

## Assessment of Analgesic Efficacy of Femoral Nerve Block and IV Fentanyl in Femur Shaft Fracture Patients for Positioning them for Neuraxial Block: Randomized Prospective Study

Anil Kumar Sinha<sup>1</sup>, Ajay Chaudhri<sup>2</sup>, Om Prakash<sup>3</sup>, Moti Lal Das<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Anesthesiology, NMCH, Patna, Bihar, India

<sup>2</sup>Senior Resident, Department of Anesthesiology, NMCH, Patna, Bihar, India

<sup>3</sup>Senior Resident, Department of Anesthesiology, NMCH, Patna, Bihar, India

<sup>4</sup>Associate Professor, Department of Anesthesiology, NMCH, Patna, Bihar, India

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Corresponding author: Dr. Om Prakash

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### Abstract

**Objective:** To compare the analgesic efficacy of femoral nerve block and IV Fentanyl in femur shaft fracture patients for positioning them for neuraxial block.

**Methods:** A randomized prospective study was conducted in Department of Anaesthesiology NMCH Patna for 12 months, 100 patients belonging to ASA grade I and ASA grade II status undergoing surgery for fracture femur. Patients were randomly allocated to either of the two groups with the help of computerized randomization into: Group A: Femoral Nerve Block and Group B: IV Fentanyl. Data was analyzed using ANOVA test.

**Results:** Both femoral nerve block and IV Fentanyl provided analgesia. The hemodynamic parameter variations (H.R., SBP, DBP, and MAP) in Fentanyl and femoral nerve block groups were statistically significant after 10 min interval. It was found that in femoral nerve block group no rescue analgesia was required and in IV Fentanyl group 100% rescue analgesia was required.

**Conclusion:** Femoral nerve block provides better analgesia, patient satisfaction and satisfactory positioning than IV fentanyl for position during spinal anesthesia in patients of fracture femur.

**Keywords:** Femoral nerve block, Efficacy, Fentanyl, Analgesia, Intervention

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### Introduction

Fracture of the femur is a common orthopedic problem following trauma in patients of all ages and central neuraxial block such as spinal anesthesia is the preferred technique for providing anesthesia. [1] Correct positioning during

central neuraxial block is the prerequisite for a successful procedure. However, limb immobility and extreme pain are the deterrents for an ideal positioning for this procedure. Various modalities like intravenous (IV) fentanyl (FENT), femoral

nerve block (FNB) or fascia iliac block with local anesthetic have been advocated to reduce the pain pre-operatively and improve the positioning of these patients. [2]

Spinal anesthesia is commonly utilized in lower extremity orthopedic surgery and has many advantages including easily performed, effective, avoiding airway related complications, reducing the incidence of deep venous thrombosis (DVT), reducing hospital mortality, minimizing hospitalization, and providing postoperative analgesia. [3, 4, 5] It has well-acknowledged beneficial effects of reducing pain, reduced opioid consumption, and improved quality of early recovery.[6]

Providing adequate pain relief not only increases comfort in these patients, but has also been shown to improve positioning for neuraxial block. Analgesics or femoral nerve block (FNB) are often used to help the patient tolerate position. Femoral nerve block has been shown to be an effective method of analgesia for fractured femoral shaft either during pre-hospital management or in the emergency department [7, 8] and also provide excellent postoperative analgesia. [9]

#### **Material & Methods:**

A prospective, randomized study was conducted in Department of Anaesthesiology, NMCH, Patna, Bihar for 12 months. 100 patients of ASA I and II between the age group of 18-65 years undergoing surgical correction of fracture shaft femur under subarachnoid anesthesia. Patients were randomly allocated into two groups:

**Group A:** femoral nerve block was administered 30 minutes before planned subarachnoid blockade.

**Group B:** IV Fentanyl 3ug/kg was administered 30 minutes before planned subarachnoid blockade.

#### **Inclusion criteria:**

1. All patients undergoing elective surgeries for femur shaft fractures.
2. Age >18 years and <65 years
3. ASA I & II

#### **Exclusion criteria:**

1. Patients with poor GCS
2. Age <18 years and >65 years
3. Patients with liver and renal diseases
4. Patients with known local anesthetic allergy
5. Patients with bleeding tendencies and coagulopathy.
6. Patients with known neuropathy.
7. Patients with skin lesion at block site.

#### **Parameters observed**

1. Heart rate
2. Systolic blood pressure
3. Diastolic blood pressure
4. Mean arterial pressure
5. VAS score at rest
6. VAS score at movement of fractured limb
7. Rescue analgesic requirement

#### **Statistical analysis:**

Statistical test applied for the analysis was ANOVA test using SPSS version 20. The Level of confidence interval was set at 95% and level of significance was set at 5%.

#### **Results:**

**Table 1:** In FNB group there is decrease in mean heart rate compared to pre-intervention period till 25 min period and stable thereafter. In Fentanyl group there is decrease in mean heart rate

at 5 min interval compared to pre-intervention period which again increased after 10 min. Difference in mean heart rate in both the groups after 10 min interval is statistically significant.

#### Summary of heart rate (HR) /minute in treatment group

Hear Rate	Femoral Block		Fentanyl		P value
	Mean	Std. Dev	Mean	Std. Dev	
Pre-intervention	85.23	8.23	88.02	8.20	0.531
5 Minutes	85.48	8.24	87.77	6.17	0.682
10 minutes	82.14	7.01	89.72	7.58	0.008
15 Minutes	81.20	8.83	88.92	6.36	0.001
20 Minutes	77.12	6.65	89.25	6.45	0.001
25 Minutes	75.37	5.20	85.36	5.63	0.001
30 Minutes	73.73	7.21	86.49	5.99	0.001

**Table 2:** Difference in mean SBP in both the groups after 10 min interval is statistically significant.

#### Summary of systolic blood pressure (SBP) in mmHg

SBP	Femoral Block		Fentanyl		p-value
	Mean	Std. Dev	Mean	Std. Dev	
Pre-intervention	141.52	9.26	137.81	9.21	0.901
5 Minutes	140.42	7.28	137.66	7.33	0.692
10 minutes	139.81	7.82	136.27	5.89	0.005
15 Minutes	126.27	7.71	135.72	5.90	0.001
20 Minutes	124.45	7.92	134.20	4.55	0.001
25 Minutes	125.86	7.72	133.82	4.20	0.001
30 Minutes	124.03	7.81	136.01	3.21	0.001

**Table 3:** Fentanyl group mean DBP increased after 5min and remained same thereafter. Difference in mean DBP in both the groups after 10 min interval is statistically significant.

#### Summary of diastolic blood pressure (DBP) in mmHg

DBP	Femoral Block		Fentanyl		p-value
	Mean	Std. Dev	Mean	Std. Dev	
Pre-intervention	81.43	5.25	77.25	5.02	1.000
5 Minutes	80.61	5.98	78.91	4.66	0.872
10 minutes	80.21	5.30	82.30	2.72	0.088
15 Minutes	80.24	4.29	81.92	1.23	0.004
20 Minutes	81.00	5.81	81.62	2.91	0.021
25 Minutes	81.83	3.12	80.72	1.46	0.030
30 Minutes	80.29	3.01	80.89	1.98	0.026

**Table 4:** MAP mean in FNB group decreased after 10 min while in Fentanyl group MAP mean increased after 10 min and remained same thereafter. Difference in mean MAP in both the groups after 10 min interval is statistically significant.

#### Mean of mean arterial blood pressure (MAP) in mmHg

MAP	Femoral Block		Fentanyl		p-value	
	Mean	Std. Dev	Mean	Std. Dev		
Pre-intervention	97.39	5.22	96.32	5.01	0.789	Not Significant
5 Minutes	97.20	5.72	97.29	4.22	0.720	Not Significant
10 minutes	96.22	5.00	99.01	3.00	0.008	Significant
15 Minutes	95.29	4.32	99.27	3.82	0.000	Significant
20 Minutes	95.00	5.91	98.28	2.72	0.001	Significant
25 Minutes	95.00	5.71	98.92	2.19	0.000	Significant
30 Minutes	94.81	4.90	98.77	1.27	0.000	Significant

**Table 5:** mean VAS at rest in FNB group decreased after 10 min interval while mean VAS at rest in Fentanyl group also decreased but remained same thereafter. Mean VAS at rest in FNB group & Fentanyl group at 10min (7.21 & 6.11), 15 min (6.81&7.20), 20min (3.22 &7.82), 25min (1.81&6.87) 30 min (3.20&6.03) which were statistically significant. That means FNB has better analgesic profile compared to IV fentanyl.

#### Summary of pain score: VAS Rest

VAS Rest	Femoral Block		Fentanyl		p-value
	Mean	Std. Dev	Mean	Std. Dev	
Pre-operative	9.21	0.00	9.00	0.00	1.000
5 Minutes	9.00	0.00	9.81	0.00	1.000
10 minutes	7.21	0.80	6.11	0.82	0.001
15 Minutes	6.81	1.28	7.20	0.83	0.001
20 Minutes	3.22	1.81	7.82	0.77	0.001
25 Minutes	1.81	1.62	6.87	0.88	0.001
30 Minutes	3.20	1.79	6.03	0.86	0.001

**Table 6: VAS Movement:** Mean VAS at movement in FNB group decreased after 10 min interval while mean VAS movement in Fentanyl group also decreased after 10 min but remained same thereafter. Difference in mean VAS at movement in both the groups after 10 min interval is statistically significant. That means FNB has better analgesic profile compared to IV fentanyl.

VAS Movement	Femoral Block		Fentanyl		p-value
	Mean	Std. Dev	Mean	Std. Dev	
Pre-operative	10.00	0.00	10.00	0.00	1.000
5 Minutes	10.00	0.00	10.00	0.00	1.000
10 minutes	9.58	0.82	8.8	0.83	0.001
15 Minutes	7.81	1.21	8.22	0.71	0.001
20 Minutes	4.82	1.37	8.20	0.70	0.001
25 Minutes	2.29	1.60	7.41	0.89	0.001
30 Minutes	3.19	1.77	7.33	0.83	0.001

#### Discussion:

Sandby-Thomas et al reported that the most frequently used agents were midazolam, ketamine, and propofol. Alternative agents

were Fentanyl, remifentanyl, morphine, nitrous oxide, and sevoflurane, whereas nerve blocks were used infrequently.[1]

In contrast to this study, Ghimire et al, reported that, FICB was more effective in reducing pain than FNB. The result may be explained by the fact that, lower volume (15mL) of lidocaine is used in the FNB group, and isolated proximal fracture occasionally innervated by sciatic and superior gluteal nerves which are not affected by FNB as shown by the increase VAS score in this group. They found a very low VAS score for the FICB group, and the possible reason might be very low baseline mean VAS score (around 3) than above 6 (median) in the present study and also longer waiting time (20 minutes) to position for spinal anesthesia, that increases the quality of FICB.[10]

Spinal anesthesia is universally accepted and preferred technique of anesthesia for surgery of fracture femur.[1] This technique has many advantages over general anesthesia like early mobility, less chances of deep vein thrombosis and mortality. [11, 12]

The hemodynamic parameter variations (H.R., SBP, DBP, MAP) in Fentanyl and FNB groups are statistically significant after 10 min interval, which implies hemodynamic parameters in FNB group are stable compared to IV Fentanyl group.

In our study, we compared all groups for 30 min. and at the end of 30 min; if VAS score is more than 4, rescue analgesia (IV Paracetamol 15mg/kg) was given. It is found that in femoral nerve block group no rescue analgesia was required and in IV Fentanyl group 100% rescue analgesia was required.

In this study, there is no documented complication like hypotension, vomiting, bradycardia, and respiratory depression which is similar to studies done by Kacha et al,[13]and Purohit et al, [14] on their

placebo controlled FICB and FNB randomized clinical trials respectively.

### Conclusion:

Femoral nerve block provides better analgesia, patient satisfaction and satisfactory positioning than IV fentanyl for position during spinal anesthesia in patients of fracture femur.

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