*Original Research Article*

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# Femoral Nerve Block Versus Intravenous Fentanyl for Positioning During Central Neuraxial Block: A Comparitive Study

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**Abstract**

*Background:* Fracture of the femur is a common orthopaedic problem following trauma in patients of all ages. This study was undertaken to compare the effectiveness of intravenous (IV) fentanyl with femoral nerve block (FNB) in positioning the patients for combined spinal epidural anesthesia (CSE).

*Methods:* 100 patients between the ages 25 to 75 years, of ASA grade I, II and III, scheduled for elective surgeries of femur fracture were evaluated in 2 groups. Group-1 (n=50) received femoral nerve block with 15ml of 1.5% lignocaine and Group-2 (n=50) patients received one dose of IV fentanyl 1µg/kg. Assessment of pain was carried out using visual analog scale (VAS). This was rated before, during and after the procedure of positioning for spinal/combined spinal epidural anesthesia (CSE). Vital parameters were tabulated.

*Results:* VAS scores were noted at 0, 2, 5,10,15 minutes and at the time of positioning. The average VAS scores at 15 minutes in Group-1 was 1.47 and 3.82 in patients in Group-2. Time taken for CSE was significantly less in Group-1 (13.02 minutes) as compared to Group-2 (19.66 minutes). Patient satisfaction scores were significantly higher in Group-1 (45/50) 1.49 as compared to non Group-2 (10/50) 0.34. Quality of patient positioning was better in Group-1 (2.78) as compared to Group-2 (1.38).

*Conclusions:* This study concludes that FNB is highly effective in giving good pain relief for positioning for regional anaesthetic procedures improving performance time and offers higher acceptance among patients with femoral fractures as compared to IV fentanyl.

**Keywords:** Combined Spinal Epidural; Femoral Nerve Block; Fentanyl; Fracture Femur; Positioning.

## Introduction

Femur fractures are are at a rise due to trauma in all age group patients. In elderly patients it leads to severe pain and considerable morbidity [1]. Patients with fracture of the femur present special problems to the anesthesiologist. The femoral shaft is subjected to major muscle forces that, especially in young patients, can deform the hip and/or thigh and angulate the bone fragments, and hence is challenging for the orthopaedic surgeon to attain reduction of the fracture [2]. Therefore, absolute muscle relaxation is required for the same. For this purpose, spinal or epidural anesthesia is routinely used in these patients. A proper positioning of the patient is required for a successful central neuraxial block. Inability of the patient to properly position the limb and extreme pain at the fracture site poses a challenge for the anaesthesiologist in terms of ideal positioning for CSE [3]. Also, any overriding of the fracture ends causes deformity and is extremely painful. Delay in positioning further aggravates pain. Administration of epidural requires relatively longer time hence positioning for patients becomes more problematic. Hence the procedure of patient

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positioning to perform a spinal block, in most cases, requires the administration of IV analgesics [4].

Several modalities like intravenous (IV) fentanyl, femoral nerve block (FNB) or fascia iliac block with local anaesthetic have been tried so as to reduce the pain and improve the positioning of these patients for CSE [4,5]. Few studies have demonstrated that a fascia iliac compartment (FIC) block provides effective analgesia for a fractured femur in terms of facilitating an adequate position for spinal anaesthesia or when administered either during pre-hospital management or in emergency departments [6-8].

Systemic analgesics, such as narcotics, are commonly used, but their morbid side effects including respiratory depression, cognitive impairment, vomiting, urinary retention etc limits their clinical utility, especially in injuries of the head, chest, or abdomen [9-11]. Various studies in the recent times have suggested that the use of femoral nerve block (FNB) using local anaesthetics. It was in fact found to be a safe and effective method [12,13].

Although femoral nerve block is one of the easiest peripheral nerve blocks to perform because the landmarks are easy to identify and the nerve is usually superficial yet the anaesthesiologist must be aware of possible risks and complications of the procedure if not done correctly. Possible complications included vascular puncture, hematoma, difficulty weight bearing/ mobilizing leading to falls and injuries [14,15]. We conducted this study to compare the analgesic effect provided by FNB with IV fentanyl prior to positioning for combined spinal epidural block in patients who are posted for the femur fracture surgery.

## Materials & Methods

After the approval of institutional ethics committee and with the informed consent, a prospective randomized double blinded study was conducted from June 2017 to December 2017. 100 patients of both sexes who were posted for femur fracture surgery between the age group of 25 to 75 years, with ASA I, II and III were included in the study. Fracture types were graded by one senior orthopedic surgeon.

Type of fractures were as shown in Figure 1. Patients were randomised into 2 groups using computer generated random number. Each group comprised 50 patients each. In Group-1 patients were given FNB before positioning for combined spinal epidural block, while in Group-2 patients were given IV fentanyl 1μg/kg 5 minutes prior to combined spinal epidural block. Patients with multiple fractures, polytrauma, peripheral neuropathy, bleeding disorders, mental disorders, neurological deficits which might hinder proper assessment during block, any allergy to study drugs were excluded from study.

Patients were asked to stay nil orally for six hours. They received a premedication with tablet Ranitidine 150 mg and tablet Alprazolam 0.5 mg at bed time. On the morning of surgery all patients had peripheral IV access with 18-gauge cannula and received an infusion with ringer lactate at a rate of 15ml/kg. Standard multipara monitor connected and electrocardiography, pulse rate, $SpO_2$, respiratory rate and non-invasive blood pressure measurement recorded. All patients were supplied with oxygen (5L/min) via a face mask.

No premedication or sedation was given. Femoral nerve blocks were administered in the anaesthesia induction room, which was adequately equipped with resuscitation equipment. All the patients were explained about the FNB procedure and also about the scoring of VAS (visual analogue score).

The blocks were given by the blind technique by loss of resistance after confirming paraesthesia. The patient was positioned supine, the anterior superior iliac spine and the pubic symphysis were marked. The line joining these 2 landmarks represents the inguinal ligament. The landmark for the femoral nerve is the center of this line where the needle is placed. Then the femoral pulse was palpated and marked.

A 23-gauge needle was used in this study and was inserted directly lateral (1-1.5 cm) to the artery in the inguinal crease. At this location, the femoral nerve is wide and superficial, and easier to pass the needle as the muscle mass is less. The needle is directed upwards toward the center of the inguinal ligament, paraesthesias elicited and the drug was injected. 15 ml of lignocaine 1.5% was injected slowly after a negative aspiration keeping the needle steady at the point of eliciting paraesthesia in the thigh. In this study 2% lignocaine was used for FNB, which was diluted to make the drug concentration 1.5% of lignocaine.

The relief of pain following FNB was assessed quantitatively using visual analog scale (VAS) (0-no pain to 10-worst pain) and satisfaction score (Table 1) at interval of 2 minutes, 5 minutes, 10 minutes, and 15 minutes. Then, patients were shifted

to the operating room and combined spinal epidural performed in sitting position after 15 minutes of giving FNB while checking VAS during positioning. After confirming the appropriate interspace, 2% lignocaine (3 ml) was injected, followed by insertion of 18 gauge Tuohy's needle in the epidural space which was confirmed by the loss of resistance to air technique.

Test dose of 3 ml lignocaine with adrenaline was given through the epidural catheter while closely monitoring the heart rate. The subarachnoid block was then performed using 25 gauge Quincke's needle one level below the insertion of the epidural catheter and 3 ml of 0.5% bupivacaine was injected into the space after obtaining a clear flow of cerebrospinal fluid. Time to perform spinal anesthesia was noted. Intra operatively the time of onset, maximum level and duration of sensory block were recorded.

In patients, wherein IV fentanyl was used were directly shifted to the operation room for the central neuraxial block in sitting position. IV fentanyl was given 5 minutes prior to the neuraxial block. VAS score was noted during positioning for the central neuraxial block. Time to perform combined spinal epidural block was noted in both groups, starting from positioning for the spinal block till the patient is made supine after the combined block. Patients acceptance and satisfaction scores were noted.

## Results

Demographic data in both the groups were comparable (Table 2). VAS values were checked regularly just before FNB/IV fentanyl (T0), then 2 minutes, 5 minutes, 10 minutes, 15 minutes after FNB (T2, T5, T10, T15) and during positioning of the patient.

Group I (FNB group) 1.473±0.1639 had lower VAS scores compared to Group II (IV fentanyl) 3.820±0.3615 and the difference was statistically significant ($P < 0.001$) as shown in Table 3. Satisfaction score was better in Group I when compared with Group II always (1.4952±0.033 versus 0.3460±0.1786).

**Table 1:** Satisfaction scores

| Visual Analog scale (VAS) | Satisfaction score |
|---|---|
| 0 | Not Satisfactory |
| 1 | Satisfactory |
| 2 | Good |
| 3 | Optimal |

**Table 2:** Demographic data of the patients in both groups

| | Group-1 | Group-2 |
|---|---|---|
| No. of patients | 50 | 50 |
| Mean age (years) | 58 | 57 |
| Sex (M/F) | 28/22 | 27/23 |
| ASA (1/2/3) | 9/22/19 | 10/28/12 |
| | **Site of fracture** | |
| Neck of femur | 28 | 30 |
| Inter-trochanteric | 10 | 12 |
| Sub-trochanteric | 3 | 1 |
| Shaft of femur | 9 | 7 |

**Table 3:** Summary of results of the procedure

| | Group-1 (n=50) | Group-2 (n=50) | P-value |
|---|---|---|---|
| VAS at T0 | 7.202±0.3560 | 7.294±0.3793 | 0.214(NS) |
| VAS at T2 | 5.554±0.2358 | 6.280±0.3511 | 0.014*(HS) |
| VAS at T5 | 3.384±0.1920 | 5.66±0.3837 | <0.001*(HS) |
| VAS at T10 | 1.736±0.1535 | 5.382±0.4154 | <0.001*(HS) |
| VAS at T15 | 0.768±0.1491 | 3.820±0.4552 | <0.001*(HS) |
| VAS during positioning | 1.474±0.1639 | 5.250±0.3615 | <0.001*(HS) |
| Quality of patient positioning (0-3) | 2.782±0.1273 | 1.382±0.2413 | <0.001*(HS) |
| Mean satisfaction scores (0-1.8) | 1.4952±0.0333 | 0.3760+0.17867 | <0.001*(HS) |
| Time for anesthesia (minute) | 13.026±0.4628 | 19.660±0.3742 | <0.001*(HS) |

*Significance value is 0.000; HS=highly significant; NS=not significant.

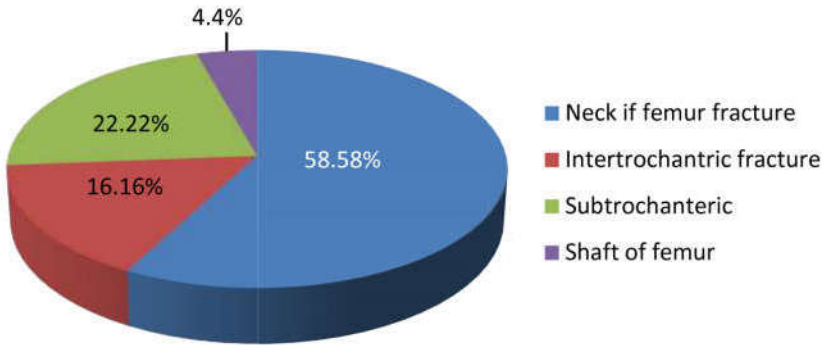


**Fig. 1:** Type of fractures in study groups

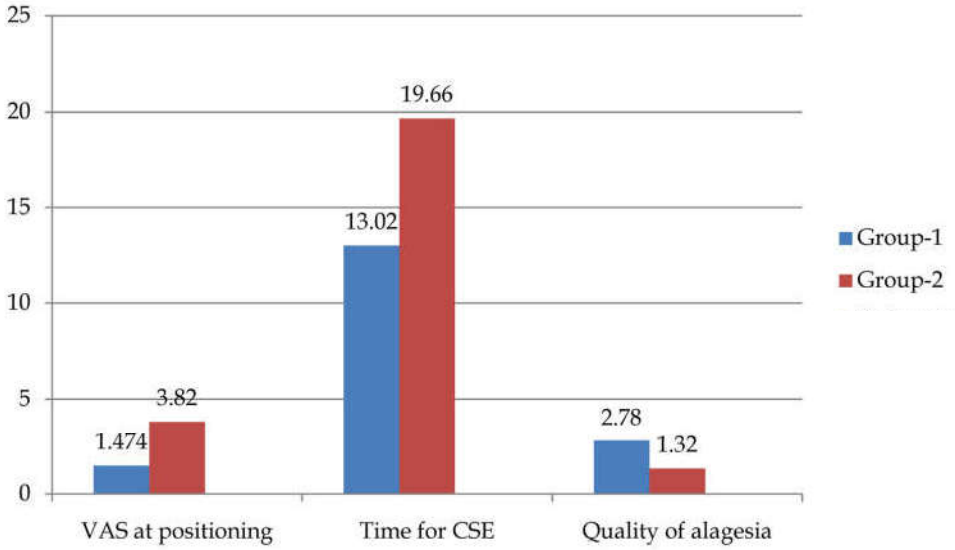


**Fig. 2:** Comparison of VAS at positioning (0-10), time for CSE (minute), quality of analgesia (0-3)

Time to perform spinal-epidural anesthesia was shorter in Group I versus Group II ($P < 0.001$) (13.026±0.4628 minutes versus 19.660±0.3742 minutes).

Quality of patient positioning for spinal anesthesia was higher in Group-1 (2.782±0.1273 as compared to Group-2 (1.382±0.2473) (Figure 2).

There was no significant difference in intra-operative hemodynamic parameters and post-operative complications between the two groups. No patients had signs of drug toxicity.

## Discussion

Central neuraxial anaesthesia is the most accepted and preferred technique of anaesthesia for surgery of fracture femur [16]. They have several advantages, the biggest of which is that the patients can be mobilised early, because of which there is a very less chance of deep vein thrombosis and mortality [17,18].

The major drawback of the CSE block is the pain during positioning for the block in patients with femur fractures, which become even worser if the patients are obese. Previously FNB has been successful in providing analgesia in patients with femoral shaft fracture. We studied the analgesic effect of the FNB to ensure proper positioning for regional techniques of CSE in comparison with IV fentanyl.

Sandby Thomas et al reported that midazolam, ketamine, and propofol, fentanyl, remifentanil, morphine, nitrous oxide, and sevoflurane are commonly used drugs to help in positioning for central neuraxial block [16]. Previously nerve blocks were infrequently used to aid positioning in spinal-epidural block. There is sufficient data to show the

usefulness of FNB in terms of analgesia in caes of fracture of the femur, which has now prompted to use the same for positioning during central neuraxial blockade as well [3,4,12,19-22].

Femoral nerve block can be performed using peripheral nerve stimulator, ultrasound guided technique or by loss of resistance technique. Geier KO concluded that there were no significant differences regarding efficiency between loss of resistance and peripheral nerve stimulator methods [25]. In present study we used blind technique that is loss of resistance and by eliciting paresthesia as shown by Khoo [26].

Sia et al compared IV fentanyl with FNB using lidocaine [4]. VAS values during placement in the sitting position were lower in the FNB group (0.5±0.5 versus 3.3±1.4 for FNB and IV fentanyl, respectively). Mosaffa et al compared IV fentanyl with fascia iliaca block using lidocaine.5 VAS values during placement in the lateral decubitus position were lower in the fascia iliaca block group [0.5 (0–1) versus 4 (2–6) for fascia iliaca block and IV fentanyl, respectively].

The results of this prospective, randomized study demonstrate that FNB using 15 ml of 1.5% lignocaine provided better pain relief prior to positioning of patients with fractured femur for the combined spinal epidural block. The VAS score and patient satisfaction was better in patients with FNB Block than those with IV fentanyl while positioning for combined spinal epidural block. We also found that the time required for the epidural block was less in FNB group patients than IV fentanyl group patients.

Bhoslse, Durranni et al also found similar results in their studies [1,14]. Also, many authors while comparing FNB with other modalities for positioning for central neuraxial block found FNB to be superior to all other modalities [3,4,6,12,14]. The drug used for the block also has a significant difference on the duration and results as shown in study conducted by Iamaroon et al, did not find much advantage of FNB over other modalities as bupivacaine was used instead of lignocaine. The effect of lignocaine in FNB comes in 5 minutes.

However, onset of analgesic effect of bupivacaine is variable and may take 25-30 minutes for full effect [5,23,24]. In this study FNB was performed with 1.5% lignocaine and time to onset was 5 min with a peak at 12 minutes. It is due to the fact that as FNB produces relaxation of the quadriceps and hence provided adequate pain relief for positioning and hence a shorter time to perform central neuraxial block [7]. Similarly, A five minute interval between T0 and the performance of CSE was chosen to maximize the analgesic effect of fentanyl [27]. Also the dosage of fentanyl was chosen to obtain potent, short-lasting analgesia with minimal side effects [27].

Arissara Iamaroon et al, in their comparative study found no significant difference between IV fentanyl and FNB in positioning for CSE block [22]. They also advocated utility of a multimodal approach (FNB + IV fentanyl) as a possible option for pain relief during positioning. In another study by Sia et al, they found that patients who received FNB had a slight better analgesia than those who received IV fentany l.4 Several authors have used two doses of IV fentanyl at 0.5-1 μg/kg with a five-minute interval between doses. But they have encountered potential adverse effects due to the same. In our study we used only a single dose of 1 μg/kg of IV fentanyl and we did not encounter any adverse events due to the same [4,22].

The major limitation of the study was that the anaesthesiologist who performed the FNB or who administered IV fentanyl proceeded with CSE block and recorded the VAS scores. So they were not blinded and hence there can be observer bias which might have a slight affect on the final outcome of our results.

## Conclusion

FNB before central neuraxial block reduces VAS score, improves satisfaction rates, lower duration for epidural bock and improves quality of patient positioning as compared to those who received IV fentanyl for positioning for central neuraxial block.

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