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A prospective study on evaluation of efficacy of combined psoas compartment and sciatic nerve blocks for postoperative analgesia in elective lower limb surgeries

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Abstract
Background: Postoperative pain management following lower limb surgeries is a critical aspect of patient care. The combination of psoas compartment block (PCB) and sciatic nerve block (SNB) has been suggested as an effective method for analgesia in these procedures. This study aimed to evaluate the efficacy and duration of sensory and motor blockade provided by combined PCB and SNB in patients undergoing elective lower limb surgeries.
Materials and Methods: A prospective study was conducted between July 2018 and June 2019, including 50 adult patients (18-60 years, ASA I-II) scheduled for elective lower limb surgeries. Patients were randomly assigned to receive combined PCB and SNB using the posterior approach for PCB (Winnie's technique) and Labat's technique for SNB. The sensory blockade was assessed using the Visual Analog Scale (VAS) at multiple intervals, and motor blockade was assessed using the Bromage score. Time to rescue analgesia was also recorded.
Results: The study revealed that sensory blockade was highly effective, with 96% of patients experiencing no pain (VAS score 1) at 30 minutes and 98% at 1 hour. However, the incidence of mild to moderate pain increased progressively, with 66% of patients reporting moderate pain at 8 hours. Motor blockade was complete in all patients at 2 hours, but by 8 hours, only 32% retained partial motor block, with most patients showing detectable weakness. Rescue analgesia was most frequently required between 9-11 hours post-surgery.
Conclusion: Combined PCB and SNB are highly effective in providing immediate postoperative pain relief in lower limb surgeries. However, the relatively short duration of the blockade highlights the necessity of timely rescue analgesia. Further studies may be required to explore techniques that prolong the efficacy of these blocks.

Keywords: Psoas compartment block, sciatic nerve block, postoperative pain, elective lower limb surgery, analgesia, motor blockade

Introduction
The combined use of psoas compartment block (PCB) and sciatic nerve block (SNB) for elective lower limb surgeries has gained considerable attention in the field of regional anesthesia. This technique offers an advantageous alternative to general anesthesia, providing effective pain management with reduced systemic effects. The psoas compartment block targets the lumbar plexus, including the femoral, obturator, and lumbosacral nerves, offering analgesia for hip, knee, and thigh procedures. On the other hand, the sciatic nerve block complements this by targeting the sciatic nerve, which supplies the posterior thigh, lower leg, and foot. The combination of these blocks can achieve nearly complete analgesia and muscle relaxation for a wide range of lower extremity surgeries [1].
A key benefit of combining the PCB and SNB is the potential for reduced opioid consumption, leading to a lower incidence of side effects such as nausea, vomiting, and respiratory depression. Additionally, regional blocks are associated with faster recovery times, allowing for earlier discharge and decreased hospital stays [2]. Research has demonstrated that when these blocks are performed together, the efficacy of pain control is significantly enhanced compared to single nerve blocks, reducing the need for supplemental analgesia [3].

Furthermore, studies indicate that the combined block results in a superior sensory and motor block profile, improving both intraoperative comfort and postoperative recovery [4]. Despite these advantages, the technique requires a high degree of skill and precision, as improper needle placement can lead to complications such as inadvertent block of other nerves or vascular structures [5].
Therefore, it is critical that anesthesiologists receive proper training and employ advanced imaging techniques such as ultrasound to guide the blocks accurately, minimizing potential risks [6].
This study aims to evaluate the effectiveness of combined psoas compartment and sciatic nerve blocks in elective lower extremity surgeries by assessing sensory and motor block, postoperative analgesia, block onset, duration, time to first rescue analgesia, and any potential complications.

Materials and Methodology

This randomized prospective study was conducted over a one-year period from July 2018 to June 2019 in the Department of Anaesthesia, Sri Lakshmi Narayana Institute of Medical Sciences. A total of 50 adult patients aged 18 to 60 years, with ASA physical status I-II, scheduled for elective lower limb surgeries, were included in the study. The sample size was determined based on previous studies and feasibility. Patients were randomly assigned using computer-generated random numbers to receive combined psoas compartment block (PCB) and sciatic nerve block (SNB).

Inclusion Criteria

- Adult patients (18-60 years).
- ASA class I-II.
- Elective lower limb surgeries.

Exclusion Criteria

- Neurological disorders.
- Age <18 or >60 years.
- ASA class >II.
- Infection at the puncture site.
- Hypersensitivity to bupivacaine.
- Coagulation disorders.
- Antenatal cases.
- Patients refusing participation.

Preoperative Preparation

An intravenous (IV) line was secured with an 18G cannula. Premedication with IV midazolam 1 mg and IV fentanyl 1 µg/kg was administered. Patients were monitored with non-invasive blood pressure, electrocardiogram (ECG), and pulse oximetry. Emergency drugs, including atropine, ephedrine, and adrenaline, were available.

Procedure

Both PCB and SNB were performed under strict aseptic conditions. For the PCB, the posterior approach (Winnie's technique) was used, while for SNB, the Labat's technique was employed. A nerve stimulator was used to guide needle placement. For PCB, 30 ml of 0.25% bupivacaine was injected, targeting the lumbar plexus. For SNB, 20 ml of 0.25% bupivacaine was administered to block the sciatic nerve. The appropriate needle placement was confirmed by twitching of the quadriceps for PCB and calf or foot contraction for SNB. Supplemental oxygen was provided during and after the procedure.

Monitors

- Non-invasive blood pressure monitor.
- Electrocardiogram (ECG).
- Pulse oximeter.

Postoperative Evaluation

Parameters such as the time of onset of sensory and motor blockade, total duration of analgesia, and time taken for the first dose of rescue analgesia were recorded. The sensory blockade was assessed using a Visual Analog Scale (VAS) at intervals of 30 minutes, 1 hour, 2 hours, 4 hours, 6 hours, and 8 hours. Motor blockade was assessed using the Bromage score at 2, 6, and 8 hours post-block. Any complications, including systemic reactions or local anesthetic toxicity, were noted.

Statistical Analysis

Data were analyzed using standard statistical methods, including means, standard deviations, and percentages. The significance of differences between groups was assessed using appropriate tests.

Results

Among the 50 patients included, the majority were male (80%) and younger than 30 years (40%), indicating a predominantly younger, male demographic. Fractures accounted for the majority of diagnoses, with "Fracture of both tibia and fibula" being the most common (36%), followed by "Fracture Tibia" (16%). These fractures likely contributed to the need for significant pain management, justifying the focus on sensory and motor blockade as key outcomes.

Table 1: Demographic characteristics

Demographic character		Frequency
Age (in years)	<30 years	20 (40%)
	31-40 years	10 (20%)
	41-50 years	6 (12%)
	51-60 years	14 (28%)
Gender	Males	40 (80%)
	Females	10 (20%)

Table 2: Types of fractures

Type of fracture	Frequency
ACL Tear	1 (2%)
Bimalleolar Fracture	4 (8%)
Crush Injury	1 (2%)
Delayed Union Femur	1 (2%)
Fracture of both tibia and fibula	18 (36%)
Fracture Femur	2 (4%)
Fracture Patella	2 (4%)
Fracture Tibia	8 (16%)
Implant	5 (10%)
Infected Wound	2 (4%)
Lisfranc Fracture	1 (2%)
Metatarsal Fracture	2 (4%)
Osteomyelitis Leg	3 (6%)

Regarding pain management, sensory blockade was highly effective, with 96% of patients reporting no pain (VAS score 1) at 30 minutes and 98% at one hour. However, the incidence of mild to moderate pain (VAS score 2 and 3)

increased over time, peaking at 8 hours where 60% of patients reported mild pain and 66% reported moderate pain. This indicates that while the nerve block provided excellent initial pain relief, its duration was limited, requiring further intervention.

Table 3: Sensory blockage

Time Interval	VAS Score 1 (No Pain)	VAS Score 2 (Mild Pain)	VAS Score 3 (Moderate Pain)
30 mins	48 (96%)	1 (2%)	-
1 hour	49 (98%)	2 (4%)	-
2 hours	48 (96%)	5 (10%)	-
4 hours	45 (90%)	9 (18%)	-
6 hours	15 (30%)	36 (72%)	10 (20%)
8 hours	-	30 (60%)	33 (66%)

Motor blockade was also efficient at 2 hours, with 100% of patients achieving a complete block (Bromage score 1). However, by 8 hours, only 32% of patients had a partial block, with a significant number showing detectable weakness.

Table 4: Motor blockade

Time Interval	Bromage Score 1 (Complete Block)	Bromage Score 2 (Almost Complete Block)	Bromage Score 3 (Partial Block)	Bromage Score 4 (Detectable Weakness)
2 hours	50 (100%)	-	-	-
6 hours	-	46 (92%)	18 (36%)	-
8 hours	-	-	32 (64%)	34 (68%)

The timing of rescue analgesia, predominantly between 9 and 11 hours post-surgery, further highlights the gradual return of sensation and motor function, necessitating additional pain management at these intervals. These findings suggest that while nerve blocks offer effective initial pain control, their short duration emphasizes the need for timely rescue analgesia.

Table 5: Time for rescue analgesia

Time Interval for Rescue Analgesia	Frequency
9-10 hours	22 (44%)
10-11 hours	28 (56%)

Discussion

This study aimed to assess the effectiveness of combined psoas compartment block (PCB) and sciatic nerve block (SNB) for postoperative analgesia in patients undergoing elective lower limb surgeries. Effective pain management is crucial in such surgeries to enhance recovery and minimize complications, and regional anesthesia techniques like PCB and SNB offer promising alternatives to general anesthesia. This study was undertaken to evaluate the onset, duration, and quality of sensory and motor blockade provided by these blocks, along with the timing of rescue analgesia.

The demographic characteristics of this study's sample were comparable to those of previous studies. In this cohort, the majority were male (80%), with a significant proportion of patients being younger than 30 years (40%). This is in line with other studies such as those by Sharma *et al.* [7], who also observed a predominantly young male population in lower limb surgery. In terms of fracture types, the most common diagnoses in this study were "Fracture of both tibia and fibula" (36%) and "Fracture Tibia" (16%), which aligns with similar studies by Singh *et al.* [8] and Gupta *et al.* [9], where fractures of the tibia and femur were frequently reported in lower limb surgeries.

Sensory blockade efficacy was high in the initial stages, with 96% of patients reporting no pain at 30 minutes and 98% at one hour. These results are consistent with those of Arora *et al.* [10], who found similar success rates for sensory blockade in the early postoperative period. However, as time progressed, the effectiveness of the blockade decreased, with significant numbers of patients experiencing mild to moderate pain at 6 and 8 hours. This decrease in analgesic efficacy is a limitation noted in study by Patel M. *et al.* [11], where the duration of nerve blocks, while effective initially, often requires supplementary analgesic interventions in the postoperative period.

Motor blockade followed a similar pattern, with 100% of patients achieving a complete block at 2 hours. By 8 hours, the blockade was reduced, with 64% of patients showing partial motor function. This finding is consistent with that of Patel G. *et al.* [12], who also noted a gradual decline in motor blockade over time, highlighting the transient nature of these blocks. Rescue analgesia was required predominantly between 9 and 11 hours, further emphasizing the need for additional pain management as the blockade waned.

Conclusion

The study demonstrated that combined psoas compartment block (PCB) and sciatic nerve block (SNB) offer effective and reliable analgesia for patients undergoing elective lower limb surgeries. While the blocks provided significant sensory and motor blockade at early intervals, the duration of analgesia was limited, requiring the use of rescue analgesia after approximately 9-11 hours. These findings emphasize the importance of timely pain management and highlight the potential benefits of combined nerve blocks for postoperative care.

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Conflicts of Interest: None declared.

References

1. Chan VW, Perlas A, Lupu M, *et al.* The psoas compartment block: A review. Reg Anesth Pain Med. 2002;27(6):586-592.

2. Kessler P, Pagel P. Regional Anesthesia for Lower Limb Surgery. Eur J Anaesthesiol. 2004;21(12):917-924.
3. Borgeat A, Ekatodramis G, Amsler F, *et al*. The combined psoas compartment block and sciatic nerve block in hip surgery: A clinical study. Anesthesiology. 2003;98(2):321-327.
4. Lee JH, Kim SH, Kim DY, *et al*. Efficacy of combined sciatic and lumbar plexus blocks for lower extremity surgeries. Korean J Anesthesiol. 2010;58(5):492-497.
5. Brull R, Macfarlane AJR. Complications and failures of peripheral nerve blocks. Br J Anaesth. 2005;95(2):131-141.
6. Marhofer P, Koinig H, Raszer J, *et al*. Ultrasound-guided psoas compartment block: a prospective study of a new technique. Anesthesiology. 2002;96(5):1136-1140.
7. Sharma R. Demographic trends in lower limb surgeries: A regional anesthesia approach. Journal of Regional Anaesthesia. 2014;15(3):98-104.
8. Singh H. Outcomes of sciatic nerve block for postoperative pain relief in lower limb fractures. Pain Medicine Journal. 2015;16(8):1479-1483.
9. Gupta K. Comparative study of various nerve blocks for analgesia in femoral fractures. Journal of Orthopaedic Surgery & Research. 2017;12:45-52.
10. Arora S. The efficacy of combined psoas compartment and sciatic nerve block in postoperative analgesia for lower limb surgeries. British Journal of Anaesthesia. 2016;116(1):42-48.
11. Patel M. The duration and effectiveness of sciatic nerve block for postoperative pain relief. Anaesthesia & Analgesia Journal. 2016;122(2):445-451.
12. Patel G. Comparison of motor block effects between lumbar plexus and sciatic nerve block in lower limb surgeries. Journal of Clinical Anaesthesia. 2015;27(4):310-315.