e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2022; 12(9); 281-288

Original Research Article

A Prospective Randomized Comparative Study between Combined Sciatic- Femoral Nerve Block and Spinal Anaesthetic Block for Unilateral below Knee Surgery of Lower Limb

Pal S[1], Srivastava L[2], Majumdar S[3], Chakraborty S[4], Sarkar M[5], Rudra J[6]

[1]Senior Resident, Department of Anaesthesiology, NRS Medical College, Kolkata, WB

[2]Senior Resident, Department of Anaesthesiology, NRS Medical College, Kolkata, WB

[3]Associate Professor, Department of Anaesthesiology, NRS Medical College, Kolkata, WB

[4]Associate Professor, Department of Anaesthesiology, IPGME&R and SSKM, Kolkata, WB

[5]Professor, Department of Anaesthesiology, NRS Medical College, Kolkata, WB

[6]Professor, Department of Anaesthesiology, NRS Medical College, Kolkata, WB

Received: 19-07-2022 / Revised: 20-08-2022 / Accepted: 11-09-2022

Corresponding author: Dr Chakraborty S

Conflict of interest: Nil

Abstract

Introduction: Aim was to study the combined sciatic-femoral nerve block in operative management for unilateral below knee surgery and to compare the hemodynamic parameters in these nerve blocks with commonly used subarachnoid block.

Material and Methods: 70 patients of 20 to 60 yrs, ASA grade I and II, had undergone unilateral below knee surgery of lower limb were divided into two groups – the spinal anaesthetic block group (SAB) and the sciatic femoral nerve block group (SFB). In SFB group femoral block was performed by paravascular approach (three-in-one block) and sciatic nerve block was given by classic Labat approach. Patients in SAB group were received subarachnoid block using 25 G Quincke's needle in L3-4 interspace with 3.5 cc hyperbaric inj. Bupivacaine (0.5%). Post-operative pain was measured by Visual Analogue Scale (VAS) score at every 4 hours interval for 36 hours.

Results: The mean sensory and motor block onset time and duration in SFB group was much higher than SAB group. The post-operative pain by VAS score was found statistically significant from 8 to 28 hours ($p < 0.05$) with higher VAS score in SAB group than SFB group.

Conclusion: Though time consuming, combined Sciatic- Femoral nerve block resulted in better intra-operative haemodynamic control and post-operative pain management than subarachnoid block for unilateral below knee surgery.

Keywords: Sciatic- Femoral nerve block, Visual Analogue Scale, Paravascular approach

Introduction

Effective pain control is essential for optimal care of surgical patients. Crush injury and compound fracture of limbs are severely painful because of the involved extensive soft tissue and bony injuries. Failure to relieve such pain would be morally and ethically unacceptable. This led to the concept of multimodal approach to provide pain relief. Regional anaesthesia is one of the most important components of this multimodal approach. Regional techniques for anaesthesia and analgesia of lower limb have been regarded as more difficult than those of upper limb [1] Also due to wide spread acceptance of spinal and epidural anaesthesia, these two techniques of central neuraxial blockade are the most often used techniques for lower limb surgeries. Although effective, they provide little selectivity for the operated side and are subjected to number of side effects, such as arterial hypotension, bradycardia, urinary retention and post dural puncture headache. Peripheral nerve blocks can also avoid some of the complications of subarachnoid block. Advances in needles, catheters and nerve stimulator technology, and ultrasound imaging have facilitated localization of neural structures and improved success rates [2].Taking the above mentioned factors into consideration, it was decided to do a study on combined sciatic-femoral nerve block and compare it with subarachnoid block for unilateral surgery of lower limb.

Aims and Objectives

The aim of this study was to study the combined sciatic-femoral nerve block in operative management for unilateral below knee surgery of lower limb and to compare the hemodynamic parameters in these nerve blocks with the commonly used Spinal anaesthesia.

Material and Methods

After approval by the college ethics committee, written informed consent was obtained from each patient. 70 patients of aged 20 to 60 yrs, of ASA grade I and II, had undergone unilateral below knee surgery were divided into two groups – the subarachnoid block group (SAB) and the sciatic femoral nerve block group (SFB). All patients were kept on 8 hours fasting and were given tab. Alprazolam (0.25 mg) the night before surgery and Tab. Pantoprazole (40 mg) in the morning of surgery. The procedure was explained in details to all the patients. A peripheral venous line was secured in all patients and Inj. Ringer lactate was loaded at 10 ml/kg body weight. On arrival to operation theatre ASA standard monitors were attached and baseline pulse rate, blood pressure and oxygen saturation were recorded and monitored during peri-operative period. Femoral nerve block was performed first via three-in-one block method followed by the sciatic nerve block, so as to make positioning of the patient more comfortable for the sciatic nerve block. The patient was made to lie supine with the leg to be anaesthetized slightly abducted. A 22G 5cm insulated needle was connected to the exploring end of the nerve stimulator. The ground electrode being fixed to the opposite limb. The block was performed by the anterior approach described by Winnie *et al* [3] with digital pressure being maintained distal to the point of injection. The needle was inserted through a skin wheal raised approximately 1 cm lateral to the femoral artery and 1.5 cm below the inguinal ligament. The needle was directed slightly cephalad and advanced until contractions of quadratus femoris muscle ("Dancing Patella" sign) was observed at a current of 0.3 mA. Care was taken not to inject the drug at a contraction perceived at 0.2 mA or lower to avoid intraneuronal injection.10 mL 1% lignocaine with adrenaline (1:200,000) and 10 ml of 0.5% bupivacaine was injected incrementally after a negative aspiration test. Classic Labat approach[4] technique was used for sciatic nerve block. The patient was placed in the Sim's position with the leg to be anaesthetized was kept upper most, knee flexed and resting on the dependent lower extremity. From posterior superior iliac spine to the midpoint of the greater trochanter a line was drawn. A perpendicular line was drawn bisecting this line. From greater trochanter to the sacral hiatus a second line was drawn. The intersection of this line with the perpendicular line was the point of entry where a skin wheal was raised by inj. Lignocaine with adrenaline (1:200000) 1 ml. A 15 cm 22 G insulated needle was inserted perpendicular to the skin. Satisfactory needle positioning was confirmed by the presence of planter flexion and dorsiflexion of the foot at a current of 0.3 mA. Care was taken not to inject the drug at a contraction perceived at 0.2 mA or lower to avoid intraneuronal injection. 15 mL 1% lignocaine with adrenaline (1:2,00,000) and 15 ml of 0.5% bupivacaine was injected incrementally after a negative aspiration test. The subarachnoid block was given using 25G Quincke's needle, in L3- L4 interspace under aseptic method. After confirmation of free flow of clear CSF hyperbaric inj. Bupivacaine (0.5%) 3.5 cc, was injected into subarachnoid space. Time of complete onset of sensory and motor block was recorded. Time '0' for clinical assessment was taken at the completion of injection of anaesthetic solution at the sciatic nerve in SFB group and injection of bupivacaine in the subarachnoid space in SAB group. Sensory block was assessed as complete when there was loss of pin prick sensation for both femoral and sciatic distribution in SFB group and loss of pin prick sensation up to T_{10} level in SAB group. Motor block was assessed as complete when there was loss of dorsi flexion and planter flexion at the ankle and loss of extension of the leg at the knee joint in SFB group and loss of ability to move leg or feet in SAB group. The quality of block was assessed as "GOOD" if no other sedative or analgesic was used, "Adequate" if propofol was given in sedative dose of 50 mcg/kg/min and "Poor" if in addition to propofol , inj Tramadol 100 mg iv and N_2O was used. Resolution from motor block, time to micturate post operatively and first demand of analgesic was recorded. Due to extensive dressing resolution of sensory block was assessed by asking the patient about when their leg started feeling normal again. On first demand of analgesic post operatively, inj. Tramadol 100 mg i.m. was used. Subsequently 100 mg i.m. was given on demand subjected to a maximum dose of 200 mg/ 24 hours. Noninvasive blood pressure, pulse rate and oxygen saturation was monitored throughout the procedure. The blood pressure was maintained by i.v. fluids but at a blood pressure of <90/60 mm Hg, vasoconstrictor inj. ephedrine was used i.v. Degree of pain was assessed by using Visual analog scale ranging from 0 (no pain) to 10 (worst imaginable pain). It was measured at every 4 hours interval up to 36 hours.

Statistical Analysis

Based on the duration of surgery from a previous study, sample size was calculated (two tailed) based on the assumption of α (type I error) = 1.96, β (type II error)= 0.84 and power of study 80% to detect a difference of 15 minutes. Sample size of 35 derived for each arm from this formula. Haemodynamic parameters within the group were analysed with paired "t" test. Rest of the variables were analysed using unpaired "t" test. P value < 0.05 was considered as statistically significant.

Results

Table 1: Distribution of patients according to gender and ASA grading in both the groups

Parameters	SAB Group (n=35)	SFB Group (n=35)	P value
Age (Years)	36.66±12.40	35.06±11.00	>0.05
Genger (F:M)	6:29	7:28	
ASA Grading (I:II)	31:4	34:1	

Table 2: Comparisons of sensory block, motor block, onset and duration, demand of analgesia, time of micturation between the two groups

Parameter	SAB Group (n=35) [Mean±SD]	SFB Group (n=35) [Mean±SD]	P Value
Sensory block onset	5.17 ± 1.27	18.48 ± 3.55	0.000*
Sensory block duration	523.14 ± 145.01	1419.71±303.67	0.000*
Motor block onset	10.26 ± 1.91	30.85 ± 3.88	0.000*
Motor block duration (Knee)	156.71 ± 26.62	284.24 ± 111.41	0.000*
Motor block duration (Foot)	156.71 ± 26.62	785.00 ± 221.07	0.000*
Demand of analgesia	418.71 ± 161.40	1177.94±256.43	0.000
Time of micturation	241.97 ± 27.95	143.29 ± 23.04	0.000*

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

Table 3: Quality of combined Femoral Sciatic nerve block

Gradation	Number of patients	Percentage (%)	Additional drugs used
Good	33	94.28	None
Adequate	1	2.86	Propofol drip @ 50 µg/kg/min
Poor	1	2.86	Propofol drip @ 50 µg /kg/min + Inj. Tramadol 100 mg i.v. + N_2O

Table 4: Distribution of patients according to complications in both the groups –

Complications	SAB Group (n=35)		SFB Group(n=35)	
	No.	%	No.	%
Inguinal Haematoma(IH)	0	0	1	2.86
Urinary Retention(UR)	2	5.71	0	0
Post dural puncture headache (PDPH)	3	8.57	0	0
Nausea and vomiting (NV)	1	2.86	0	0
None	29	82.86	34	97.14
Total	35	100	35	100

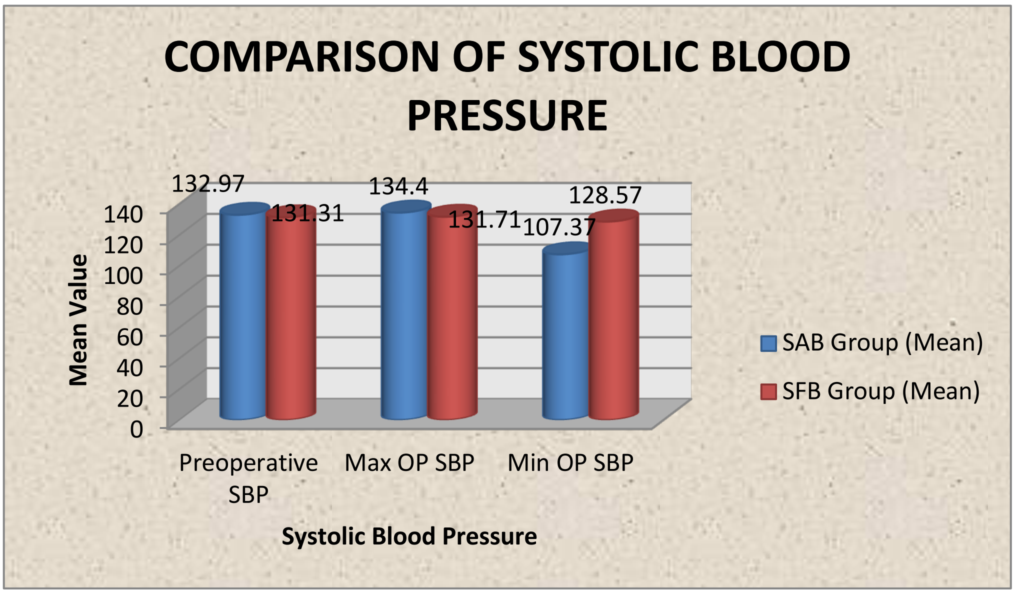

Figure 1: Bar diagram showing comparison of mean systolic blood pressure in both the groups

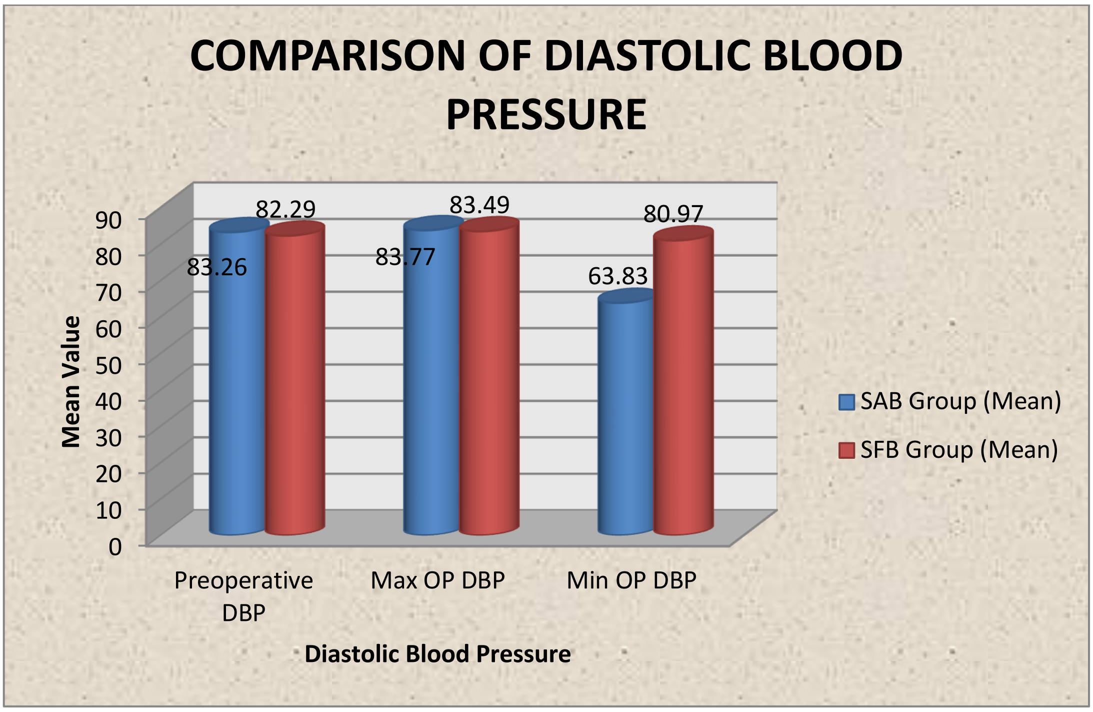

Figure 2: Bar diagram showing comparison of mean diastolic blood pressure in both the groups

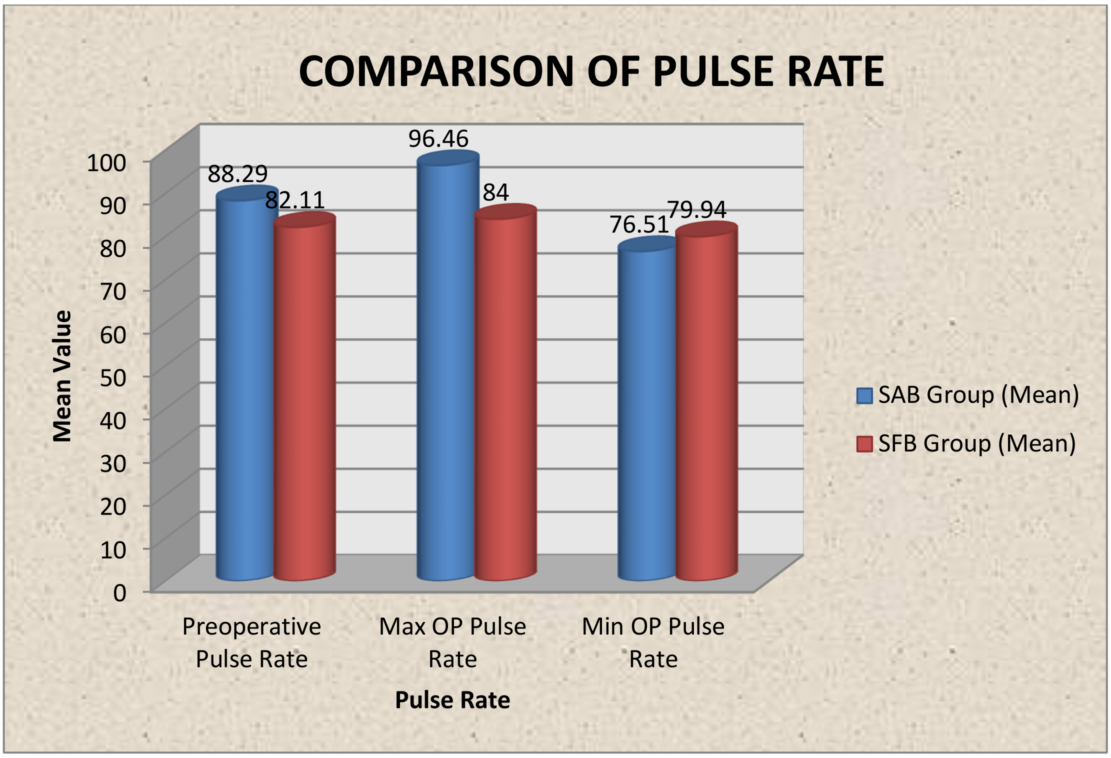

Figure 3: Bar diagram showing comparison of mean pulse rate in both the groups

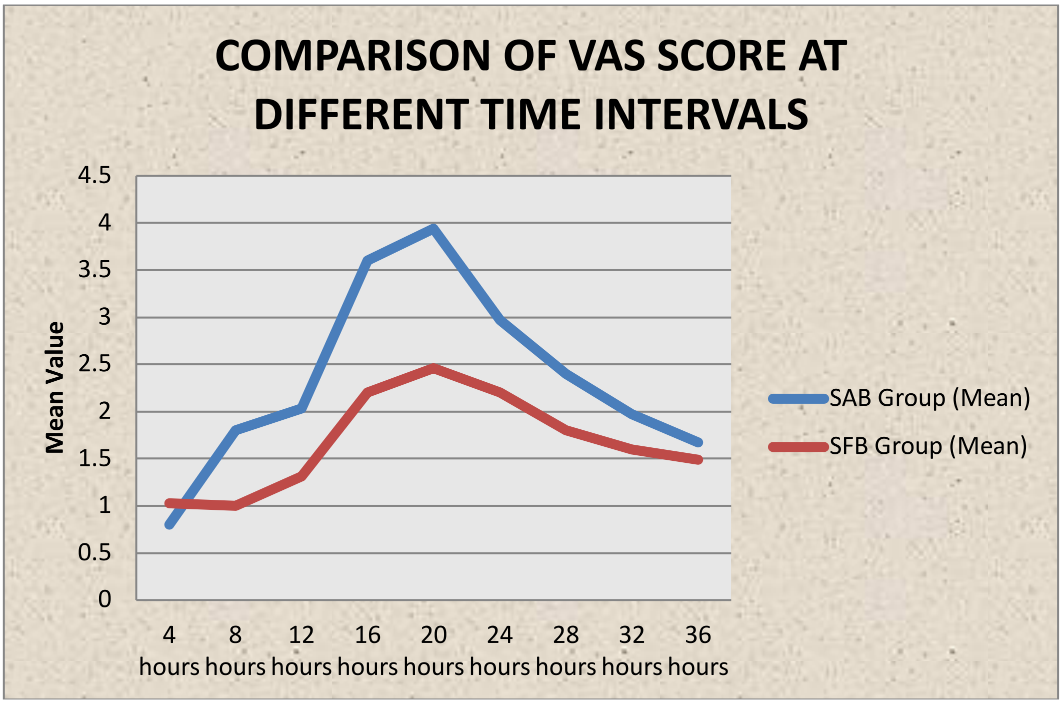

Figure 4: Line diagram showing comparison of VAS score at different time intervals between the two groups

Patient's demographic profile, ASA physical status was comparable in both groups and differences were statistically not significant ($p \geq 0.05$).The quality of block was good in maximum number of patients (94.28 %). However 1 patient (2.86%) needed additional propofol drip @ 50 mcg/ kg /min. In 1 patient (2.86%) in addition to propofol drip , inj. Tramadol 100 mg i.v. was given and the patient was given 50% N_2O and 50% O_2 as a supplement.. In SFB group there was one case in which femoral artery was accidentally pricked and a haematoma was noted after the procedure (2.86%). It however did not increase in size and was later resolved. In SAB group, two patients (5.71%) had to be catheterized post operatively, three patients (8.57%) reported about post dural puncture headache and one (2.86%) had nausea and vomiting. Table 2 is showing statistically significant ($P < 0.05$) higher mean sensory block onset and duration in SFB group in comparison to SAB group.

Table 2 shows statistically significant ($P < 0.05$) higher mean motor block onset and duration in SFB group in comparison to SAB group. Table 2 shows a higher mean time for demand of analgesia in the SFB group in comparison to the SAB group. Table 2 shows a statistically significant ($P < 0.05$) higher time of micturition in SAB group in comparison to the SFB group. SFB showed group to be hemodynamically more stable than SAB group. Figure 4 shows statistically significant difference in VAS score at 8 hours, 12 hours, 16 hours, 20 hours, 24 hours and 28 hours ($P < 0.05$) with a higher VAS in SAB group in comparison to SFB group.

Discussion

The combined femoral sciatic nerve block has considerable advantages over General or Spinal anaesthesia. It does not cause aspiration, pneumonia, nausea, vomiting, sore throat or hoarseness. Its stability for cardiovascular system and prolonged post operative pain relief are added advantages. Patients with fracture of lower limb might report after considerable blood loss and with much pain. The anaesthetic procedure in use therefore should impart minimum cardiovascular insult and should give a good quality of prolonged post operative pain relief. The combined femoral sciatic nerve block provides all of these benefits and so the present study was formatted to evaluate the combined femoral sciatic nerve block in unilateral surgery of lower limb. The results were compared with the subarachnoid block which is widely used as an anaesthetic procedure for such operations. The study included seventy patients of both sexes who were equally distributed in two groups (n=35).In SAB group, the mean sensory block onset was 5.17 ± 1.27 min, while in the SFB group it was 18.48 ± 3.55 min. The difference was found to be statistically significant (P < 0.05) with a higher mean sensory block onset in SFB group in comparison to SAB group. The mean time for complete sensory loss in group SFB (18.48 minutes) was considerably shorter than that observed by Guido Fanelli *et al* [5] in their study (37 minutes).

The reason may be that we used a mixture of Lignocaine and Bupivacaine in our study instead of Bupivacaine as a sole agent as they did. Patients were asked about when their limb started feeling normal again. The maximum time taken in SAB group was 785 minutes. In SFB group it was considerably longer, 1795 minutes being the maximum. In SAB group, the mean sensory block duration was 523.14 ± 145.01 min, while in the SFB group it was 1419.71 ± 303.67 min. The difference was found to be statistically significant (P < 0.05) with higher mean sensory block duration in SFB group in comparison to SAB group. The findings were similar to those observed by Allen JG *et al* [6]. who reported it to be 24.2 ±7.9 hours in SFB. In the group SAB however the return to normal sensation was <10.5 ± 8.3 hours as mentioned in the work of Allen JG *et al*. In SAB group, the mean motor block onset was 10.26 ± 1.91 min, while in the SFB group it was 30.85 ± 3.88 min. The difference was found to be statistically significant (P < 0.05) with a higher mean motor block onset in SFB group in comparison to SAB group. In 2 patients of SFB group, motor block onset was incomplete; hence, they were excluded from this analysis. The mean time taken for motor block in SFB was shorter than mean 51 minutes as observed by Guido Fanelli *et al*. They had used Bupivacaine as the sole agent, whereas in our study Lignocaine and Bupivacaine were used in combination. The recovery from mean motor block was faster in group SAB with a mean duration of 156.71 ± 26.62 min.

In the group SFB the recovery was comparatively late. Also the recovery from the effect of femoral nerve block was faster than the recovery from the effect of sciatic nerve block. The mean motor block duration for knee was 284.24 ± 111.41 min and that for foot was 785.00 ± 221.07 min. The difference was statistically significant (p< 0.05) when compared to SAB group. The results were very similar to that noted by Guido Fanelli *et al* (Foot-788 ± 448, Knee-290 ± 91). The amount of Bupivacaine used in their study was similar (Femoral 10ml, sciatic 15ml) to our study. Post operative pain scoring was done by Visual Analog Scale every 4th hour until 36 hour. At 4th hour there was increase in pain scoring in group SFB (1.03 ± 0.71) as compared to group SAB (0.80 ± 0.93) but the difference was statistically not significant. The difference was found to be statistically significant at 8 hours, 12 hours, 16 hours, 20 hours, 24hours and 28 hours (p< 0.05) with a higher VAS in SAB group in comparison to SFB group. The difference was found to be statistically not significant at 32 hours and 36 hours (p> 0.05), showing that the VAS score was comparable at these two time intervals.

The initial decrease in pain scoring in group SAB signifies excellent effect of SAB on pain scoring in immediate post-operative period. However the SAB could not maintain a consistent pain relief which proved to be a better asset of SFB. Allen JG *et al* had noted such feature of SAB and our findings correlate with that. At the

32nd and 36th hour there was insignificant difference in the pain scoring between the two groups. The reason could be that the effect of SFB waned off by then and also the pain must have naturally decreased by then making it possible for the oral and intramuscular analgesics sufficient to manage it.

Conclusion

Though time consuming, combined Sciatic-Femoral nerve block resulted in better intra-operative haemodynamic control and post-operative pain management than subarachnoid block for unilateral below knee surgery of lower limb.

References

1. Miller RD, ed. Miller's Anesthesia. 8th ed. Philadelphia: Churchill Livingstone; 2015: 1736.
2. Enneking FK, *et al*: Regional Anesth Pain Med 2005; 30:4.
3. Winnie AP, Ramamurthy S, Durrani Z. The inguinal paravascular technique of lumber plexus anesthesia. The "3 – in – 1 block". Anesth Analg1973; 52: 989 – 996.
4. Labat G. Regional anaesthesia. Its technique and clinical applications. Philadelphia, WB Saunders, 1923.
5. Fanelli G., Casati A. *et al*. Cardiovascular effects of two different regional anaesthetic techniques for unilateral leg surgery. Acta Anaesthesiol Scand. 1998 Jan; 42(1): 80 – 4.
6. Allen JG, Denny NM, Oakman N. Post operative analgesia following Total Knee Arthroplasty, A study comparing spinal anaesthesia and combined sciatic femoral 3-in-1 block. Reg Anesth pain Med 1998; 23: 142-146