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ULTRASOUND GUIDED SINGLE POINT VERSUS DOUBLE POINT POPLITEAL NERVE BLOCK FOR POST OPERATIVE ANALGESIA IN PATIENTS UNDERGOING FOOT SURGERIES

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ABSTRACT

Background: Popliteal nerve blockade is widely used for pain control after foot surgery. This study compared single point and double point ultrasound guided approaches to determine whether separate targeting of the tibial and common peroneal nerves improves postoperative analgesia.

Methods: This prospective, randomized, double-blind, comparative study included 60 patients of age between 18–65 years with ASA physical status I–II undergoing elective foot surgery under spinal anaesthesia. Patients were allocated equally into two groups. Group SP received 20 mL of 0.5% isobaric levobupivacaine with fentanyl 25 µg as a single injection proximal to the sciatic bifurcation. Group DP received 10 mL of 0.5% isobaric levobupivacaine with fentanyl 25 µg separately around the tibial and common peroneal nerves. Duration of first rescue analgesia, rescue analgesic consumption, VAS scores, procedural time, haemodynamic variables, number of attempts, patient satisfaction and complications were assessed.

Results: Duration of analgesia was significantly longer with DP than SP (962.54 ± 65.09 versus 746.81 ± 56.31 mins; $p < 0.001$). Rescue analgesic requirement was lower in DP (1.23 ± 0.55 versus 2.12 ± 0.55 doses; $p < 0.001$). VAS scores were significantly lower with DP at later postoperative intervals. Procedural time and haemodynamic parameters were comparable between groups. Repeated needle insertion and complications were infrequent, statistically not significant. **Conclusion:** Double point ultrasound guided popliteal blockade provided longer postoperative analgesia, lower pain scores and reduced rescue analgesic requirements compared with the single point approach, without increasing procedural time or complications.

KEYWORDS: Popliteal nerve block, Ultrasound guidance, Single point technique, Double point technique, Postoperative analgesia.

INTRODUCTION

Foot surgeries are frequently associated with significant postoperative pain, which may delay mobilization, recovery and increase opioid consumption. Ultrasound guided popliteal nerve block provides effective analgesia while minimizing the adverse effects associated with systemic analgesics and neuraxial techniques. Sciatic nerve divides into two nerves: tibial nerve (TN) and common peroneal nerve (CPN). These nerves separate at 5–7 cm above the popliteal fossa; TN lies medial and CPN lateral to the fossa[1,2]. Ultrasound guidance facilitates accurate nerve identification, needle placement and assessment of local anaesthetic spread. Popliteal nerve block can be performed proximal to the bifurcation as a single point injection or distally by separately targeting the tibial and common peroneal nerves. The double point approach may provide more uniform local anaesthetic spread and prolonged analgesia compared with the single point technique. However, studies comparing proximal and distal approaches remains limited and such a comparison has not been previously conducted at our institution.

MATERIAL AND METHODS

Following approval from the Institutional Ethics Committee of Government Medical College, Amritsar and informed written consent. This prospective, randomized, double-blind, comparative study was conducted in 60 patients age between 18–65 years, of either sex, with ASA physical status I–II and scheduled for elective foot and ankle surgery under spinal anaesthesia. Patients with ASA III–IV status, refusal to participate, inability to cooperate, coagulation or bleeding abnormalities, hypersensitivity to the study medications, morbid obesity or infection at the injection site were excluded. Primary objectives was to compare time to 1st rescue analgesia, rescue analgesia dose used in 24 hours and procedural time (time required to complete the block). The Secondary objectives was number of attempts (number of pricks taken for each block), haemodynamics parameters (intra operative and post operative) and complications (vessel puncture, nerve injury, drug reaction,

nausea /vomiting). Preoperative assessment included medical history, physical and systemic examination, airway evaluation and routine laboratory investigations. Premedication consisted of oral alprazolam 0.25 mg and pantoprazole 40 mg on the night before and morning of surgery with sip of water, along with intravenous midazolam 0.03 mg/kg before the start of surgery. After securing an intravenous line with an 18G cannula, coloading was done with Ringer's lactate. Standard monitoring including ECG, NIBP, SpO_2, HR and RR was instituted. Under strict aseptic precautions, spinal anaesthesia was administered at the L3–L4 interspace using 3 mL of 0.5% hyperbaric levobupivacaine. Sensory block was assessed using the pin-prick method and motor block using the Modified Bromage Scale. Surgery commenced after achieving adequate anaesthesia. Patients were randomly allocated using computer generated random numbers into two groups of 30 patients each: Group SP (n = 30): Received a single ultrasound-guided injection of 20 mL of 0.5% isobaric levobupivacaine with fentanyl 25 µg administered 6 cm proximal to the bifurcation of the sciatic nerve. Group DP (n = 30): Received ultrasound guided double injections distal to the sciatic bifurcation, with 10 mL of 0.5% isobaric levobupivacaine with fentanyl 25 µg deposited around the tibial nerve and 10 mL around the common peroneal nerve.

At the completion of surgery, ultrasound guided popliteal sciatic nerve block was performed under strict aseptic precautions with the patient in the prone position using a high frequency ultrasound probe (8–14 MHz). In Group SP, the sciatic nerve was identified in the popliteal fossa and traced proximally to a point at least 6 cm above the popliteal crease, proximal to its bifurcation. The characteristic ultrasound appearance of the sciatic nerve and the "seesaw sign" were visualized. After negative aspiration for blood, 20 mL of 0.5% isobaric levobupivacaine with fentanyl 25 µg was injected circumferentially around the sciatic nerve in 5 mL incremental doses under continuous ultrasound guidance. In Group DP, the sciatic nerve was initially identified in a similar manner and traced distally to its bifurcation into the tibial nerve (TN) and common peroneal nerve (CPN). Once both branches were clearly visualized, 10 mL of study solution containing 0.5% isobaric levobupivacaine with fentanyl 25 µg was injected around the tibial nerve and 10 mL around the common peroneal nerve after negative aspiration, ensuring adequate spread of local anaesthetic around each nerve under ultrasound guidance.

Postoperative assessment of pain was evaluated using the VAS Score at hourly intervals for the first 4 hours, every 2 hours until 12 hours and every 4 hours until 24 hours. Duration of analgesia was considered the interval from block completion until the first analgesic request or VAS >3 (IV diclofenac 75mg). Rescue analgesia was administered when the VAS > 3, the timing and total number of rescue doses during the first 24 hours were recorded. Heart rate, blood pressure, respiratory rate, oxygen saturation and ECG were monitored intraoperatively and postoperatively for 24hrs. Bradycardia (HR <50 beats/min) was treated with IV atropine 0.4 mg, while hypotension (>20% fall in SBP or MAP <60 mmHg) was managed with IV fluids and incremental ephedrine 5mg. Procedural duration, number of attempts, complications and patient satisfaction were also documented. Satisfaction was assessed after 24 hours using a five point Likert scale.

Sample Size And Statistical Analysis

Data was compiled in Microsoft Excel and analysed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean ± Standard deviation(SD) and categorical variables were expressed as frequencies and percentages. Quantitative variables were compared using the independent-sample Student's t-test while qualitative variables using the Chi-square or Fisher's exact test. A p-value <0.05 was considered statistically significant. 30 patients per group provided 90% study power at a 95% confidence level, ensuring adequate sensitivity to detect clinically significant differences between the two groups. The study was conducted with a power of 90% and a confidence level of 95% ($\alpha = 0.05$).

OBSERVATIONS AND RESULTS

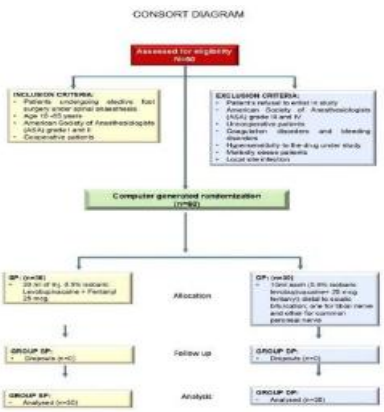

Figure 1: Consort Diagram showing patient flow through the study.

In the present study of 60 patients, age, sex distribution, ASA physical status were comparable between the two groups as shown in Table 1.

TABLE 1: Demographic variables, ASA physical status

Parameters	Group SP (n=30)	Group DP (n=30)	p value
Age (years) (Mean ± SD)	39.93±13.38	42.30±14.093	0.507 (NS)
Gender (Female/Male) (n)	15/15	11/19	0.435 (NS)
ASA Grade (I/II) (n)	18/12	17/13	1.000 (NS)

S: Significant ($p < 0.005$); NS: Non-Significant ($p > 0.05$); HS: Highly Significant ($p < 0.001$)

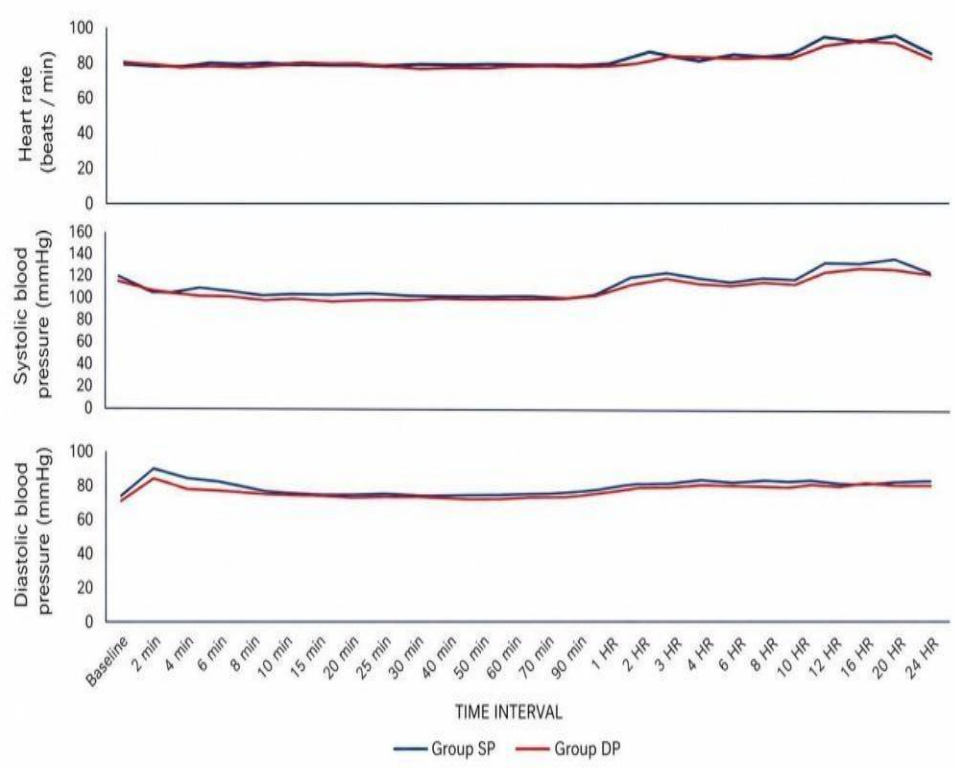

Figure 2: Heart rate, systolic blood pressure, diastolic blood pressure variation in Group SP and Group DP.

Intraoperatively heart rate was comparable between groups in figure 2. Post operatively in first 10 hrs, mean heart rate was comparable between both groups with no significant difference ($p > 0.05$). At 12 and 20 hours, Group SP showed a significantly higher heart rate. Similarly, at 16 hours, Group DP had a higher heart rate. By 24 hours, heart rate decreased in both groups, indicating adequate pain control and haemodynamic stabilization. Similarly, mean systolic blood pressure remained comparable between both groups during the initial 10 postoperative hours, with no statistically significant difference ($p > 0.05$). However, at 12 and 20 hours, Group SP showed a significant increase in SBP. At 16 hours, Group DP had significantly higher mean SBP. At 24 hours, mean SBP decreased and the difference was not significant. Other haemodynamic parameters like mean respiratory rate, oxygen saturation, diastolic blood pressure were comparable between the two groups throughout the intraoperative and postoperative period.

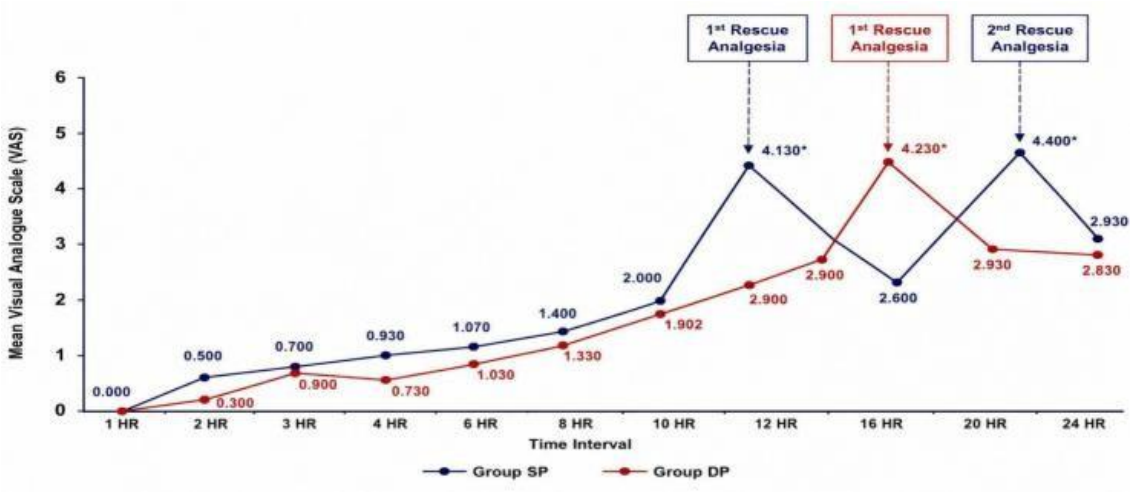

Figure 3: Visual Analogue Scale (VAS) and time to first and second rescue analgesia in Group SP and Group DP

Graph 3 shows VAS score remained below 3 in both groups during the initial 10 hours, without a significant difference. In SP, VAS increased to 4.13 at 12 hours, when the first rescue analgesia was required. In DP, the VAS increase to 4.23 occurred later at 16 hours. SP required a second rescue dose at 20 hours when VAS reached 4.40, whereas DP did not require a second rescue dose during the 24 hour observation period.

TABLE 2: Procedure time, Rescue analgesia doses, Number of attempts and adverse effects and complications in 24 hours in Group SP and Group DP

Parameters	**Group SP (n=30)**		**Group DP (n=30)**		**p value**
	Mean	SD	Mean	SD	
Procedure time (mins)	5.38	1.24	5.73	0.73	0.18 (NS)
Time to first rescue analgesia (mins)	746.81 (12.44 hrs)	56.31	962.54 (16.04 hrs)	65.09	0.001 (HS)
Number of doses of rescue analgesia	2.12	0.55	1.23	0.55	0.001 (HS)
	No.	%age	No.	%age	
Number of attempts (1/2)(n)	27/3	80.00/ 20.00	26/4	83.33/ 16.67	1.00 (NS)
Adverse effects and complications (vessel puncture, nerve injury, nausea & vomiting, drug reaction) (n)	1/0/0/0	3.33/0.00/ 0.00/0.00	1/0/0/0	3.33/0.00/ 0.00/0.00	1.00 (NS)

S: Significant ($p < 0.005$); NS: Non-Significant ($p > 0.05$); HS: Highly Significant ($p < 0.001$)

DISCUSSION

The study found that both groups were comparable in terms of age, gender and ASA grading and were statistically non-significant as shown in Table 1. Procedural time in DP group required more time to perform the block but the difference was not statistically significant. The mean duration was 5.73 ± 0.73 minutes for DP compared with 5.38 ± 1.24 minutes for SP (p=0.186). Comparable findings have been described by Tripathi R et

al.[3](2024), Faiz SHR et al.[4] and Eldegwy MH et al.[5], supporting that targeting both nerve components does not increase block performance time.

VAS score remained below 3 for the first 10 hours in both groups. Thereafter, pain increased earlier in SP, reaching 4.13 at 12 hours and rescue analgesia was given. In DP, this increase occurred at 16 hours, with a VAS of 4.23. A further rise to 4.40 at 20 hours resulted in a second rescue dose in SP, while DP did not require another dose upto 24 hours. Similar benefits of the double point approach have been reported in Nag K et al.[6], March X et al.[7] which have reported the improved analgesia to more effective local anaesthetic distribution as seen in DP group.

First request for rescue analgesia occurred significantly later in DP than SP (962.54 ± 65.09 minutes versus 746.81 ± 56.31 minutes), (p=0.001). This prolonged effect is consistent with reports by Nag K et al.[6], Kina SF et al.[8](2025), Snehitha KN et al.[9](2026). The more extensive distribution of levobupivacaine with fentanyl around both the tibial and common peroneal components may contribute to the longer duration of neural blockade observed with DP. Patients receiving the DP technique required significantly fewer rescue analgesic doses in postoperative period. The mean requirement was 1.23± 0.55 doses compared with 2.12 ± 0.55 doses in SP (p=0.001). DP patients generally required one rescue dose at approximately 16 hours, whereas SP patients required two doses at 12 and 20 hours. These observations are consistent with previous reports of Nag K et al.[6], Kina SF et al.[8](2025) and Snehitha KN et al.[9](2026) showing reduced postoperative analgesic consumption following double point blockade.

Haemodynamic variables remained comparable between the groups. Transient increases in heart rate and blood pressure coincided with higher pain scores before rescue medication and subsequently decreased after rescue analgesia. Similar haemodynamic stability following ultrasound guided popliteal blockade has been described by Tripathi R et al.[3], Snehitha KN et al.[9] and Provenzano DA et al.[10] Most blocks were completed with a single needle attempt in both groups and no significant difference was observed (p=1.00). So, the additional injection required for the DP technique not increased procedural difficulty. Similar findings have been reported by Faiz SHR et al.[4], Nag K et al.[6], March X et al.[7] Complications were infrequent and comparable between groups. Vessel puncture occurred in 3.33% of patients in each group, while nerve injury, nausea, vomiting and drug related reactions were not observed. These findings are consistent with Snehitha KN et al.[9], Perlas A et al[11] and Fournier R et al.[12] demonstrating the favourable safety profile of ultrasound guided popliteal nerve blockade.

CONCLUSION

Ultrasound guided double point popliteal sciatic nerve block provides superior and prolonged postoperative analgesia with reduced rescue analgesic requirements compared with the single point technique, without increasing procedural time or complications.

LIMITATIONS

The absence of a control group and the restriction of postoperative assessment to 24 hours were the main limitations of this study. Further studies with longer follow up are required to establish the long term efficacy and safety of the technique.

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