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Original Research Article

Comparative study of anterior and posterior approaches for sciatic nerve block for lower limb and foot surgery in diabetic patients

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ABSTRACT

Introduction: Sciatic nerve block (SNB) is an established technique of anaesthesia for lower limb and foot surgeries. Although several approaches to SNB have been described not a single one is ideal in all respect. We aimed to compare commonly used two approaches to SNB to fin d out which one is better with regard to efficacy and patient satisfaction.

Materials and Methods: Consented 60 diabetic patients of ASA grade II,III posted for foot and /or lower limb surgery were randomly allocated to receive SNB by either anterior (n=30) or posterior (n=30) approach. Blocks were performed utilizing peripheral nerve stimulator (PNS), with 25 ml of local anaesthetic mixture (10 ml of 2% lignocaine with adrenaline and 15 ml of 0.5% bupivacaine). Time taken to perform block with number of attempts required, onset of sensory and motor block, duration of analgesia were record ed and compared. We also had compared comfort level of the patients.

Observations and Results: Out of 60 patients, 1of anterior and 2 of posterior approach es had failed block. Time taken to perform anterior approach was significantly less ($p< 0.05$) when compared to posterior approach. Patients were comfortable with anterior approach than that of posterior. Faster onset of sensory and motor block, and more duration of analgesia was observed with the posterior group but the difference was not statistically significant.

Conclusion: Our study concluded that though efficacy of both the anterior and posterior approaches to block sciatic nerve was same, anterior approach is easier than posterior approach as it requires lesser time to perform and gives far better patient comfort.

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1. Introduction

For lower limb surgeries regional anaesthesia is a popular and routine technique. A well known procedure amongst regional anaesthesia is the sciatic nerve block which is used either as a single block or combined with other lower limb nerve blocks.[1,2] Peripheral nerve blocks have become a favoured anaesthetic option in the management of diabetic patients as they provide better quality post operative analgesia with minimal haemodynamic and metabolic disturbances than general anaesthesia.[3] As these patients have associated comorbid conditions like ischemic heart disease, autonomic neuropathy, hypertension, cerebrovascular disease, chronic renal disease due to long standing diabetes even central neuroaxial blockade can pose problems due to compromised cardiac condition. So sciatic nerve block with or without saphenous / Femoral nerve block is a better option in terms of safety. Sciatic nerve (SN) can be blocked at various levels along its pathway.[2,4] In 1974 Winni modified the classic posterior approach to sciatic nerve block which was introduced by Labat.[5,6] This modified approach is used most frequently (posterior approach). But this approach requires repositioning the patient in lateral decubitus which is sometimes not possible or cumbersome in patients with limited mobility, obesity. It also necessitates recognition of many bony landmarks which can be difficult at times. During placement of block, the patient usually experiences pain and discomfort

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as needle passes through different layers of muscles. In 1963 anterior approach was described by Beck.[7] Advantage of this approach is patient lie in supine position during block procedure. Also palpating and identifying landmarks is easy, though patient may feel some pain when needle touches femur this can be lessened by giving internal rotation to leg. So the purpose of this study was to compare these two different approaches in regard to time required to perform block, onset of anaesthesia, duration of analgesia and to record patients comfort level.

2. Materials and Methods

Source of data: After ethical clearance from college committee, 60 diabetic patients undergoing lower leg and foot surgeries were selected for study during period of May 2015 to May 2017 at Dr. D. Y. Patil Medical College, Kolhapur.

2.1. Study design

Prospective randomised single blind study

2.2. Sample size

60 patients were selected based on inclusion criteria. Sample size is based on minimum number required to consider $p< 0.05$ as significant. They were divided by computer generated random number method in two groups of 30 each. Group A (n=30) patients received anterior approach and Group P (n=30) patients received posterior approach to sciatic nerve block.

2.3. Inclusion criteria

Diabetic patients scheduled for lower limb (foot and ankle) surgeries belonging to ASA grade II and III and aged above 20 years.

2.4. Exclusion criteria

Patients refusal for study, coagulation abnormalities, skin infection at the site of needle entry and patients with chronic pain syndrome were excluded from the study.

Patients were shifted to sliding scale for sugar control, were advised to fast overnight and were given Tab Alprazolam 0.25 mg orally night before. All routine and if required specific lab investigations were done. Morning insulin was omitted, fasting sugar and electrolytes were checked and urine ketones were ruled out. Patients were explained about procedure and written consent for study was obtained. In the operation theatre patients were started on IV infusion according to fasting sugar levels. Goal was to keep sugar level in range of 150-200 mg% intraoperatively. Multipara monitor was attached and baseline pulse, NIBP, Sao2, ECG were recorded. Oxygen was given via nasal prongs with 4 lit/min. Then patients received sciatic nerve block by either of approaches under all aseptic precautions with local infiltration at site of entry as described below. Patients in whom medial aspect of lower leg was involved received additional saphenous nerve block at knee level.[8]

Group A: Beck ' s approach: With patient supine and lower extremity rotated externally a line was drawn between anterior superioriliac spine (ASIS) and pubic tubercle (PT). A second line was drawn parallel to first line passing through greater trochanter (GT). A perpendicular line was drawn from junction of medial $1/3^{rd}$ and middle $1/3^{rd}$ of the first line and this was extended to second line to define point of entry of the needle. A 15 cm long stimuplex needle was then passed at right angle to the skin till we get desired motor response of plantar flexion and inversion of foot at 5 mA current. Then the current was gradually reduced to 0.4mA and the motor response was confirmed. Sometimes manipulations like internal rotation of the leg to negotiate lessor trochanter were done. Desired motor response was obtained at the depth of 9-12 cm from the skin.[2,7,9] Group P: Winnie's approach: Patient was positioned laterally with the limb to be blocked uppermost, the lower leg was extended straight and the upper leg was maximally flexed at hip and was bend at right angle at knee. A line was drawn from GT to posterior superioriliac spine (PSIS). A second line was drawn from GT to sacral hiatus (SH). A perpendicular was drawn bisecting the first line and that was extended to second line to define the point of the needle entry. A 15 cm long stimuplex needle was passed perpendicular to the skin searching for desired motor response of palnter flexion and inversion of foot at 5mA current. Then the current was gradually reducd to 0.4 mA to conform the needle position. Desired motor response was obtained at the depth of 8-10 cm from the skin.[2,9]

Plexygon nerve stimulator was used, in itial setting was kept at 5mA, desired response was of posterior tibial nerve (plantar flexion and inversion at 0.4mA was taken as end point)[10] and 25 ml of local anaesthetic mixture (10 ml of 2% lignocaine with adrenaline 1: 2,00,000 and 15 ml of 0.5% bupivacaine) was injected in aliquots after negative aspiration for blood.

Saphenous nerve block: Patient was placed in supine position. Subcutaneous infiltration of lignocaine 2% with adrenaline (5-7) ml was made in anterior and posterior direction at level 3-4 cm distal to medial tibial condyle.[11]

3. Observations and Results

3.1. Observations

Observations were done by other PG student who was not actually involved in study. For each patient following parameters were noted during procedure: Time taken to perform the block (from point of inserting the needle to administration of local anaesthetic), time for total execution of block i.e. time from giving position, drawing landmarks

and actually performing block till drug was injected and Number of attempts required to get desired response. During the procedure patient was assessed for pain by VAS score (VAS 0= no pain VAS 1,2 = mild pain and VAS >3 = severe pain) VAS 0,1, 2 was taken as comfortable patient and VAS > 3 as patient not comfortable. At every 5 min interval sensory and motor functions were assessed by pin prick and movement of ankle joint respectively in territory of common peroneal and posterior tibial nerve on a three point scale, with 0 corresponds to normal sensation or movement, 1 corresponding to blunted sensation or moderately impaired movement and 2 corresponding to an absence of sensation or movement.[12] A complete block was said to be achieved when patient had sensory 2 grade and motor 2 grade block in the distribution of both common peroneal and tibial nerve. When score for either sensory or motor was less than 2 in any of nerve distribution then block is considered as incomplete. In case of complete failure or inadequate action (after 20 mins) supplementation was done with injection fentanyl 2 mic /kg iv, injection midazolam 0.04 mg/kg, and if required with propofol infusion 6-10 mg /kg /hr. Post operatively time for first request for pain relief was noted by ward nurse as per instructions and this was taken as duration of analgesia (from onset of complete block to first request of pain relief). And rescue analgesia was provided with inj tramadol 100 mg iv drip. Postoperatively patients were followed for two days to rule out any residual neural injury.

3.2. *Statistical analysis*

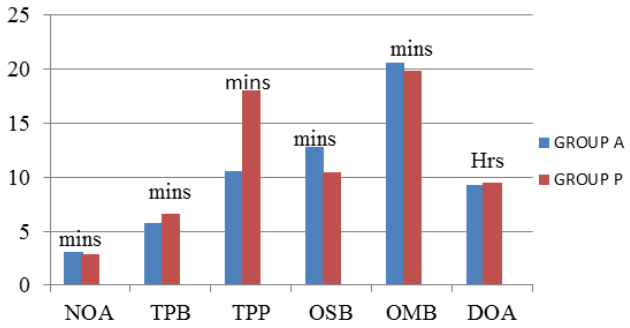
Statistical software namely SPSS 18.0, R environment vers 3.2.2 for the data analysis and Microsoft word and excel have been used to generate values tables and graphs.

Continuous measurement = Mean + SD. Categorical measurements = number % Students t test (two tailed, independent) for significance of study parameter Chi-square test /Fisher exact test for significance of study parameter on categorical scale. Non parametric setting for Qualitative data analysis. Fisher exact test used as sample size is small Significant figures: (p value : < 0.001, 0.05) considered very significant and significant.

4. Results

Table 1 Demographic distribution shows there are no significant differences in two groups regarding age, weight and sex and ASA grade.

Table 2 Compares all other variables. Time taken to perform the block is significantly less in group A than in group P($p< 0.05^*$). Time taken to complete the procedure is significantly more in group P than in group A ($p < 0.05^*$). Statistically there is no significant difference observed in both the groups with regard to number of attempts required for placement of the block (p= 3.95). Sensory onset time is early in group P than in group A but the difference is not statistically significant (p= 0.16). Onset of motor block in both the groups is comparable (p=0.63). We can see duration of analgesia in group A and in group P is almost similar. We can observe from the table that there is statistically significant difference in Comfort level of the patients ($p < 0.005^*$) 60% of group A while only 20% of group P patient appear to be comfortable about the procedure.



Graph 1: Study variables (X axis – variables : NOA-number of attemts, TPB- time to perform block in mins, TPP-time to perform procedure in mins, OSB- onset of sensory block in mins, OMB- onset of motor block in mins, DOA- duration of analgesia in hrs. Y axis:- Time variable)

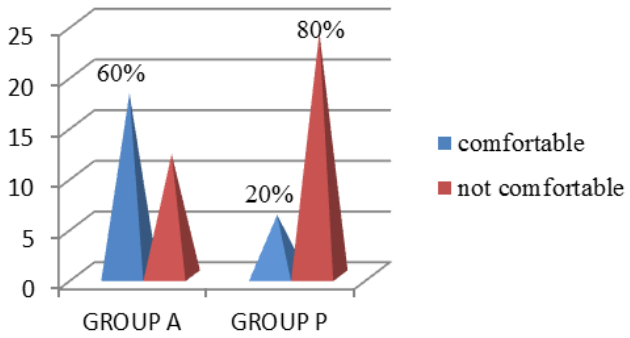


Fig. 1: Number of comfortable patients in percentage in both the groups X axis: Group Y axis: Number of patients

5. Discussion

Peripheral nerve block is an extremely effective and useful technique for lower limb and foot surgeries.[9,13] In high risk patients with unstable haemodynamics central neuroaxial blockade which causes bilateral blockade with extensive sympathectomy should be avoided. As peripheral nerve block can be confined to regional area without affecting patients sympathetic nervous system it gives better haemodynamic stability so is a suitable technique[3,14] Unilateral spinal or graded epidural anaesthesia are other methods to

Table 1: Demographic data (mean and standard deviation) in two groups

Parameters	Group A	Group P	P value
Age (years)	52.57 + 11.13	56.87 + 9.36	0.111
Weight (kgs)	71.23 + 12.04	71.47 + 13.15	0.943
Height (cms)	162 + 0.07	160 + 0.08	0.355
BMI	27.03 + 3.71	27.74 + 4.06	0.482
Sex (M/F)	26/4	27/3	>0.05
ASA (II/III)	16 /14	17/ 13	0.795

Table 2: Comparison of study variables in two groups (mean and standard deviation,%)

Variables	Group A	Group P	P value
Time to perform block Time to perform procedure	5.83 + 1.17 13.6 + 4.3	6.44 + 1.14 18.0 + 5.6	0.044* < 0.05*
Number of attempts	3. 07 + 0.91	2.87 + 0.90	0.395
Sensory block onset (min)	12.87 + 7.38	10.53 + 5.42	0.168
Motor block onset (min)	20.67 + 7.04	19.87 + 5.72	0.631
Duration of analgesia (hrs)	9.3 + 3.5	9.5 + 3.9	> 0.05
Comfort of patient	18 (60%)	6 (20%)	< 0.005*

deal with such patients under regional anaesthesia but are not free from their own side effects or complications.[15–17] While General anaesthesia is an acceptable alternative it comes with its own complications.[18]

With the use of USG machine peripheral nerve blocks are being used widely and precisely for almost all of the surgeries either intraoperatively or for postoperative analgesia. In Maharashtra state due to strict law of PCPNDT, it is not easy to get USG machine at operation theatre, our institute lack this facility so here we are using our gold standard PNS guided technique. For lower leg and foot surgeries. In literature various approaches to block SN are described and most of the time posterior approach of Labat is used.[5–7,9,12,19] In posterior approach patient needs to be in lateral position which is cumbersome to the patient, and sometimes it is not safe for obese or unstable patient. Also there are some difficulties in monitoring and handling of patients airway in lateral position. These drawbacks are taken very well taken care in supine position with Beck's anterior approach. In observations we found time taken to perform block and total procedural time was more in posterior approach and the difference was statistically significant than that of anterior one. This might be due to time taken to give lateral position and to identify multiple bony landmarks. Our results are similar to study done by Junichi and Alsatli.[20,21] There are few studies comparing lateral and posterior approach to SNB with better results with posterior approach.[22,23] Few old studies indicated high failure rate and more pain in anterior approach but one should take in consideration that in those early times studies were mainly by paresthesia elicitation technique. By doing some modification like internal rotation of leg we can bypass lessor trochanter after hitting it and that makes procedure relatively painfree. Also when we use PNS it is uncommon to see block failure, we took plantar flexion as a final response which gives us high success rate.[10] The onset of peripheral blocks are greatly affected by volume and concentration of local anaesthetics.[24–26] Here in our study we kept it same for both the groups so whatever is difference, is due to different site where we block SN. We observed late onset motor and sensory block in group A which can be explained by more non-neural tissue component around the nerve as we go distally and it takes more time to block it.[27] Rest all parameters were comparable in both the groups. Comfort level of patient was significantly less in group P as compared to group A, the reason may be difficulty in getting in lateral position and to remain in that position for about 15-20 mins which is inconvenient to the patient. To assess block properly we avoided any sedation or analgesics prior to block. Actually being deep block both approaches are painful but we observed supine patients were more comfortable. When we compared number of attempts in both the groups there was no significant difference. Thus overall efficacy of both the approaches is same. Duration of analgesia when compared was more with posterior approach than anterior but difference was not statistically significant. Out of 60 patients 2 of anterior and 1 of posterior approach had a failed block, failure rate between the groups is not statistically significant.

6. Conclusion

Through our study we have come to the conclusion that though efficacy of both the approaches to block sciatic nerve is same, anterior approach is easier than posterior and requires lesser time to perform with better patient comfort and satisfaction.

7. Conflict of interest

None.

Limitation of our study is with USG machine one can do block procedures easily, safely and precisely we are lacking on that ground.

8. Source of Funding

None.

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