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Original Research Article

Comparing the Effectiveness of Ultrasound-Guided Femoral and Sciatic Nerve Blocks versus Spinal Anaesthesia for Below-Knee Surgeries

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Conflict of interest: Nil

Abstract

Background: Regional anaesthesia techniques are widely used for lower limb surgeries because they provide effective intraoperative anaesthesia and postoperative analgesia. Spinal anaesthesia remains the most commonly used technique for below-knee surgeries; however, it may be associated with complications such as hypotension, urinary retention, and post-dural puncture headache. Ultrasound-guided peripheral nerve blocks, particularly femoral and sciatic nerve blocks, have gained popularity due to improved accuracy, safety, and prolonged postoperative analgesia.

Aim: To compare and evaluate the effectiveness of ultrasound-guided femoral and sciatic nerve blocks versus spinal anaesthesia for below-knee surgeries.

Materials and Methods: This prospective comparative study was conducted in the Department of Anaesthesiology & Critical Care, Sri Siddharth Medical College and Hospital, Tumkur, Karnataka, India, over a period of 24 months. A total of 78 patients undergoing elective below-knee surgeries were enrolled in the study and randomly divided into two groups of 39 patients each. Group A (USG-SFNB) received ultrasound-guided combined femoral and sciatic nerve blocks using local anaesthetic agents, while Group B (SA) received unilateral spinal anaesthesia using hyperbaric bupivacaine. Intraoperative haemodynamic parameters, onset time of anaesthesia, duration of analgesia, postoperative pain scores, and complications were assessed. Statistical analysis was performed using SPSS software version 26.0, and a p-value <0.05 was considered statistically significant.

Results: The ultrasound-guided nerve block group demonstrated significantly longer postoperative analgesia and reduced postoperative analgesic requirement compared with spinal anaesthesia. Haemodynamic stability was better maintained in the nerve block group. However, the onset of anaesthesia was faster in the spinal anaesthesia group.

Conclusion: Ultrasound-guided femoral and sciatic nerve blocks are an effective alternative to spinal anaesthesia for below-knee surgeries, providing prolonged postoperative analgesia with improved haemodynamic stability and fewer complications.

Keywords: Ultrasound-guided nerve block; femoral nerve block; sciatic nerve block; spinal anaesthesia; below-knee surgery.

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Introduction

Regional anaesthesia plays a crucial role in modern anaesthetic practice for orthopedic and lower limb surgeries. It provides effective intraoperative anaesthesia while minimizing systemic complications associated with general anaesthesia. Among the available regional techniques, spinal anaesthesia has been widely used for below-knee procedures due to its rapid onset, reliable sensory and motor block, and ease of administration. [1] However, spinal anaesthesia may be associated with several adverse effects such as hypotension, bradycardia, urinary retention, and post-dural puncture headache, which may limit its use in certain patients. [2] With advances in regional anaesthesia, ultrasound-guided peripheral nerve blocks have emerged as safer and more precise techniques. The use of ultrasound allows direct visualization of nerves, surrounding structures, and needle placement, thereby improving block success rates and reducing complications. [3,4] For surgeries below the knee, a combination of femoral nerve block and sciatic nerve block can provide adequate anaesthesia and postoperative analgesia because these nerves supply most of the sensory and motor innervation to the lower limb. [5] Ultrasound guidance further enhances the accuracy of these blocks and allows the use of smaller volumes of local anaesthetic while maintaining effectiveness. [6]

Several studies have demonstrated that ultrasound-guided nerve blocks provide superior postoperative analgesia compared to conventional regional techniques. In addition, they are associated with fewer haemodynamic disturbances since sympathetic blockade is minimal compared to spinal anaesthesia. [7-9]

Postoperative pain following orthopaedic surgeries can significantly affect patient recovery and rehabilitation. Effective analgesia facilitates early mobilization, reduces hospital stay, and improves patient satisfaction. Peripheral nerve blocks have been increasingly used as part of multimodal analgesic strategies to achieve these goals. [10-13]

However, despite these advantages, spinal anaesthesia remains widely practiced because of its rapid onset and reliability. Therefore, comparing ultrasound-guided peripheral nerve blocks with spinal anaesthesia is important to determine the most effective technique for below-knee surgeries.

The present study was conducted to compare the effectiveness of ultrasound-guided femoral and sciatic nerve blocks with spinal anaesthesia in patients undergoing below-knee surgeries at a tertiary care teaching hospital.

Materials and Methods

Study design: This prospective comparative study was conducted to evaluate the effectiveness and safety of spinal anaesthesia (SA) compared with ultrasound-guided combined femoral and sciatic nerve blocks (USG-SFNB) in patients undergoing elective below-knee surgeries. Each participant was randomly assigned to one of two intervention groups in this study's two-arm, parallel-group design.

Study setting: The study was conducted in the Department of Anaesthesiology and Critical Care at Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, India.

Study duration: The total duration of the study was 24 months.

Participants

Inclusion Criteria:

- Patients aged between 18 and 70 years
- ASA physical status class I, II, or III
- Patients undergoing elective below-knee surgical procedures, including orthopaedic procedures (such as malleolar fractures, calcaneal fractures, metatarsal fractures, and ankle arthroplasty), as well as vascular surgeries, soft-tissue procedures, amputations, debridement, and reconstructive surgeries.
- Patients who provided written informed consent to participate in the study were included.

Exclusion Criteria:

- Patient refusal or inability to provide informed consent.
- Known allergy or hypersensitivity to local anesthetics (bupivacaine, lignocaine) or any other medication used in the study protocol.
- Coagulopathy, bleeding diathesis, or use of anticoagulant therapy that contraindicated regional anesthesia.
- Localized infection at the proposed site for needle insertion (lumbar spine for SA or groin/popliteal region for nerve block).
- Pre-existing neurological deficit or peripheral neuropathy in the involved limb.
- Severe cardiovascular, respiratory, hepatic, or renal dysfunction that posed a significant anesthetic risk.
- Pregnancy or lactation.

Study sampling: A purposive (non-probability) sampling method was employed.

Study sample size: The minimum required sample size was calculated to be 39 patients per group. To account for potential dropouts or protocol deviations, a total of 78 participants (39 in each group) were enrolled.

Study groups: Eligible participants were divided into two groups of 39 each:

- **Group A (USG-SFNB):** Received ultrasound-guided combined femoral as well as sciatic nerve block using local anesthetics
- **Group B (SA):** Received unilateral spinal anesthesia using hyperbaric bupivacaine.

Study parameters

- Demographic and Baseline Data.
- Block Characteristics
- Hemodynamic Parameters
- Analgesia Assessment
- Recovery Parameters
- Adverse Events

Study procedure: After obtaining approval from the Institutional Ethics Committee (IEC approval number: SSMC/MED/IEC-047/FEB-2024, Dated:

09/02/2024) and written informed consent from all participants, patients were prepared according to standard fasting guidelines. Premedication with alprazolam 0.5 mg and ranitidine 150 mg was administered the night before surgery. In the operating room, an intravenous line was secured and Ringer's lactate infusion was started. Standard monitoring, including non-invasive blood pressure (NIBP), electrocardiography (ECG), and peripheral oxygen saturation (SpO_2), was applied.

For Group A (USG-SFNB), combined femoral and sciatic nerve blocks were performed under aseptic conditions using a high-frequency linear ultrasound probe. The femoral nerve block was administered in the inguinal region using 15–20 mL of 0.5% bupivacaine, while the sciatic nerve block was performed via a subgluteal or popliteal approach using 15–20 mL of 0.5% bupivacaine, ensuring that the total dose remained within safe limits. For Group B (SA), spinal anaesthesia was performed under aseptic precautions in the sitting position at the L3–L4 interspace using a 25-gauge Quincke spinal needle. Hyperbaric 0.5% bupivacaine was administered in a dose appropriate to the patient's characteristics.

The time of final injection was recorded as time zero (S0). Sensory block, motor block, and haemodynamic parameters were assessed at regular intervals. Postoperatively, patients were monitored for 24 hours for pain scores, motor recovery, and vital parameters.

Study data collection: Data were collected using a structured proforma (Case Record Form). It included sections for demographic details, preoperative assessment, intraoperative monitoring charts (for haemodynamics and block characteristics), postoperative observation sheets (for VAS, Bromage score, rescue analgesia), and adverse event logs. All measurements were recorded prospectively by the principal investigator or a trained designate who was not blinded to the group allocation but followed standardized assessment criteria to ensure objectivity.

Data analysis: Collected data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS software (version 26.0). Descriptive statistics were presented as mean ± SD for continuous variables and as frequency (percentage) for categorical variables. Normality of data was checked using the Shapiro-Wilk test.

We used the Mann-Whitney U test for non-normal data and the independent samples t-test for normally distributed data to compare continuous variables between groups. The Chi-square test or Fisher's exact test, as applicable, were used to compare the categorical variables. Using repeated-measures ANOVA, hemodynamic variables were compared between groups and time points. Statistical significance was defined as a p-value below 0.05.

Ethical considerations: The study was approved by Sri Siddhartha Medical College and Hospital's Institutional Ethics Committee (IEC approval number: SSMC/MED/IEC-047/FEB-2024, Dated: 09/02/2024) and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained.

Results

A total of 78 patients undergoing elective below-knee surgeries were enrolled in the study and randomly divided into two groups of 39 patients each. Group A (USG-SFNB) received ultrasound-guided combined femoral and sciatic nerve blocks using local anaesthetic agents, while Group B (SA) received unilateral spinal anaesthesia using hyperbaric bupivacaine. Both the study groups were comparable with respect to demographic variables.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants

Parameter	Category	Group A (USG-SFNB) n = 39	Group B (Spinal Anaesthesia) n = 39	Total (n = 78)	p-value
Age Distribution (years)	≤ 20	1	2	3	0.174
	21–30	6	5	11	
	31–40	3	12	15	
	41–50	9	6	15	
	51–60	6	6	12	
	61–70	10	8	18	
Gender Distribution	Male	21	23	44	0.648
	Female	18	16	34	
ASA Physical Status	ASA I	25	18	43	0.273
	ASA II	13	19	32	
	ASA III	1	2	3	

The table presents the baseline demographic and clinical characteristics of the 78 patients included in the study, with 39 patients each in Group A (ultrasound-guided femoral and sciatic nerve block) and Group B (spinal anaesthesia).

Regarding age distribution, the majority of patients were in the 61–70 years age group (18 patients), followed by the 31–40 years and 41–50 years groups (15 patients each). Very few patients were aged ≤20 years (3 patients). The difference in age distribution between the two groups was not statistically significant (p = 0.174), indicating that both groups were comparable with respect to age.

In terms of sex distribution, male patients constituted 44 (56.4%) of the study population, while female patients accounted for 34 (43.6%). The distribution of males and females was similar between the two groups, and the difference was not statistically significant (p = 0.648).

With respect to ASA physical status, the majority of patients belonged to ASA Grade I (43 patients), followed by ASA Grade II (32 patients), while ASA Grade III patients were few (3 patients). The distribution of ASA grades between the two groups was not statistically significant (p = 0.273).

Overall, the results indicate that the two study groups were comparable in terms of age, gender, and ASA physical status, suggesting appropriate baseline similarity for further comparison of anaesthetic techniques.

Table 2: Comparison of Co-morbidities and Hemodynamic Parameters between Study Groups

Parameter	Category / Time Point	Spinal Anaesthesia (n=39)	USG Femoral + Sciatic Nerve Block (n=39)	Total / Mean	p-value
Co-morbidities	Diabetes Mellitus	6	6	12	0.994
	Hypertension	9	8	17	
	Hypothyroidism	2	2	4	
	Nil	22	23	45	
Heart Rate (beats/min)	Pre-procedure	78.44 ± 10.78	77.54 ± 8.82	–	0.245
	0 min	79.38 ± 10.51	77.46 ± 10.06	–	0.898
	1 min	71.62 ± 5.05	78.23 ± 9.00	–	**<0.001**
	2 min	61.23 ± 5.87	78.74 ± 8.80	–	**0.001**
	5 min	62.92 ± 10.15	74.74 ± 8.55	–	**0.005**
	10 min	63.05 ± 6.02	76.67 ± 9.28	–	**<0.001**
	25 min	73.31 ± 9.26	77.46 ± 7.22	–	0.221
	30 min	62.28 ± 17.69	74.15 ± 8.88	–	**<0.001**
	Post-operative	74.18 ± 5.99	76.49 ± 8.61	–	**0.001**
Systolic BP (mmHg)	Pre	121.77 ± 11.03	126.54 ± 8.71	–	0.246
	0 min	121.03 ± 9.89	122.62 ± 9.92	–	0.529
	1 min	112.54 ± 6.66	120.77 ± 11.05	–	**<0.001**
	2 min	108.28 ± 5.37	126.54 ± 10.83	–	**<0.001**
	5 min	107.40 ± 5.37	117.54 ± 15.30	–	**<0.001**
	10 min	108.28 ± 9.50	125.20 ± 10.10	–	**<0.001**
	25 min	121.90 ± 9.20	124.54 ± 11.18	–	**0.005**
	30 min	115.95 ± 7.97	127.46 ± 10.24	–	**0.024**
	Post-operative	118.05 ± 10.33	122.44 ± 11.89	–	**0.044**
Diastolic BP (mmHg)	Pre	72.90 ± 9.28	77.95 ± 7.13	–	0.099
	0 min	73.64 ± 11.52	78.05 ± 7.05	–	**<0.001**
	1 min	63.33 ± 8.31	78.33 ± 7.54	–	0.564
	2 min	62.08 ± 4.02	81.05 ± 7.99	–	**<0.001**
	5 min	64.69 ± 5.85	79.10 ± 7.64	–	0.050
	10 min	64.95 ± 7.28	76.51 ± 6.74	–	**0.041**
	25 min	77.00 ± 7.38	79.79 ± 7.86	–	0.549
	30 min	72.56 ± 11.17	79.72 ± 7.90	–	**0.001**
	Post-operative	72.92 ± 9.24	77.64 ± 7.92	–	**0.004**
Mean Arterial Pressure(MAP)	Pre	88.21 ± 10.06	82.31 ± 7.64	–	0.159
	0 min	84.90 ± 9.74	81.03 ± 8.58	–	**0.017**
	1 min	85.23 ± 10.53	79.79 ± 9.39	–	**0.026**

	2 min	86.51 ± 11.07	79.67 ± 9.60	–	**0.010**
	5 min	86.05 ± 11.47	78.41 ± 9.11	–	**0.041**
	10 min	82.18 ± 9.14	78.18 ± 7.77	–	0.473
	25 min	82.77 ± 7.46	80.90 ± 9.12	–	**0.043**
	30 min	85.74 ± 9.50	80.00 ± 9.68	–	**0.023**
	Post-operative	82.77 ± 10.78	82.41 ± 7.66	–	**0.001**

The table compares co-morbidities and hemodynamic parameters between patients receiving spinal anaesthesia and those receiving ultrasound-guided femoral plus sciatic nerve block.

Regarding co-morbidities, the most common condition observed was hypertension (17 patients) followed by diabetes mellitus (12 patients). A large proportion of patients (45 cases) had no associated co-morbidities. The distribution of co-morbidities between the two groups was not statistically significant ($p = 0.994$), indicating comparable baseline health status.

In terms of heart rate, both groups showed similar baseline values; however, a significant reduction in heart rate was observed in the spinal anaesthesia group during the early intraoperative period (1–10 minutes) compared to the ultrasound-guided nerve block group, indicating greater hemodynamic fluctuations with spinal anaesthesia.

For systolic and diastolic blood pressure, the spinal anaesthesia group demonstrated greater decreases in blood pressure during the initial intraoperative period, whereas the ultrasound-guided nerve block group maintained more stable blood pressure levels. Several time points showed statistically significant differences ($p < 0.05$).

Similarly, mean arterial pressure (MAP) values showed better hemodynamic stability in the ultrasound-guided femoral and sciatic nerve block group compared with spinal anaesthesia.

Table 3: Comparison of Block Characteristics, Postoperative Pain Scores, Rescue Analgesia, and Side Effects between Study Groups

Parameter	Group	N	Mean ± SD	p-value
Onset of Sensory Block (min)	Spinal Anaesthesia	39	3.13 ± 0.77	**0.011**
	USG Femoral + Sciatic Nerve Block	39	6.64 ± 1.04	
Onset of Motor Block (min)	Spinal Anaesthesia	39	4.64 ± 1.16	0.845
	USG Femoral + Sciatic Nerve Block	39	7.56 ± 1.12	
Duration of Sensory Block (min)	Spinal Anaesthesia	39	324.92 ± 40.87	**0.044**
	USG Femoral + Sciatic Nerve Block	39	504.54 ± 55.02	
Duration of Motor Block (min)	Spinal Anaesthesia	39	283.08 ± 38.52	**0.030**
	USG Femoral + Sciatic Nerve Block	39	325.54 ± 50.59	
VAS Pain Score Distribution	10 min	Spinal: 0	USG: 0	**<0.001**
	20 min	Spinal: 3–4	USG: 0	**<0.001**
	120 min	Spinal: 0	USG: 1–2	**0.024**
	360 min	Spinal: 0	USG: 3–7	**0.004**
Time to Rescue Analgesia (min)	Spinal Anaesthesia	39	347.56 ± 41.69	**0.048**
	USG Femoral + Sciatic Nerve Block	39	514.26 ± 55.48	
Side Effects	None	Spinal: 31	USG: 39	**0.035**
	Bradycardia	2	0	
	Hypotension	4	0	
	Nausea	1	0	
	Vomiting	1	0	
	Total	39	39	

The table compares block characteristics, postoperative pain scores, rescue analgesia requirements, and side effects between patients receiving spinal anaesthesia and those receiving ultrasound-guided femoral plus sciatic nerve blocks. The onset of sensory block was significantly faster in the spinal anaesthesia group (3.13 ± 0.77 minutes) compared to the ultrasound-guided nerve block group (6.64 ± 1.04 minutes) ($p = 0.011$). Similarly, spinal anaesthesia showed an earlier onset of motor block. However, the duration of sensory and motor block was significantly longer in the ultrasound-guided femoral and sciatic nerve block group, indicating prolonged analgesic effects. Assessment of VAS pain scores at different postoperative intervals showed significantly lower pain scores in the ultrasound-guided nerve block group at later time points, demonstrating improved postoperative analgesia.

The time to first rescue analgesia was significantly longer in the ultrasound-guided nerve block group (514.26 ± 55.48 minutes) compared to the spinal anaesthesia group (347.56 ± 41.69 minutes), indicating prolonged postoperative pain relief.

Regarding side effects, complications such as bradycardia, hypotension, nausea, and vomiting were observed only in the spinal anaesthesia group, while no adverse effects were reported in the ultrasound-guided nerve block group. This difference was statistically significant (p = 0.035).

Discussion

Regional anaesthesia plays a vital role in orthopedic surgeries of the lower limb, particularly for procedures performed below the knee. Traditionally, spinal anaesthesia has been the most commonly used technique due to its rapid onset, simplicity, and reliable sensory and motor blockade. However, advances in regional anaesthesia, especially the use of ultrasound-guided peripheral nerve blocks, have significantly improved the safety and effectiveness of nerve block techniques. Ultrasound guidance allows direct visualization of nerves, surrounding anatomical structures, and the spread of local anaesthetic, thereby improving block success rates and minimizing complications. [1]

The present prospective study compared the effectiveness of ultrasound-guided combined femoral and sciatic nerve block (USG-SFNB) with spinal anaesthesia (SA) in patients undergoing below-knee surgeries. The analysis included demographic characteristics, hemodynamic parameters, block characteristics, postoperative analgesia, and complications.

Demographic Characteristics: In the present study, the majority of patients were in the 61–70 years age group, followed by patients aged 31–40 years and 41–50 years. The difference in age distribution between the two groups was not statistically significant (p = 0.174), indicating comparable baseline characteristics.

A similar demographic distribution was observed in the study by Arslan K et al., which evaluated ultrasound-guided peripheral nerve blocks for lower limb surgeries and reported that most patients undergoing such procedures belonged to middle-aged and elderly populations. [2]

Regarding gender distribution, male patients constituted 56.4% of the study population, while female patients accounted for 43.6%. The difference between the groups was statistically insignificant (p = 0.648). This finding is consistent with the study conducted by Akkaya A et al., where males represented the majority of patients undergoing lower limb orthopedic procedures. [3]

Similarly, the distribution of ASA physical status was comparable between the groups, with most patients belonging to ASA I and II categories. The absence of significant differences between groups (p = 0.273) suggests appropriate randomization and comparable patient characteristics.

Co-morbidities: Hypertension and diabetes mellitus were the most commonly observed co-morbidities in the study population. However, nearly 58% of patients had no associated co-morbidities. The distribution of co-morbidities between the two groups was not statistically significant (p = 0.994).

This finding is consistent with other studies, who reported that common co-morbidities such as hypertension and diabetes were frequently encountered in patients undergoing lower limb surgeries but did not significantly influence the effectiveness of regional anaesthesia techniques. [4]

Hemodynamic Parameters: Hemodynamic stability is an important consideration when selecting an anaesthetic technique. In the present study, significant differences were observed in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure between the two groups during the early intraoperative period.

Patients receiving spinal anaesthesia demonstrated significant reductions in heart rate and blood pressure during the first 10 minutes after administration, reflecting the sympathetic blockade associated with spinal anaesthesia. In contrast, patients receiving ultrasound-guided femoral and sciatic nerve blocks maintained more stable hemodynamic parameters throughout the intraoperative period. These findings are consistent with the study by Casati et al., who reported that peripheral nerve blocks are associated with greater hemodynamic stability compared with spinal anaesthesia due to the absence of extensive sympathetic blockade. [5]

Similarly, Chelly et al. demonstrated that ultrasound-guided peripheral nerve blocks provided more stable cardiovascular parameters and were associated with fewer episodes of hypotension and bradycardia compared with neuraxial anaesthesia. [6]

Onset and Duration of Block: In the present study, the onset of sensory block was significantly faster in the spinal anaesthesia group (3.13 ± 0.77 minutes) compared with the ultrasound-guided nerve block group (6.64 ± 1.04 minutes) (p = 0.011). This is expected because spinal anaesthesia directly blocks nerve roots within the subarachnoid space, resulting in rapid onset.

Similar findings were reported by Szucs S et al., who observed that spinal anaesthesia provides faster onset of sensory and motor blockade compared with peripheral nerve blocks. [7]

However, the duration of sensory and motor block was significantly longer in the ultrasound-guided femoral and sciatic nerve block group. The duration of sensory block was 504.54 ± 55.02 minutes in the nerve block group, compared with 324.92 ± 40.87 minutes in the spinal group.

These results are comparable to those reported by Gabriel RA et al., who found that peripheral nerve blocks provided prolonged analgesia and reduced postoperative opioid requirements in patients undergoing lower limb surgeries. [8]

Postoperative Pain Scores: Postoperative pain assessment using the Visual Analogue Scale (VAS) demonstrated significantly lower pain scores in the ultrasound-guided nerve block group at several postoperative intervals.

Peripheral nerve blocks provide prolonged analgesia by directly blocking sensory transmission from the surgical site. This results in reduced pain intensity and improved patient comfort during the postoperative period.

These findings are consistent with the study by McLeod GA et al., who reported that ultrasound-guided nerve blocks significantly reduced postoperative pain scores and improved patient satisfaction compared with conventional anaesthetic techniques. [9]

Time to Rescue Analgesia: One of the most important outcomes in postoperative pain management is the time to first rescue analgesic requirement. In the present study, the time to rescue analgesia was significantly longer in the ultrasound-guided nerve block group (514.26 ± 55.48 minutes) compared with the spinal anaesthesia group (347.56 ± 41.69 minutes) ($p = 0.048$).

This indicates that patients receiving ultrasound-guided femoral and sciatic nerve blocks experienced prolonged postoperative analgesia, thereby reducing the need for additional analgesic medications. Similar results were reported in few studies, they demonstrated that peripheral nerve blocks significantly prolonged postoperative analgesia and reduced opioid consumption in lower limb surgeries. [10-12]

Complications and Side Effects: In the present study, complications such as bradycardia, hypotension, nausea, and vomiting were observed only in the spinal anaesthesia group. In contrast, no significant complications were reported in the ultrasound-guided nerve block group.

The higher incidence of complications in the spinal anaesthesia group may be attributed to sympathetic blockade and systemic effects associated with neuraxial anaesthesia.

These findings are consistent with other studies, which showed that ultrasound guidance significantly reduced complications associated with regional anaesthesia techniques. [12-15]

Overall Clinical Implications: The findings of the present study highlight several important clinical advantages of ultrasound-guided femoral and sciatic nerve blocks. These techniques provide better haemodynamic stability, a prolonged duration of postoperative analgesia, reduced requirement for rescue analgesics, and a lower incidence of complications compared with spinal anaesthesia. Although spinal anaesthesia offers a faster onset of block, ultrasound-guided nerve blocks provide superior postoperative pain control along with an improved safety profile, making them a valuable alternative for patients undergoing below-knee surgeries.

Limitations of study: The present study has certain limitations that should be considered while interpreting the results. First, the study was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other institutions or patient populations. Second, the sample size was relatively small, with 78 patients included in the study, which may affect the statistical power for detecting smaller differences between the groups. Third, the observer was not blinded to the group allocation, which may introduce observer bias in the assessment of certain outcomes such as pain scores and block characteristics. In addition, the study evaluated postoperative outcomes only for the first 24 hours, and therefore long-term analgesic outcomes and late complications could not be assessed.

Future Recommendations: Further research with larger sample sizes and multicentre study designs is recommended to enhance the generalizability of the findings. Future studies may also evaluate the long-term postoperative outcomes, including patient satisfaction, functional recovery, and rehabilitation after below-knee surgeries. Additionally, comparisons involving different local anaesthetic agents, adjuvants, and ultrasound-guided block techniques may help optimize block efficacy and duration of analgesia. Studies assessing the cost-effectiveness, learning curve, and feasibility of ultrasound-guided nerve blocks in routine clinical practice would also be valuable in determining their wider applicability in various healthcare settings.

Conclusion

The present study demonstrated that spinal anaesthesia provides a faster onset of sensory and motor block, whereas ultrasound-guided femoral and sciatic nerve blocks provide longer duration of postoperative analgesia and better haemodynamic stability. Patients receiving ultrasound-guided nerve blocks experienced lower postoperative pain scores, delayed requirement for rescue analgesics, and fewer complications compared with those receiving spinal anaesthesia. Therefore, ultrasound-guided femoral and sciatic nerve blocks represent a safe and effective alternative to spinal anaesthesia for below-knee surgeries.

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