

PERICAPSULAR NERVE GROUP REGIONAL BLOCK: IMPACT ON POSTOPERATIVE ANALGESIA AND RECOVERY IN PATIENTS UNDERGOING HIP JOINT SURGERIES UNDER SPINAL ANESTHESIA

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ABSTRACT

Background: The hip surgeries (total hip arthroplasty) and other surgeries are linked with important postoperative pain that may slow down the process of mobilization and recovery. PENG block is a relatively new regional anesthesia method that is aimed at offering good analgesia without affecting motor activity. Nevertheless, the data about its effectiveness is still contradictory, especially in the local populations.

Objective: To compare the results of PENG block and control in patients who are subjected to hip joint surgeries with the use of spinal anesthesia.

Methodology: This is a non-randomized controlled trial that took place in the Department of Anesthesia, DHQ Hospital, Gujranwala during June 2025 and September 2025. Sixty patients (30 to 70 years of age, ASA I-II) who received hip surgery under spinal anesthesia were enrolled with the help of consecutive sampling. The patients were divided into two groups: Group A was given 20 ml of 0.125% bupivacaine in PENG block and Group B was given no block. The Numeric Rating Scale (NRS) was used to measure pain at various intervals in 24 hours. Primary outcomes included pain score, need for opioid, and time to first opioid consumption. The SPSS v25 was used to analyze data with a significant p value of 0.05.

Result: The mean pain score of patients using PENG block was lower at 6, 12 and 24 hours after surgery than controls ($p < 0.05$). The PENG group had a lower need of opioid analgesia (about 70% vs. 95%), and the time to first opioid requirement was much longer (about 11-13 hours vs. 5-7 hours; $p < 0.05$).

Conclusion: PENG block is a better analgesic agent, decreases opioid use, and extends time to first analgesic request in patients undergoing hip surgeries under spinal anesthesia. It is a good motor-sparing pain treatment method that is appropriate to use in enhanced recovery regimes.

Keywords: PENG block, hip arthroplasty, postoperative pain, regional anesthesia, opioid consumption, spinal anesthesia

INTRODUCTION

Total hip arthroplasty (THA) is a very common surgical operation, which is recommended in the case of degenerative hip disease, osteoarthritis, and traumatic hip fractures. The conditions are common especially among the elderly population and the conditions are characterized by a high morbidity, poor quality of life and high mortality. Despite the fact that THA is a good intervention that helps to restore the functional abilities of the joint, relieve pain, it is often linked to significant postoperative pain that negatively influences the recovery process, slows down the mobilization process, and increases hospitalization.^{1, 6, 7}

Postoperative pain management is thus needed to enable early mobilization, minimize complications of deep vein thrombosis, pulmonary complications, and enhance the overall functional recovery. The time taken to walk after hip surgery is a major predictor of good clinical outcomes and insufficient analgesia may be a major obstacle to the rehabilitation process. As a result, a multimodal analgesic strategy is suggested, which involves using systemic analgesics and regional anesthesia methods to decrease opioid use, minimize the adverse effects of drugs, and patient satisfaction.⁷

In the recent years, the approaches of regional anesthesia focusing on the sensory innervation of the hip joint have become a more and more popular matter. The pericapsular nerve group (PENG) block is a new ultrasound-based method of ultrasound-guided analgesia in hip-related surgeries with minimal negative motor effects, first introduced in 2018.^{3,4} It is associated with the deposition of local anesthetic between the psoas and ilium in the fascial plane, and is directed at the articular branches of the femoral, accessory obturator, obturator nerves, which is an important benefit because it results in motor-sparing analgesia that is especially relevant to preventive early postoperative mobility and functional recovery.^{3,4}

Although the mechanism and theoretical benefits of the PENG block are promising, its clinical effectiveness in patients undergoing THA is still in contention. Some randomized controlled trials have found that PENG block reduces postoperative pain scores, and opioid requirements and increases time to first analgesic request compared to traditional analgesic regimens, but other studies have found no significant difference in pain outcomes between PENG block and no block.^{5,6,7}

Moreover, recent systematic reviews and meta-analyses have tried to elucidate the role of the PENG block in hip surgeries. There is an indication that the PENG block can lead to a decrease in postoperative pain, opioid use, and a good safety profile, but the quality of evidence is moderate, and interstudy heterogeneity still restricts conclusive remarks on the use of the PENG block.^{8,9,10}

Besides, the majority of the existing literature is based in foreign contexts, and there are few data about the local people. The diverse differences in patient factors, perception of pain and health care practices mean that region specific evidence is required to inform clinical decision-making. Thus, the current research paper will compare the results of PENG block versus control in participants subjected to hip joint surgeries under spinal anesthesia with the focus on the postoperative pain management and opioid use. The aim of the present study is to present local evidence to understand whether the supplementation with PENG block has the potential to enhance analgesic effects and justify its common usage in clinical practice.

OBJECTIVE

To compare the outcomes of pericapsular nerve group (PENG) block versus control in patients undergoing hip joint surgeries under spinal anesthesia.

METHODOLOGY

This was a non-randomized controlled trial and it was carried out in the Department of Anesthesia, DHQ Hospital, Gujranwala. The study was carried out over a period of June 2025 to September 2025. The study enrolled 60 patients and each group had 30 patients. The size of the sample was estimated using the 90 percent study power and 95 percent of the confidence level to provide sufficient statistical viability and reliability of the findings. The design was selected to compare the results of intervention group using pericapsular nerve group (PENG) block and the control group using standard care to evaluate the efficacy of the design in alleviating postoperative pain and opioid usage of patients undergoing hip joint surgery using spinal anesthesia.

Inclusion Criteria

Patients aged 30–70 years of either gender, classified as American Society of Anesthesiologists (ASA) physical status I–II, and those undergoing hip surgery under spinal anesthesia were included.

Exclusion Criteria

Patients having known allergy to local anesthetics, infection at the site of puncture, cognitive impairment or dementia, chronic renal failure or coagulopathy/spinal deformity were excluded.

Data Collection Procedure

Qualified patients were recruited to the study after seeking and receiving ethical approval by the institutional review committee and written informed consent after receiving all the information. Each patient had baseline demographic data and pertinent clinical variables. The registered patients were then divided into two categories; Group A would have an ultrasound-guided pericapsular nerve group (PENG) block done with 20 ml of 0.125% bupivacaine and Group B would be the control group and would not receive any block. The Numeric Rating Scale (NRS) was used to measure postoperative pain at 2, 6, 12, 18 and 24 hours following surgery. Where the pain score was over 3, opioid analgesia was given in line with protocol, and the time to first opioid requirement was well noted based on the operational criteria set.

Data Analysis

Statistical Package of Social Sciences (SPSS) version 25 was used to analyze the data. All data was inputted, cleansed and validated before analysis to provide accuracy. Quantitative variables age, BMI, operative time, pain scores, and time to first opioid consumption were described as mean + SD. Normality of data was tested and then an independent samples t-test was used to compare these continuous variables in the two groups. Qualitative variables such as gender, ASA physical status, comorbidities (smoking, diabetes, hypertension, and anemia) were reported in frequencies and percentages and compared with each other through chi-square test. To manage possible confounding variables, stratification was undertaken on the issues of age, gender, ASA status, BMI and comorbidities. Independent t-test and chi-square test where necessary were used to perform post-stratification analysis. A statistically significant p-value was set at 0.05 and 95% confidence interval was used to interpret results.

RESULTS

The study consisted of 60 patients who received a hip joint surgery under spinal anesthesia to compare the effectiveness of pericapsular nerve group (PENG) block with control in terms of postoperative analgesia. The sample population was equally split into two groups with 30 patients in the PENG block group and 30 patients in the control group. No statistically significant difference was found in baseline demographic and clinical characteristics between the two groups ($p > 0.05$), and this ensures homogeneity of the study sample.

Baseline Characteristics

Variable	PENG Group (n = 30)	Control Group (n = 30)	p-value
Mean Age (years)	Comparable	Comparable	>0.05
Gender (M/F)	Similar distribution	Similar distribution	>0.05
ASA I/II	Comparable distribution	Comparable distribution	>0.05
BMI (kg/m ²)	Similar	Similar	>0.05
Operative time (min)	Comparable	Comparable	>0.05

The baseline parameters did not show any statistically significant difference between the two groups meaning that the two groups were well matched to be analyzed.

Postoperative Pain Scores (NRS)

The average pain scores of the PENG block and control groups at the various postoperative time intervals were always lesser than each other. At 6, 12 and 24 hours after surgery, statistically significant decrease in pain scores was found ($p < 0.05$) with better analgesic effects of the PENG block.

Opioid Requirement

Outcome	PENG Group (n = 30)	Control Group (n = 30)	p-value
Opioid required	21 (70%)	29 (96.7%)	0.02
No opioid required	9 (30%)	1 (3.3%)	—

The rescue opioid analgesia need was also found to be significantly lower in the PENG group than in the control group ($p = 0.02$) indicating a lesser postoperative analgesic need.

Time to First Opioid Consumption

Group	Mean Time to First Opioid (hours)	Standard Deviation
PENG Block	12.1 hours	± 6.5
Control	6.2 hours	± 4.8
p-value	< 0.001	—

The time to first opioid administration was significantly prolonged in the PENG block group compared to the control group, indicating prolonged postoperative analgesia in patients receiving the block.

In general, patients who received pericapsular nerve group (PENG) block displayed a much superior postoperative analgesia, reduced pain scores, decreased opioid use, and time to first opioid requirement. These results are a strong indication that PENG block gives effective and clinically significant analgesia to surgeries on the hip joint under spinal anesthesia.

DISCUSSION

The current research proves that the pericapsular nerve group (PENG) block is a good method of regional anesthesia to decrease the use of opioids and enhance postoperative analgesia in patients undergoing hip surgeries under spinal

anesthesia. The results are in line with the existing literature that underlines the significance of multimodal analgesia and regional nerve blocks in patients with hip fractures and arthroplasty.^{1,2,15}

The analgesic effect in this trial would be comparable to the works of Giovanni Pascarella et al. that demonstrated significantly lower scores in postoperative pain, first opioid requirement, and greater functional recovery following PENG block after total hip arthroplasty.⁷

One of the greatest benefits of the PENG block is that it has the motor-sparing feature, which maintains quadriceps strength and supports early mobilization. Early mobilization has been shown to be important in reduced thromboembolic events, pulmonary complications, and length of stay in the hospital, as well as the preservation of motor activity which contributes to early physiotherapy attendance and recovery of functional capabilities.^{6,7}

But there are conflicting results in some studies. Parag Kukreja and colleagues did not find any significant difference in overall quality of recovery or pain scores between patients undergoing PENG block and patients undergoing standard analgesic regimens after total hip arthroplasty.⁶ The differences could be attributed to variations in the anesthetic technique, anesthetic dose, surgical factors, and multimodal analgesic protocols.

The role of PENG block in analgesia of hip surgery is further supported by high-level evidence. A consistent body of systematic reviews and meta-analyses has demonstrated that PENG block decreases the level of postoperative pain, and opioid use and remains safe.^{8,9,10} These investigations reveal its specific efficacy in the first 24 hours postoperative, the time of peak analgesic requirement.

These results of Yu L et al. further affirm that PENG block is a significant pain management tool during rest and movement without clinically significant motor blockade to the advantage of early rehabilitation and ambulation.¹⁰

These findings are reinforced by randomized controlled trials. Lin X et al. also showed better pain control during the early period in elderly patients with hip fractures treated with PENG block than traditional forms of analgesic treatment.⁵ Lin DY et al. also reported that PENG block is more effective in pain control in the early period than the traditional analgesic techniques.¹¹

In addition to perioperative analgesia, new data indicate that PENG block can also be applied in preoperative and emergency environments. Jin Z et al. showed that early administration can better patient positioning during spinal anesthesia, decrease the level of comfort and consequently decrease the amount of opioid used by patients with a fracture in the neck.¹²

The decrease in opioid use in the present research is in line with the principles of multimodal analgesia, which seeks to reduce opioid-induced side effects like nausea, vomiting, respiratory depression, delirium, and delayed recovery.^{1,2} The scientific rationale of the PENG block is also further substantiated by anatomical and clinical research aimed at describing the sensory innervation of the anterior hip capsule and justifying the target blockade of articular branches of the hip pain transmission.¹⁸

The positive findings notwithstanding, the weaknesses of this study are its rather small sample size and non-randomized nature, which can lead to some selection bias. Hence, the role of PENG block in analgesia during hip surgery needs large-scale randomized controlled trials using standardized analgesic methods and follow-up to further confirm its value.

CONCLUSION

Pericapsular nerve group (PENG) block is a successful method of regional anaesthesia of patients receiving hip joint surgery under spinal anaesthesia. It has a huge impact on postoperative pain scores and reduces the requirement of opioid analgesia, as well as the time to first opioid requirement. These advantages also lead to better patient comfort and facilitation of better recovery measures especially through the ability to mobilize patients without major motor block. The PENG block has the potential to become a great addition to multimodal analgesia approaches in hip surgeries because of its simplicity, safety profile, and motor-sparing benefit. Nevertheless, given the fluctuations in available evidence, additional large-scale randomized controlled trials are suggested to confirm these results and develop standardized guidelines on its application in different groups of people.

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