POSITIONING OF FRACTURE FEMUR PATIENTS FOR SPINAL ANESTHESIA: FEMORAL NERVE BLOCK OR INTRAVENOUS FENTANYL?

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ABSTRACT

Background: Fracture of the femur is a common, but extremely painful bone injury. Anaesthesiologists face the common problem of improper positioning of the patient while giving sitting spinal due to their extreme pain.

Methods: After Institutional Ethical Committee (IEC) clearance, 60 American Society of Anaesthesiologists (ASA) I/II patients age 18 to 80 years with fracture femur were recruited. Patients in Femoral Nerve Block (FNB) group received ultrasound-guided FNB was given with 15 mL of 1% lignocaine after visualizing the femoral nerve. Patients in the fentanyl group received injection fentanyl 1μg/kg IV. The target was to reduce the Visual Analog Scale (VAS) score less than 4. If despite the intervention, VAS was more than 4, a repeat fentanyl dose (0.5μg/kg) was given.

Results: Mean VAS during positioning was 1.57 in FNB versus 2.93 in the fentanyl group (p<0.001). An additional dose of fentanyl required was less in FNB group and was more in fentanyl group (p<0.001). Performer rated quality of patient position was more in FNB group (mean±SD) 2.73 + 0.450 while 1.47 + .507 in fentanyl group. This difference was statistically more significant (p<0.001). Patients satisfaction was more in the FNB group than fentanyl group (p<0.001) which was highly significant.

Conclusion: Ultrasound-guided FNB provides better analgesia, patient satisfaction, less time for anesthesia and satisfactory positioning than IV fentanyl for a central neuraxial block in patients undergoing surgeries for femur fractures.

Keywords: Ultrasound, femoral nerve block, IV fentanyl, femur fractures


INTRODUCTION

Fracture of the femur is a common, but extremely painful bone injury. This is because of the lowest pain threshold of the periosteum among the deep somatic structures. These patients get scheduled for surgical repair (internal fixation of the fracture or replacement of the femoral head with arthroplasty) and Subarachnoid Blockade (SAB) is the commonest anesthetic technique in these patients. Extreme pain and limb immobility hinder a successful central neuraxial block.

Various modalities like IV drugs: fentanyl, nalbuphine or regional anesthetic techniques like femoral nerve block (FNB) or fascia iliaca block have been used to relieve pain and in turn improve the positioning in these patients. 1, 2 Intravenous fentanyl is inadequate as a sole analgesic agent in fracture femur patient and requires more supplemental analgesics (i.e. rescue analgesia) in comparison to FNB. 3 There have been contradictory results regarding the superiority of FNB on IV fentanyl. Hence, we aimed to compare the analgesic effect of commonly performed USG guided FNB with IV fentanyl prior to positioning the patient with fracture femur for the subarachnoid blockade.

MATERIALS AND METHOD

The prospective study was done to compare the analgesic effect of FNB with IV fentanyl prior to positioning patient with fracture femur for SAB. After Institutional ethical committee clearance, 60 ASA I/II patients between the age of 18 to 80 years with fracture femur was recruited. Flowchart of participants shown in figure 1. All these patients were explained about the procedure and trained in the visual analog score (VAS) preoperatively. The exclusion criteria included patients with poly-trauma, allergy to the local anesthetics, coagulopathy, infection at the puncture site, mental disorder, communication failure, and neurological disorders. The patients were allocated by computer-generated random numbers into two groups of 30 patients each: an FNB group and IV fentanyl (FENT) group. The random allocation sequence was concealed in opaque, sealed envelopes until a group was assigned. Premedication such as oral benzodiazepines (alprazolam 0.25 mg) was given at bedtime on the day before surgery.

On arrival in the induction area, all patients were monitored with standard ASA monitors. An IV line was secured and infusion of lactated Ringer’s solution started as maintenance. Ultrasound-guided FNB was
given with 15 mL of 1% lignocaine after visualizing
the femoral nerve in the FNB group. Figure 2 shows
the sonoanatomy of the femoral nerve. Patients in the
FENT group received injection fentanyl 1 μg/kg IV.
After 5 minutes of either group were made
to sit up for SAB. If any patient complained of pain
scores ≥4 during positioning, IV fentanyl 0.5 μg/kg
was given every 5 min until the pain score decreased
to < 4. A maximum dose of 3 μg/kg fentanyl was given.
If pain score<4 could not be achieved, the patient
was excluded from the study. SAB was performed by
anaesthesiologist who was blinded for the study.

Following parameters were then assessed
1. Pain score using the visual analog scale at
   baseline and during positioning (0 = no pain,
   10 = maximal pain)
2. Additional fentanyl requirements during
   positioning.
3. Patient positioning and satisfaction of
   anaesthesiologist for SAB by satisfaction scale
   (0 = not satisfactory, 1 = satisfactory, 2 = good,
   3 = optimal).
4. Patient acceptance on a scale of 10 (0= nil, 10=
   maximum)
5. Vital parameters: heart rate (HR), mean
   arterial pressure (MAP) by non-invasive blood
   pressure (NIBP) and oxygen saturation (SpO₂)
   at baseline and during positioning.
6. Side effects

The sample size for this study was estimated
from a pilot study among 10 patients over a period
of 2 months. The pilot study had demonstrated
that patients given the FNB had a lower pain score
(mean=1.5) compared to IV fentanyl during posi-
tioning. Considering the 95% level of confidence,
80% power and an estimated mean difference of 1.8
in VAS pain score with a standard deviation of 2.45;
a sample size of 30 per group was required.

Data were analyzed using IBM SPSS Version
22.0 software package. Parametric variables were
described as mean ± SD; qualitative variables as
number (percentage). Student’s t-test was used to
compare the two groups. P-value<0.05 was consid-
ered as statistically significant and p <0.001 as
highly significant and not significant if p >0.05.

RESULTS

Table 1 represents the demographic data of the
patients. The two groups were comparable in terms
of age, weight, and duration of surgery. Baseline
values for VAS, HR, systolic blood pressure (SBP),
diastolic blood pressure (DBP) and oxygen satu-
ration (SpO₂) were also comparable among the two
groups (figure 3 and table 2).

After the intervention, patients in group FNB
group had significantly less mean VAS group.
Mean VAS during positioning was 1.57 in FNB versus 2.93 in FENT group (p<0.001) (Table 2, Figure 3). In order to achieve a target VAS of <4 before positioning, the number of an additional dose of fentanyl required was significantly less in the FNB group. (p<0.001) (Table 2, Figure 4). Performer rated quality of patient position was more in FNB group (mean±SD) 2.73 + 0.450 while 1.47 + .507 in FENT group. This difference was statistically more significant (p<0.001). Patients satisfaction was more in the FNB group than FENT group (p<0.001) which was highly significant (Table 2, Figure 4).

Mean blood pressure, heart rates, and SpO$_2$ before, during positioning of SAB, were comparable among the groups (Table 2). However, none of the patients in either group had their oxygen saturation below 90%. There was no inadvertent vascular puncture or adverse effect of systemic local anesthetic toxicity in the study group.

**DISCUSSION**

This prospective randomized study shows that FNB is more effective than IV fentanyl to facilitate the sitting position for SAB in patients with fracture shaft femur. The patients were more comfortable, with better VAS scores after FNB. Patient positioning has been a challenge during SAB during femur fracture. Various modalities to provide pain relief include medications like fentanyl, remifentanil, morphine, nitrous oxide, and sevoflurane. Lately, FNB has been used for this purpose. Capdevila et al.\textsuperscript{4} reported effective and safe analgesia provided by using continuous FNB for bilateral femoral shaft surgery. We used single shot femoral block before patient positioning in femur fractures, concluding that it is useful in improving the quality of positioning and satisfaction among the patients. Sia S et al.\textsuperscript{2} concluded that FNB is more advantageous than IV fentanyl to facilitate the sitting position for spinal anesthesia in patients undergoing surgery for femoral shaft fractures. Their results showed that patients with FNB had statistically lower VAS scores (0.5±0.5) when compared to IV fentanyl group (3.3±1.4). We also had similar results in our study where the VAS scores were significantly less in the FNB group (1.57± 0.67) as compared to the IV fentanyl group (2.93± 0.64) with p<0.001. Jadon A et al.\textsuperscript{5} compared peripheral nerve stimulator guided FNB with IV fentanyl for SAB in patients undergoing surgery for a femur fracture. They concluded that the former is better in terms of analgesia, patient satisfaction, and the anesthesia time. We used USG for FNB and found similar results.

According to Bhoshle et al.\textsuperscript{6} FNB apart from providing pain relief and better positioning, decreases performance time. They hypothesized that it is a simple block requiring few instructions to teach postgraduate trainees to execute it.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Mean &amp; Standard deviation of other variables</th>
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<tbody>
<tr>
<td></td>
<td>FNB (n=30)</td>
</tr>
<tr>
<td>VAS BL</td>
<td>7.93 + 0.58</td>
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<tr>
<td>VAS DP</td>
<td>1.57 + 0.67</td>
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<tr>
<td>MAP BL</td>
<td>83.83 + 12.98</td>
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<tr>
<td>MAP DP</td>
<td>82.57 + 12.65</td>
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<tr>
<td>SpO$_2$ BL</td>
<td>98.00 + 2.03</td>
</tr>
<tr>
<td>SpO$_2$ DP</td>
<td>98.20 + 1.91</td>
</tr>
<tr>
<td>HR BL</td>
<td>83.87 + 11.48</td>
</tr>
<tr>
<td>HR DP (corrected)</td>
<td>80.93 + 8.65</td>
</tr>
<tr>
<td>Quality of position (0-3)</td>
<td>2.73 + 0.450</td>
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<tr>
<td>Number of additional dose of fentanyl required</td>
<td>0.13 + 0.34</td>
</tr>
<tr>
<td>Patient's acceptance scoring</td>
<td>8.70 + 0.46</td>
</tr>
</tbody>
</table>

SD: standard deviation
Unpaired t-test
'P-value highly significant
Gosavi et al. assessed pain during a change of position from supine to sitting after FNB with lidocaine; VAS scores were 2.7±1.1.13. In our study mean VAS during positioning was 1.57 in the FNB group and 2.93 in IV fentanyl group (p<0.001) which was highly significant.

In a study done to compare the analgesia for positioning of femur fracture patients, Lamaroon et al. concluded that peripheral nerve stimulator guided FNB was not much help as compared to IV fentanyl. This could be explained by the fact that they used bupivacaine, which takes a longer time to act than lignocaine. However, their block provided postoperative pain relief in these patients. In our study, we found significant differences in pain reduction, quality of positioning and satisfaction of patient in the FNB group. We did not study the postoperative pain relief in our patients.

Durrani et al. compared FNB with IV nalbuphine during positioning in patients in fracture femur. They also concluded that FNB is beneficial as it allows relaxation of quadriceps and hence better positioning.

Ranjit et al. in their study concluded that ultrasound-guided FNB is more effective than IV fentanyl for reducing pain in patients with proximal femur fracture before spinal anaesthesia. We also found a similar finding in our study which was highly significant p<0.001.

In another study done by Reddy et al. concluded that femoral nerve block was a better analgesic drug compared to intravenous fentanyl for positioning of the hip during spinal anaesthesia in femoral fracture surgeries, in terms of analgesic effect, patient satisfaction, lower pain scores and lesser time is taken. We also found similar results between the two groups and the differences were highly significant. Hence the majority of the studies establish the superiority of FNB over paraventral analgesic techniques.

We used the VAS scale for assessment of pain in patients as it is easier for elderly patients to comprehend. Also, we used titrated doses of fentanyl (0.5 μg/kg) at an interval of five minutes. This was to prevent any untoward effects of fentanyl (respiratory depression and excess sedation). With ultrasound becoming available in the majority of the hospitals and institutes, USG guided nerve block is an easy but effective method for pain relief and better patient positioning. Hence, it should be brought in regular practice to give a block before positioning the patient.

**CONCLUSION**

Ultrasound-guided FNB provides better analgesia, patient satisfaction, less time for anaesthesia, and satisfactory positioning than IV fentanyl for a central neuraxial block in patients undergoing surgeries for femur fractures.

**REFERENCES**


