MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.5.120.123

OPEN ACCESS

Key Words
Lumbar plexus block, sciatic nerve block, visual analogue scale (VAS) score, spinal anesthesia, analgesia

Corresponding Author
R. Karthikeyan,
Department of Anaesthesiology, Government Medical College, Dindigul, Tamilnadu, India

Author Designation
[1-2]Assistant Professor

Received: 21 November 2023
Accepted: 31 December 2023
Published: 10 January 2024

Citation: R. Karthikeyan and M. Suguna, 2024. A Comparison of the Effects of Combined Lumbar Plexus and Sciatic Nerve Blocks versus Spinal Bupivacaine and Fentanyl in Lower Limb Orthopaedic Operations. Res. J. Med. Sci., 18: 120-123, doi: 10.59218/makrjms.2024.5.120.123

A Comparison of the Effects of Combined Lumbar Plexus and Sciatic Nerve Blocks versus Spinal Bupivacaine and Fentanyl in Lower Limb Orthopaedic Operations

[1]R. Karthikeyan and [2]M. Suguna
[1-2]Department of Anaesthesiology, Government Medical College, Dindigul, Tamilnadu, India

ABSTRACT
With the emergence of new tools like ultrasonography and peripheral nerve stimulators, peripheral nerve blocks are becoming more and more common for various lower limb procedures. It offers more effective, stable hemodynamic and extended postoperative analgesia. Sixty patients were divided into two groups at random: group I patients received spinal anesthesia with 2.5 ml of Bupivacaine (12.5 mg) hyperbaric solution and at L3-L4 level and group II patients received ultrasound guided lumbar plexus block with 0.25% Bupivacaine 25 ml and sciatic nerve block with 0.25% Bupivacaine 20ml. Visual analogue scale (VAS) score was measured in the postoperative phase and rescue analgesic Inj. Tramadol 100mg im was given. The duration of analgesia in Group II was longer than in Group I: however, onset of sensory and motor block was significantly later in Group II than in Group I. The comparatively delayed onset of sensory and motor block in patients given lumbar and sciatic nerve block has often raised questions about the efficiency of nerve blocks. The VAS score was found to be significantly lower for a much longer time into the postoperative period in Group II than in Group I. Combination of lumbar plexus and sciatic nerve block provided effective analgesia for a prolonged time into the postoperative period.

INTRODUCTION

The outcomes of pain management in these patients affect hospital and patient costs, length of hospital stay and time to patient remobilization[3]. Lower limb surgeries such as total hip arthroplasty, total knee arthroplasty and anterior cruciate ligament reconstruction are associated with moderate to severe postoperative pain that can contribute to immobility-related complications, delay in hospital discharge and interfere with functional outcome[1,2]. The neuroendocrine stress responses, central sensitization of the neurological system and muscular spasms brought on by pain stimuli are all diminished by regional anaesthesia procedures[5]. Spinal anaesthesia has been a widely utilised method of regional anaesthesia among those now in use for procedures on the lower limbs. Almost all other regional procedures cannot compare to the quick onset and ease of use of spinal anaesthesia. Such advantages must be evaluated against drawbacks such post-dural puncture headache, back discomfort, urination problems and the incredibly uncommon possibility of hematoma or infection[6]. With adjuncts, spinal anaesthesia reduces postoperative pain for 3-4 hours. Another alternative for postoperative pain management is intravenous opioids. These systemic opioids may have negative side effects such respiratory depression and PONV. Peripheral nerve blockade (PNB) of one or more main nerves supplying the lower limb is an alternate method of regional anaesthesia. In comparison to spinal anaesthesia, PNB may offer long-lasting, effective unilateral analgesia with less opioid and autonomic-related side effects, less motor block and less significant neurological consequences[7]. Continuous PNB approaches do seem to offer pain reduction that is superior to systemic opioid analgesia, in contrast to neuraxial analgesia, but with a reduced incidence of adverse effects[8]. Increased interest in PNB for lower limb surgery has also been aided by developments in nerve location, such as ultrasound imaging and continuous catheter technology[9]. A lumbar plexus block and a “high” sciatic nerve block must be combined in order to anaesthetize and relieve pain across the whole leg[10]. In lower limb orthopaedic operations, we conducted the research to evaluate spinal anaesthesia with adjuvants to combined lumbar plexus and sciatic nerve blocks.

MATERIALS AND METHODS

This was a prospective randomised controlled and study, conducted in 60 patients (30 in each group). In the first group, patients received spinal anaesthesia at the L3-L4 level using 2.5 ml of bupivacaine (12.5 mg) hyperbaric solution. In the second group, patients received ultrasound guidance for lumbar plexus block with 0.25% Bupivacaine in a 25 ml dose and sciatic nerve block with 0.25% Bupivacaine in a 20 ml dose. In this study both sexes (male and female): 15-50 years old: 40-70 kg and ASA physical status I and II were included. Patient rejection, an ASA physical status of III or higher, a spinal deformity, an allergy to local anaesthetics, a preexisting neurological deficiency, diabetes, asthma, obesity, hypertension, pregnancy, breast-feeding and a psychiatric condition are all reasons for refusing the procedure were excluded.

The patient was placed in lateral decubitus for the lumbar plexus block and the posterior approach was used to block the lumbar plexus after identifying the midline (spinous processes), both iliac crests and posterior superior iliac spine. The posterior transgluteal technique was used to do the sciatic nerve block and the nerve was located by the contraction of the gastrocnemius and tibialis anterior muscles (plantar flexion and dorsiflexion of the foot, respectively). Following anaesthesia and then every 30 minutes thereafter, intraoperative measurements of NIBP, SPO2 pulse and heart rate were taken. The parameters were recorded by an anaesthesiologist not familiar with the method.

In the early postoperative period, at 30-mins intervals up to 6 hrs following surgery and then at 7th, 8th, 12th, 18th and 24th hours postoperatively, the severity of pain was evaluated using a VAS score. Unaware of the anaesthesia approach, one ward nurse evaluated the patient’s VAS score and side symptoms when they were transferred to the PACU. When the VAS score fell below three centimetres or at the patient’s request, rescue analgesic was administered. The patient’s receipt of rescue analgesic marked the conclusion of the study. Tramadol (100 mg im) via injection was used as a pain reliever. The first 24 hours were used to document any problems, such as vomiting, local hematomas and urine retention. Statistical Analysis Used: IBM SPSS Statistics for Windows, Version 20.0.

RESULTS

In this study, to compare spinal bupivacaine versus ultrasound guided combined lumbar plexus and sciatic nerve block in below knee orthopedic procedures were determined. In the age group of 20-30 years 9 patients were observed in each group, in 31-40 years group I of 9 patients and group II of 5patients, in the age group of 41-50 years 9 patients of were observed in each group; in the age group of 51-60 years group I were 3 patients and group II of 7patients were observed. The mean age in group I was 37.46±9.51 years and group II was 40.56±11.58 years. In group I, 19 no. of male patients and 11 no. of female patients were observed. Similarly,

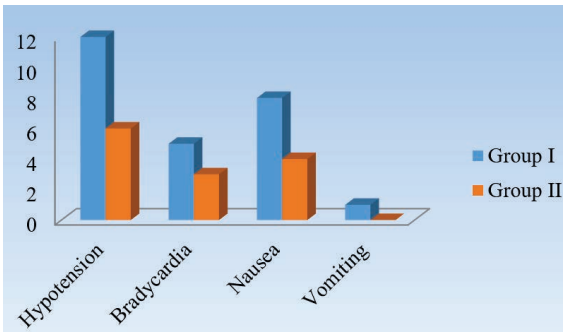

Fig. 1: Comparison of mean VAS scores between 0 min to 24 hours

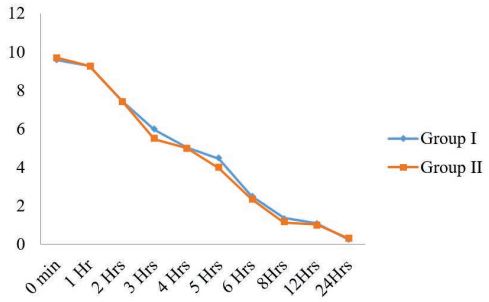

Fig. 2: Comparison of complications in both group1 and group 2

Table 1: Comparison of demographic data's of both groups

Parameters	Group 1	Group 2	p-value
Mean Age(years)	37.46±9.51	40.56±11.58	0.131
Gender distribution	Male-19		
Female-11	Male-20		
Female-20	0.5		
Mean BMI	32.38±7.38	32.48±7.62	0.621
ASA			0.536
ASA I	22	20	
ASA II	8	10	

Table 2 Comparison of vitals of both groups and their probabilities

Parameters	Group 1	Group 2	p-value
Pre-Operative HR	86.73±9.61	79.56±6.74	0.0004
Pre-Operative MAP	82.93±8.46	91.8±10.37	0.0001
Pre-Operative SPO2	99.03±0.36	98.76±0.504	0.142
Intra-Operative HR	82.8±8.38	83.33±8.25	0.351
Intra-Operative MAP	90.2±10.8	89.63±9.03	0.205
Intra-Operative SPO2	98.93±0.37	99±0.13	0.382

Table 3: Comparison of mean onset of sensory block

Onset of sensory block	Group 1	Group 2
Mean	2.7	18.1
SD	0.632	2.53
p-value	0.0003	

Table 4: Comparison of mean onset of motor block

Onset of motor block	Group 1	Group 2
Mean	7.9	34.7
SD	1.82	4.67
p-value	0.0001	

in group II 20 no. of male patients and 10 no. of female patients were observed. In group I, the mean BMI values was 32.38±7.38 and in group II mean BMI value was 32.48±7.62. In group I, 22 nos. of ASA I patients and 8 nos. of ASA II was observed. In group II, 20 nos. of ASA I patients and 10 nos. of ASA II was observed.

In group I, the mean Pre-Operative HR of 86.73±9.61was observed: in group II the mean Pre-Operative HR of 79.56± 6.74 was observed; the higher mean HR value was observed in Group I patients. In group I, the mean Pre-Operative MAP of 82.93±8.46was observed: in group II the mean Pre-Operative HR of 91.8± 10.37 was observed; the higher mean MAP value was observed in Group II patients. In group I, the mean pre-Operative SPO2 of 99.03±0.36 was observed, similarly in group II of mean pre-Operative SPO2 of 98.76±0.504 was observed; the higher mean SPO2 was observed in Group I. In group I, the mean Intra-Operative HR of 82.8±8.38 was observed; in group II the mean intra-Operative HR of 83.33±8.25 was observed. In group I, the mean Intra-Operative MAP of 90.2±10.8 was observed; in group II the mean intra-Operative MAP of 89.63± 9.03 was observed. In group I, the mean Intra-Operative SPO2 of 98.93±0.37 %was observed: in group II the mean intra-Operative SPO2 of 99±0.13 %was observed.

In group I, the mean Onset of sensory block was 2.7±0.632 min and in group II the mean Onset of sensory block was 18.1±2.53 min. mean onset of sensory blockade was lower in group I. In group I, the mean Onset of motor block was 7.9± 1.82 min and in group II the mean Onset of motor block of 34.7± 4.67 min. lesser onset of motor blockade was observed in group I. Mean VAS scores between 0 min to 4hours of >0.05 was observed statistically insignificant: p-value of 5 Hours to 12Hrs <0.05 was observed statistically significant. In group I, the mean duration of analgesia was 263.56±25.83 min which was lesser than group II, the mean duration of analgesia was 707.1±101.7 min. In both groups I&II, the higher no of hypotension and nausea patients was observed, very few patients having vomiting. In group II, the higher no of hypotension and nausea patients was observed.

DISCUSSIONS

The psoas technique in lower limb orthopaedic procedures with sciatic nerve blocking has been investigated in a number of studies. Due to the more reliable blockage induced by the whole lumbosacral plexus block, this study combined the sciatic nerve block and lumbar plexus block rather than using either approach alone. In contrast to spinal anaesthesia, this study demonstrated that administering a lumbar plexus-sciatic nerve block delivers effective anaesthesia with fewer problems. According to the study by de Visme et al., combined psoas compartment and sciatic nerve blocks reduced hypotension and enhanced analgesia in elderly patients having hip

fracture surgery compared to spinal anaesthesia. Although Group II analgesia lasted longer than Group I did, the onset of sensory and motor block occurred in Group II much later than it did in Group I. The effectiveness of nerve blocks has frequently been questioned due to the significantly delayed onset of sensory and motor block in individuals receiving lumbar and sciatic nerve blocks. The block may be administered in a preoperative room equipped with the right monitoring tools, which eliminates the need for an induction and increases operating room productivity. The Williams *et al*. research, which discovered that regional anaesthesia with an induction chamber was related with lowest anesthesia-controlled time, lends credence to it.

In comparison to Group I, Group II VAS score was shown to be much lower for a much longer length of time after surgery. This suggests that Group II patients are doing better overall. Similar conclusions were drawn from a research by Luber *et al.,* who discovered that lumbar plexus block appeared to have benefits for early postoperative analgesia, resulting in higher patient satisfaction and comfort. According to the Auroy *et al*. study, there is a significant rate of serious problems following posterior lumbar plexus blockade as well as a risk of neurologic issues following the use of a nerve stimulator. The complications that were recorded included cardiac arrest, convulsions from systemic local anaesthetic toxicity and temporary neurological impairment. No such issues were noted in the study's small sample size.

CONCLUSION

The results of this prospective, randomised trial showed that patients having lower limb orthopaedic surgery benefit from successful unilateral anaesthesia and improved postoperative analgesia when receiving a lumbar plexus-sciatic nerve block in combination. It has the potential to offer good postoperative and intraoperative analgesia, allowing for early limb mobilisation and minimally invasive patient rehabilitation.

REFERENCES

1. Bonica, J., editor., 1990. Postoperative Pain. In: The Management of Pain., Lea and Febiger, (Eds.)., Philadelphia,, pp: 461-480.
2. Pang, W.W.T.C. Hsu, C.C. Tung and C.P. Hung, 2000. Is total knee replacement more painful than total hip replacement? Acta. Anaesthesiol. Sin., 38: 143-148.
3. Hogan, M.,V.R.E. Grant, L. Lee and Jr, 2009. Analgesia for total hip and knee arthroplasty: A review of lumbar plexus, femoral and sciatic nerve blocks. Am. J. Orthop. (Belle. Mead. NJ.,) 38: 129-133.
4. Kehlet, H., 1989. Surgical stress: The role of pain and analgesia. Br. J. Anaesth., 63: 189-195.
5. Grant, C.R.K. and M.R. Checketts, 2008. Analgesia for primary hip and knee arthroplasty: The role of regional anaesthesia. Contin. Educ. Anaesth. Crit. Care. Pain., 8: 56-61.
6. Mulroy, M.F. and S.B. McDonald, 2003. Regional anesthesia for outpatient surgery. Anesthesiol. Clin. North Am., 21: 289-303.
7. Horlocker, T.T., S.L. Kopp, M.W. Pagnano and J.R. Hebl, 2006. Analgesia for total hip and knee arthroplasty: A multimodal pathway featuring peripheral nerve block. J. Am. Acad. Orthop. Surgeons., 14: 126-135.
8. Richman, J.M., S.S. Liu, G. Courpas, R. Wong and A.J. Rowlingson, 2006. Does continuous peripheral nerve block provide superior pain control to opioids? a meta-analysis. Anesthesia. Analg., 102: 248-257.
9. Evans, H., S.M. Steele, K.C. Nielsen, M.S. Tucker and S.M. Klein, 2005. Peripheral nerve blocks and continuous catheter techniques. Anesthesiol. Clin. North Am., 23: 141-162.
10. Chayen, D., H. Nathan and M. Chayen, 1976. The psoas compartment block. Anesthesiology., 45: 95-99.
11. Kundu, S., M. Mukherjee and D. Bhattacharya, 2016. A comparative study of spinal bupivacaine and fentanyl versus combined lumbar plexus and sciatic nerve block in lower limb orthopedic procedures. Ind. J. Pain, 30: 189-193.
12. Pattajoshi, B., S. Panigrahi, P. Mohanty, R.K. Mohanty and S.K. Panigrahi, 2022. A prospective comparative study between ultrasound-guided combined sciatic-femoral nerve block versus spinal anesthesia for the patients undergoing elective below-knee surgeries. Cureus., Vol. 14 .10.7759/cureus.26137.
13. Horasanli, E., M. Gamli, Y. Pala, M. Erol, F. Sahin and B. Dikmen, 2010. A comparison of epidural anesthesia and lumbar plexus-sciatic nerve blocks for knee surgery. Clinics., 65: 29-34.
14. Greengrass, R.A., S.M. Klein, F.J. D'Ercole, D.G. Gleason, C.L. Shimer and S.M. Steele, 1998. Lumbar plexus and sciatic nerve block for knee arthroplasty: Comparison of ropivacaine and bupivacaine. Can. J. Anaesth., 45: 1094-1096,
15. Anjani, B. and G, Deepa, 2022. Study on evaluating adequacy of combined lumbar plexus and sacral plexus block in lower limb surgeries. Med. Pulse. Int. J. Anesth., 21: 78-82.