

# A PERICAPSULAR NERVE GROUP (PENG) BLOCK AS AN ANALGESIC OPTION FOR IMMEDIATE PAIN CONTROL IN FEMUR FRACTURES IN THE EMERGENCY DEPARTMENT: A PROSPECTIVE INTERVENTIONAL STUDY

S.Rangaraj<sup>1</sup>, H.M.Haja Shareef<sup>2</sup>, M.Santhosh Kumar<sup>3</sup>

Received : 17/04/2026  
Received in revised form : 25/05/2026  
Accepted : 11/06/2026

## Keywords:

PENG block, femur fracture, regional anaesthesia, pain management, ultrasound-guided block.

## Corresponding Author:

Dr. S.Rangaraj,

Email: rajaranganambi@gmail.com

DOI: 10.47009/jamp.2026.8.3.271

Source of Support: Nil,  
Conflict of Interest: None declared

Int J Acad Med Pharm  
2026; 8 (3); 1550-1552



<sup>1</sup>Assistant Professor, Department of Anaesthesiology, Government Medical College, Kallakurichi, Tamilnadu, India

<sup>2</sup>Associate Professor, Department of Anaesthesiology, Government Medical College, Kallakurichi, Tamil Nadu, India

<sup>3</sup>Assistant Professor, Department of Anaesthesiology, Government Medical College, Namakkal, Tamil Nadu, India

## ABSTRACT

**Background:** Effective pain control in femur fractures remains a clinical challenge in the emergency department. The Pericapsular Nerve Group (PENG) block is a novel ultrasound-guided regional anaesthesia technique targeting the articular branches of the femoral, obturator, and accessory obturator nerves supplying the hip joint. **Methods & Materials:** This prospective interventional study was conducted on 20 patients aged >18 years with hemodynamically stable femur fractures. Under ultrasound guidance, 20 mL of 0.25% bupivacaine was administered using the PENG block technique. Pain was assessed using the Visual Analog Scale (VAS) before and 10 minutes after the block. Hemodynamic parameters (HR, BP, SpO<sub>2</sub>) were also recorded. Statistical analysis was performed using paired t-test and Wilcoxon signed-rank test. **Results:** There was a significant reduction in pain scores, with mean VAS decreasing from  $9.3 \pm 1.2$  to  $2.5 \pm 1.4$  ( $p < 0.001$ ). Significant reductions were observed in systolic BP (133.45 to 113.50 mmHg), diastolic BP (89.90 to 71.10 mmHg), and heart rate (108.6 to 92.9 bpm) ( $p < 0.01$ ). SpO<sub>2</sub> showed a slight but statistically significant improvement. **Conclusion:** The PENG block is an effective and safe technique for rapid analgesia in femur fractures, with significant pain reduction and improved hemodynamic stability. It can be considered a valuable analgesic modality in emergency settings.

## INTRODUCTION

Pain associated with femur fractures is severe and requires prompt and effective management. Inadequate analgesia leads to increased sympathetic activity, hemodynamic instability, and patient discomfort. Conventional systemic analgesics such as opioids and NSAIDs may be associated with adverse effects including respiratory depression, nausea, vomiting, and delirium, especially in elderly patients. The Pericapsular Nerve Group (PENG) block is a novel ultrasound-guided regional anaesthesia technique that targets the articular branches of the femoral, obturator, and accessory obturator nerves supplying the anterior hip capsule. This targeted approach provides effective analgesia while preserving motor function. This study aims to evaluate the effectiveness of the PENG block for immediate pain relief in femur fractures in the emergency department.<sup>[1-5]</sup>

**Aim:** To evaluate the efficacy of the PENG block in reducing pain in patients with femur fractures.

**Primary Objective:** To assess reduction in pain using Visual Analog Scale (VAS) Secondary Objectives: To evaluate changes in Heart rate (HR), Blood pressure (BP), Peripheral Oxygen saturation (SpO<sub>2</sub>).

## MATERIALS AND METHODS

This study is designed as a prospective interventional study conducted at Government Kallakurichi Medical College, Tamil Nadu, over a period of three months. A total of 20 patients will be included in the study. Eligible participants will comprise adult patients aged more than 18 years, who are hemodynamically stable and have provided informed consent. Patients will be excluded if they refuse participation, have a known allergy to local anaesthetics, bleeding disorders, or a history of

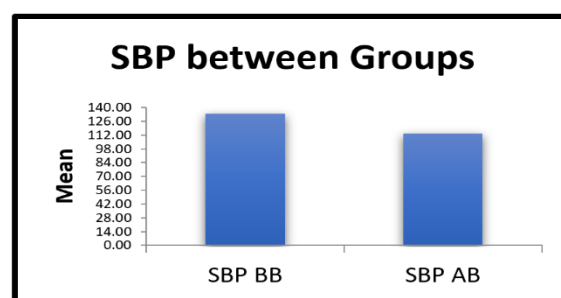
chronic analgesic use. Additional exclusion criteria include significant hepatic or renal failure, infection at the injection site, and hemodynamic instability at presentation.

**Procedure:** After obtaining approval from the Institutional Ethics Committee and securing written informed consent, eligible patients were enrolled in the study. Baseline monitoring included electrocardiography (ECG), non-invasive blood pressure (NIBP), and pulse oximetry (SpO<sub>2</sub>). Baseline visual analogue scale (VAS) scores and hemodynamic parameters were recorded prior to the intervention. The pericapsular nerve group (PENG) block was performed under ultrasound guidance using a low-frequency curvilinear probe placed parallel to the inguinal crease. Key anatomical landmarks, including the anterior inferior iliac spine (AIIS), superior pubic ramus, and psoas tendon, were identified. A 25G Quincke needle was inserted using an out-of-plane technique, and 20 mL of 0.25% bupivacaine was administered in the plane between the psoas tendon and the pubic ramus. Following the block, pain scores (VAS) and hemodynamic parameters were reassessed at 10 minutes to evaluate the analgesic efficacy.

**Statistical Analysis:** Data were analysed using Statistical Package for the Social Sciences (SPSS) version 23. Continuous variables were expressed as

mean  $\pm$  standard deviation, while categorical variables were presented as frequency and percentage. For comparison of hemodynamic parameters before and after the intervention, the paired t-test was applied. Changes in pain scores measured by the visual analogue scale (VAS) were analysed using the Wilcoxon signed-rank test. A p-value of less than 0.05 was considered statistically significant.

## RESULTS

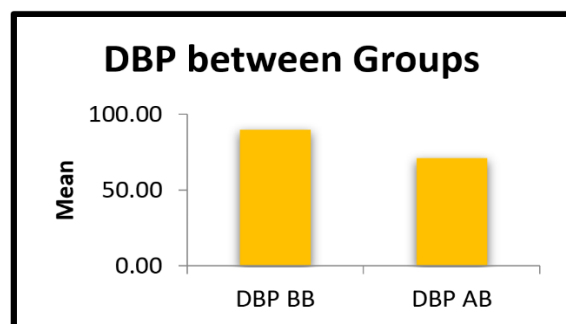


The above table shows comparison of Systolic blood pressure between before and after block by Paired sample t-test were t-value=13.707, p-value=0.0005<0.01 which shows highly statistical significance difference at p < 0.01 level.

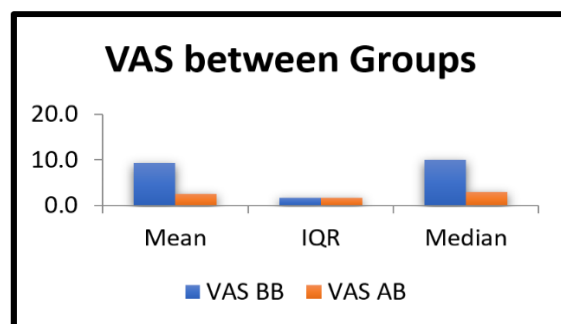
**Table 1: Comparison of Systolic blood pressure between before and after block by Paired sample t-test**

|     | Groups       | Mean   | N  | SD    | t-value | p-value  |
|-----|--------------|--------|----|-------|---------|----------|
| SBP | Before Block | 133.45 | 20 | 11.99 | 13.707  | 0.0005** |
|     | After Block  | 113.50 | 20 | 7.42  |         |          |

\*\*Highly Statistical Significance at P<0.01 level



The above table shows comparison of Diastolic blood pressure between before and after block by Paired sample t-test were t-value=12.445, p-value=0.0005<0.01 which shows highly statistical significance difference at p < 0.01 level.



The above table shows comparison of VAS between Before and after block by Wilcoxon Signed rank test were Z-value=3.937, p-value=0.0001<0.01 which shows highly statistical significance difference at p < 0.01 level.

**Table 2: Comparison of Diastolic Blood Pressure between before and after block by Paired sample t-test**

|     | Groups       | Mean  | N  | SD   | t-value | p-value  |
|-----|--------------|-------|----|------|---------|----------|
| SBP | Before Block | 89.90 | 20 | 6.27 | 12.445  | 0.0005** |
|     | After Block  | 71.10 | 20 | 7.18 |         |          |

\*\*Highly Statistical Significance at P<0.01 level

**Table 3: Comparison of VAS between before and after block by Wilcoxon Signed rank test**

|      | Before Block | After Block | Z- Value | p-Value  |
|------|--------------|-------------|----------|----------|
| N    | 20           | 20          | 3.937    | 0.0001** |
| Mean | 9.3          | 2.5         |          |          |

|                                                   |     |     |  |  |
|---------------------------------------------------|-----|-----|--|--|
| Median                                            | 10  | 3.0 |  |  |
| S.D                                               | 1.2 | 1.4 |  |  |
| IQR                                               | 1.8 | 1.8 |  |  |
| **Highly Statistical Significance at P<0.01 level |     |     |  |  |

## DISCUSSION

This study demonstrates that the PENG block provides rapid and effective analgesia in patients with femur fractures. The significant reduction in VAS scores within 10 minutes highlights the immediate analgesic effect of the block. The decrease in heart rate and blood pressure indicates reduced sympathetic response due to pain relief. PENG block provides more targeted analgesia to the anterior hip capsule while preserving motor function, which is advantageous for patient positioning and early mobilization.<sup>[6,7]</sup>

These findings are consistent with previous studies by Girón-Arango et al., which described the effectiveness of PENG block in hip fracture analgesia.

Thorough familiarity with anatomy, safe monitoring and injection technique, and knowledge of local anaesthetic pharmacology and toxicity would prevent complications. Using the ultrasonography real time needle position can be confirmed and is a promising approach that should further decrease the risk of complication.

## CONCLUSION

The PENG block is a safe, effective, and rapid analgesic technique for femur fractures. It significantly reduces pain and improves hemodynamic stability. It can be recommended as a valuable analgesic modality in emergency departments.

**Limitations:** The present study has certain limitations. The small sample size may limit the generalizability of the findings. Being a single-centre study, the results may not be representative of broader populations. Additionally, the short duration of follow-up restricts the assessment of long-term outcomes and sustained analgesic effects. Furthermore, the absence of a comparison group limits the ability to draw definitive conclusions regarding the relative efficacy of the intervention.

**Recommendations:** Future research should focus on conducting larger randomized controlled trials to enhance the strength and generalizability of the evidence. Comparative studies with other regional anaesthesia techniques are warranted to determine the relative efficacy and safety of the PENG block. Additionally, further studies should aim to evaluate long-term analgesic outcomes, including duration of pain relief, functional recovery, and patient satisfaction, to better establish the clinical utility of this intervention.

**Ethical Consideration:** Approval for the study was obtained from the Institutional Ethics Committee prior to commencement. Written informed consent was obtained from all participants before enrolment. All patient data were handled with strict confidentiality, and privacy was maintained.

## REFERENCES

1. L. Giron-Arango, P. W. H. Peng, K. J. Chin, R. Brull, and A. Perlas, "Pericapsular nerve group (PENG) block for hip fracture," *Regional Anesthesia & Pain Medicine*, vol. 43, no. 8, pp. 859–863, 2018.
2. A. J. Short, J. J. G. Barnett, M. Gofeld et al., "Anatomic study of innervation of the anterior hip capsule: implication for image guided intervention," *Regional Anesthesia and Pain Medicine*, vol. 43, no. 2, pp. 186–192, 2018.
3. U. Shukla, M. Jahan, S. Naaz, and S. Srivastava, "USG guided femoral nerve block vs fascia iliaca compartment block as post operative analgesia in hip fracture patients," *International Journal of Research in Medical Sciences*, vol. 6, no. 9, p. 3057, 2018.
4. N. H. Amin, J. A. West, T. Farmer, and H. G. Basmajian, "Nerve blocks in the geriatric patient with hip fracture: a review of the current literature and relevant neuroanatomy," *Geriatric Orthopaedic Surgery & Rehabilitation*, vol. 8, no. 4, pp. 268–275, 2017.
5. M. Gerhardt, K. Johnson, R. Atkinson et al., "Characterisation and classification of the neural anatomy in the human hip joint," *HIP International*, vol. 22, no. 1, pp. 75–81, 2012.
6. J. Callear and K. Shah, "Analgesia in hip fractures. Do fascia iliac blocks make any difference?," *BMJ Quality Improvement Reports*, vol. 5, no. 1, Article ID u210130.w4147, 2016.
7. B. J. Archana, D. N. Nagaraj, P. Pradeep, and S. Lakshmi Prabha, "Anatomical variations of accessory obturator nerve: a cadaveric study with proposed clinical implications," *International Journal of Anatomy and Research*, vol. 4, no. 2, pp. 2158–2161, 2016.