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A Study of the Effect of Combined Sciatic and Femoral Block in Below-Knee Surgeries — A Cross-Sectional Study

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ABSTRACT

Background: Effective management of perioperative pain in surgeries of the lower extremity, particularly in procedures performed below the knee, remains a pivotal element of contemporary anaesthetic practice. The choice of anaesthetic technique therefore directly influences intraoperative and postoperative outcome. The combined sciatic and femoral nerve block is a safe, effective, and reliable alternative to general and spinal anaesthesia techniques.

Objective: To assess the effect of combined sciatic and femoral nerve block in below-knee surgeries with respect to hemodynamic stability, onset and duration of sensory and motor block and postoperative pain management. **Methods:** The present investigation has been designed as a hospital-based, prospective, cross-sectional observational study. 60 adult patients of either sex who present to the institution for elective surgery on the leg below the knee during the study period and who are deemed fit for surgical intervention after pre-anaesthetic evaluation and obtaining written inform consent for participating in study. Combined sciatic and femoral nerve block is given as per study protocol. The data collected was subjected to statistical analysis.

Result: Combined sciatic and femoral nerve block provided rapid onset of anesthesia, prolonged postoperative analgesia, excellent hemodynamic stability, and a low incidence of complications. Overall, the study demonstrates that combined sciatic and femoral nerve block is a safe, effective, and reliable anesthetic technique for below-knee orthopedic surgeries, offering superior perioperative pain management and improved patient outcomes.

Conclusion: The study demonstrates that combined sciatic and femoral nerve block is a safe, effective, and reliable anesthetic technique for below-knee orthopedic surgeries, offering superior perioperative pain management and improved patient outcomes.

Keywords: *Combined sciatic–femoral nerve block, Below-knee surgeries, Regional Anaesthesia.*

INTRODUCTION

Effective management of perioperative pain in surgeries of the lower extremity, particularly in procedures performed below the knee, remains a pivotal element of contemporary anaesthetic practice. Below-knee surgeries encompass a heterogeneous spectrum of orthopaedic and general surgical procedures including tibial nailing and plating, ankle and calcaneal fracture fixation, bimalleolar K-wire fixation, below-knee amputation, and debridement of lower-leg cellulitis. These procedures are commonly associated with substantial postoperative nociceptive input, and inadequately controlled pain has been shown to impair early rehabilitation, prolong hospital stay, and adversely affect overall functional recovery.[1, 2] The choice of anaesthetic technique therefore directly influences not only intra-operative haemodynamic stability but also the quality of postoperative analgesia, the magnitude of opioid consumption, and the incidence of

perioperative adverse events.[3]
Historically, general anaesthesia (GA) and central neuraxial techniques, principally subarachnoid (spinal) anaesthesia, have been the most widely used modalities for below-knee surgery. General anaesthesia, although reliable in providing surgical conditions, is associated with airway manipulation, polypharmacy, postoperative nausea and vomiting, delayed emergence, opioid-related respiratory depression, and an increased risk of postoperative cognitive dysfunction, particularly in geriatric patients.[4] Spinal anaesthesia offers rapid onset and dense surgical block, but is frequently accompanied by sympathetic blockade-induced hypotension, bradycardia, urinary retention, post-dural puncture headache, and clinically significant haemodynamic fluctuations.[5,6] Such fluctuations are particularly hazardous in elderly patients and in those with limited cardiovascular reserve, in whom even a transient drop in mean arterial pressure may precipitate end- organ hypo perfusion and adverse cardiovascular events.[6,7]

Against this background, peripheral nerve blocks (PNBs) have emerged as a versatile and increasingly preferred alternative for lower-limb anaesthesia and analgesia. PNBs selectively interrupt nociceptive transmission at the level of a peripheral nerve or plexus, thereby producing site-specific anaesthesia without inducing the generalized sympathetic blockade characteristic of neuraxial techniques. They are particularly attractive in patients in whom neuraxial techniques are contraindicated, such as those receiving anticoagulant or antiplatelet therapy, those with severe valvular heart disease or fixed cardiac output states, and patients with localised infection over the lumbar spine.[8,9] Several systematic reviews and meta-analyses have documented that, when compared with general anaesthesia, regional and peripheral techniques are associated with superior postoperative pain control, reduced opioid requirements, lower rates of postoperative nausea and vomiting, decreased thromboembolic and pulmonary complications, earlier ambulation, and shorter hospital stays.[8,10]

Anatomically, sensory and motor innervation of the lower limb arises from the lumbosacral plexus. The lumbar plexus (L1–L4) gives origin to the femoral nerve, the obturator nerve, and the lateral femoral cutaneous nerve, which collectively supply the anterior thigh and the medial aspect of the leg below the knee via the saphenous branch of the femoral nerve. The sacral plexus (L4–S3) gives rise to the sciatic nerve, the largest nerve in the body, which descends through the gluteal region and subsequently divides into the tibial and common peroneal nerves, providing sensory and motor innervation to the posterior thigh, the posterior aspect of the knee joint, and almost the entire leg and foot below the knee, with the exception of a narrow medial strip supplied by the saphenous nerve.[11,12] Consequently, complete surgical anaesthesia of the leg below the knee mandates blockade of both the sciatic and the femoral (or saphenous) nerves, a requirement that provides the anatomical rationale for the combined sciatic–femoral nerve block (SFNB).[11]

The classical approach to the sciatic nerve was first described by Gaston Labat in the early twentieth century and remains, with minor modifications by Winnie, one of the most widely used techniques in clinical practice.[12,13] In Labat's posterior (transgluteal) approach, the patient is placed in the lateral (Sims) position with the leg to be blocked uppermost and both hip and knee flexed. A line is drawn from the posterior superior iliac spine to the greater trochanter of the femur; a perpendicular bisector is then drawn from the midpoint of this line, and a second line is drawn from the greater trochanter to the sacral hiatus. The intersection of the perpendicular bisector with this second line defines the cutaneous needle-entry point.[12,13] Sub gluteal, anterior, lateral, and par sacral modifications have subsequently been developed for situations in which lateral positioning is undesirable, but the classical Labatt approach continues to be favored for its consistency of anatomical landmarks and reproducible success rates.[13]

The femoral nerve emerges between the psoas major and iliacus muscles, passes deep to the inguinal ligament, and enters the femoral triangle lying lateral to the femoral artery beneath the fascia iliac. The classical landmark technique, popularised by Winnie as the inguinal paravascular or '3-in-1' block, involves needle insertion 1–2 cm lateral to the femoral arterial pulsation immediately below the inguinal crease, with the needle directed cephalad at approximately 30–45 degrees to the skin.[14,15] A characteristic 'patellar dance' — an upward movement of the patella produced by quadriceps contraction in response to electrical stimulation of the femoral nerve — indicates correct needle-to-nerve apposition and is regarded as the most reliable end-point when nerve-stimulator guidance is employed.[14]

Two principal techniques are currently used to localise nerves during peripheral block placement: peripheral nerve stimulation (PNS) and ultrasound (US) guidance. Peripheral nerve stimulators deliver a calibrated low-amplitude electrical current through an insulated needle; eliciting a specific motor response at a stimulating current of 0.2–0.5 mA at 0.1 ms is considered indicative of optimal needle position close to, but not within, the neural element.[9,12] Although ultrasound guidance offers real-time visualization of neural and vascular structures and is associated with shorter onset times, reduced local anaesthetic volumes, and a lower risk of inadvertent vascular puncture in experienced hands, peripheral nerve stimulation remains an effective, safe, and widely available alternative in resource-limited settings where high-frequency ultrasound is not routinely accessible.[8,9]

Local anaesthetics constitute the pharmacological foundation of peripheral nerve blockade. They reversibly bind the intracellular domain of voltage-gated sodium channels in their open and inactivated states, thereby preventing sodium influx, raising the threshold for action-potential generation, and blocking impulse propagation along the nerve fibre.[16]

Bupivacaine, a long-acting amide local anaesthetic introduced into clinical practice in the1960s, is the agent most extensively used for peripheral nerve blocks owing to its prolonged duration of action of approximately four to eight hours and its capacity to provide reliable surgical anaesthesia together with sustained postoperative analgesia.[16] Lignocaine (lidocaine), a shorter-acting amide, is frequently combined with bupivacaine to shorten the latency of onset while preserving the prolonged offset characteristic of bupivacaine, thereby achieving a more clinically favorable temporal profile.[17]

The addition of adrenaline (epinephrine) at a final concentration of 1:200 000 to the local anaesthetic solution further augments the quality and duration of the block. Adrenaline produces local vasoconstriction, which reduces systemic absorption of the local anaesthetic, thereby lowering the peak plasma concentration, increasing the maximal safe dose, prolonging the duration of sensory blockade, and serving as a pharmacological marker of inadvertent intravascular injection.[17,18] Combinations of 0.5% bupivacaine with 1.5–2% lignocaine and adrenaline 1:200 000 are widely employed in peripheral nerve blocks for lower-limb surgery and have been shown to yield clinically dependable surgical anaesthesia with a favorable safety profile when total doses are kept within recommended limits.[17,18]

The clinical utility of the combined sciatic–femoral nerve block has been documented in a wide range of below-knee and knee procedures. Pattajoshi and colleagues, in a prospective randomized comparative study conducted at a tertiary teaching hospital in Odisha, India, compared peripheral nerve stimulator-guided combined SFNB with subarachnoid block in seventy-four adults undergoing elective below-knee surgery and demonstrated significantly prolonged total duration of anaesthesia and time to first analgesic request in the SFNB group, alongside an essentially zero incidence of perioperative adverse events compared with 64.9% in the spinal anaesthesia group.[19] Bansal and colleagues, in a study of one hundred patients undergoing lower-limb surgery under combined femoral and sciatic blockade with ropivacaine with and without the addition of fentanyl, reported postoperative analgesia of approximately twelve to thirteen hours with preserved haemodynamic stability and no evidence of neuraxial-type complications.[20]

In the setting of total knee arthroplasty, Sato and colleagues conducted a prospective randomized double-blind comparison of continuous versus single-injection sciatic blockade added to continuous femoral blockade and showed a significant reduction in 48-hour cumulative morphine consumption (4.9 ± 5.9 mg versus 9.7 ± 9.5 mg, $P = 0.002$) and lower visual analogue scale pain scores at rest in the continuous sciatic block group.[21] Hussien and colleagues, in a randomized double-blinded trial of sixty patients comparing combined femoral–sciatic block with the adductor canal–IPACK combination, observed lower opioid consumption in the femoral–sciatic group, with equivalent visual analogue scale pain scores between the two regimens.[22] Kurnaz and colleagues, comparing unilateral spinal anaesthesia with combined sciatic–femoral block using levobupivacaine in patients undergoing knee arthroscopy, reported significantly lower visual analogue scale scores at six hours postoperatively in the combined block group, indicating superior early postoperative analgesia.[23] El-Tohamy, evaluating a single-needle-entry technique for combined sciatic–femoral block in fifty-one adults undergoing below-knee surgery, demonstrated complete sensory and motor blockade in all subjects with no procedural complications.[24]

Beyond pain control, combined sciatic–femoral blockade carries additional clinical advantages. Because the sympathetic outflow above the level of the lumbar plexus is preserved, profound vasodilatation and the resultant hypotension that frequently accompany subarachnoid block are largely avoided, rendering this technique particularly useful in patients with limited cardiovascular reserve, in those with severe aortic stenosis or fixed cardiac-output states, and in patients on antiplatelet or anticoagulant therapy in whom neuraxial blockade is contraindicated.[9,25] Reduced opioid consumption translates into a lower incidence of opioid-related adverse effects, including respiratory depression, sedation, postoperative nausea and vomiting, pruritus, and urinary retention, and contributes to the broader goal of opioid-sparing perioperative analgesia advocated by enhanced-recovery-after-surgery (ERAS) protocols.[26]

Despite this growing body of evidence, several issues continue to limit the universal adoption of combined sciatic–femoral nerve blockade for below-knee surgery in routine clinical practice. Reported success rates and onset times vary considerably across studies, reflecting heterogeneity in patient selection, the anatomical approach employed, the type of guidance (landmark, peripheral nerve stimulator, or ultrasound), and the local anaesthetic regimen used.[13,19] Most published evidence has originated from high-volume tertiary centres, predominantly in elective knee arthroplasty populations, and data from tribal and resource-limited Indian settings, in which ultrasound guidance is not routinely available, remain sparse. There is therefore a recognized need to generate region-specific evidence describing the performance, safety, and clinical effectiveness of peripheral nerve stimulator-guided combined sciatic–femoral block in below-knee surgery in such settings.[9,19]

Objective assessment of the quality of peripheral nerve blockade is essential to enable meaningful inter-study comparison. Sensory blockade is conventionally assessed using the ten-centimetre visual analogue scale, on which patients indicate pain intensity between zero (no pain) and ten (worst imaginable pain), while motor blockade is graded by the modified Bromage score, which ranges from zero (no motor block) to four (complete motor block).[19,21] Time to onset of sensory blockade, time to onset of motor blockade, total duration of sensory and motor blockade, time to first request for rescue analgesia, total intra-operative and postoperative opioid requirement, and intra-operative haemodynamic parameters together constitute a standard composite of outcomes that adequately characterises both the efficacy and the safety of a peripheral nerve block.[19,20,21]

The present cross-sectional study has therefore been undertaken to evaluate, in a prospectively enrolled cohort of sixty adult patients undergoing elective below-knee surgery at a tertiary care teaching hospital in a tribal region of central India, the effect of peripheral nerve stimulator-guided combined sciatic and femoral nerve block, performed using a fixed dose of 0.5% bupivacaine and 1.5% lignocaine with adrenaline 1:200 000, on intra-operative haemodynamic parameters (heart rate, systolic and diastolic blood pressure, and mean arterial pressure), on the time of onset and the total duration of sensory and motor blockade, and on perioperative opioid requirements. The data generated are intended to inform clinical decision-making regarding the routine use of this technique in below-knee surgery in similar healthcare contexts and to provide a basis on which future randomised controlled trials may be designed.[9,19,20]

AIM AND OBJECTIVES

Aims of present study to evaluate the effect of combined sciatic and femoral nerve block in below-knee surgeries. The primary objective is to assess the effect of combined sciatic and femoral nerve block in below-knee surgeries with respect to hemodynamic stability, including blood pressure, pulse rate, and mean arterial pressure and to assess the onset of action, duration and requirement of opioid during combined sciatic and femoral nerve block in below-knee surgeries.

MATERIALS AND METHODS

Study Design

The present investigation has been designed as a hospital-based, prospective, cross-sectional observational study. The study does not involve random allocation to comparative anaesthetic interventions and is therefore not a randomized controlled trial, data are collected prospectively against a pre-specified, standardized study protocol so as to minimize observational and recording bias.

Study Setting and Period

The study was conducted in the Department of Anaesthesiology of a tertiary care teaching hospital catering to a predominantly tribal population in the central region of Maharashtra, India. The total duration of the study from the date of approval by the Institutional Ethics Committee will be twelve months, The source population comprises all consecutive adult patients of either sex who present to the institution for elective surgery on the leg below the knee during the study period and who are deemed fit for surgical intervention after pre-anaesthetic evaluation and obtaining written inform consent for participating in study.

Sample Size Estimation

The sample size has been calculated for the primary outcome of haemodynamic stability, taking the mean intra-operative mean arterial pressure as the index continuous variable. Using the standard formula for sample-size determination for estimation of a population mean as recommended by Lwanga and Lameshow (WHO, Geneva, 1991), with an assumed population mean of 12.0 (in conventional clinical units pertinent to the primary outcome), an anticipated standard deviation of 2.8, a Z-value of 1.96 corresponding to a 95% confidence level ($\alpha = 0.05$), and an absolute precision of 1, the minimum required sample size is calculated as fifty-six. Power has been pre-specified at 80% and the level of significance at 5%, with all hypothesis tests carried out as two-sided tests.

Sampling Technique

Simple random sampling will be employed. All patients fulfilling the inclusion criteria and consenting to participate will be enrolled consecutively from the elective operating-theatre list until the target sample size of sixty has been achieved.

Eligibility Criteria Inclusion criteria

- Adult patients between 18 and 70 years of age, of either sex.
- Patients scheduled to undergo elective below-knee surgery.
- American Society of Anesthesiologists (ASA) physical status grade I, II or III.
- Patients willing and able to provide written informed consent in a language they understand (English, Hindi or Marathi).

Exclusion criteria

- Known hypersensitivity or allergy to amide-type local anaesthetics, lignocaine, bupivacaine, or adrenaline.
- Coagulopathy or any other bleeding diathesis, including patients on therapeutic anticoagulation that cannot safely be interrupted
- Severe peripheral vascular disease of the ipsilateral lower limb.
- Local infection, cellulitis or skin breach overlying the proposed needle-entry site for sciatic or femoral block.

- Pre-existing peripheral neuropathy involving the lower limb.
- Inability or unwillingness to comply with the study procedures, intra-operative monitoring or postoperative follow-up.

Withdrawal criteria

Subjects will be withdrawn from the study if (i) the patient withdraws consent at any stage or the combined sciatic and femoral nerve block fails to achieve a clinically adequate surgical block

Ethical Considerations and Informed Consent

The protocol will be reviewed and approved by the Institutional Ethics Committee before commencement of enrolment. Written informed consent will be obtained from every eligible participant in a language they understand, after providing them with a patient information sheet and an opportunity to ask questions. Confidentiality of all participant data will be maintained throughout the study period.

Pre-anaesthetic Evaluation and Premedication

A detailed history and a thorough general and systemic clinical examination will be carried out on the evening before surgery as part of the routine pre-anaesthetic check-up. Investigations doen as per hospital protocol and requirement of patient. Patients will be advised to fast for at least eight hours for solids and two hours for clear fluids prior to surgery. Premedication will consist of tablet alprazolam 0.25 mg orally on the night preceding surgery and tablet pantoprazole 40 mg orally one hour prior to surgery.

Operating-room Preparation and Baseline Monitoring

On arrival in the operating room, the patient will be received and the identity, surgical site, and consent re-verified. Standard ASA monitoring started and baseline parameter noted. An 18-gauge intravenous cannula will be secured in the forearm of the limb opposite to the side of surgery, and a maintenance infusion of Ringer's lactate will be commenced at 4 mL/kg/h. Intravenous midazolam 0.04 mg/kg will be administered for anxiolysis prior to performance of the block. Resuscitation equipment, drugs for the management of local anaesthetic systemic toxicity (including 20% intralipid emulsion), and equipment for general anaesthesia will be kept readily available throughout the procedure.

Performance of the Combined Sciatic and Femoral Nerve Block

1 Sciatic nerve block – posterior (Labat) approach with PNS guidance

The patient is placed in the lateral (Sims) position, with the side to be blocked uppermost and both the hip and the knee flexed so that the heel of the operated limb rests on the knee of the contralateral non-operated limb. The skin overlying the gluteal region is prepared with chlorhexidine 2% in alcohol and draped in a sterile fashion. The surface landmarks for block are identified and marked and subcutaneous skin wheal is raised with 2 mL of 2% lignocaine.

A 100-mm insulated stimulating needle is connected to the peripheral nerve stimulator and advanced perpendicular to the skin. Initial contraction of the gluteal musculature occurs because of direct muscle stimulation; further advancement leads to disappearance of gluteal twitches and the appearance of contraction of the hamstring group, followed by dorsiflexion or plantar flexion of the foot, indicating stimulation of the tibial component of the sciatic nerve. The stimulating current is progressively reduced; once a clear distal motor response (plantar flexion or dorsiflexion of the foot) is obtained at a current between 0.2 and 0.4 mA, after careful negative aspiration, a total of 15 mL of local anaesthetic solution — comprising 8 mL of 0.5% bupivacaine and 7 mL of 1.5% lignocaine with adrenaline 1:200 000 — is injected incrementally over 60–90 seconds, with intermittent negative aspiration after every 5 mL.

2 Femoral nerve block – inguinal paravascular approach with PNS guidance

Following completion of the sciatic block, the patient is turned to the supine position with the affected limb slightly abducted and externally rotated. The femoral arterial pulsation is palpated immediately below the inguinal crease using the non-dominant thumb, the tip of which is placed along the lateral border of the artery. A skin wheal of local anaesthetic is raised 1–1.5 cm lateral to the artery at the midpoint of the inguinal ligament. A 50-mm short-beveled insulated stimulating needle, connected to the peripheral nerve stimulator (initial output 1.0 mA, 2 Hz, 0.1 ms), is then inserted at the marked point at an angle of 30–45 degrees to the skin in a cephalic direction. A clear, brisk contraction of the quadriceps muscle producing an upward movement of the patella — the so-called 'patellar dance' — is sought as the desired motor response. Once this response is reproducibly elicited at a stimulating current of approximately 0.5–0.6 mA, after careful negative aspiration, 10 mL of local anaesthetic solution comprising 5 mL of 0.5% bupivacaine and 5 mL of 1.5% lignocaine with adrenaline 1:200 000 is injected incrementally, with negative aspiration after every 5 mL.

Outcome Measures and Their Assessment Sensory blockade

Sensory blockade will be assessed by loss of pin-prick sensation and loss of cold-temperature discrimination in the cutaneous distributions of the femoral and sciatic nerves. The depth of sensation will be graded as score 2 (normal sensation), score 1 (decreased or dull pin-prick sensation) and score 0 (complete loss of pin-prick sensation). Subjective pain intensity will be assessed using the ten-centimetre visual analogue scale (VAS), on which the patient marks the point representing the current intensity of pain between 0 mm (no pain) and 100 mm (worst imaginable pain).

Motor blockade

Motor blockade will be graded using the modified Bromage scale. Assessment will be performed at five-minute intervals for the first twenty minutes and at ten-minute intervals thereafter until complete loss of motor function is achieved.

Operational definitions

'Onset time of sensory block' is defined as the interval, in minutes, between completion of injection of local anaesthetic and the documented loss of pin-prick and temperature sensation over both the sciatic and femoral cutaneous distributions (sensory score 2 in both distributions). 'Onset time of motor block' is defined as the interval, in minutes, between completion of injection and a modified Bromage score of 4. 'Duration of sensory block' is defined as the interval, in minutes, between achievement of complete sensory block (score 0) and the first return of dull pain sensation (score 1) in the operated lower limb. 'Duration of motor block' is defined as the interval, in minutes, between achievement of complete motor block (Bromage 4) and the first detectable resolution of motor block at the knee or foot. 'Duration of analgesia' is defined as the interval between achievement of complete sensory block and the first request for rescue analgesia. The procedure will be commenced once the VAS is less than 2 and the modified Bromage score is 0 in the operative limb.

Haemodynamic parameters and adverse events

Heart rate, systolic blood pressure, mean arterial pressure, peripheral oxygen saturation and respiratory rate will be recorded at the following time points: pre-block (baseline), and at 5, 10, 15, 30, 45, 60, 75 and 90 minutes intra-operatively, followed by postoperative time points at 0, 1, 2, 4, 8, 12 and 24 hours. Hypotension is defined as systolic blood pressure less than 90 mmHg and will be managed with intravenous mephentermine 6 mg as a bolus, repeated as required. Bradycardia is defined as a heart rate of less than 60 beats per minute and will be managed with intravenous atropine 0.6 mg. Postoperative nausea and vomiting will be managed with intravenous ondansetron 8 mg and intravenous pantoprazole 40 mg as required.

Rescue analgesia and failed block

If, despite correct technique, the combined sciatic–femoral block fails to produce a clinically adequate surgical block within the predefined latency (no surgical anaesthesia within 30 minutes), this will be recorded as a failed block; the patient will then receive subarachnoid block as rescue anaesthesia in accordance with departmental protocol and will be excluded from outcome analysis. Postoperatively, intravenous paracetamol 20 mg/kg every eight hours will be prescribed as the baseline analgesic. If the VAS exceeds 4 at any time during the 24-hour postoperative period, rescue analgesia in the form of intravenous diclofenac 1–1.5 mg/kg will be administered and the time of first rescue analgesic request, together with any subsequent supplemental analgesic requirement, will be documented. The end-point of postoperative observation will be the time of first rescue analgesia or 24 hours, whichever occurs earlier.

Statistical Analysis

Data will be coded and entered into a Microsoft Excel® spreadsheet and analysed using the Statistical Package for the Social Sciences (SPSS®) version 21.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Quantitative data (age, body-mass index, baseline and intra-operative haemodynamic variables, onset and duration of sensory and motor blockade, duration of analgesia, opioid consumption) will be summarized as mean ± standard deviation when normally distributed, or as median with interquartile range when not normally distributed. Qualitative data (sex distribution, ASA grade, indications for surgery, incidence of adverse events) will be expressed as frequencies and percentages.

Table 1: Age Distribution of Study Participants

Age Group (Years)	Frequency (n=60)	Percentage
18–30	18	30.00%
31–50	28	46.70%
51–70	14	23.30%
Total	**60**	**100%**

The majority of patients belonged to the 31–50 years age group, accounting for 46.7% of the study population. Patients aged 18–30 years constituted 30%, while 23.3% were between 51–70 years. This indicates that below-knee surgeries requiring combined sciatic and femoral block were more commonly performed in middle-aged individuals.

Table 2: Gender Distribution

Gender	Frequency	Percentage
Male	38	63.30%

Female	22	36.70%
Total	**60**	**100%**

Among the study participants, males constituted the majority with 63.3%, while females accounted for 36.7%. This reflects the higher occurrence of below-knee orthopedic procedures among male patients.

Table 3: Type of Below-Knee Surgery

Surgical Procedure	**Frequency**	**Percentage**
Tibial Fracture Fixation	24	40.00%
Ankle Surgery	18	30.00%
Foot Procedures	12	20.00%
Tendon Repair	6	10.00%
Total	**60**	**100%**

Tibial fracture fixation was the most commonly performed surgery, accounting for 40% of cases, followed by ankle surgeries in 30% of patients. Foot procedures and tendon repairs constituted smaller proportions of the study population.

Table 4: Hemodynamic Parameters – Mean Heart Rate(Beats/min)

Time Interval	**Mean ± SD**
Preoperative	84.5 ± 8.2
5 min	82.1 ± 7.9
10 min	80.6 ± 7.4
15 min	79.8 ± 6.8
30 min	78.9 ± 6.5
45 min	79.2 ± 6.7
60 min	80.1 ± 7.0
75 min	81.0 ± 7.3
90 min	82.4 ± 7.6

Test applied: Repeated Measures ANOVA **p-value:** 0.04

The mean heart rate showed a gradual decline following administration of the combined sciatic and femoral block, with values remaining within physiological limits throughout surgery. The variation in heart rate across time intervals was statistically significant ($p = 0.041$), indicating stable intraoperative hemodynamics.

Table 5: Hemodynamic Parameters – Mean Arterial Pressure (MAP)

Time Interval	**MAP (Mean ± SD)**
Preoperative	94.2 ± 7.6
5 min	92.8 ± 7.2
10 min	91.5 ± 6.9
15 min	90.6 ± 6.5
30 min	89.8 ± 6.2
45 min	90.1 ± 6.4
60 min	90.9 ± 6.8
75 min	91.8 ± 7.0
90 min	92.3 ± 7.2

Test applied: Repeated Measures ANOVA **p-value:** 0.056

Mean arterial pressure remained relatively stable throughout the intraoperative period. Although a mild decline in MAP was noted after administration of the block, the changes were minimal and not statistically significant ($p = 0.056$). The MAP values remained within acceptable physiological ranges during surgery. These findings indicate that combined sciatic and femoral nerve block provides good hemodynamic stability and can be safely used in below-knee surgeries.

Table 6: Time of Onset of Sensory and Motor Block

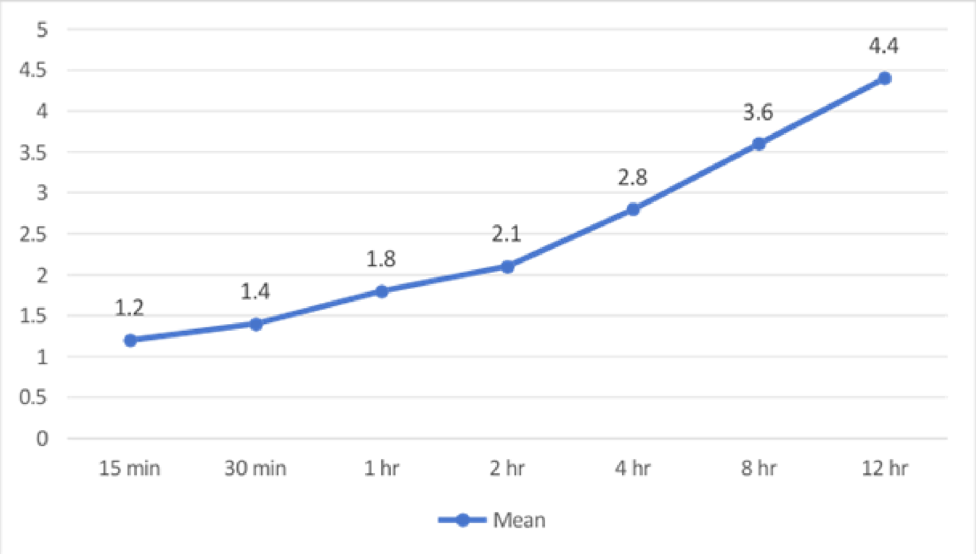
Parameter	**Mean ± SD (minutes)**
Sensory Block Onset	8.4 ± 2.1
Motor Block Onset	12.6 ± 2.8

The mean onset time for sensory block was 8.4 ± 2.1 minutes, whereas motor block onset occurred slightly later at 12.6 ± 2.8 minutes. This demonstrates that sensory blockade developed earlier than motor blockade following administration of the anesthetic agents. Early onset of sensory analgesia is advantageous as it provides prompt pain relief and facilitates timely surgical intervention. The findings suggest that the combined nerve block technique has a rapid onset suitable for operative procedures.

Table 7: Duration of Sensory and Motor Block

Parameter	Mean ± SD (hours)
Duration of Sensory Block	9.8 ± 1.6
Duration of Motor Block	7.2 ± 1.3

The duration of sensory blockade was longer than that of motor blockade. Sensory block lasted for an average of 9.8 ± 1.6 hours, while motor block persisted for 7.2 ± 1.3 hours. Prolonged sensory analgesia is beneficial as it provides extended postoperative pain relief. Early recovery of motor function compared to sensory function may also facilitate postoperative mobilization and patient comfort.



Graph 8: Postoperative VAS Score Comparison

Postoperative pain scores, assessed using the Visual Analogue Scale (VAS), gradually increased with time following surgery. The mean VAS score was lowest during the early postoperative period, measuring 1.2 ± 0.5 at 15 minutes and 1.4 ± 0.6 at 30 minutes. Pain scores increased progressively up to 12 hours postoperatively, where the mean score reached 4.4 ± 1.4. Statistical analysis showed a highly significant difference in VAS scores over time ($p < 0.001$), indicating effective early postoperative analgesia provided by the combined nerve block.

Table 9: Duration of Analgesia and Rescue Analgesic Requirement

Parameter	Mean ± SD
Duration of Analgesia (hours)	10.8 ± 2.2
Rescue Analgesic Requirement in 24 hrs (mg)	78.5 ± 18.4

The mean duration of postoperative analgesia achieved with the combined sciatic and femoral block was 10.8 ± 2.2 hours. This prolonged duration of analgesia delayed the requirement for rescue analgesics in the postoperative period. The average rescue analgesic requirement during the first 24 hours was relatively low at 78.5 ± 18.4 mg. These findings suggest that the nerve block technique provides effective and sustained postoperative pain control.

Table 10: Intraoperative Blood Loss and IV Fluids

Parameter	Mean ± SD
Blood Loss (mL)	148.6 ± 42.3
IV Fluids Administered (mL)	1120 ± 240

The average intraoperative blood loss observed in the study was 148.6 ± 42.3 mL, which was within acceptable limits for below-knee surgeries. Adequate intravenous fluid replacement was maintained during surgery, with a mean fluid administration of 1120 ± 240 mL. Proper fluid management contributed to maintenance of hemodynamic stability throughout the procedure. The findings indicate that the anesthetic technique was associated with satisfactory intraoperative management.

Table 11: Comparison of Hemodynamic Stability According to Duration of Surgery

uration of Surgery	Stable Hemodynamics	Mild Fluctuations	p-value
<60 min (n=24)	22 (91.7%)	2 (8.3%)	0.418
≥60 min (n=36)	30 (83.3%)	6 (16.7%)	

Incidence of Side Effects

The majority of patients, 81.7%, did not experience any adverse effects following administration of the combined nerve block. Nausea and vomiting were observed in 8.3% of patients, while shivering occurred in 6.7% of cases. Pruritus was noted in only 3.3% of patients, and no cases of respiratory depression were reported. Overall, the incidence of side effects was low, suggesting that combined sciatic and femoral nerve block is a safe anesthetic technique with minimal complications

DISCUSSION

The present study was conducted to evaluate the efficacy and safety of combined sciatic and femoral nerve block for below-knee surgical procedures. Sixty adult patients undergoing various below-knee orthopedic surgeries were included and assessed for demographic characteristics, block characteristics, hemodynamic stability, postoperative analgesia, and adverse effects.

The majority of patients in the present study belonged to the 31–50 years age group (46.7%), followed by 18–30 years (30.0%) and 51–70 years (23.3%). This finding indicates that below-knee orthopedic procedures are more frequently performed among middle-aged adults, which may be attributed to increased occupational activity, trauma, and musculoskeletal injuries in this age group with an overall mean age comparable to that reported by **Bansal L et al.[77]**

Male patients predominated in the present study population, accounting for 63.3% of cases, whereas females constituted 36.7%. The higher proportion of male patients may be explained by greater exposure to outdoor activities, occupational hazards, and road traffic accidents leading to lower limb injuries.

In the present study surgical procedures performed, tibial fracture fixation represented the largest category (40%), followed by ankle surgeries (30%), foot procedures (20%), and tendon repairs (10%). This distribution reflects the common indications for below-knee surgeries in tertiary care centers and demonstrates the broad applicability of combined sciatic and femoral nerve block across different orthopedic interventions.

An important finding of the present study was the maintenance of stable intraoperative hemodynamics following administration of the nerve block. Mean heart rate showed a gradual reduction from baseline values during surgery while remaining within physiological limits. The observed variation was statistically significant (p=0.041), indicating effective attenuation of surgical stress responses without clinically significant bradycardia. Similar reductions in heart rate following peripheral nerve blockade have been reported in previous studies and are considered indicative of adequate analgesia and sympathetic stability.

In the present study Mean arterial pressure also remained stable throughout the operative period. Although a slight decline in MAP was observed following block administration, the changes were not statistically significant (p=0.056). The absence of major fluctuations in blood pressure suggests that the combined nerve block technique provides excellent cardiovascular stability. The onset characteristics observed in the present study demonstrated rapid establishment of surgical anesthesia. The mean onset time of sensory block was 8.4 ± 2.1 minutes, while motor block onset occurred at 12.6 ± 2.8 minutes. Earlier onset of sensory blockade compared with motor blockade is a well-recognized feature of peripheral nerve blocks and is clinically advantageous because it allows early pain relief and timely commencement of surgery.

In the present study Postoperative pain assessment using the Visual Analogue Scale revealed excellent analgesic efficacy during the early postoperative period. Mean VAS scores remained low during the first few hours after surgery and increased gradually over time, reaching 4.4 ±1.4 at 12 hours postoperatively. The highly significant variation in VAS scores across time intervals (p<0.001) reflects the gradual wearing off of the block while still maintaining acceptable pain control for a prolonged duration. Similar postoperative pain profiles have been reported in studies utilizing combined femoral and sciatic nerve blocks, highlighting their effectiveness in reducing postoperative discomfort.

The mean duration of analgesia achieved in the present study was 10.8 ± 2.2 hours, which provided substantial postoperative pain relief and delayed the need for rescue analgesics. Furthermore, the mean rescue analgesic requirement during the first 24 hours was relatively low (78.5 ± 18.4 mg), indicating effective analgesic coverage provided by the nerve block.

The average rescue analgesic requirement in the present study was 78.5 ± 18.4 mg during the first 24 hours, reflecting effective postoperative pain control. Similarly, Dharmendra Mishra et al. found that patients with successful nerve blocks required a mean of 1.28 ± 0.45 doses of intravenous tramadol (2 mg/kg) as rescue analgesia during the first 24 postoperative hours. Both studies demonstrate that peripheral nerve block techniques significantly reduce postoperative analgesic requirements and provide satisfactory pain relief. Intraoperative blood loss and fluid administration remained within expected limits for below-knee orthopedic procedures. The mean blood loss was 148.6 ± 42.3 mL, while the average intravenous fluid requirement was 1120 ± 240 mL. Adequate fluid management contributed to maintenance of hemodynamic stability and favorable perioperative outcomes. These findings indicate that the anesthetic technique was associated with satisfactory intraoperative management.

The safety profile of the combined sciatic and femoral nerve block was favorable. More than four-fifths of patients (81.7%) experienced no adverse effects. The incidences of nausea and vomiting (8.3%), shivering (6.7%), and pruritus (3.3%) were low, and no patient developed respiratory depression. The absence of serious complications underscores the safety of peripheral nerve block techniques and is consistent with previous reports demonstrating low complication rates compared with systemic opioid-based analgesia or general anesthesia.

Analysis of hemodynamic stability according to duration of surgery revealed no significant association between operative duration and cardiovascular fluctuations (p=0.418). Stable hemodynamics were maintained in the majority of patients regardless of whether surgery lasted less than or more than 60 minutes. This finding suggests that the effectiveness of the nerve block is maintained even during relatively prolonged surgical procedures.

Assessment of motor blockade using Bromage score revealed that 100% of the subjects in both the scores had achieved a Bromage score of 3 universally. The results were better as compared to Palkhiwala B et. al. [82] study conducted in 2015 in Ahmedabad to observe the outcomes in combined femoral and sciatic nerve block where complete block was achieved in only 92% of the patients.Assessment of pain was done during the preoperative period (baseline) and at intervals of 1 hour, 2 hours, 4 hours, 6 hours, 12 hours, and 24 hours. It was seen that the grand mean score of pain by SA (2.347±0.044) was more in comparison to that in subjects with USG- guided SFNB (1.961±0.073). However, the change with time observed was significant in both groups ($p < 0.001$) The mean increase in VAS at 24 hours in comparison to baseline was, however, significantly more ($p < 0.05$) in the SA group of subjects (1.784±0.111) in comparison to those receiving USG-guided SFNB (1.324±0.190). 0.8 ± 2.2rlier than motor blockade, allowing prompt pain relief and facilitating timely commencement of surgery.

The mean duration of sensory block was 9.8 ± 1.6 hours, while the mean duration of motor block was 7.2 ± 1.3 hours. Sensory blockade persisted longer than motor blockade, providing prolonged postoperative analgesia while permitting earlier recovery of motor function. Postoperative pain scores remained low during the early postoperative period and increased gradually over time, indicating effective pain control following the nerve block.The mean duration of postoperative analgesia was 10.8 ± 2.2 hours, reflecting sustained analgesic efficacy. The average rescue analgesic requirement during the first 24 postoperative hours was low (78.5 ± 18.4 mg), suggesting reduced dependence on additional analgesics. Intraoperative blood loss was within acceptable limits, with a mean value of 148.6 ± 42.3 mL, and adequate fluid replacement was maintained throughout surgery. The majority of patients (81.7%) experienced no adverse effects following administration of the combined nerve block.

CONCLUSION

Overall, the study demonstrates that combined sciatic and femoral nerve block is a safe, effective, and reliable anesthetic technique for below-knee surgeries, offering superior perioperative pain management and improved patient outcomes.

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