Section: Anaesthesiology

Original Research Article

COMPARISON OF SCIATIC NERVE BLOCK QUALITY ACHIEVED USING ANTERIOR AND POSTERIOR APPROACHES-USG GUIDED

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Abstract

Background: The co-administration of sciatic and femoral nerve blocks can provide anaesthesia and analgesia in patients undergoing lower extremity surgeries. Several approaches to achieving sciatic nerve block have been described, including anterior and posterior approaches. The present study aimed to compare and evaluate the effectiveness of Anterior and posterior approaches of sciatic nerve block for below-knee orthopaedic surgeries. **Materials and Methods:** In total, 60 study patients were randomly assigned to receive either anterior (Group A, n = 30) or posterior (Group P, n=30) sciatic nerve block. The demographic and hemodynamic parameters were recorded for both group patients. The following parameters were determined afterwards: sensory and motor block start and end times, mean duration of sensory and motor block, time to first rescue analgesia and mean total dose of analgesia. **Result:** Female patients (52%) were found more than males, with a mean age of 40.43±10.88 years. The mean heart rate and mean arterial pressure were reported as statistically significant ($p<0.05$) in both groups. The mean onset time of sciatic sensory blockade onset in Group A was 14.46±1.27 min, and in Group P was 8.62±0.66 min. The mean sciatic sensory and motor blockade duration in anterior and posterior approaches was also statistically significant ($p<0.05$) among both groups. Time to first rescue analgesia and total dose of rescue analgesia was statistically significant ($p<0.05$) among a population of both groups. **Conclusion:** The posterior approach of sciatic nerve block provides faster onset, longer duration of the block, and less rescue analgesia in the first 24hrs than the anterior approach.

INTRODUCTION

The co-administration of sciatic and femoral nerve blocks provides anaesthesia or analgesia in patients undergoing lower extremity surgeries.[1-3] Sciatic nerve block can be applied using either an anterior or a posterior approach.[4] Anterior sciatic nerve blocks are performed with the patient in the supine position, simultaneously and from the same region as femoral nerve blocks. Turning the patient to one side is not required. Following the tourniquet's application, the patient can be transferred to the operating room without moving the patient. However, the sciatic nerve is located deep and behind the femur, which complicates the administration of the block; thus, an anterior block is considered an advanced nerve block.[5,6] The posterior approach is technically easier to perform; however, patients with lower limb fractures often experience pain until the block is achieved because they must be turned sideways to allow the fractured limb to remain on top.

Using ultrasonography (USG) and classical techniques generally increases the success rate when administering a peripheral nerve block. USG has been successfully used in anterior and posterior sciatic and femoral nerve blocks.[7] The concurrent use of USG and a nerve stimulator has been reported to improve the success rate of the block, as well as the quality of the anaesthesia.[4] Anterior approach of sciatic nerve block is performed with patients in the supine position. Therefore, this block would benefit a significant group of patients who cannot assume the lateral decubitus position. Other advantages are that the limb must not be flexed, and both sciatic and femoral blocks can be placed with patients in the same position. The posterior approach is technically easier to perform. However, patients with Lower limb fractures often experience pain until the block is achieved because they must be turned sideways to allow the fractured limb to remain on top.[1,4] The present study aimed to compare and evaluate the effectiveness of Anterior and posterior approaches of

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sciatic nerve block for below-knee orthopaedic surgeries.

MATERIALS AND METHODS

This cross-sectional comparative study was conducted at Tirunelveli Medical College Hospital for six months on 60 patients. Patients undergoing elective lower limbs, especially below-knee orthopaedic surgical procedures in orthopaedic surgery theatre, were assessed for inclusion and exclusion criteria and included in the study after obtaining written informed consent for participating in the study. Institutional ethical committee clearance was obtained, and 60 patients were randomly divided into two Groups with 30 patients each. Group A: Given Sciatic nerve block by USG guided Anterior Approach with Femoral nerve block. Group P: Given Sciatic nerve block by USG guided Posterior Approach with Femoral nerve block.

Inclusion Criteria

Patients aged 18 to 65 years, ASA PS - I & II, undergoing Elective Orthopedic below-knee surgeries and given valid informed consent were included.

Exclusion Criteria

Patients with ASA III & IV, co-morbidities such as heart diseases, chronic renal diseases, chronic liver diseases, cerebrovascular diseases, chronic lung diseases, and traumatic brain injuries, patients with a bleeding disorder and coagulation abnormalities and morbid obesity, patients with BMI>35 kg/m2, and patients with Block failure, inability to visualise sciatic nerve and who refused to participate in the study were excluded.

Patients were examined thoroughly with the evaluation of history and clinical examination. All patients were fasting overnight and given acid aspiration prophylaxis with Ranitidine 150mg and Metaclopromide 10mg the night before surgery. In the operating room, routine monitoring was attached, including ECG, NIBP, and pulse oximeter, and vital baseline parameters were recorded. Each patient was given premedication Inj. Glycopyrrolate 4mcg/kg and Inj midazolam 0.1mg/kg intramuscular 45 min before surgery. Baseline cardio-respiratory parameters like heart rate, Blood pressure, and oxygen saturation were recorded (T0).

USG gave group A patients a sciatic nerve block-guided anterior approach. In the supine position and leg externally rotated, the curvilinear transducer is placed transversely over the anteromedial aspect of the thigh approximately at the lesser trochanter level. Femur appeared as a hyperechoic rim with a shadow beneath the vastus intermedius. Medial to the femur is the adductor magnus muscle. Here sciatic nerve was visualised as a hyperechoic oval structure between the two muscles. 30ml of local anaesthetics, 0.25 % bupivacaine, and 1% lignocaine with adrenaline are injected.

USG gave group-P patients a Sciatic nerve block-guided anterior approach. The patient is in a lateral decubitus position with an affected limb top. The limb is flexed at the hip and knee. The initial transducer is positioned in the depression between the greater trochanter and ischial tuberosity. The sciatic nerve was visualised as an oval hyperechoic structure between the two hyperechoic bony prominences below the gluteus maximus muscle. 30ml of Local anaesthetic, 0.25% bupivacaine and 1% lignocaine with adrenaline is injected.

Both groups were given femoral nerve block in the supine position using a linear transducer and 10ml of local anaesthetic 0.25% bupivacaine and 1% lignocaine with adrenaline. The transducer is placed in a transverse orientation over the inguinal crease to identify the femoral artery. The artery is visualised as a round anechoic pulsating structure with the easily compressible femoral vein located medial to it. Lateral to the femoral artery femoral nerve appears round hyperechoic structure. Using an in-plane technique femoral nerve is infiltrated with the local anaesthetic drug. The maximum dose of local anaesthetic drug was kept as 2mg per kg for bupivacaine and 7mg per kg for lignocaine with adrenaline. Cardio-respiratory parameters like Heart rate, Blood pressure, and Oxygen saturation were recorded intra-operatively at 5 min (T1), 10 min (T2) and 20 min (T3) post-block. In case of block failure, surgery proceeded with the spinal neuraxial blockade, and the patient was eliminated from the study group Time of onset of motor and sensory block was noted and recorded. The patient was shifted to a postoperative ward for observation. Postoperatively, the duration of the blockade was assessed by the onset of pain and limb movement and recorded. At the onset of pain, patients were given Inj. Paracetamol 1g intravenously 4th hourly. Time for the requirement of first rescue analgesia and total dose of Inj. Paracetamol in the first 24 hrs postoperative period was noted and recorded.

Statistical Analysis

The data was analysed using SPSS version 20, and descriptive statistics were done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t-test and ANOVA single-factor test. Categorical variables were analysed with the Chi-Square and Fisher Exact Test, and a statistical significance was taken as $P < 0.05$.

RESULTS

Most patients (32%) were reported in the age group of > 50, with a mean age of 40.43±10.88 years. Female patients (52%) were found more than males. ASA classification distribution, mean Spo2 was found comparable in both groups. However, mean HR and MAP were reported as statistically significant ($p<0.05$) in both groups [Table 1].

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Table 1: Observation of demographic and hemodynamic parameters of both group patients

Parameters	Observation N (%)		P-value
	Group A (N=30)	Group P (3=40)	
Gender			
Male	14	15	0.796
Female	16	15	
Age group (years)			
< 30	12 20%		-
31-40	16 26%		
41-50	13 (22%)		
> 50	19 32%		
Mean Age (years± SD)	40.43 ±10.88	42±11.5	0.591
ASA Classifications			
I	14	16	0.606
II	16	14	
Mean Heart Rate beats/min) (Mean±SD)			
Baseline	102.07 ±7.18	99 ±7.4	0.109
T1	80.8 ±5.62	70.2± 5.53	0.001
T2	100.3± 5.48	70.27 ±5.74	0.001
T3	100.77± 5.66	69.1 ±5.44	0.001
MAP (mmHg) (Mean± SD)			
Baseline	82.37± 6.69	88.23 ±7.4	0.001
T1	64.67± 2.94	70.2± 5.53	0.001
T2	80.5± 6.3	70.37± 5.74	0.001
T3	80± 5.97	69.73± 5.44	0.001
Mean sPo2 (%) (Mean± SD)			
Baseline	100	100	NA
T1	100	100	NA
T2	100	100	NA
T3	100	100	NA

Table 2: Observation of sciatic sensory and motor block along with rescue analgesia among patients of both groups

	Group A (N=30)	Group P (3=40)	P-value
Mean onset time- sciatic sensory block (min)	14.46± 1.27	8.62±0.66	0.001
Mean onset time- sciatic motor block (min)	15.57±1.26	11.47±0.57	0.001
Mean duration- sciatic sensory block (min)	203.21±12.62	221.75±21.77	0.001
Mean duration-sciatic motor block (min)	128.51± 11.85	193.08±12.89	0.001
Mean time for first rescue analgesia (min)	304.91±5.5	358.35±12.85	0.001
Mean total dose of rescue analgesia (min)	2133.33± 819	1433±678.91	0.001

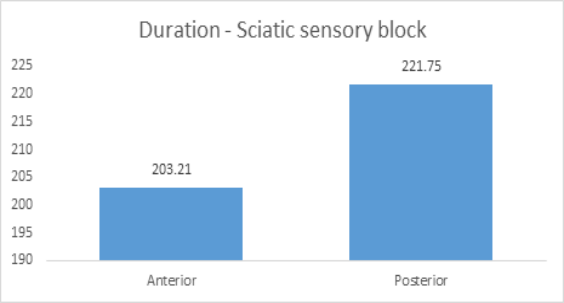

Figure 1: Observation of duration sciatic sensory block between groups

The mean time of onset of sciatic sensory blockade in the anterior approach was found (14.46±1.27 min) statistically higher (p<0.05) than in the posterior approach (8.62±0.66 min). In our study, the mean onset time of a sciatic motor blockade in the anterior approach was 15.57± 1.26 min; in the posterior approach, it was 11.47± 0.57 with a significant effect (p<0.05). The mean duration of sciatic sensory blockade in the anterior approach (was 203.21±12.62 min) and in the posterior approach (was 221.75±21.77 min), and Mean duration of sciatic Motor blockade in anterior approach 128.51±SD-11.85 min and in posterior approach 193.08 ±12.89 min was also found statistically significant (p<0.05) among population of both groups [Figures 1 and 2]. In addition, the time to first rescue analgesia and total dose of rescue analgesia was also found to be statistically significant (p<0.05) among the population of both groups [Table 2].

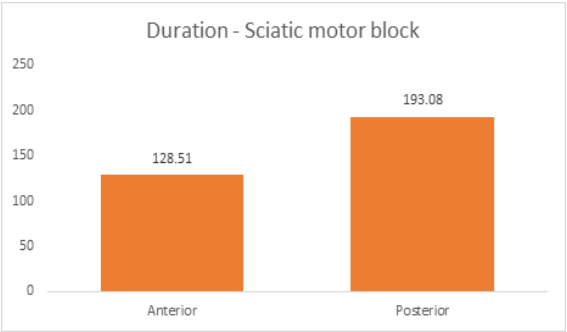

Figure 2: Observation of duration sciatic motor block between groups

DISCUSSION

The optimal regional technique and local anaesthetic depending on factors including surgery duration, indication for postoperative sympathectomy, and degree and duration of postoperative sensory/motor block needed for active and passive physical therapy.[2,3] Most below-knee procedures require

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sciatic and femoral nerve blockade. The femoral nerve can be blocked easily below the inguinal crease when a patient is supine using landmark-guided nerve stimulator, ultrasound-guided or a combination of these techniques.[4,5]

The sciatic nerve is a little more difficult to block than the femoral nerve due to its deep-seated position under the muscle plane and comparatively large nerve in the body. Many techniques have been described in the literature regarding sciatic nerve block. Landmark-guided, using a nerve stimulator, ultrasound-guided, or a combination of these techniques can be used.[8] Different approaches also have been described for sciatic nerve block- the Classic Posterior Approach of Labatt, the Lithotomy Approach of Raj, the anterior approach of Meier and the Popliteal approach.[9]

In our study, most patients (32%) were reported in the age group of > 50 years with a mean age of 40.43±10.88 years. Female patients (52%) were found more than males, and these findings follow earlier reported studies.[1] Our study's ASA classification distribution, mean Spo2 was comparable in both groups. However, mean HR and MAP were reported as statistically significant ($p<0.05$) in both groups. Ota et al. reported similar findings in their investigations.[4]

In our study, the mean time of onset of sciatic sensory blockade in the anterior approach was found (14.46±1.27 min) statistically higher ($p<0.05$) than in the posterior approach (8.62±0.66 min). In our study mean time of onset of a sciatic motor blockade in the anterior approach (15.57± 1.26 min) and in the posterior approach (11.47± 0.57 mi) was statistically significant ($p<0.05$). Yektaş et al., in their investigation, also reported a statistically significant effect ($p<0.05$) in the onset of sciatic sensory and motor blockade.[10] Alsatli et al. study demonstrated sensory block start times of 9.42 ± 1.08 min and 7.75 ± 0.97 min using the anterior and posterior approaches, respectively; this difference was significant ($p=0.001$), and the results were comparable to those of our study.[11,12]

In our study, the mean duration of sciatic sensory blockade in the anterior approach (203.21±12.62 min) and posterior approach (221.75±21.77 min) and mean duration of sciatic Motor blockade in the anterior approach (128.51±11.85 min) and posterior approach (193.08 ±12.89 min) was also found statistically significant ($p<0.05$) among the population of both groups. In their study, Fuzier et al. reported a significant effect ($p<0.05$) in mean sensory and motor blockage duration among anterior and posterior group patients.[12]

In our study, time to first rescue analgesia and total dose of rescue analgesia was also found to be statistically significant ($p<0.05$) among a population of both groups. Our patients experienced greater tourniquet pain associated with the anterior approach than the posterior approach; therefore, the total dose of Paracetamol administered was significantly higher. In one study, the posterior femoral cutaneous nerve block did not affect tourniquet pain. However, Yektaş et al. reported higher analgesic (fentanyl) and lower first-rescue analgesia in patients with the anterior approach.[10]

CONCLUSION

The present study concluded that the Posterior approach of sciatic nerve block provides faster onset, longer duration of the block, and less rescue analgesia in the first 24hrs than the anterior approach. The posterior approach of sciatic nerve block also provides better hemodynamic stability.

REFERENCES

1. Vloka JD, Hadzic A, April E, Thys DM. Anterior approach to the sciatic nerve block: the effects of leg rotation. Anesth Analg. 2001;92:460–2.
2. Ericksen ML, Swenson JD, Pace NL. The anatomic relationship of the sciatic nerve to the lesser trochanter. Implications for anterior sciatic nerve block. Anesth Analg. 2002;95:1071–4.
3. Amin WA, Abou Seada MO, Saeed MF, Mohammed SF, Abdel-Haleem TM, Shabaan EA. Continuous sciatic nerve block: a comparative study between the para sacral, lateral, and anterior approaches for lower limb surgery. Middle East J Anesthesiol. 2010;20:695–702.
4. Ota J, Sakura S, Hara K, Saito Y. Ultrasound-guided anterior approach to sciatic nerve block: a comparation with the posterior approach. Anesth Analg. 2009;108:660–5.
5. Prakash AK, Bhardwaj AK, Devi MN, Sridevi NS, Rao PK, Singh G. Sciatic nerve division: a cadaver study in the Indian population and review of the literature. Singap Med J. 2010;51:721–3.
6. Uz A, Apaydin N, Cinar SO, Apan A, Comert B, Tubbs RS, et al. A novel approach sciatic nerve block: cadaveric feasibility study. Surg Radiol Anat. 2010;32:873–8
7. Schnabel A, Middendorf B, Boschin MG, Gottschalk A, Van Aken H, Zahn PK, et al. Differences of analgesic efficacy and complication rates between ultrasound and nerve stimulator guided peripheral nerve catheters: database analysis on patient-relevant target parameters. Anesthesist. 2014;63:825–31.
8. Chelly JE. Delaunay. A new anterior approach to the sciatic nerve block. Anesthesiology 1999;91:1655–60.
9. Van Elstraete AC, Poey C, Lebrun T, Pastureau F. New landmarks for the anterior approach to the sciatic nerve block: imaging and clinical study. Anesth Analg 2002;95:214–8.
10. Yektaş A, Balkan B. Comparison of sciatic nerve block quality achieved using the anterior and posterior approaches: a randomised trial. BMC Anesthesiology. 2019;19:225
11. Alsatli RA. Comparison of ultrasound-guided anterior versus trans gluteal sciatic nerve blockade for knee surgery. Anesth Essays Res. 2012;6:29-33.
12. Fuzier R, Hoffreumont P, Bringuier-Branchereau S, Capdevilla X, Si şngelyn FJ. Does the sciatic nerve approach influence thigh tourniquet tolerance during below-knee surgery? Anesth Analg. 2005;100:1511-4.

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