

Comparing Analgesic Effectiveness of Ultrasound Guided Femoral Nerve Block versus Fascia Iliaca Block for Positioning During Spinal Anaesthesia in Adult Patients Undergoing Femoral Fracture Surgery

Amminikutty C.M.¹, Murali C.J.², Rebecca Ann Jose³

¹Associate Professor, Department of Anaesthesiology, Government Medical College, Thrissur, Kerala, India

²Assistant Professor, Department of Anaesthesiology, Government Medical College, Thrissur, Kerala, India

³Senior Resident, Department of Anaesthesiology, Government Medical College, Thrissur, Kerala, India

Received: 06-07-2025 / Revised: 11-08-2025 / Accepted: 23-09-2025

Corresponding Author: Dr. Amminikutty C.M.

Conflict of interest: Nil

Abstract:

Background: Femoral fractures are highly painful and commonly require surgical fixation, typically performed under SAB (Subarachnoid Block). However, severe pain can hinder proper positioning for SAB. PNB (Peripheral Nerve Blocks), such as FNB (Femoral Nerve Block) and FICB (Fascia Iliaca Compartment Block) offer effective analgesia in these cases.

Methods: This prospective observational study included 70 patients undergoing femur fracture surgery, divided into two groups: Group 1 (n=35) received ultrasound-guided FNB (15 ml of 0.25% bupivacaine), and Group 2 (n=35) received FICB before SAB. Parameters assessed included VAS during positioning, ease of interspinous space palpation, number of dural puncture attempts, patient satisfaction, and haemodynamic/respiratory changes.

Results: Both blocks effectively reduced pain during positioning, but Group 2 (FICB) showed significantly lower VAS scores ($p < 0.05$), indicating superior analgesia. Both techniques had a similar onset of analgesia, achieving pain relief within 15 minutes ($p < 0.05$). Patient satisfaction was higher in the FICB group ($p < 0.05$). Quality of positioning, assessed by fewer spinal attempts, was also better in the FICB group ($p < 0.05$). No significant differences were observed between groups regarding interspinous palpation, haemodynamic, or respiratory changes.

Conclusion: Preoperative FICB provides superior analgesia compared to FNB for SAB positioning in femur fracture surgeries, evidenced by lower VAS scores, better positioning, and higher patient satisfaction. Both techniques were safe with no significant impact on haemodynamics or respiration during positioning.

Keywords: Femoral Nerve Block, Fascia Iliaca Compartment Block, Spinal Anaesthesia, Bupivacaine, Visual Analogue Scale, Patient Satisfaction.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Femur fractures are the most common fractures globally, with approximately 2.9 million cases annually. The highest incidence occurs between ages 15 and 44, followed by 5–14 years and those over 60, accounting for 29% and 21% of cases, respectively.[1]

The periosteum, one of the body's most pain-sensitive tissues, contributes to the severe pain in femoral shaft fractures. It receives innervation from surrounding nerves, while the deeper periosteum is supplied by motor branches of muscles attached to the bone. In the femoral shaft, the femoral nerve, which innervates the quadriceps femoris muscle, is the primary source of periosteal innervation.

SAB (Subarachnoid Block) is the most widely used anaesthetic technique for femur fracture fixation, typically performed in sitting or lateral positions. However, positioning patients with femur fractures for SAB is challenging due to severe pain caused by fracture movement, often requiring high doses of opioids.[2] This poses risks, especially in elderly patients with comorbidities, such as respiratory depression.

Effective pre-procedure analgesia can greatly ease patient positioning and reduce opioid needs. FICB (Fascia Iliaca Compartment Block) and FNB (Femoral Nerve Block) are simple, safe, and effective regional blocks with few contraindications.[3] FICB is especially useful in

prehospital care due to its safety, ease, and high success rate.[4]

Ultrasound guidance improves the accuracy, reduces local anaesthetic dosage, enhances sensory block quality, and lowers complication rates compared to landmark or nerve stimulator techniques.[5] Ultrasound-guided FNB offers rapid, long-lasting, opioid-sparing analgesia, especially beneficial in elderly patients with hip fractures.[6]

Pain assessment using the VAS (Visual Analogue Scale) involves marking a 100-mm line from “no pain” to “worst pain possible,” providing a simple yet effective pain quantification method.[7]

Aims and Objectives

The study aimed to compare the analgesic efficacy of ultrasound-guided FNB and FICB in patients with femur fractures to facilitate optimal positioning for spinal anaesthesia. The study evaluates the effectiveness and quality of analgesia using the VAS 20 minutes post-block, the ease of patient positioning assessed by the number of spinal attempts, and monitors for any intervention-related complications.

Materials and Methods

Study Design: This prospective observational study was conducted in the Department of Anaesthesiology at Government Medical College, Thrissur, Kerala, India, after obtaining approval from the Institutional Research and Ethics Committees. The study included patients aged between 18 and 80 years who were scheduled for surgical management of femur fractures.

Inclusion and Exclusion Criteria: The study included patients aged 18 to 80 years with ASA physical status I or II who were scheduled for proximal femur fracture surgeries. Patients were excluded if they had any of the following: refusal to participate, cardiovascular or cerebrovascular disease, raised intracranial pressure, psychiatric illness, agitation or anxiety, vertebral column deformity, bleeding disorders, local infection or malignancy at the injection site, sepsis, history of seizures, or known allergy to local anaesthetics or study drugs.

Sample Size Calculation: As per the study conducted by Jain N, Mathur PR, Patodi V, and Singh S. A comparative study of ultrasound-guided femoral nerve block versus fascia iliaca compartment block in patients with fractured femurs for reducing pain associated with positioning for subarachnoid block. *Indian J Pain* 2018; 32:150-4.[6]

The mean VAS score in 20 minutes in group A-femoral nerve block (μ_1) = 1.88 The mean VAS score in 20 minutes in group B-fascia iliaca block (μ_2) = 2.40 d = mean difference.

SD1 (standard deviation in group A) = 0.83 Sd2 (standard deviation in group B) = 0.52 Z_{α} at 0.05 significance = 1.96

Z_{β} at 80% power = 0.84

Sample size (N) can be calculated by substituting values in the formula.

$$\frac{(Z_{\alpha} + Z_{\beta})^2 \times (S_1^2 + S_2^2)}{d^2}$$

Final sample size (N) = 70 (35 in each group)

Data Collection Procedures

Seventy patients with proximal femur fractures who met the inclusion criteria were enrolled and divided into two groups of 35 each: Group 1 received ultrasound-guided FNB, and Group 2 received FICB, both with 20 ml of 0.25% bupivacaine, 20 minutes prior to spinal anaesthesia. All patients received standard premedication, fasting instructions, IV access, and baseline monitoring, along with oxygen supplementation and pre-procedure sedation using IV midazolam (0.01–0.05 mg/kg) and fentanyl (1 mcg/kg). Under ultrasound guidance, nerve blocks were administered in the supine position using a high-frequency linear probe. Spinal anaesthesia was performed in the lateral position with the fractured side down using a 25G spinal needle at the L3–L4 interspace under aseptic precautions. Pain during positioning was assessed using the VAS, and other parameters recorded included ease of palpating interspinous space (graded 1–5), number of dural puncture attempts, MAP, respiratory rate, heart rate, and patient satisfaction (satisfied/not satisfied).

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using SPSS version 20, with graphs generated using Excel or SPSS. Continuous variables were expressed as mean \pm standard deviation based on their distribution, while categorical variables were presented as frequencies and percentages. Baseline demographic and clinical parameters were compared using the chi-square test or Fisher’s exact test, as appropriate. Outcome variables between the two groups were analyzed using an unpaired t-test for normally distributed continuous data. A p-value of <0.05 was considered statistically significant.

Results

Table 1: Distribution of Cases in Each Group

Group	Number of Cases
Femoral Block	35
Fascia Iliaca Block	35

Table 1 observes the equal distribution of patients across both study groups (35 each).

Table 2: Demographic and Anthropometric Characteristics of Study Groups

Variable	Group	N	Mean ± SD	P-Value
Age (in years)	Femoral	35	59.11 ± 15.55	0.396
	FICB	35	55.54 ± 19.20	
Weight (kg)	Femoral	35	60.09 ± 7.95	0.903
	FICB	35	59.86 ± 7.67	
Height (cm)	Femoral	35	159.97 ± 6.59	0.708
	FICB	35	159.42 ± 5.42	
BMI (kg/m ²)	Femoral	35	23.43 ± 2.55	0.915
	FICB	35	23.50 ± 2.67	

Table 2 shows comparable baseline age, weight, height, and BMI between the two groups (p>0.05).

Table 3: Sex and ASA Grade Distribution

Variable	Femoral	FICB	Total	P-Value
Sex				
Male	21	19	40 (57.1%)	
Female	14	16	30 (42.9%)	
ASA Grade				
ASA I	13	18	31	0.229
ASA II	22	17	39	

Table 3 illustrates the distribution of sex and ASA grades, showing no significant differences between groups.

Table 4: Ease of Palpating Spine

Ease of Palpation	Femoral	FICB	Total	P-Value
Easily palpable	26	26	52	0.819
Palpable	8	7	15	
Difficult	1	2	3	

Table 4 observes that ease of palpation was similar between groups, with most spines being easily palpable.

Table 5: VAS Score Distribution Over Time

Time Interval	Femoral (Mean ± SD)	FICB (Mean ± SD)	P-Value
Before block	7.82 ± 0.75	7.91 ± 0.95	0.676
5 min	6.86 ± 0.81	6.74 ± 0.82	0.559
10 min	5.80 ± 0.87	5.31 ± 0.86	0.022*
15 min	4.20 ± 1.11	3.63 ± 1.00	0.027*
20 min	2.94 ± 0.64	2.34 ± 0.68	0.000*
During positioning	1.65 ± 0.64	1.23 ± 0.73	0.011*

* Significant (p<0.05)

Table 5 shows that VAS scores reduced significantly faster in the FICB group after 10 minutes.

Table 6: Hemodynamic and Respiratory Parameters during Study

Parameter	Time	Femoral (Mean ± SD)	FICB (Mean ± SD)	P-Value
Heart Rate	Before block	86.31 ± 9.22	81.86 ± 7.30	0.028*
HR during positioning		79.05 ± 5.93	78.60 ± 5.87	0.747
MAP before block		89.77 ± 8.72	92.71 ± 10.59	0.209
MAP during positioning		86.31 ± 6.30	88.54 ± 10.52	0.286
RR before block		15.23 ± 1.66	15.26 ± 1.40	0.938
RR during positioning		12.94 ± 1.23	13.09 ± 0.98	0.594

* Significant (p<0.05)

Table 6 demonstrates that hemodynamic and respiratory parameters were mostly similar, except for a slightly lower baseline heart rate in the FICB group.

Table 7: Clinical Outcomes – Spinal Attempts and Patient Satisfaction

Outcome	Femoral	FICB	P-Value
No. of spinal attempts (Mean ± SD)	1.8 ± 0.86	1.3 ± 0.53	0.01*
Patient satisfaction (Satisfied/Not Satisfied)	27 / 7	34 / 1	0.02*

Table 7 shows significantly better outcomes with FICB, including fewer spinal attempts and higher patient satisfaction.

Discussion

Pain during positioning for SAB is a significant concern in patients with femur fractures, even in those with a normal spine. Inadequate analgesia leads to multiple attempts, prolonged painful positioning, and sometimes failure to accomplish SAB. Therefore, ensuring proper pain relief before surgical preparation or immobilization is crucial both for patient comfort and for the anaesthesiologist to achieve an effective block. [8-11]

Traditionally, opioids have been administered for positioning analgesia. However, opioids carry adverse effects such as nausea, vomiting, respiratory depression, cognitive impairment, and urinary retention, particularly in elderly patients. [12,13] PNBs have thus emerged as safer alternatives. Among them, FNB, three-in-one block, and FICB are commonly employed. Studies suggest that compared with FNB, both three-in-one block and FICB provide superior analgesia. [11,14] Hence, this study compared FICB and FNB in patients undergoing femur fracture surgery.

FNB and FICB are well-recognized for acute pain relief in lower extremity trauma. [15,16] While FICB blocks the femoral, obturator, and lateral femoral cutaneous nerves, providing broad sensory coverage of the hip joint, FNB mainly covers the anterior thigh and knee. Literature indicates that ultrasound-guided PNBs significantly reduce pain scores, opioid use, and opioid-related complications, while improving patient satisfaction. [17,18] Reported complications are rare but may include nerve injury, hematoma, or local anaesthetic toxicity.

The comparative efficacy of FNB versus FICB remains debated. Some studies found no difference; others favored FNB for early analgesia, while FICB was found better for preoperative positioning. [19,20] The consensus is that FICB is simpler, quicker to perform, and particularly useful in improving patient positioning for SAB. [21] Our study aligns with these observations, as FICB provided significantly lower VAS scores at 10, 15, and 20 minutes and during positioning compared to FNB ($p < 0.05$).

Choice of local anaesthetic is also important. Although lignocaine has a rapid onset, its short duration is a drawback. Bupivacaine, as used in our

study, provides longer-lasting analgesia compared to ropivacaine. [22,23] Use of ultrasound further enhances block accuracy, reduces anaesthetic dose, and improves block quality compared to blind or nerve stimulator techniques. [24,25]

Patient positioning during SAB can be lateral or sitting. Lateral positioning is often more comfortable and associated with fewer post-dural puncture headaches compared to sitting. [26-28] In our study, lateral positioning was adopted, and analgesia with FICB facilitated better comfort.

Previous studies comparing FNB and FICB have shown mixed results. Jadon et al. found FNB superior to intravenous fentanyl for positioning during SAB. [29] Jain et al. reported lower VAS scores with FNB compared to FICB. In contrast, our findings demonstrated superior analgesia with FICB, consistent with its broader nerve coverage. Similarly, Newman et al. reported FNB superiority in their trial, [30] while our results favoured FICB. Ghimire et al. found comparable positioning quality with both blocks using landmark technique, [31] but in our study, FICB required significantly fewer spinal attempts and had higher patient satisfaction.

Importantly, no block-related complications were reported in our study, consistent with findings from Ghimire et al. and Bantie et al. Even hemodynamic and respiratory parameters were comparable between groups, supporting prior results by Meeta et al. [32] This suggests that both FNB and FICB are safe techniques, but FICB provides better patient comfort and facilitates smoother SAB.

In summary, although both blocks provided effective analgesia, the fascia iliaca block was associated with superior pain control, fewer spinal attempts, and higher patient satisfaction. It can thus be recommended as the preferred option for positioning femur fracture patients for subarachnoid block.

Limitations

This study has several limitations, including a small sample size, subjective pain assessment via the Visual Analogue Scale, and variability in anaesthesiologist technique. Additionally, lack of postoperative follow-up and non-standardized timing between trauma and surgery may have influenced pain perception and block effectiveness.

Conclusion

Based on the findings of this study, it can be concluded that while both FNB and FICB are effective in providing preoperative analgesia for

patients undergoing femur fracture surgery, FICB offers superior analgesic quality for facilitating spinal anaesthesia. This is evidenced by significantly lower VAS scores during positioning, fewer attempts required for successful dural puncture, and higher patient satisfaction in the FICB group. Additionally, the administration of FICB did not result in any significant hemodynamic or respiratory changes during positioning for spinal anaesthesia, confirming its safety and efficacy as a pre-procedural analgesic technique.

References

1. Agarwal-Harding KJ, Meara JG, Greenberg SLM, et al. Estimating the global incidence of femoral fracture from road traffic collisions: a literature review. *J Bone Joint Surg Am* 2015;97(6):e31.
2. Foss NB, Kehlet H. Mortality analysis in hip fracture patients: implications for design of future outcome trials. *Br J Anaesth* 2005;94(1):24–9.
3. Somvanshi M, Tripathi A, Meena N. Femoral nerve block for acute pain relief in fracture shaft femur in an emergency ward. *Saudi J Anaesth* 2015;9(4):439–41.
4. Hards M, Brewer A, Bessant G, et al. Efficacy of prehospital analgesia with fascia iliaca compartment block for femoral bone fractures: a systematic review. *Prehosp Disaster Med* 2018;33(3):299–307.
5. Ultrasound for Regional Anesthesia [Internet]. [Cited 2024 Aug 4]. Available from: <https://usra.ca/>
6. Ultrasound-Guided Femoral Nerve Block in Geriatric Patients with Hip Fracture in the Emergency Department - Taipei Medical University [Internet]. [Cited 2024 Aug 4]. Available from: <https://hub.tmu.edu.tw/en/publications/ultrasound-guided-femoral-nerve-block-in-geriatric-patients-with->
7. Delgado DA, Lambert BS, Boutris N, et al. Validation of digital visual analog scale pain scoring with a traditional paper-based visual analog scale in adults. *J Am Acad Orthop Surg Glob Res Rev* 2018;2(3):e088.
8. Reddy ED, Rao BD. Comparative study of efficacy of femoral nerve block and IV fentanyl for positioning during femur fracture surgery. *International Surgery Journal* 2016;3(1):321–4.
9. Singh AP, Kohli V, Bajwa SJS. Intravenous analgesia with opioids versus femoral nerve block with 0.2% ropivacaine as preemptive analgesic for fracture femur: a randomized comparative study. *Anesth Essays Res* 2016;10(2):338–42.
10. Forouzan A, Masoumi K, Yadegar N, et al. Comparison of femoral nerve block with intravenous morphine sulfate for pain relief of femoral fracture. *Asian Journal of Scientific Research* 2015;8(3):429.
11. Purohit S, Ejjapuredi S, Badami RN. Positioning for regional anesthesia in femur fracture surgeries: how effective is femoral nerve block? A randomized control study. *International Journal of Research in Medical Sciences* 2017;5(8):3590–5.
12. Abou-Setta AM, Beaupre LA, Rashedi S, et al. Comparative effectiveness of pain management interventions for hip fracture: a systematic review. *Ann Intern Med* 2011;155(4):234–45.
13. Chang A, Dua A, Singh K, White BA. Peripheral nerve blocks. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 Jul 12]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK459210/>
14. Iamaroon A, Raksakietisak M, Halilamien P, et al. Femoral nerve block versus fentanyl: Analgesia for positioning patients with fractured femur. *Local Reg Anesth* 2010;3:21–6.
15. Emmerson BR, Varacallo M, Inman D. Hip Fracture Overview. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 Jul 12]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK557514/>
16. Dalens B, Vanneuville G, Tanguy A. Comparison of the fascia iliaca compartment block with the 3-in-1 block in children. *Anesth Analg* 1989;69(6):705–13.
17. Nagel EM, Gantioque R, Taira T. Utilizing ultrasound-guided femoral nerve blocks and fascia iliaca compartment blocks for proximal femur fractures in the emergency department. *Adv Emerg Nurs J* 2019;41(2):135–44.
18. Qin L, You D, Zhao G, Li L, Zhao S. A comparison of analgesic techniques for total knee arthroplasty: a network meta-analysis. *J Clin Anesth* 2021;71:110257.
19. Kanadli H, Dogru S, Karaman T, et al. Comparison of the efficacy of femoral nerve block and fascia iliaca compartment block in patients with total knee replacement. *Minerva Anesthesiol* 2018;84(10):1134–41.
20. Wang X, Sun Y, Wang L, et al. Femoral nerve block versus fascia iliaca block for pain control in total knee and hip arthroplasty. *Medicine (Baltimore)* 2017;96(27):e7382.
21. Cooper AL, Nagree Y, Goudie A, et al. Ultrasound-guided femoral nerve blocks are not superior to ultrasound-guided fascia iliaca blocks for fractured neck of femur. *Emerg Med Australas* 2019;31(3):393–8.
22. Keramidas EG, Rodopoulou SG. Ropivacaine versus lidocaine in digital nerve blocks: a prospective study. *Plast Reconstr Surg* 2007;119(7):2148–52.
23. Kotmire VS, Sonavane SR, Chaure SB, et al. Bupivacaine versus ropivacaine for postoperative analgesia in femorosciatic blocks in lower

- limb surgeries-a randomised clinical trial. JCDR [Internet]. 2021 [cited 2024 Jul 12]; Available from: https://jcdr.net/article_fulltext.asp?issn=0973-709x&year=2021&volume=15&issue=11&page=UC10&issn=0973-709x&id=15641
24. Di Filippo A, Falsini S, Adembri C. Volume mínimo de anestésico em anestesia regional guiada por ultrassom. *Revista Brasileira de Anestesiologia* 2016;66:499-504.
 25. Nerve Stimulator vs ultrasound-guided femoral nerve block for ease of positioning before spinal anesthesia in fracture femur patients: a randomized comparative study [Internet]. [Cited 2024 Jul 12]. Available from: <https://www.ctdt.co.in/abstractArticleContent-Browse/CTDT/23212/JPJ/fullText>
 26. Durrani HD, Butt KJ, Khosa AH, et al. Pain relief during positioning for spinal anesthesia in patients with femoral fracture: a comparison between femoral nerve block and intravenous nalbuphine. *Pakistan Journal of Medical and Health Sciences* 2013;7:928-32.
 27. Barman R, Basumatary K, Hazarika A. Effectiveness of ultrasonography guided femoral nerve block for patient positioning during central neuraxial block in elderly patients for fracture of femur - a prospective, randomized control trial. *Journal of Evolution of Medical and Dental Sciences* 2021;10:2390-5.
 28. Zorrilla-Vaca A, Makkar JK. Effectiveness of lateral decubitus position for preventing post-dural puncture headache: a meta-analysis. *Pain Physician* 2017;20(4):E521-9.
 29. Jadon A, Kedia SK, Dixit S, et al. Comparative evaluation of femoral nerve block and intravenous fentanyl for positioning during spinal anaesthesia in surgery of femur fracture. *Indian J Anaesth* 2014;58(6):705-8.
 30. Newman B, McCarthy L, Thomas PW, et al. A comparison of pre-operative nerve stimulator-guided femoral nerve block and fascia iliaca compartment block in patients with a femoral neck fracture. *Anaesthesia* 2013;68(9):899-903.
 31. Ghimire A, Bhattarai B, Koirala S, et al. Analgesia before performing subarachnoid block in the sitting position in patients with proximal femoral fracture: a comparison between fascia iliaca block and femoral nerve block. *Kathmandu University Medical Journal* 2015;13:152-5.
 32. Gupta M, Kamath SS. Comparison of preoperative ultrasound guided fascia iliaca block versus femoral nerve block for proximal femur fractures before positioning for spinal anesthesia: an observational study. *Korean J Pain* 2020;33(2):138-43.