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Research Article

A Comparative Evaluation of Hemodynamic Stability, Safety Profile, and Postoperative Outcomes of PENG Block and Supra-Inguinal Fascia Iliaca Compartment Block in Peri-Articular Hip Surgeries

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ABSTRACT

Background: Effective postoperative analgesia following peri-articular hip surgeries is essential for early mobilization, functional recovery, and patient satisfaction. The Pericapsular Nerve Group (PENG) block has emerged as a motor-sparing regional analgesic technique that specifically targets the sensory innervation of the anterior hip capsule, whereas the Supra-Inguinal Fascia Iliaca Compartment Block (SFICB) is an established regional block providing broad analgesic coverage. Comparative evidence regarding their effects on hemodynamic stability, safety, and postoperative recovery remains limited. This study was undertaken to compare the hemodynamic stability, safety profile, and postoperative outcomes of PENG block and SFICB in patients undergoing peri-articular hip surgeries. **Methods:** A prospective, randomized comparative study was conducted on 60 adult patients undergoing peri-articular hip surgeries. Patients were randomly allocated into two equal groups: Group P received ultrasound-guided PENG block (n=30), while Group S received ultrasound-guided SFICB (n=30). Baseline demographic characteristics, intraoperative hemodynamic parameters, block-related complications, postoperative pain scores using the Visual Analogue Scale (VAS), rescue analgesic requirements, quadriceps muscle strength, independent ambulation, patient satisfaction, and length of hospital stay were recorded and compared. Statistical analysis was performed using SPSS version 26.0, and a p-value <0.05 was considered statistically significant. **Results:** Baseline demographic characteristics, ASA physical status, surgical diagnosis, duration of surgery, and intraoperative hemodynamic parameters were comparable between the two groups ($p>0.05$). The incidence of block-related complications was low and did not differ significantly between groups. However, the PENG group demonstrated significantly lower postoperative VAS scores at 2, 6, 12, and 24 hours ($p\leq0.001$), longer

duration before first rescue analgesia (11.8±2.6 vs. 8.3±2.4 hours, p<0.001), fewer rescue analgesic doses (1.1±0.4 vs. 1.9±0.6, p<0.001), better quadriceps muscle strength (4.6±0.5 vs. 3.7±0.7, p<0.001), higher rates of independent ambulation within 24 hours (86.7% vs. 63.3%, p=0.037), and greater patient satisfaction (9.3±0.8 vs. 8.4±0.9, p<0.001). Although the hospital stay was shorter in the PENG group, the difference was not statistically significant (p=0.057). **Conclusion:** Both PENG block and SFICB were safe regional analgesic techniques with comparable intraoperative hemodynamic stability. However, the PENG block provided superior postoperative analgesia, reduced rescue analgesic requirements, better preservation of quadriceps muscle strength, earlier mobilization, and greater patient satisfaction. These findings support the PENG block as a preferable motor-sparing regional anaesthetic technique for peri-articular hip surgeries.

KEYWORDS: Pericapsular Nerve Group (PENG) Block. Supra-Inguinal Fascia Iliaca Compartment Block (SFICB). Peri-Articular Hip Surgery.

INTRODUCTION

Peri-articular hip surgeries are among the most frequently performed orthopedic procedures for conditions such as fractures of the neck of femur, intertrochanteric fractures, acetabular fractures, avascular necrosis, and degenerative hip diseases. Despite advances in surgical techniques, postoperative pain remains a major concern because severe pain delays mobilization, prolongs hospital stay, increases opioid consumption, and adversely affects functional recovery. Effective perioperative analgesia therefore plays a pivotal role in enhanced recovery after surgery (ERAS) protocols and contributes significantly to improved patient satisfaction and surgical outcomes.[1]

Regional anaesthesia techniques have become an integral component of multimodal analgesia for hip surgeries. Conventional techniques including femoral nerve block, lumbar plexus block, and fascia iliaca compartment block provide effective analgesia but are frequently associated with varying degrees of quadriceps weakness due to motor blockade. This motor impairment delays ambulation, increases the risk of falls, and may hinder early rehabilitation, particularly in elderly patients undergoing hip surgeries. Consequently, there has been increasing interest in motor-sparing regional analgesic techniques that can provide effective pain relief while preserving muscle strength.[2]

The supra-inguinal fascia iliaca compartment block (SFICB) has gained popularity because of its ability to achieve wider cephalad spread of local anaesthetic beneath the fascia iliaca, resulting in blockade of the femoral nerve, lateral femoral cutaneous nerve, and, variably, the obturator nerve. Compared with the infra-inguinal approach, SFICB provides improved postoperative analgesia and facilitates patient positioning for spinal anaesthesia. Nevertheless, significant quadriceps weakness may still occur owing to femoral nerve involvement, limiting early mobilisation.[3]

The Pericapsular Nerve Group (PENG) block, first described by Girón-Arango and colleagues in 2018, represents a novel ultrasound-guided regional anaesthesia technique specifically designed to block the articular branches supplying the anterior hip capsule. By targeting the sensory branches of the femoral nerve, accessory obturator nerve, and obturator nerve while largely sparing the motor branches, the PENG block offers the potential advantage of excellent analgesia with preservation of quadriceps muscle strength. This characteristic has generated considerable interest among

anaesthesiologists managing patients undergoing hip surgeries.[4]

Several recent clinical studies have demonstrated encouraging results with the PENG block, including superior postoperative pain control, reduced opioid requirements, improved patient positioning during spinal anaesthesia, earlier mobilisation, and enhanced functional recovery. However, available evidence comparing PENG block with SFICB remains limited, particularly regarding intraoperative hemodynamic stability, safety profile, postoperative recovery, and overall clinical outcomes. Existing studies have reported varying results owing to differences in patient populations, surgical procedures, local anaesthetic techniques, and outcome measures. Therefore, further comparative evaluation is warranted to establish the relative efficacy and safety of these two regional analgesic techniques.[5]

The present study was therefore undertaken to compare PENG block and Supra-Inguinal Fascia Iliaca Compartment Block in patients undergoing peri-articular hip surgeries with special emphasis on intraoperative hemodynamic stability, safety profile, postoperative pain relief, rescue analgesic requirements, quadriceps muscle preservation, and early postoperative recovery. The findings of this study may contribute to evidence-based selection of the optimal regional anaesthetic technique for peri-articular hip surgeries, thereby improving patient comfort, facilitating early rehabilitation, and enhancing overall perioperative outcomes.

AIM

To compare the hemodynamic stability, safety profile, and postoperative outcomes of Pericapsular Nerve Group (PENG) Block and Supra-Inguinal Fascia Iliaca Compartment Block in patients undergoing peri-articular hip surgeries.

OBJECTIVES

1. To compare intraoperative hemodynamic parameters between patients receiving PENG block and Supra-Inguinal Fascia Iliaca Compartment Block.
2. To compare the safety profile and block-related complications associated with PENG block and Supra-Inguinal Fascia Iliaca Compartment Block.
3. To compare postoperative outcomes including pain scores, rescue analgesic requirement, quadriceps muscle strength, and functional recovery between the two groups.

MATERIALS AND METHODOLOGY

Source of Data

The data were collected from patients undergoing elective peri-articular hip surgeries admitted to the Department of Anaesthesiology in collaboration with the Department of Orthopaedics of the tertiary care teaching hospital. Eligible patients satisfying the inclusion criteria were enrolled after obtaining written informed consent.

Study Design

The study was conducted as a prospective, randomized, comparative analytical study.

Study Location

The study was conducted in the Department of Anaesthesiology and Critical Care in collaboration with the Department of Orthopaedics at the tertiary care teaching hospital.

Study Duration

The study was conducted over a period of 24 months including patient recruitment, intervention, postoperative follow-up, data collection, statistical analysis, and preparation of the dissertation.

Sample Size

A total of 60 patients were included in the study.

- Group P (PENG Block): 30 patients
- Group S (Supra-Inguinal Fascia Iliaca Compartment Block): 30 patients

Patients were randomly allocated into two equal groups using a computer-generated randomization sequence.

Inclusion Criteria

Patients who fulfilled all of the following criteria were included:

- Age ≥18 years.
- Either gender.
- American Society of Anesthesiologists (ASA) Physical Status I-III.
- Patients undergoing elective peri-articular hip surgeries under spinal anaesthesia.
- Patients willing to provide written informed consent.

Exclusion Criteria

Patients with any of the following were excluded:

- Patient refusal.
- Allergy to local anaesthetic drugs.
- Infection at the site of block.
- Coagulopathy or patients receiving anticoagulants.
- Pre-existing neurological deficits involving the lower limb.
- Severe hepatic or renal dysfunction.
- Severe cardiovascular instability.
- Pregnancy.
- Cognitive impairment preventing pain assessment.

Procedure and Methodology

Following Institutional Ethics Committee approval, eligible patients were recruited after obtaining written informed consent. Preoperative evaluation included detailed history, physical examination, airway assessment, ASA grading, routine laboratory investigations, and anaesthetic fitness.

Patients were randomly assigned into either the PENG group or the Supra-Inguinal Fascia Iliaca Compartment Block group.

Standard ASA monitoring comprising ECG, non-invasive blood pressure, pulse oximetry, and heart rate monitoring was instituted. Baseline hemodynamic parameters were recorded.

Under strict aseptic precautions and ultrasound guidance, the allocated regional block was administered using 30 mL of 0.2% ropivacaine with 8 mg dexamethasone.

After confirmation of adequate analgesia, spinal anaesthesia was administered in the sitting position. Ease of positioning was noted.

Throughout surgery, heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, oxygen saturation, and adverse events were recorded at predefined intervals.

Following surgery, patients were monitored for 24 hours. Pain was assessed using the Visual Analogue Scale (VAS) at regular postoperative intervals. Rescue analgesia was administered whenever VAS ≥4 according to institutional protocol.

Quadriceps muscle strength was evaluated using the Medical Research Council (MRC) grading system. Time to first rescue analgesia, total rescue analgesic consumption, postoperative complications, and overall recovery parameters were recorded and compared between the two groups.

Sample Processing

All clinical observations were recorded on a structured case record form immediately after assessment. The collected data were checked daily for completeness and consistency. Data were entered into Microsoft Excel, verified for accuracy, and subsequently transferred to SPSS software for statistical analysis.

Statistical Methods

Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 26.0.

- Continuous variables were expressed as Mean ± Standard Deviation (SD).

- Categorical variables were expressed as frequency and percentage.
- Independent Student's *t*-test was used to compare continuous variables.
- Chi-square test or Fisher's Exact test was used for categorical variables wherever appropriate.
- Repeated measures ANOVA was used for comparison of serial hemodynamic variables.
- A p-value <0.05 was considered statistically significant.

Data Collection

Data were collected using a predesigned case record form that included:

- Demographic characteristics (age, gender, BMI)
- ASA physical status
- Diagnosis and type of surgery
- Block characteristics
- Ease of spinal positioning
- Intraoperative heart rate, systolic BP, diastolic BP, and mean arterial pressure
- Postoperative VAS pain scores
- Quadriceps muscle strength (MRC grading)
- Time to first rescue analgesia
- Total rescue analgesic consumption within 24 hours
- Postoperative complications including nausea, vomiting, hypotension, bradycardia, local anaesthetic toxicity, hematoma, infection, nerve injury, and falls
- Overall postoperative recovery and functional outcome

OBSERVATION AND RESULTS

Table 1: Baseline demographic and perioperative characteristics of study participants

Variable	PENG (n=30)	SFICB (n=30)	Test of significance	95% CI	p value
Age (years), Mean±SD	59.2±12.8	60.9±14.2	t=0.49	−5.24 to 8.64	0.627
Male	18 (60.0%)	17 (56.7%)	χ^2=0.07	RR 1.06 (0.68-1.65)	0.793
Female	12 (40.0%)	13 (43.3%)			
BMI (kg/m²), Mean±SD	25.3±3.2	25.8±3.5	t=0.58	−1.25 to 2.25	0.563
ASA I	10 (33.3%)	9 (30.0%)	χ^2=0.16		0.923
ASA II	17 (56.7%)	18 (60.0%)			
ASA III	3 (10.0%)	3 (10.0%)			
Neck of femur fracture	13 (43.3%)	12 (40.0%)	χ^2=0.08		0.960
Intertrochanteric fracture	11 (36.7%)	12 (40.0%)			
AVN/OA/Other	6 (20.0%)	6 (20.0%)			
Duration of surgery (min), Mean±SD	96.4±18.3	99.8±17.6	t=0.73	−12.7 to 5.9	0.467

Table 1 compares the baseline demographic and perioperative characteristics of patients in the PENG and Supra-Inguinal Fascia Iliaca Compartment Block (SFICB) groups. The mean age of participants was comparable between the PENG group (59.2±12.8 years) and the SFICB group (60.9±14.2 years), with no statistically significant difference (t=0.49, 95% CI: −5.24 to 8.64, p=0.627). The gender distribution was also similar, with males comprising 60.0% in the PENG group and 56.7% in the SFICB group, while females

accounted for 40.0% and 43.3%, respectively (χ^2=0.07, RR=1.06, 95% CI: 0.68–1.65, p=0.793). The mean body mass index was comparable between the groups (25.3±3.2 vs. 25.8±3.5 kg/m²; t=0.58, 95% CI: −1.25 to 2.25, p=0.563). Similarly, there were no significant differences in ASA physical status distribution (χ^2=0.16, p=0.923), with most patients belonging to ASA II in both groups. The distribution of surgical diagnoses, including neck of femur fractures, intertrochanteric fractures, and AVN/osteoarthritis/other conditions, was comparable (χ^2=0.08, p=0.960). The mean duration of surgery was also similar between the PENG (96.4±18.3 minutes) and SFICB (99.8±17.6 minutes) groups (t=0.73, 95% CI: −12.7 to 5.9, p=0.467).

Table 2: Comparison of intraoperative hemodynamic parameters

Variable	PENG (n=30)	SFICB (n=30)	Test of significance	95% CI	p value
Baseline Heart Rate (beats/min)	82.4±9.3	83.7±8.8	t=0.56	−5.9 to 3.3	0.578
Lowest Heart Rate	73.8±7.5	72.6±8.1	t=0.59	−2.8 to 5.2	0.556
Baseline SBP (mmHg)	129.8±12.4	131.4±11.9	t=0.51	−7.8 to 4.6	0.612
Lowest SBP (mmHg)	114.5±10.8	112.9±11.4	t=0.56	−4.5 to 7.7	0.579
Baseline DBP (mmHg)	79.2±7.8	80.1±8.2	t=0.43	−5.0 to 3.2	0.668
Lowest DBP (mmHg)	68.4±6.5	67.8±6.9	t=0.35	−2.7 to 3.9	0.728
Mean Arterial Pressure (mmHg)	91.7±7.4	91.0±7.9	t=0.35	−3.3 to 4.7	0.725
Episodes of hypotension	2 (6.7%)	3 (10.0%)	Fisher's exact=0.22	OR 0.64 (0.10-4.13)	0.640
Episodes of bradycardia	1 (3.3%)	2 (6.7%)	Fisher's exact=0.35	OR 0.48 (0.04-5.64)	0.554

Table 2 compares the intraoperative hemodynamic parameters between patients receiving PENG block and SFICB. The baseline heart rate was comparable between the PENG (82.4±9.3 beats/min) and SFICB (83.7±8.8 beats/min) groups (t=0.56, 95% CI: −5.9 to 3.3, p=0.578). Similarly, the lowest heart rate recorded intraoperatively did not differ significantly between the groups (73.8±7.5 vs. 72.6±8.1 beats/min; t=0.59, p=0.556). Baseline systolic blood pressure was comparable (129.8±12.4 vs. 131.4±11.9 mmHg; t=0.51, p=0.612), as was the lowest systolic blood pressure during surgery (114.5±10.8 vs. 112.9±11.4 mmHg; t=0.56, p=0.579). No significant differences were observed in baseline diastolic blood pressure (79.2±7.8 vs. 80.1±8.2 mmHg; t=0.43, p=0.668), lowest diastolic blood pressure (68.4±6.5 vs. 67.8±6.9 mmHg; t=0.35, p=0.728), or mean arterial pressure (91.7±7.4 vs. 91.0±7.9 mmHg; t=0.35, p=0.725). Episodes of hypotension occurred in 6.7% of patients in the PENG group and 10.0% in the SFICB group (Fisher's exact=0.22, OR=0.64, 95% CI: 0.10–4.13, p=0.640), while bradycardia was noted in 3.3% and 6.7% of patients, respectively (Fisher's exact=0.35, OR=0.48, 95% CI: 0.04–5.64, p=0.554).

Table 3: Comparison of safety profile and block-related complications

Variable	PENG (n=30)	SFICB (n=30)	Test of significance	95% CI	p value
Block failure	1 (3.3%)	2 (6.7%)	Fisher's exact=0.35	OR 0.48 (0.04-5.64)	0.554
Vascular puncture	0 (0%)	1 (3.3%)	Fisher's exact		0.313
Local hematoma	0 (0%)	1 (3.3%)	Fisher's exact		0.313
Local anaesthetic toxicity	0 (0%)	0 (0%)			
Nerve injury	0 (0%)	0 (0%)			
Infection at injection site	0 (0%)	0 (0%)			
Postoperative nausea/vomiting	2 (6.7%)	3 (10.0%)	Fisher's exact=0.22	OR 0.64 (0.10-4.13)	0.640
Falls due to quadriceps weakness	0 (0%)	1 (3.3%)	Fisher's exact		0.313
Overall complications	3 (10.0%)	6 (20.0%)	χ^2=1.18	RR 0.50 (0.14-1.82)	0.277

Table 3 presents the comparison of the safety profile and block-related complications between the PENG and SFICB groups. Block failure occurred in one patient (3.3%) in the PENG group and two patients (6.7%) in the SFICB group, without statistical significance (Fisher's exact=0.35, OR=0.48, 95% CI: 0.04–5.64, p=0.554). Vascular puncture and local hematoma were each observed in one patient (3.3%) in the SFICB group, whereas no such complications occurred in the PENG group (p=0.313 for both). Importantly, no cases of local anaesthetic systemic toxicity, nerve injury, or injection-site infection were reported in either group. Postoperative nausea and vomiting occurred in 6.7% of patients in the PENG group and 10.0% in the SFICB group, with no statistically significant difference (Fisher's exact=0.22, OR=0.64, 95% CI: 0.10–4.13, p=0.640). Falls related to quadriceps weakness were observed only in one patient (3.3%) in the SFICB group. Although the overall complication rate was numerically lower in the PENG group (10.0%) than in the SFICB group (20.0%), the difference was not statistically significant (χ^2=1.18, RR=0.50, 95% CI: 0.14–1.82, p=0.277).

Table 4: Comparison of postoperative outcomes

Variable	PENG (n=30)	SFICB (n=30)	Test of significance	95% CI	p value
VAS at 2 hours	1.8±0.7	2.6±0.8	t=4.13	−1.19 to −0.41	<0.001*
VAS at 6 hours	2.4±0.8	3.6±0.9	t=5.47	−1.64 to −0.76	<0.001*
VAS at 12 hours	3.0±0.9	4.2±1.0	t=4.88	−1.69 to −0.71	<0.001*
VAS at 24 hours	2.1±0.8	2.9±0.9	t=3.63	−1.24 to −0.36	0.001*
Time to first rescue analgesia (hours)	11.8±2.6	8.3±2.4	t=5.42	2.21 to 4.79	<0.001*

Total rescue analgesic doses (24 hrs)	1.1±0.4	1.9±0.6	t=6.12	−1.06 to −0.54	<0.001*
Quadriceps MRC grade at 6 hrs	4.6±0.5	3.7±0.7	t=5.72	0.58 to 1.22	<0.001*
Independent ambulation within 24 hrs	26 (86.7%)	19 (63.3%)	χ^2=4.36	RR 1.37 (1.01-1.86)	0.037*
Patient satisfaction score (0-10)	9.3±0.8	8.4±0.9	t=4.08	0.46 to 1.34	<0.001*
Length of hospital stay (days)	4.7±1.1	5.3±1.3	t=1.94	−1.22 to 0.02	0.057

Table 4 compares the postoperative outcomes between the PENG and SFICB groups. Patients receiving the PENG block experienced significantly lower postoperative pain scores at all assessed time points, with VAS scores of 1.8±0.7 versus 2.6±0.8 at 2 hours (t=4.13, p<0.001), 2.4±0.8 versus 3.6±0.9 at 6 hours (t=5.47, p<0.001), 3.0±0.9 versus 4.2±1.0 at 12 hours (t=4.88, p<0.001), and 2.1±0.8 versus 2.9±0.9 at 24 hours (t=3.63, p=0.001). The duration until the first rescue analgesia was significantly longer in the PENG group (11.8±2.6 hours) compared with the SFICB group (8.3±2.4 hours) (t=5.42, 95% CI: 2.21–4.79, p<0.001). Patients in the PENG group also required significantly fewer rescue analgesic doses within the first 24 hours (1.1±0.4 vs. 1.9±0.6; t=6.12, p<0.001). Quadriceps muscle strength at 6 hours, assessed using the Medical Research Council grading system, was significantly better following the PENG block (4.6±0.5 vs. 3.7±0.7; t=5.72, p<0.001). Independent ambulation within 24 hours was achieved by 86.7% of patients in the PENG group compared with 63.3% in the SFICB group (χ^2=4.36, RR=1.37, 95% CI: 1.01–1.86, p=0.037). Furthermore, patient satisfaction scores were significantly higher in the PENG group (9.3±0.8 vs. 8.4±0.9; t=4.08, 95% CI: 0.46–1.34, p<0.001). Although the average length of hospital stay was shorter in the PENG group (4.7±1.1 days) than in the SFICB group (5.3±1.3 days), this difference did not reach statistical significance (t=1.94, 95% CI: −1.22 to 0.02, p=0.057).

DISCUSSION

In the present study, baseline characteristics were comparable between the PENG and SFICB groups. Mean age, sex distribution, BMI, ASA grade, type of hip pathology, and duration of surgery did not differ significantly between groups. This indicates good baseline matching and reduces the possibility that postoperative differences were due to demographic or surgical variation. Similar baseline comparability was reported by Aliste et al. (2021)[1], Duan et al. (2023)[2], and Saini et al. (2024)[3] in studies comparing PENG block with fascia iliaca or supra-inguinal fascia iliaca block for hip surgeries. The uploaded dissertation also reported comparable demographic characteristics between groups before outcome comparison.

Intraoperative hemodynamic parameters were stable in both groups. Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and episodes of hypotension or bradycardia were not significantly different between PENG and SFICB groups. This suggests that both regional techniques were safe from a hemodynamic perspective. Similar observations were made by Desmet et al. (2017)[4] and Lin et al. (2021)[5], who reported that regional blocks for hip surgery provided effective analgesia without

clinically significant hemodynamic instability. Duan et al. (2023)[2] also observed no major hemodynamic concerns while comparing continuous PENG block and fascia iliaca compartment block after total hip arthroplasty.

Regarding safety, the present study showed low complication rates in both groups. Block failure, vascular puncture, hematoma, postoperative nausea/vomiting, and falls were numerically lower in the PENG group, but the differences were not statistically significant. No patient developed local anaesthetic systemic toxicity, nerve injury, or injection-site infection. These findings are comparable with Girón-Arango et al. (2018)[6], who introduced the PENG block as a targeted anterior hip capsule block, and with Amin et al. (2023)[7], who reported that PENG block was effective and safe for hip-related pain management. The absence of major block-related adverse events in the present study supports the safety of both ultrasound-guided techniques.

Postoperative outcomes were significantly better in the PENG group. VAS scores at 2, 6, 12, and 24 hours were significantly lower with PENG block compared with SFICB. Time to first rescue analgesia was longer, total rescue analgesic requirement was lower, quadriceps strength was better, independent ambulation within 24 hours was higher, and patient satisfaction was significantly greater in the PENG group. These findings are strongly supported by Duan et al. (2023)[2], who found that PENG block produced better postoperative analgesia, improved quadriceps strength, earlier ambulation, and reduced rescue analgesia compared with fascia iliaca block. Similarly, Saini et al. (2024)[3] reported better quadriceps strength and weight-bearing capacity with PENG block compared with supra-inguinal fascia iliaca block. Aliste et al. (2021)[1] also found that PENG block resulted in less quadriceps motor block compared with supra-inguinal fascia iliaca block, supporting the motor-sparing advantage of PENG.

The better quadriceps preservation observed in the present study may be explained by the anatomical target of the PENG block, which primarily blocks the articular sensory branches of the femoral, obturator, and accessory obturator nerves supplying the anterior hip capsule, while relatively sparing the main motor branches of the femoral nerve. Short et al. (2018)[8] demonstrated that the anterior hip capsule receives dense sensory innervation from these articular branches, providing anatomical support for the analgesic efficacy of PENG block. In contrast, SFICB may spread toward the femoral nerve and cause quadriceps weakness, which can delay early mobilization.

Although hospital stay was shorter in the PENG group, the difference was not statistically significant. This may be due to the small sample size and the influence of surgical, orthopedic, and rehabilitation-related factors on discharge planning. Similar findings were reported by Aliste et al. (2021)[1], where motor preservation was better with PENG block, but differences in broader recovery outcomes such as hospital stay were less consistent. Overall, the present study suggests that PENG block offers superior postoperative analgesia and functional recovery while maintaining a safety profile comparable to SFICB.

CONCLUSION

The present study demonstrated that both the Pericapsular Nerve Group (PENG) block and the Supra-Inguinal Fascia Iliaca Compartment Block (SFICB) provided effective regional analgesia with comparable intraoperative hemodynamic stability and an excellent safety profile in patients undergoing peri-articular hip surgeries. Baseline demographic characteristics and perioperative variables were similar between

the two groups, ensuring a valid comparison of outcomes. Although both techniques were associated with a low incidence of block-related complications, the PENG block consistently produced superior postoperative outcomes. Patients receiving the PENG block experienced significantly lower postoperative pain scores, prolonged duration before the first rescue analgesic requirement, reduced analgesic consumption, better preservation of quadriceps muscle strength, earlier independent ambulation, and higher patient satisfaction. While the length of hospital stay was slightly shorter in the PENG group, the difference was not statistically significant. Overall, the findings suggest that the PENG block is a more effective motor-sparing regional analgesic technique than the SFICB for peri-articular hip surgeries, offering enhanced postoperative analgesia and functional recovery without compromising hemodynamic stability or patient safety.

LIMITATIONS OF THE STUDY

1. The study was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other institutions and patient populations.
2. The sample size was relatively small (60 patients), which may have limited the statistical power to detect differences in infrequent complications and secondary outcomes.
3. Postoperative follow-up was limited to the early postoperative period (24 hours), and long-term analgesic efficacy, functional recovery, and rehabilitation outcomes were not evaluated.
4. The study included different types of peri-articular hip surgeries, and variations in surgical procedures and tissue trauma may have influenced postoperative pain and recovery.
5. Functional outcomes were assessed primarily using quadriceps muscle strength and early ambulation, while validated long-term functional outcome scores and quality-of-life assessments were not included.
6. Although standardized analgesic protocols were followed, individual variations in pain perception and analgesic response could not be completely eliminated.

REFERENCES

1. Aliste J, Layera S, Bravo D, Jara A, Muñoz G, Barrientos C, et al. Randomized comparison between pericapsular nerve group block and suprainguinal fascia iliaca block for total hip arthroplasty. Reg Anesth Pain Med. 2021;46(10):874-8.
2. Duan L, Zhang L, Shi CG, Huang LG, Ao H, Wang ZP, et al. Comparison of continuous pericapsular nerve group block versus continuous fascia iliaca compartment block on pain management and quadriceps muscle strength after total hip arthroplasty: a prospective, randomized controlled study. BMC Anesthesiol. 2023;23:223.
3. Saini T, Aggarwal S, Mittal R, Sharma A, Kaur M. Pericapsular nerve group block versus supra-inguinal fascia iliaca block for functional outcome in hip fracture patients. Indian J Anaesth. 2024;68(6):542-8.
4. Desmet M, Vermeylen K, Van Herreweghe I, Carlier L, Soetens F, Lambrecht S, et al. A longitudinal supra-inguinal fascia iliaca compartment block reduces morphine consumption after total hip arthroplasty. Reg Anesth Pain Med. 2017;42(3):327-33.
5. Lin DY, Morrison C, Brown B, Saies AA, Pawar R, Vermeulen M, et al. Pericapsular nerve group block provides improved short-term analgesia compared with femoral nerve block in hip fracture surgery. Reg Anesth Pain Med. 2021;46(5):398-403.
6. Girón-Arango L, Peng PWH, Chin KJ, Brull R, Perlas A. Pericapsular nerve group block for hip fracture. Reg Anesth Pain Med. 2018;43(8):859-63.
7. Amin SR, Abdelrahman MA, Elhelw M, Abdelhamid BM. Comparison between

pericapsular nerve group block and fascia iliaca compartment block for hip surgeries: systematic review and meta-analysis. Egypt J Anaesth. 2023;39(1):275-83.
8. Short AJ, Barnett JJG, Gofeld M, Baig E, Lam K, Agur AMR, et al. Anatomic study of innervation of the anterior hip capsule: implication for image-guided intervention. Reg Anesth Pain Med. 2018;43(2):186-92.
9. Hao H, Yan X, Xu D. Evaluation of pericapsular nerve group block for analgesic effect in elderly patients with femoral neck fracture undergoing hip arthroplasty. J Healthc Eng. 2022;2022:7452716.
10. Baheti S, Sinha C, Kumar A, Anand RK. Ultrasound-guided fascia iliaca block versus pericapsular nerve group block for hip fracture surgery under spinal anaesthesia. Cureus. 2024;16(8):e67245.
11. Bauiomy H, Elsharkawy H, Abdalla M, Ali H. Comparison between pericapsular nerve group block and suprainguinal fascia iliaca block for positioning during spinal anaesthesia in hip fracture surgery. Egypt J Anaesth. 2024;40(1):230-7.
12. Yao J, Yang Y, Qiu Y, Wulan N. Pericapsular nerve group block versus supra-inguinal fascia iliaca compartment block for hip surgery: a systematic review and meta-analysis. Asian J Surg. 2025;48(8):3345-52.
13. Baran O, Şahin T, Özdemir M, Aydin ME. Comparative analysis of continuous pericapsular nerve group block and suprainguinal fascia iliaca compartment block for postoperative analgesia after total hip arthroplasty. J Orthop Surg Res. 2025;20(1):671.