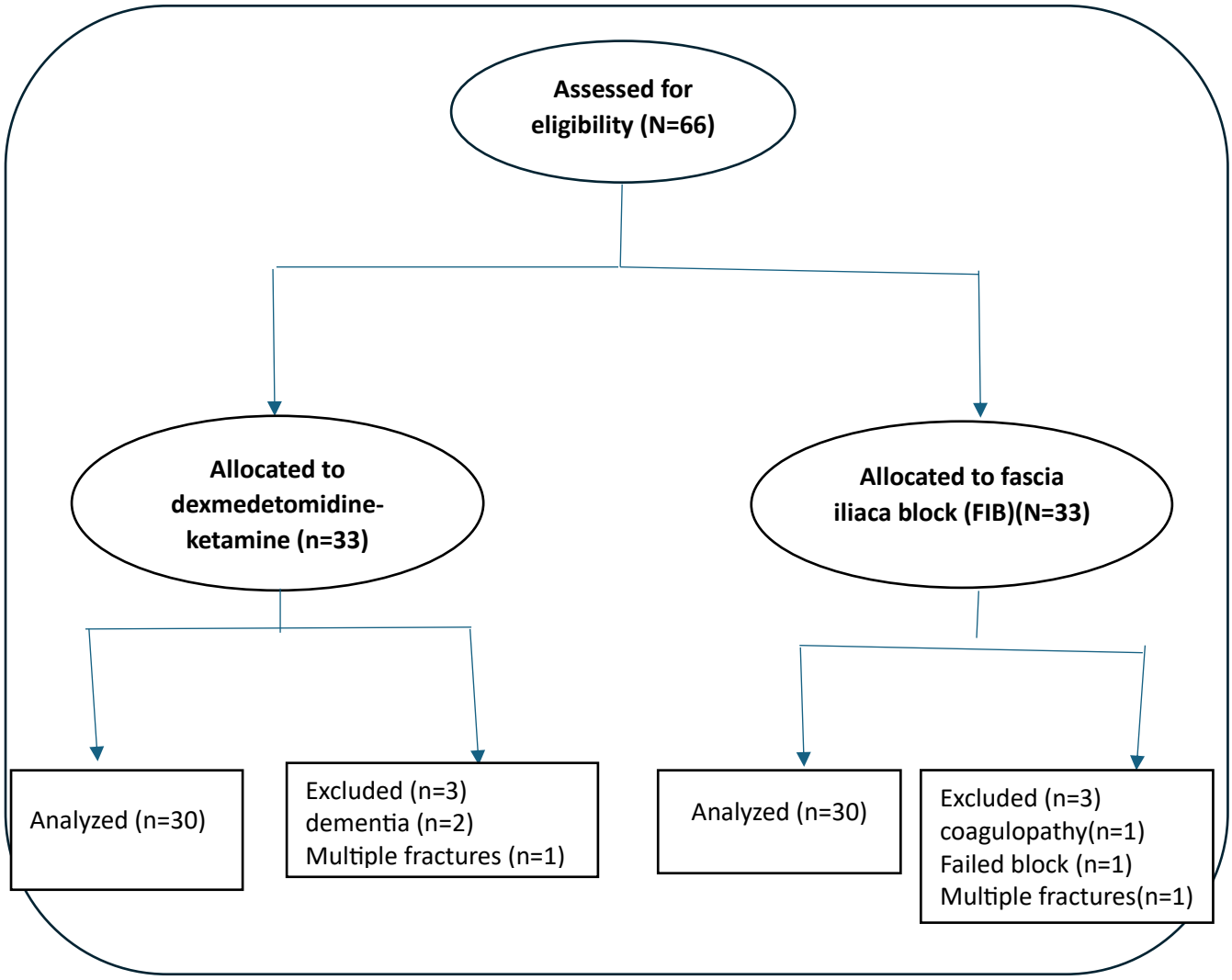

Figure (2): flowchart of the study.

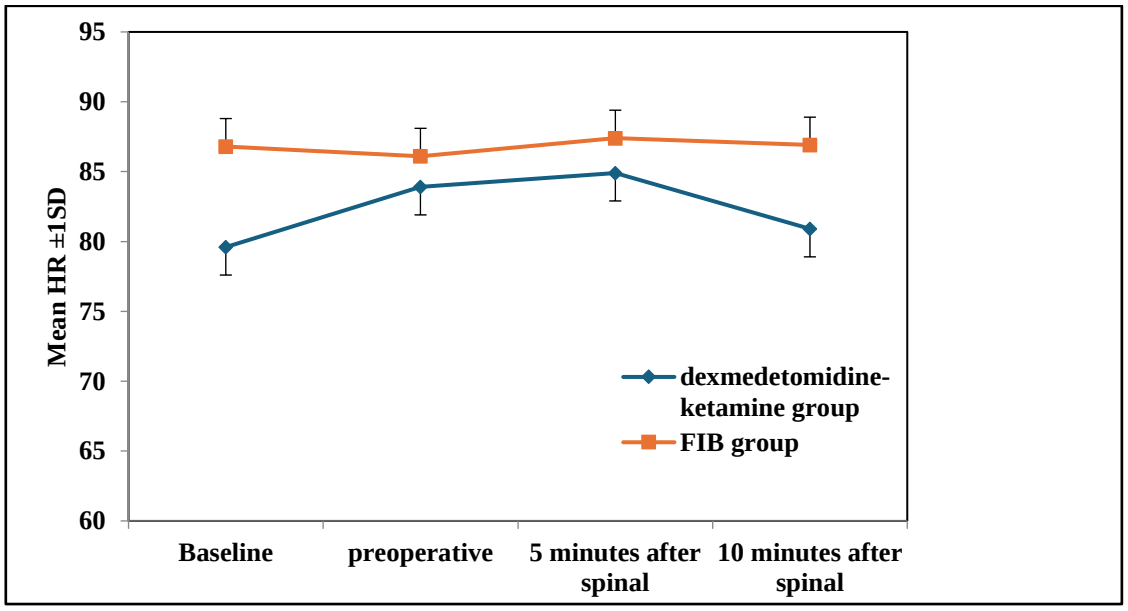

Figure (3): distribution of HR between studied groups

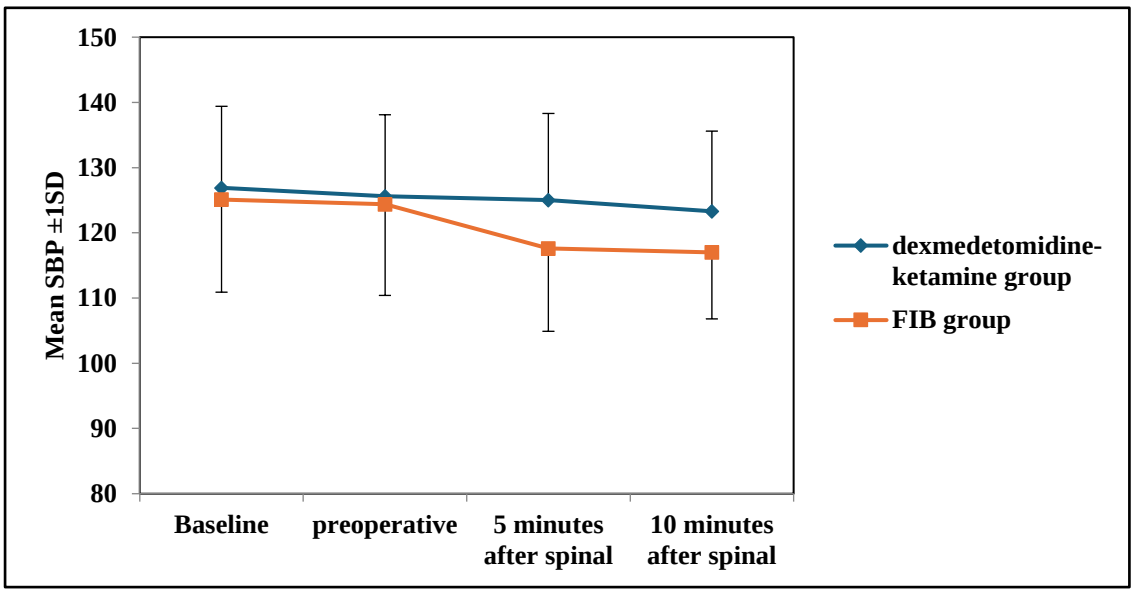

Figure (4): distribution of SBP between studied groups

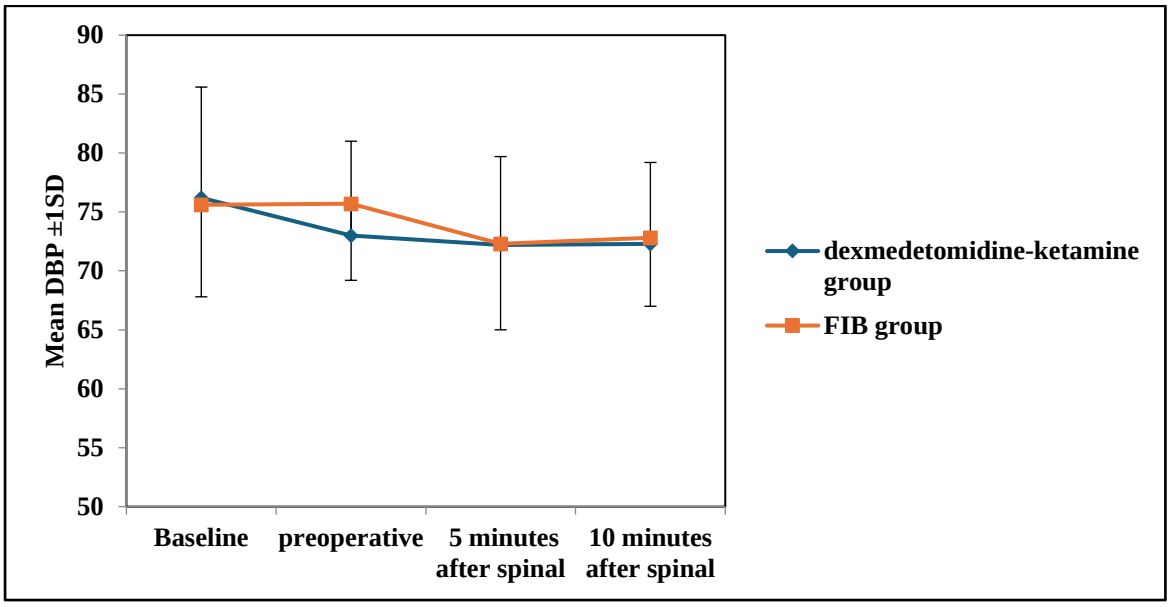

Figure (5): distribution of DBP between studied groups

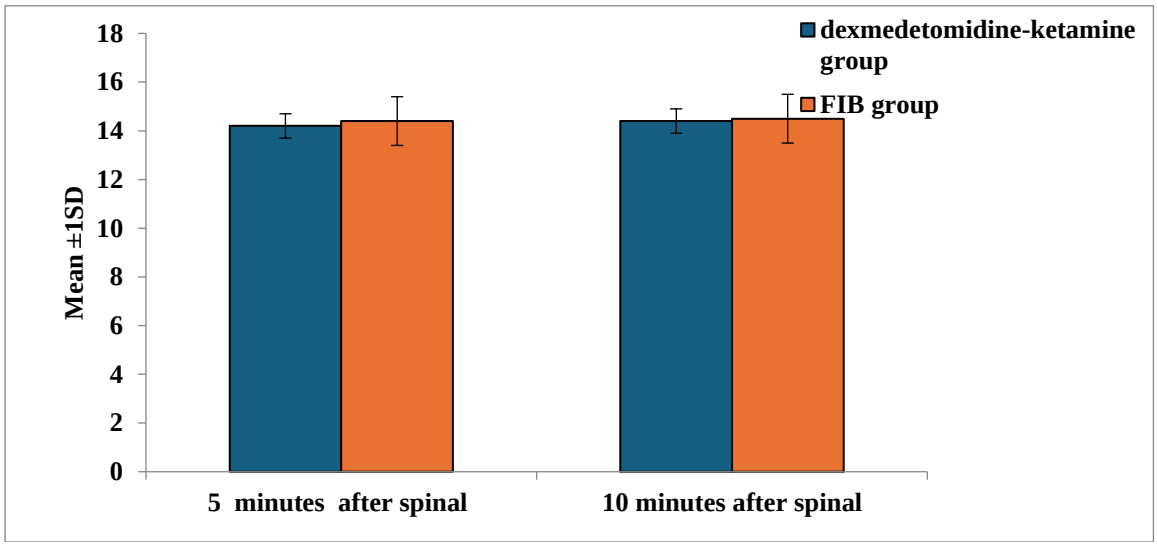

Figure (6): distribution of RR between studied groups

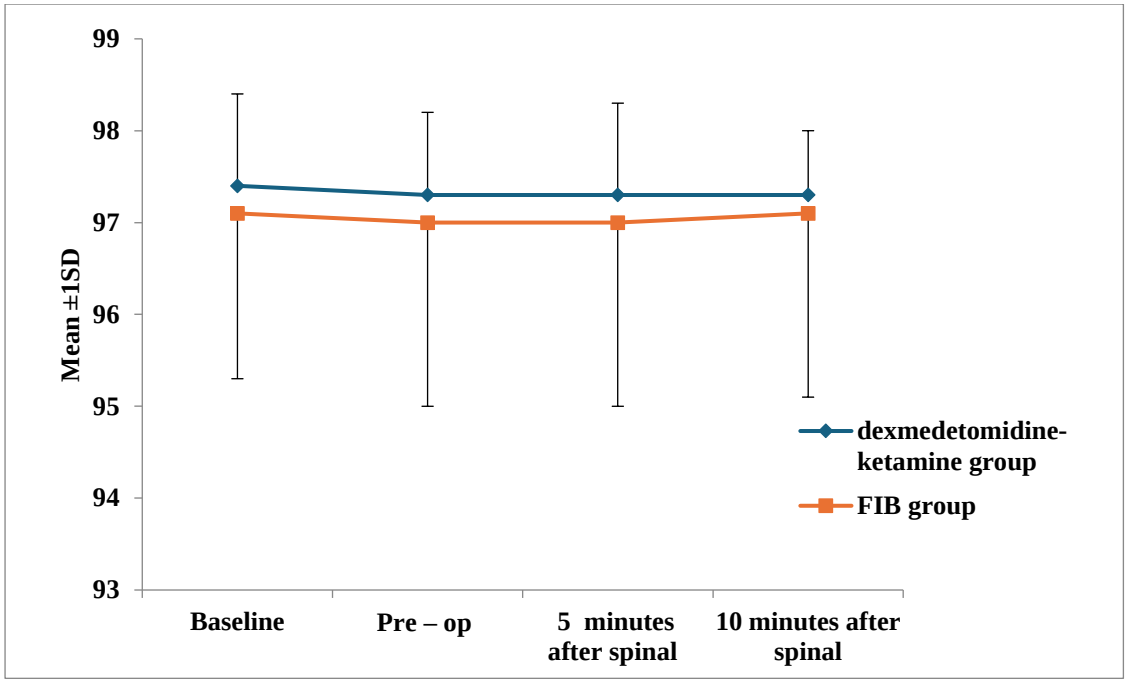

Figure (7): distribution of SPO_2 between studied groups.

Discussion

The primary discovery of our research demonstrated dexmedetomidine-ketamine group had higher mean behavioral pain scale score compared to FIB group with significant p value 0.039,

FIB group had a higher mean score of the "Quality of Patient Position" than dexmedetomidine-ketamine group during spinal anesthesia, which indicates a significant difference between the two groups in terms of patient satisfaction and anesthetist satisfaction.

Patients undergoing spinal anesthesia for procedures involving the lower limbs or hip fractures have reported less discomfort when using a fascia iliaca block for positioning and treatments related to positioning. Studying patients receiving spinal anesthesia for hip fracture surgery, Madabushi et al., (2016) examined the efficacy of intravenous fentanyl and fascia iliaca block on femur fractures. The group who had fascia iliaca block had much less discomfort and far easier positioning than the one that had intravenous fentanyl. [6]

Also, in a study conducted by Lee et al., 2020 who study 46 patients scheduled for proximal femur fracture under spinal anesthesia. Patients were assigned randomly into two groups (ketamine-dexmedetomidine group and fentanyl-dexmedetomidine group). They revealed that ketamine-dexmedetomidine group provide better analgesia and quality of position during spinal anesthesia [7].

Conversely, there have been studies that have shown mixed or even nonexistent differences in pain levels when comparing fascia iliaca block to other analgesic therapies. No significant difference in pain levels was seen between the two groups during positioning or after surgery, according to a randomized controlled experiment by Foss et al., (2007) In that study 48 patients with probable hip fractures were enrolled, and they were split into two groups of 24 at random. Patients receiving a placebo intramuscular injection of isotonic saline in addition to a FIB containing 1.0% mepivacaine were included in the FIB group. A placebo FIB containing 0.9% saline and an intramuscular injection of 0.1 mg/kg morphine were administered to the participants in the morphine group [8]. This discrepancy in outcomes could be caused by using different medications (such as morphine) than what we did in our trial.

Regarding the mean scores for the "Quality of Patient Position" during spinal anesthesia.

Several studies support the efficacy of fascia iliaca block in improving patient positioning and ease of positioning during spinal anesthesia, particularly in patients undergoing lower limb surgeries or with hip fractures. A study by Abdelaziz et al., (2023) reported significantly better positioning scores and reduced need for additional analgesics in the fascia iliaca block group compared to the intravenous fentanyl group. [9]

On the other hand, some studies have reported conflicting results or no significant difference in positioning quality or ease between fascia iliaca block and other interventions. A study by Nisarga and Kannan (2021) in which Fifty patients were assigned to one of the two groups: group A (receiving FIB, n=25) and group B (receiving QLB, n=25), found no significant difference in positioning quality between the two groups [10]. These conflicting results may refer to small samples size and use of different block techniques.

As regarding the mean scores for "Anesthetist Satisfaction" during spinal anesthesia. Several studies support the use of fascia iliaca block in improving anesthetist satisfaction and ease of performing regional anesthesia, particularly in patients undergoing lower limb surgeries or with hip fractures. Gupta and Kamath (2020) conducted a randomized controlled experiment in which patients were randomly assigned to one of two groups using convenience non-probability sampling. There were 35 participants in fascia iliaca block group (FIB) and 35 participants in femoral nerve block group (FNB); the former group got a 0.25% bupivacaine FIB while the latter group received FNB. In the group that had fascia iliaca blocks rather than femoral nerve blocks, they were far more satisfied with the anesthesiologist [11]. In contrast to other therapies, fascia iliaca blocks have shown mixed or no significant change in anesthetist satisfaction in some trials. Study by Nisarga and Kannan (2021) found no significant difference in anesthetist satisfaction between the two groups. The assessment of anesthetist satisfaction can be subjective and may depend on the specific scoring system or criteria used in each study. Additionally, factors such as the timing of block administration, the dosage used, and the presence of pre-existing conditions may influence the ease of performing regional anesthesia and, consequently, the anesthetist's satisfaction [10]

Our results indicate that patients who received the fascia iliaca block had significantly higher satisfaction scores compared to those who received intravenous dexmedetomidine and ketamine. These findings are in line with several previous studies that have demonstrated the efficacy of fascia iliaca block in improving patient satisfaction and comfort during positioning for spinal anesthesia in fracture femur patients. For instance, a study by Bantie et al., (2022) seventy-two male and female patients ranging in age from eighteen to sixty-five years old who were scheduled for femur operations and had American Society of Anesthesiologists (ASA) physical status I to II. The patients were randomly assigned to one of three equal groups, fentanyl group, fascia iliaca block group (FIB) and femoral nerve block group (FNB). FIB and FNB groups reported higher levels of patient satisfaction and positioning during spinal anesthesia compared to fentanyl group [12]. Also, Hsu et al., (2018) reported that FIB improve quality of patient position during spinal anesthesia which in turn decrease time need for spinal anesthesia compared to intravenous analgesic group in a study comprised one hundred and forty-one patients scheduled to femur fracture under spinal anesthesia [13].

A study by Nisarga and Kannan (2021) found no significant difference in patient satisfaction scores between patients who received quadratus lumborum block and those who received fascia iliaca block for positioning during spinal anesthesia. The assessment of patient satisfaction can be influenced by various factors, such as the effectiveness of pain management, the overall experience during the procedure, and individual patient expectations. Additionally, the use of different scoring systems or criteria for assessing patient satisfaction may contribute to variations in the reported results. [10]

Our results indicate that the two groups experienced different types and frequencies of side effects. The findings of this study are consistent with previous research that has compared the side effect profiles of intravenous analgesia and regional anesthesia techniques

for positioning during spinal anesthesia. Eighty patients scheduled for femur operations were randomly assigned to have ultrasound-guided FIB, according to research conducted by Sivakumar et al., (2018). The intravenous group (ID) was given FIB (40 mL of 0.25% bupivacaine mixed with 2 mL of 0.9%) then, i.v dexmedetomidine first as a loading dose of 1 µg/kg over 30 minutes, and then as a maintenance dosage of 0.5 µg/kg/h until the operation was completed. for FIB Forty milliliters of 0.25% bupivacaine and two milliliters of 1 µg/kg dexmedetomidine were administered to the perineural group (LD). Compared to individuals who had a fascia iliaca block, those who received intravenous dexmedetomidine were more likely to have respiratory depression and hypoxia [14]. On the other hand, a randomized controlled trial by Korra et al., (2020) found no significant difference in the incidence of side effects between patients who received intravenous fentanyl and those who received a fascia iliaca block for positioning during spinal anesthesia. The incidence and severity of side effects may depend on various factors, such as the specific drugs used, dosages, patient comorbidities, and the presence of underlying respiratory or cardiovascular conditions. Additionally, the use of different criteria or definitions for side effects may contribute to variations in the reported results across studies [15].

The heart rate data between the studied groups was measured at different time points. At baseline, there was no significant difference in heart rate between the two groups, after that dexmedetomidine-ketamine group had a significantly lower heart rate compared to FIB group. Several studies have reported similar observations, with dexmedetomidine being associated with a reduction in heart rate due to its sympatholytic effects. A randomized controlled trial by Ge et al., (2015) in which they compare the effect of dexmedetomidine (38 patients) versus Saline (37 patients) in abdominal colectomy operation, they found a significant decrease in heart rate in the dexmedetomidine group compared to the control group, particularly in the early post-operative period [16]. Similar to this, Korra et al., (2020) conducted a single blinded, randomized research with 60 ASA grade I and II patients between the ages of 18 and 70 who were undergoing femur fracture operations under spinal anesthesia. Two groups of thirty patients each were randomly assigned to the patients. Group FIB: Before surgery, an ultrasound-guided fascia iliaca compartment block was performed using 30 milliliters of 0.25% bupivacaine. Fifteen minutes ahead of schedule, the subarachnoid block was finished. Fentanyl was infused intravenously into Group FENT prior to surgery at a dose of two micrograms per kilogram of assessed body weight. They observed a significant decrease in heart rate between the fentanyl and fascia iliaca block groups [15].

Information of the experimental groups variously obtained systolic and diastolic blood pressure readings. Groups A and B diastolic blood pressure readings did not differ statistically significantly from one another; however, their systolic blood pressure readings did.

Some studies have reported conflicting results regarding the impact of dexmedetomidine and ketamine on blood pressure during spinal anesthesia. A study by Korra et al., (2020) found no significant difference in systolic and diastolic blood pressure between the fascia iliaca block group and the IV fentanyl group in patients undergoing lower limb surgeries. This may be due to different sample size and use of fentanyl in the control group and the use of other medications, and the presence of surgical stimuli can also influence blood pressure response [15].

Several studies have reported similar observations, with dexmedetomidine being associated with a reduction in blood pressure, particularly diastolic blood pressure, due to its sympatholytic effects.

Ge et al., (2015) discovered that the dexmedetomidine group significantly lowered their blood pressure compared to the control group, especially in the early post-operative period, in a randomized controlled experiment. [16] It is important to note that the effects of dexmedetomidine and ketamine on blood pressure can vary depending on factors such as dosage, timing of administration, hydration status, and patient-specific factors like age, comorbidities, and baseline cardiovascular status.

We found no statistically significant difference in the respiratory rate data between the two groups under study. Zhan et al., (2021) assessed the impact of dexmedetomidine on surgical patients' respiratory performance by a comprehensive review and meta-analysis. The association between dexmedetomidine and a marginally elevated risk of respiratory depression was discovered, yet it was unclear what this meant in terms of therapeutic implications [17].

Conclusion

In conclusion, while both methods demonstrate efficacy in facilitating spinal anesthesia for fracture femur patients, the fascia iliaca block appears to offer a superior profile in terms of pain control, positioning quality, satisfaction measures, and side effect management.

References

1. Luger, T. J., Kammerlander, C., Gosch, M., Luger, M. F., Kammerlander-Knauer, U., Roth, T., & Kreutziger, J. Neuroaxial versus general anaesthesia in geriatric patients for hip fracture surgery: does it matter?. Osteoporosis international, (2010). 21, 555-572.
2. Sandby-Thomas, M., Sullivan, G., & Hall, J. E. A national survey into the peri-operative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur. Anaesthesia, (2008). 63(3), 250-258.
3. Callear, J., & Shah, K. Analgesia in hip fractures. Do fascia-iliac blocks make any difference?. BMJ Open Quality, (2016). 5(1), u210130-w4147.
4. Sinha, S. K., Joshiraj, B., Chaudhary, L., Hayaran, N., Kaur, M., & Jain, A. A comparison of dexmedetomidine plus ketamine combination with dexmedetomidine alone for awake fiberoptic nasotracheal intubation: a randomized controlled study. Journal of Anaesthesiology Clinical Pharmacology, (2014). 30(4), 514-519.
5. Patel, A., Davidson, M., Tran, M. C., Quraishi, H., Schoenberg, C., Sant, M., ... & Sun, X. Dexmedetomidine infusion for analgesia and prevention of emergence agitation in children with obstructive sleep apnea syndrome undergoing tonsillectomy and adenoidectomy. Anesthesia & Analgesia, (2010). 111(4), 1004-1010.
6. Madabushi, R., Rajappa, G. C., Thammanna, P. P., & Iyer, S. S. Fascia iliaca block vs intravenous fentanyl as an analgesic technique before positioning for spinal anesthesia in patients undergoing surgery for femur fractures—a randomized trial. Journal of clinical anesthesia, (2016). 35, 398-403.
7. Lee KH, Lee SJ, Park JH, Kim SH, Lee H, Oh DS, et al., Analgesia for spinal anesthesia positioning in elderly patients with proximal femoral fractures: Dexmedetomidine-ketamine versus dexmedetomidine-fentanyl. Medicine (Baltimore). 2020;99(20):e20001.
8. Foss, N. B., Kristensen, B. B., Bundgaard, M., Bak, M., Heiring, C., Virkelyst, C., & Kehlet, H. Fascia iliaca compartment blockade for acute pain control in hip fracture patients: a randomized, placebo-controlled trial. The Journal of the American Society of Anesthesio-logists, (2007). 106(4), 773-778.
9. Abdelaziz MS, Hakim KYK, Ibraheem PNA, Mohamed MA. Fascia Iliaca Block versus Intra-Venous Analgesia for Positioning of Neck Femur Fracture in Patient Undergoing Spinal Anathesia. QJM: An International Journal of Medicine. 2023; 116 (Supplement_1): hcad 069. 48.
10. Nisarga, R., & Kannan, S. Comparison of Pre-Operative Ultrasound Guided Fascia Iliaca Block and Quadratus Lumborum Block for Reduction of Pain During Positioning for Spinal Anaesthesia and Post-Operative Analgesia in Patients with Femoral Neck Fracture. RGUHS Journal of Medical Sciences, (2021). 11(4).
11. Gupta, M., & Kamath, S. S. Comparison of preoperative ultrasound guided fascia iliaca block versus femoral nerve block for proximal femur fractures before positionning for spinal anesthesia: an observational study. The Korean Journal of Pain, (2020). 33(2), 138-143.
12. Bantie M, Mola S, Girma T, Aweke Z, Neme D, Zemedkun A. Comparing analgesic effect of intravenous fentanyl, femoral nerve block and fascia iliaca block during spinal anesthesia positioning in elective adult patients undergoing femoral fracture surgery: a randomized controlled trial. Journal of pain research.2020:3139-46.
13. Hsu Y-P, Hsu C-W, Bai C-H, Cheng S-W, Chen C. Fascia iliaca compartment block

versus intravenous analgesic for positionning of femur fracture patients before a spinal block: A PRISMA-compliant meta-analysis. Medicine (Baltimore). 2018; 97(49):e13502.
14. Sivakumar, R. K., Panneerselvam, S., Cherian, A., Rudingwa, P., & Menon, J. Perineural vs. intravenous dexmedetomidine as an adjunct to bupivacaine in ultrasound guided fascia iliaca compartment block for femur surgeries: A randomised control trial. Indian Journal of Anaesthesia, (2018). 62(11), 851-857.
15. Korra, A. N., Brahmaroutu, R. K., & Rao, A. K. Comparative evaluation between fascia iliaca compartment block and intravenous fentanyl administration for painless positioning during spinal Anaesthesia in fracture femur surgeries: A randomized controlled study. IJMA, (2020). 3(1), 306-310.
16. Ge, D. J., Qi, B., Tang, G., & Li, J. Y. Intraoperative dexmedetomidine promotes postoperative analgesia in patients after abdominal colectomy: a consort-prospective, randomized, controlled clinical trial. Medicine, (2015). 94(37), e1514.
17. Zhan, Y., Yang, L., Li, Y., Guo, Y., Yuan, C., & Wen, Z. Effects of dexmedetomidine on respiratory function in patients undergoing surgery: A systematic review and meta-analysis. International Journal of Surgery, (2021). 94, 106112.