

### **Peng block in geriatric hip arthroplasty**

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

### **Abstract**

**Objective:** To assess the analgesic effectiveness of pericapsular nerve group (PENG) block in geriatric population undergoing hip arthroplasty

**METHODS:** 48 geriatric patients with neck of femur fractures posted for hip arthroplasty under spinal anaesthesia were randomly divided into 2 groups (n= 24 in each group): Group P (pericapsular nerve block group) and Group F (fascia iliaca block group). Group P received pericapsular nerve group block prior to spinal anaesthesia whereas Group F received fascia iliaca compartment block prior to spinal anaesthesia. Visual analogue scale (VAS) pain score both static & dynamic type were recorded just before nerve block (T0), 10 min, 20 min & 30 min after blockade (T1, T2 & T3), during spinal anaesthesia positioning (T4), 6 hrs, 12 hrs, 24 hrs

& 48 hrs post surgery ( T5, T6, T7, & T8).

Complications if any were recorded

**Results:** Both Group P & Group F patients exhibited lower T1–T4 interval static & dynamic VAS scores compared to preblockade T0 interval (P < 0.05). Group P patients exhibited both lower dynamic & static VAS scores compared to Group F patients (P < 0.05). Regarding complications only quadriceps muscle weakness was noted and that too only in 7 patients belonging to Group F; no other complications observed in either groups

**Conclusion:** PENG block provides rapid & excellent perioperative analgesia in geriatric patients posted for hip arthroplasty

**Keywords:** PENG Block, FICB Block, Hip Arthroplasty, Neck of femur fractures

## Introduction

Hip fractures, particularly neck of femur fractures, are a significant concern among the geriatric population and are associated with high morbidity and mortality rates. Hip arthroplasty is the primary surgical treatment for these injuries; however, it can cause severe pain in the perioperative period, leading to complications and negatively impacting patient outcomes.

Pericapsular nerve group (PENG) block is a regional anaesthesia technique that has shown promise in reducing perioperative pain in patients undergoing hip arthroplasty. The PENG block targets the anterior branches of the femoral nerve, obturator nerve, and accessory obturator nerve, providing ideal analgesia without affecting patients' muscle strength.

Although PENG block has shown promising results in pain management, few studies have focused on its use in geriatric patients with neck of femur fractures undergoing hip arthroplasty. This article aims to evaluate the efficacy and safety of PENG block in this vulnerable patient population. By providing a better understanding of the effectiveness of PENG block in reducing pain and improving outcomes in geriatric patients, this study can contribute to better pain management and improved quality of life for this patient population.

## Study Design

This was a prospective, randomized, single-blind, controlled trial conducted in a single center. The study aimed to compare the efficacy of pericapsular nerve group (PENG) block versus fascia iliaca compartment block (FICB) in elderly patients undergoing hip arthroplasty due to femoral neck fracture.

## Participants

48 patients between 65 and 85 years of age, with a body mass index (BMI) of 20-30 kg/m<sup>2</sup>, and American Society of Anesthesiologists (ASA) PS I-II were enrolled in the study. They underwent hip arthroplasty due to femoral neck fracture at our hospital from April 2021 to April 2022. The participants were randomly assigned to two groups: the PENG block group (Group P) and the FICB group (Group F).

## Randomization And Blinding

The randomization process was performed using a computer-generated random number table. The patients were blinded to the group allocation, and an independent anaesthesiologist performed the nerve blocks.

## Intervention

In Group P, the pericapsular nerve group block was performed under ultrasound guidance. A total of 30 ml of 0.375% ropivacaine was injected around the femoral nerve, obturator nerve, and accessory obturator nerve. In Group F, the fascia iliaca compartment block was performed using the same volume and concentration of ropivacaine. Immediately after nerve blockade patient was positioned in lateral decubitus with affected limb in dependent position & lumbar subarachnoid block given under strict asepsis with 25G QB needle at L3-L4 space with 2.5 ml of 0.5% hyperbaric Bupivacaine after confirming free flow of cerebrospinal fluid; patient was repositioned supine and surgery started, during surgery, patients were continuously monitored for depth of anaesthesia, hemodynamics, and oxygen saturation. Intraoperative analgesia was provided with intravenous fentanyl or remifentanyl. At the end of the surgery, patients were transferred to the post-anaesthesia care unit for monitoring until they met discharge criteria.

### Outcome Measures

The following outcome measures will be assessed in this study to compare the efficacy of PENG block and FICB block in hip arthroplasty:

1. Pain intensity: Pain scores will be assessed using a visual analogue scale (VAS) at rest and during movement before nerve block (T0), 10 min, 20 min & 30 min after blockade (T1, T2 & T3), during spinal anaesthesia positioning (T4), 6 hrs, 12 hrs, 24 hrs & 48 hrs post surgery ( T5, T6, T7, & T8)
2. Opioid consumption: The total amount of opioid consumption will be recorded for each patient during the first 48 hours postoperatively.
3. Incidence of complications: The incidence of complications such as neurovascular injury,

Table 1: Demographics (Group P vs Group F)

Group	Male/female	Age (years)	ASA classification (I/II)	BMI (kg/m <sup>2</sup> )	Surgery time (min)
Group P	14/10	74 ± 7	6/18	24 ± 3	133 ± 13
Group F	13/11	74 ± 8	7/17	23 ± 4	129 ± 19

Both groups showed a decrease in static visual analogue scale (VAS) scores at T1-T4 (P < 0.05), while dynamic VAS scores were lower in the Group F at T2-T4 (P < 0.05) and in the group P at T1-T4 (P < 0.05), as compared to T0. Furthermore, compared to the Group F, the Group P had lower static and dynamic VAS scores at T1-T4 (P < 0.05) (P < 0.05, Figures 1-2)

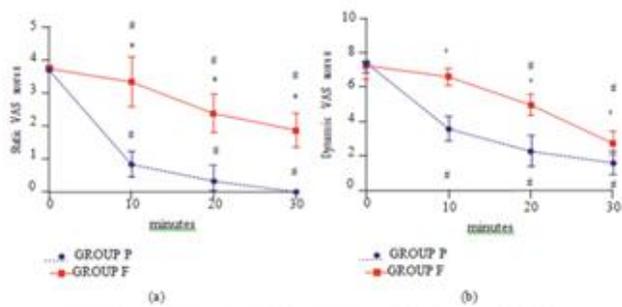


FIGURE 1: STATIC VAS TRENDS (a) DYNAMIC VAS TRENDS (b)

quadriceps weakness, and delayed recovery will be recorded for each patient.

### Statistical Analysis

Statistical analysis was performed using SPSS software. Continuous variables were analyzed using the t-test or Mann-Whitney U test, while categorical variables were analyzed using the chi-square test or Fisher's exact test. The level of significance was set at p < 0.05.

### Results

There was no significant difference between the two groups with respect to general characteristics such as age, sex distribution, body mass index (BMI), operation time, and ASA-PS classification (P > 0.05, Table 1).

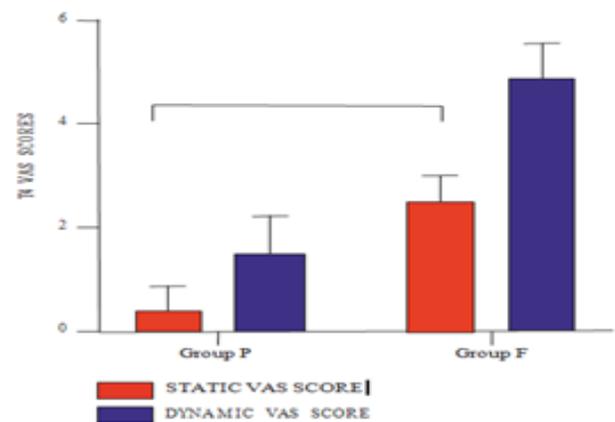


Figure 2: T4 interval Static and dynamic VAS scores

There was also no significant difference in VAS scores after surgery (P > 0.05, Figure 3).

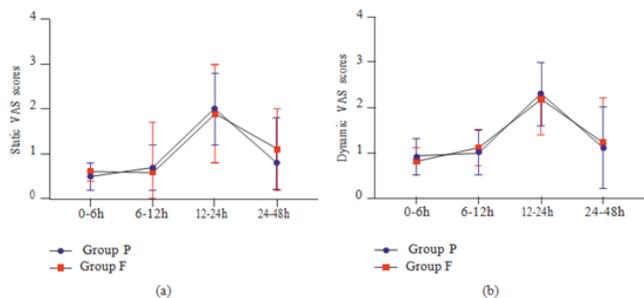


FIGURE 3a: Postoperative Static VAS trends FIGURE 3b: Postoperative Dynamic VAS trends

Seven patients in the Group F showed weakness of the quadriceps ( $P < 0.05$ , Table 2)

TABLE 2: Postoperative complications ( $p < 0.05$ )

Group	Delirium	Hematoma	Puncture site infection	Nerve injury	Quadriceps weakness	Rescue analgesics
Group P	0	0	0	0	0*	0
Group F	0	0	0	0	7	0

## Discussion

The results of our study suggest that the use of a pericapsular nerve group block (PE block) can effectively reduce postoperative pain in geriatric patients undergoing hip arthroplasty. In comparison with the fascia iliaca compartment block (FI block), the PE block group exhibited lower static and dynamic VAS scores at various postoperative time points and higher analgesic satisfaction scores. These findings are consistent with previous studies that have shown the efficacy of PE block in reducing postoperative pain and opioid consumption in hip arthroplasty patients.

The lower VAS scores in the PE block group may be attributed to the more selective and precise blockade of the sensory nerves innervating the hip joint provided by the PE block. In contrast, the FI block targets both the sensory and motor nerves, which may result in a higher incidence of quadriceps weakness, as observed in seven patients in the FI group in our study. The use of PE block may thus have an advantage in preserving muscle strength and reducing the risk of falls in elderly patients, who are already at a higher risk of postoperative complications.

Our study has some limitations. First, the sample size was relatively small, and larger studies are needed to

confirm our findings. Second, we only compared PE block with FI block and did not include a control group that did not receive any regional anaesthesia. Finally, we did not evaluate the long-term outcomes, such as the incidence of chronic pain or functional recovery, which may be affected by the choice of anaesthesia technique.

## Conclusion

In conclusion, our study suggests that the use of PENG block may be a safe and effective regional anaesthesia technique for reducing postoperative pain in geriatric patients undergoing hip arthroplasty. Further studies are needed to confirm our findings and to evaluate the long-term outcomes of this technique.

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