

COMPARATIVE ANALYSIS OF THE EFFECTS OF UNILATERAL SPINAL ANESTHESIA VERSUS STANDARD SPINAL ANESTHESIA IN LOWER-LIMB ORTHOPEDIC SURGERIES AT A TERTIARY CARE HOSPITAL

Vikash Kumar Singh¹, Chandrashekhar Prasad¹, Rahul Kumar Singh²

¹Senior Resident, Department of Anesthesia, RDJM Medical College & Hospital, Turki, Muzaffarpur, Bihar, India.

²Assistant Professor, Department of Orthopedics, RDJM Medical College & Hospital, Turki, Muzaffarpur, Bihar, India.

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Corresponding Author:
Dr. Rahul Kumar Singh,
Email: drrahulsingh.1341@gmail.com

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Abstract

Background: The present study was conducted for comparing the effects of unilateral spinal anaesthesia versus standard spinal anaesthesia in lower-limb orthopaedic surgery. **Materials and Methods:** A total of 40 subjects within the age-range of 20 to 60 years were enrolled in the present study. Only those subjects were enrolled which were scheduled to undergo lower-limb orthopaedic surgery. All the subjects were randomly divided into two study groups with 20 subjects in each group as follows: Group 1: Patients undergoing surgery under unilateral spinal anaesthesia, and Group 2: Patients undergoing surgery under standard spinal anaesthesia. Complete demographic and clinical details of all the patients was recorded. Electrocardiogram, Heart Rate (HR), SpO₂, Non-invasive Arterial Blood Pressure (NIBP) and nasal capnometer was used in the operative room. Follow-up was done and all the details were recorded and compared. Assessment of all the results was done using SPSS software. **Result:** Mean age of the patients of group 1 and group 2 was 43.5 years and 44.8 years respectively. Mean anaesthesia readiness time (mins) among patients of group 1 and group 2 was 16.7 mins and 20.7 mins respectively (p-value < 0.05). Mean duration of motor block (mins) among patients of group 1 and group 2 was 161.7 mins and 179.2 mins respectively (p-value < 0.05). Mean duration of analgesia (mins) among patients of group 1 and group 2 was 179.3 mins and 212.7 mins respectively (p-value < 0.05). **Conclusion:** Both unilateral SA and standard spinal anaesthesia provide good quality sensory and motor block for lower limb orthopaedic surgery. However, slightly better results were obtained with standard spinal anaesthesia.

INTRODUCTION

Orthopedic surgery is one of the most rapidly growing surgical specialties in the world. A total of 22.3 million orthopedic surgical procedures were performed worldwide in 2017. The number of annual orthopedic procedures is forecasted to increase 4.9% annually, approaching 28.3 million surgeries by the year 2022.^[1-3] Anesthetic techniques for orthopedic surgical procedures include general and regional anesthesia techniques. Over the past decades, regional anesthesia has become the anesthetic technique of choice for many orthopedic procedures. Regional anesthesia entails the injection of local anesthetic solution to interrupt signal transmission in peripheral nerves or spinal nerve roots that provide sensory and motor supply to operative structures.^[4]

Unilateral spinal anaesthesia has found a resurgence in recent years. Conventional bilateral spinal anaesthesia is performed in most cases; however unilateral spinal anaesthesia can be used. The basic objective of unilateral spinal anaesthesia is to limit the nerve block exclusively to the surgery site. So important factors affecting successful unilateral subarachnoid block include baricity and volume of drug, the position of the patient, type of needle and its bevel direction and speed of injection. The advantage of unilateral spinal anaesthesia over bilateral spinal anaesthesia is that it provides a stronger block on the side of surgery and accelerated recovery of the nerve block. There is a lower incidence of hypotension and better maintenance of cardiovascular stability. Hence it can be a valuable technique for high-risk patients.^[5-7] Hence; the present study was conducted for comparing the

effects of unilateral spinal anaesthesia versus standard spinal anaesthesia in lower-limb orthopaedic surgery.

MATERIALS AND METHODS

The present study was conducted for comparing the effects of unilateral spinal anaesthesia versus standard spinal anaesthesia in lower-limb orthopaedic surgeries in the Department of Orthopedics and Department of Anesthesia, RDJM Medical College & Hospital, Turki, Muzaffarpur, Bihar, India. A total of 40 subjects within the age-range of 20 to 60 years were enrolled in the present study. Only those subjects were enrolled which were scheduled to undergo lower-limb orthopaedic surgery. All the subjects were randomly divided into two study groups with 20 subjects in each group as follows:

Group 1: Patients undergoing surgery under unilateral spinal anaesthesia

Group 2: Patients undergoing surgery under standard spinal anaesthesia

Complete demographic and clinical details of all the patients were recorded. Electrocardiogram, Heart Rate (HR), SpO₂, Non-invasive Arterial Blood Pressure (NIBP) and nasal capnometer was used in the operative room. Premedication of all the patients was done with alprazolam 0.25 mg at night before the day of operative procedure. Before the starting of the surgery, all the patients were given half litre of Ringer lactate solution. All the patients underwent

surgery according to their respective study groups. Different parameters variable like anaesthesia readiness time, degree of motor block on operated limb was evaluated using a Modified Bromage scale when patient was anaesthesia wise ready for surgery (Bromage 0: Free movement of limb at hip, knee and ankle joint. Bromage 1: Free movement of limb at knee and ankle joint. Bromage 2: Free movement limb at ankle joint. Bromage 3: No movement of limb at hip, knee and ankle joint) were evaluated. Follow-up was done and all the details were recorded and compared. Assessment of all the results was done using SPSS software.

RESULTS

Mean age of the patients of group 1 and group 2 was 43.5 years and 44.8 years respectively. Mean BMI of patients of group 1 and group 2 was 26.8 Kg/m² and 27.1 Kg/m² respectively. Mean duration of procedure was 146.2 mins among patients of group 1 and was 142.9 mins among patients of group 2 (p-value > 0.05). Mean anaesthesia readiness time (mins) among patients of group 1 and group 2 was 16.7 mins and 20.7 mins respectively (p-value < 0.05). Mean duration of motor block (mins) among patients of group 1 and group 2 was 161.7 mins and 179.2 mins respectively (p-value < 0.05). Mean duration of analgesia (mins) among patients of group 1 and group 2 was 179.3 mins and 212.7 mins respectively (p-value < 0.05).

Table 1: Demographic data

Variable	Group 1	Group 2	p-value	
Mean age (years)	43.5	44.8	0.12	
Gender	Males	13	11	0.28
	Females	7	9	0.74
Mean BMI (Kg/m ²)	26.8	27.1	0.36	
ASA Grade	Grade I	8	6	0.29
	Grade II	12	14	0.88

Table 2: Operative time

Operative time (mins)	Group 1	Group 2
Mean	146.2	142.9
SD	18.3	17.4
p- value	0.661	

Table 3: Block characteristics

Variables	Group 1	Group 2	p- value
Mean anaesthesia readiness time (mins)	16.7	20.7	0.001*
Degree of motor block: Grade 0/1/2/3	0/0/0/20	0/0/0/20	1
Mean duration of motor block (mins)	161.7	179.2	0.017*
Mean duration of analgesia (mins)	179.3	212.7	0.003*

*: Significant

DISCUSSION

Majority of patients who undergo orthopaedic lower extremity surgery (OLES) such as total knee arthroplasty are in the advanced age group. Presence of cardiac, endocrine, renal, cerebral, and respiratory tract diseases increases morbidity risk during and after operations among these patients. In addition,

postoperative pain treatment of these patients also poses a problem for anaesthetists. Anaesthesia approach for these patients generally includes general anaesthesia (GA), central neuraxial block, and usage of systematic analgesic for postoperative pain treatment. Psoas compartment block (PCB) is an alternative approach used to overcome many side effects related to GA and central neuraxial block

techniques. Sciatic nerve block combined with psoas compartment block ensures unilateral lower extremity anaesthesia. Recently, sciatic nerve block combined with psoas compartment block is used as an alternative technique to central neuraxial block and GA. Femoral, lateral femoral cutaneous, and obturator nerves are simultaneously blocked with psoas compartment block.^[8-11] Hence; the present study was conducted for comparing the effects of unilateral spinal anaesthesia versus standard spinal anaesthesia in lower-limb orthopaedic surgery.

Mean age of the patients of group 1 and group 2 was 43.5 years and 44.8 years respectively. Mean BMI of patients of group 1 and group 2 was 26.8 Kg/m² and 27.1 Kg/m² respectively. Mean duration of procedure was 146.2 mins among patients of group 1 and was 142.9 mins among patients of group 2 (p-value > 0.05). Mean anaesthesia readiness time (mins) among patients of group 1 and group 2 was 16.7 mins and 20.7 mins respectively (p-value < 0.05). In a previous study conducted by Priyadarshini NA et al, authors evaluated the onset and duration of Sensory and motor block in both unilateral and bilateral spinal anaesthesia and the adverse effects of buprenorphine given intrathecally with 0.5 % bupivacaine for Spinal anaesthesia. Because of haemodynamic stability and faster recovery characteristics of unilateral spinal block, it can be used as a suitable technique in patients with a limited cardiovascular reserve and for outpatient anaesthesia.^[12]

In the present study, mean duration of motor block (mins) among patients of group 1 and group 2 was 161.7 mins and 179.2 mins respectively (p-value < 0.05). Mean duration of analgesia (mins) among patients of group 1 and group 2 was 179.3 mins and 212.7 mins respectively (p-value < 0.05). In another similar study conducted by Moosavi Tekye SM et al, authors compared unilateral and bilateral spinal anaesthesia with respect to the intra- and postoperative advantages and complications of each technique. When unilateral spinal anaesthesia was performed using a low-dose, low-volume and low-flow injection technique, it provides adequate sensory-motor block and helps to achieve stable hemodynamic parameters during orthopaedic surgery on a lower limb.^[6] Efficacy of unilateral spinal anaesthesia with sequential combined spinal epidural anaesthesia for lower limb orthopaedic surgery was compared in another previous study conducted by Magar JS et al. Their study concluded that unilateral SA is a cost-effective and rapidly performed anaesthetic technique. Unilateral SA with 10 mg bupivacaine and sequential CSEA with 5 mg spinal and incremental epidural top up, both provide good quality sensory and motor block for lower limb orthopaedic surgery but sequential CSEA provides significantly more stable haemodynamics with feasibility to prolong block.^[13] Lux EA analysed a large number of patients for the incidence of adverse events after continuous spinal anaesthesia with a microcatheter. Nearly all patients (98.4%) were satisfied with spinal anaesthesia and

confirmed that they would choose this kind of anaesthesia again. Spinal anaesthesia using a 28-gauge microcatheter appears to be a safe and appropriate anaesthetic technique in lower leg surgery for aged patients.^[14]

CONCLUSION

Both unilateral SA and standard spinal anaesthesia provide good quality sensory and motor block for lower limb orthopaedic surgery. However; slightly better results were obtained with sequential standard spinal anaesthesia.

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