International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 7, July 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.7.2024.76

ORIGINAL RESEARCH

Comparative Efficacy Evaluation of Unilateral Spinal Anesthesia versus Standard Spinal Anesthesia in Patients Undergoing Lower-Limb Orthopedic Surgeries: An Institutional Based Study

Hinaben Kanubhai Patel[1], Vijay Tejabhai Khodifad[2], Samarth Dubey[3], Hitanshi N Panchal[4]

[1]Assistant Professor, [2]Junior Resident, Department of Anesthesiology, GMERS Medical College and General Hospital, Rajpipla, Gujarat, India
[3]Junior Resident, Department of Orthopaedics, GMERS Medical College and General Hospital, Rajpipla, Gujarat, India
[4]MBBS Graduate, GMERS Medical College and Hospital, Gotri, Vadodara, Gujarat, India

Corresponding Author
Dr. Hitanshi N Panchal
MBBS Graduate, GMERS Medical College and Hospital, Gotri, Vadodara, Gujarat, India
Email: hitanshipanchal@yahoo.in

Received: 04June 2024 Accepted: 15July 2024

ABSTRACT

Aim: Spinal anaesthesia is commonly utilized in lower limb orthopaedic surgeries due to its ease of performance and high success rate. The aim of this prospective randomized study was to assess the intra- and postoperative advantages and complications of unilateral and bilateral spinal anaesthesia, providing a comparative analysis of both techniques. **Materials and Methods:** The study involved dividing 50 patients into two randomized groups, A and B, for comparing the effects of different spinal anaesthesia techniques. Group A received standard spinal anaesthesia on even days, while Group B received unilateral spinal anaesthesia on odd days. Patients aged 18 to 60 years with ASA class I or II were included, with exclusion criteria such as a history of certain medical conditions or inability to be placed in a lateral position. Data analysis was done using SSPS software. **Results:** The bilateral group had 18 male participants and 7 female participants, whereas the unilateral group had 21 male participants and 4 female participants. The average duration of surgery in the bilateral group was 93.51 minutes, while in the unilateral group, it was 92.12 minutes. Duration of motor and sensory block was significantly higher among patients of the bilateral group. **Conclusion:** Employing a low-dose, low-volume, and low-flow injection technique for unilateral spinal anaesthesia has demonstrated efficacy in providing sufficient sensory-motor block and maintaining stable hemodynamic parameters during lower limb orthopaedic surgery.

Keywords: Bradycardia, Nausea, Vomiting.

INTRODUCTION

Spinal anaesthesia is commonly utilized in lower limb orthopaedic surgeries due to its ease of performance and high success rate.[1] This technique provides rapid and effective sensory and motor blockade, leading to a reduction in the stress response to surgical trauma, decreased intraoperative blood loss, lower incidence of postoperative thromboembolism, and decreased morbidity and mortality compared to general anaesthesia.[2,3]

Despite its benefits, spinal anaesthesia can be associated with side effects such as hypotension, bradycardia, nausea and vomiting, post puncture headache, and urine retention. Hypotension is the most commonly observed side effect of bilateral spinal anaesthesia, affecting over 30% of patients. Studies have shown that spinal anaesthesia extending to the T5 level can lead to a decrease in mean arterial blood pressure and an increase in heart rate, potentially causing bradycardia due to its impact on the cardio-accelerator fibres originating from T1-T4.[4,5]

Unilateral spinal anaesthesia, which selectively affects sensory, motor, and sympathetic functions on one side of the body, offers advantages over bilateral blocks by reducing the occurrence of adverse effects.[6]

DOI: 10.69605/ijlbpr_13.7.2024.76

Benefits of unilateral spinal anaesthesia include a lower incidence of clinically relevant hypotension, reduced risk of urine retention, improved patient satisfaction, enhanced mobility during recovery, and limited block effects on the operative side.Successful implementation of unilateral spinal anaesthesia requires attention to various factors such as the spinal needle type, bevel direction, injection rate, volume, baricity, and local anaesthetic concentration. The patient's positioning on the operating table also plays a crucial role in determining the spread of anaesthesia, especially when using hyperbaric anaesthetic solutions.Overall, unilateral spinal anaesthesia offers several benefits and may be preferred in certain clinical scenarios to minimize side effects and optimize patient outcomes.[7,8] Attention to detail in technique and patient positioning is essential for achieving successful unilateral spinal blocks in practice.[6]The aim of this prospective randomized study was to assess the intra- and postoperative advantages and complications of unilateral and bilateral spinal anaesthesia, providing a comparative analysis of both techniques.

MATERIALS AND METHODS

The study involved dividing 50 patients into two randomized groups, A and B, for comparing the effects of different spinal anaesthesia techniques. Group A received standard spinal anaesthesia on even days, while Group B received unilateral spinal anaesthesia on odd days. Patients aged 18 to 60 years with ASA class I or II were included, with exclusion criteria such as a history of certain medical conditions or inability to be placed in a lateral position. Standard preoperative procedures were followed, including IV cannulation, fluid administration, and monitoring. Group A received spinal anaesthesia at the L3-L4 interspace in the sitting position, while Group B underwent the procedure in the lateral decubitus position. Hemodynamic monitoring was conducted throughout, and any hypotension or bradycardia was managed promptly. Data analysis was done using SSPS software.

RESULTS

In the bilateral group (n=25), the average age was 30.4 years, while in the unilateral group (n=25), the average age was 28.8 years. The difference in age between the two groups was found to be statistically significant (p > 5%).In terms of gender distribution, the bilateral group had 18 male participants and 7 female participants, whereas the unilateral group had 21 male participants and 4 female participants. The difference in gender distribution between the two groups was also statistically significant (p > 5%). The average duration of surgery in the bilateral group was 93.51 minutes, while in the unilateral group, it was 92.12 minutes(table 1)**.** Duration of motor and sensory block was significantly higher among patients of the bilateral group.Duration of motor and sensory block was significantly higher among patients of the bilateral group.

Table 1: Demographic data.

Specification	Bilateral group (n=25)	Unilateral group (n=25)	P Value
Age	30.4	28.8	>5%
Sex			
Male	18	21	>5%
Female	7	4	>5%
Duration of surgery(min)	93.51	92.12	

Table 2: Duration of motor and sensory block

	Bilateral group (n=25)	Unilateral group (n=25)	P value
Duration of motor block (min)	170.32	134.19	0.04 (Sig)
Duration of sensory block (min)	185.24	152.72	0.01 (Sig)
Bromage scale IV	7	10	0.62
Bromage scale III	18	15	

Table 3: Complications

Complications	Bilateral group (n=25)	Unilateral group (n=25)	P value
Nausea and vomiting	6	1	0.01
Headache	7	3	0.03
Hypotension	5	0	0.02
Bradycardia	1	0	0.01

DISCUSSION

Bilateral spinal anaesthesia is widely utilized in adults undergoing lower limb orthopaedic surgery and is generally considered safe, but it is associated with numerous complications. The most frequently observed side effects are hypotension and bradycardia, stemming from sympathetic blockade.[10] On the other hand, unilateral spinal anaesthesia selectively impacts sensory, motor, and sympathetic functions on one side of the body, offering the

DOI: 10.69605/ijlbpr_13.7.2024.76

advantages of a spinal block without the typical adverse effects associated with bilateral administration.[11] Notably, the cardiovascular stability following unilateral spinal anaesthesia stands out as one of its most significant benefits. In contrast to bilateral spinal anaesthesia, where hypotension can affect up to 30% of patients even with intermediate dosages, the incidence of hypotension with unilateral spinal anaesthesia ranges from 0% to 6%.

The research findings indicate that the immediate positioning of the patient after spinal anaesthesia significantly influences the dispersion of anaesthetics within the spinal cord.[12] The baricity of the local anaesthetic, whether hypo- or hyperbaric in relation to the specific gravity of the cerebrospinal fluid, plays a crucial role in achieving unilateral block. It is also noteworthy that the distance between the left and right nerve roots in the lumbar region enables the attainment of unilateral spinal anaesthesia.

Research by Kuusniemi et al.[13] has highlighted the superior effectiveness of hyperbaric bupivacaine compared to plain bupivacaine in achieving unilateral spinal anaesthesia. However, determining the optimal timing for lateral positioning poses a challenge, especially with the use of higher doses of hyperbaric bupivacaine (12-20mg), as there is a risk of the anaesthetic drug migrating over a period of 30-60 minutes. Conversely, with lower doses (5-8mg) of the anaesthetic solution, placing the patient in the lateral position for 10-15 minutes can help prevent the migration of the anaesthetic drug.Our study revealed that none of the patients in the unilateral spinal anaesthesia group encountered hypotension, while five patients in the bilateral group experienced hypotension, with a statistically significant p-value of less than 0.02. Additionally, Chohan and Afshan[14] conducted a study administering unilateral spinal anaesthesia before lower-limb surgery in elderly patients categorized as ASA classification III or IV, with an average age of 60. The authors reported no significant hemodynamic changes and utilized hyperbaric bupivacaine 0.5%.[15]

CONCLUSION

In conclusion, employing a low-dose, low-volume, and low-flow injection technique for unilateral spinal anaesthesia has demonstrated efficacy in providing sufficient sensory-motor block and maintaining stable hemodynamic parameters during lower limb orthopaedic surgery.

REFERENCES

1. Singla D, Kathuria S, Singh A, Kaul TK, Gupta S. Risk Factors for Development of Early Hypotension during Spinal Anesthesia. J Anaesth Clin Pharmacol 2006; 22: 387-93.
2. Ward RJ, Bonica JJ, Frend PG, Akamatsu T, Danziger F, Englesson S. Epidural and Subarachnoid Anesthesia. Cardiovascular and Respiratory Effects. JAMA. 1965;191:275-78
3. Casati A, Fanelli G, Beccaria P, Aldegheri G, Berti M, Senatore R, et al. Block Distribution and Cardiovascular Effects of Unilateral Spinal Anesthesia by 0.5% Hyperbaric Bupivacaine. A Clinical Comparison with Bilateral Spinal Block. Minerva Anesthesiol. 1998;64: 307-12.
4. Casati A, Fanelli G, Aldegheri G, Colnaghi E, Casaletti E, Cedrati V, et al. Frequency of hypotension during conventional or asymmetric hyperbaric spinal block. Reg Anesth Pain Med 1999;24:214-9.
5. Casati A, Fanelli G. Unilateral spinal anesthesia: state of the art. Minerva Anestesiol 2001;67:855-62.
6. Critchley LA, Morley AP, Derrick J. The influence of baricity on the haemodynamic effects of intrathecal bupivacaine 0.5%. Anaesthesia 1999;54:469-74
7. Al Malyan M, Becchi C, Falsini S, et al. Role of patient posture during puncture on successful unilateral spinal anaesthesia in outpatient lower abdominal surgery. Eur J Anesthesiol2006;23:491-5.
8. Casati A, Fanelli G. Restricting spinal block to the operative side: why not? Reg Anesth Pain Med 2004; 29:4-6.
9. Picard J, Meek T. Complications of regional anesthesia. Anesthesia 2010;65 (Suppl 1): 105-15.
10. Di Cianni S, Rossi M, Casati A, Cocco C, Fanelli G. Spinal anesthesia: an evergreen technique. Acta Biomed. 2008;79:9–17.
11. 7. Macfarlane AJ, Prasad GA, Chan VW, Brull R. Does regional anesthesia improve outcome after total knee arthroplasty? Clin OrthopRelat Res. 2009;467:2379–402.
12. Merivirta R, Kuusniemi K, Jaakkola P, Pihlajamäki K, Pitkänen M. Unilateral spinal anaesthesia for outpatient surgery: a comparison between hyperbaric bupivacaine and bupivacaine-clonidine combination. Acta Anaesthesiol Scand. 2009;53:788–93.
13. Kuusniemi KS, Pihlajamaki KK, Pitkanen MT. A low dose of plain or hyperbaric bupivacaine for unilateral spinal anesthesia. Reg Anesth Pain Med 2000;25:605-10.
14. Chohan U1, Afshan G, Hoda MQ, Mahmud S. Hemodynamic Effects of Unilateral Spinal Anesthesia in High Risk Patients. J Pak Med Assoc 2002;52:66-9.
15. Moosavi Tekye SM, Alipour M. Comparison of the effects and complications of unilateral spinal anesthesia versus standard spinal anesthesia in lower-limb orthopedic surgery. Rev Bras Anestesiol. 2013. http://dx.doi.org/10.1016/j.bjane.2013.06.014