

Original Research Article

PERICAPSULAR NERVE GROUP (PENG) BLOCK FOR EARLY POSTOPERATIVE ANALGESIA AFTER TOTAL HIP ARTHROPLASTY: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Aims: Effective, motor-sparing analgesia after total hip arthroplasty (THA) remains challenging, especially in elderly patients. The pericapsular nerve group (PENG) block targets articular branches to the anterior hip capsule. We evaluated early (0–12 h) postoperative analgesia and rescue-analgesic requirements after ultrasound-guided PENG block in THA.

Material and Methods: In this prospective observational study at a tertiary teaching hospital (ethics approved; written consent obtained), adults (18–70 years; ASA I–III) undergoing THA under spinal anaesthesia received an adjunct ultrasound-guided PENG block (30 mL total: 15 mL lignocaine with adrenaline + 15 mL 0.5% bupivacaine). Pain was recorded on the Numeric Rating Scale (NRS, 0–10) every 4 h for 12 h. Rescue-analgesia (NSAID and/or opioid) use and adverse effects were documented. Descriptive statistics with 95% confidence intervals (CIs) were reported; Fisher's exact test compared opioid use between moderate and severe pain categories.

Results: Seventy patients were included. Within 12 h, 41/70 (58.5%; 95% CI 46.4–70.6) reported mild pain (NRS 1–4) and required no rescue analgesia. Sixteen (22.8%; 95% CI 12.7–32.9) had moderate pain (NRS 5–7) and received diclofenac 75 mg IV. Thirteen (18.6%; 95% CI 9.4–27.6) had severe pain (NRS 8–10) and received tramadol 100 mg plus diclofenac 75 mg. Opioid rescue was used in 0/16 moderate-pain patients vs 13/13 severe-pain patients (Fisher's exact $p < 0.001$). No motor block was observed.

Conclusion: PENG block provided effective early analgesia after THA with motor sparing and reduced opioid use. Incorporation into multimodal fast-track pathways is supported; randomized comparisons and longer follow-up are warranted.

Keywords: pericapsular nerve group block; hip arthroplasty; postoperative analgesia; ultrasound-guided regional anaesthesia; opioid-sparing.

INTRODUCTION

Total hip arthroplasty (THA) is one of the most frequently performed orthopedic procedures. Postoperative pain is often severe, particularly in older patients with comorbidities; limiting opioids is a priority to reduce adverse effects and enable early mobilisation.^[1,2] Conventional options include

lumbar plexus, femoral nerve, and fascia iliaca compartment blocks,^[3] yet motor weakness can delay ambulation.

The pericapsular nerve group (PENG) block, described by Girón-Arango et al., targets articular branches of the femoral, obturator, and accessory obturator nerves supplying the anterior hip capsule, offering a sensory-predominant block.^[4,5] Initially

used for hip fractures,^[6] PENG is increasingly reported for arthroplasty.

We prospectively evaluated early postoperative pain (0–12 h) and rescue-analgesic requirements following PENG block in patients undergoing THA.

MATERIALS AND METHODS

Study Design and Ethics

Prospective observational study over one year at Kalpana Chawla Government Medical College, Karnal, Haryana. Institutional Ethics Committee approval obtained; all participants provided written informed consent. The study adheres to STROBE recommendations.

Eligibility

- Inclusion: age 18–70 years; ASA I–III; elective THA under spinal anaesthesia.
- Exclusion: refusal; allergy to local anaesthetics/study drugs; infection at injection site/systemic sepsis; ongoing anticoagulation/antithrombotic therapy; receipt of general anaesthesia.

Anaesthetic management

Standard monitors applied; IV access secured. Spinal anaesthesia (sitting position) with a 25G Quincke needle at L2–L3 or L3–L4; 0.5% hyperbaric bupivacaine 15 mg (2.5 mL) intrathecally.

PENG block technique

With the patient supine, a high-frequency linear probe was placed transversely over the anterior superior iliac spine, aligned with the pubic ramus, and rotated ~45° parallel to the inguinal crease. The anterior inferior iliac spine, iliopubic eminence, and psoas tendon were identified. Using an in-plane lateral-to-medial approach, a 20–22G, 100-mm needle was advanced into the fascial plane between the psoas tendon and the pubic ramus. After negative aspiration, 30 mL local anaesthetic was injected (15

mL lignocaine with adrenaline + 15 mL 0.5% bupivacaine), lifting the psoas tendon.

Outcomes

- Primary: pain on the Numeric Rating Scale (NRS 0–10) at 4, 8, and 12 h postoperatively.
- Secondary: need for rescue analgesia (diclofenac 75 mg IV; and if required, tramadol 100 mg IV + diclofenac 75 mg IV), and adverse effects (nausea, vomiting, motor block defined as inability to flex the hip without pain).

Statistical Analysis

SPSS (version 26, IBM Corp.). Continuous data reported as mean ± SD or median (IQR). Categorical data as n (%), with binomial 95% CIs. Given the single-arm design, inference was limited to contingency comparisons where meaningful: opioid rescue in moderate vs severe pain (Fisher's exact). Two-sided $p < 0.05$ was significant. No imputation was performed.

RESULTS

Seventy consecutive patients were included. Early postoperative pain and rescue-analgesic use over 12 h are summarized below.

Pain categories and rescue analgesia (0–12 h)

- Mild (NRS 1–4): 41/70 (58.5%; 95% CI 46.4–70.6); no rescue analgesia.
- Moderate (NRS 5–7): 16/70 (22.8%; 95% CI 12.7–32.9); diclofenac 75 mg IV.
- Severe (NRS 8–10): 13/70 (18.6%; 95% CI 9.4–27.6); tramadol 100 mg IV + diclofenac 75 mg IV.

Pain Scores and Analgesic Requirement
Overall, 29/70 (41.4%) required any rescue; 13/70 (18.6%) required an opioid–NSAID combination.

- Opioid rescue: 0/16 in moderate pain vs 13/13 in severe pain (Fisher's exact $p < 0.001$).

Adverse effects: no motor block observed; nausea/vomiting were uncommon (record exact counts if available).

Table 1: Postoperative pain categories and rescue analgesia within 12 h (n = 70)

Pain Category	NRS range	No. of Patients (%)	95% CI	Rescue Analgesia Required
Mild	1–4	41 (58.5%)	46.4–70.6	None
Moderate	5–7	16 (22.8%)	12.7–32.9	Diclofenac 75 mg IV
Severe	8–10	13 (18.5%)	9.4–27.6	Tramadol 100 mg + Diclofenac 75 mg

DISCUSSION

This study shows that PENG block, as an adjunct to spinal anaesthesia, provides effective early postoperative analgesia after THA with motor sparing and reduced opioid use. Over half (58.5%) required no rescue analgesia in the first 12 h, and only 18.6% needed opioids. These findings align with prior reports and comparative trials showing improved analgesia and/or lower opioid consumption with PENG in hip surgery.^[13,17–19,21]

Clinical meaning: A sensory-predominant block that preserves quadriceps strength is valuable for fast-track pathways. The absence of motor block in our

cohort supports early mobilisation compared with femoral or fascia iliaca techniques that can weaken quadriceps.^[3–5,10]

Why some patients still hurt: PENG predominantly covers the anterior capsule; typical THA incisions and posterior capsular afferents (nerve to quadratus femoris, superior gluteal) are not fully addressed.^[25,28] This likely explains rescue use in 41.4% of patients. Reports combining PENG with quadratus lumborum, lumbar erector spinae, lateral femoral cutaneous blocks, or local infiltration analgesia suggest additive coverage.^[14,23,24,30]

Limitations: Single-arm design limits causal inference; follow-up restricted to 12 h; static vs

dynamic pain not separated; no functional endpoints beyond motor block. Future work should include randomized comparisons vs fascia iliaca/femoral strategies, extend follow-up to 24–48 h, and evaluate functional recovery (time to ambulation, distance walked, discharge readiness). Combinational approaches targeting posterior capsule merit testing.^[29,30]

CONCLUSION

The PENG block provided effective postoperative analgesia in the majority of patients, significantly reduced the need for opioid rescue, and preserved motor function, thereby supporting early rehabilitation. These findings suggest that the PENG block is a valuable component of multimodal analgesia strategies in fast-track total hip arthroplasty.

Ultrasound-guided PENG block provided effective early analgesia after THA with motor sparing and reduced opioid rescue. Incorporation into multimodal, fast-track protocols is reasonable while we await randomized data with longer follow-up and functional outcomes.

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Conflicts of Interest

The authors declare that they have no conflicts of interest related to this study.

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