

COMPARISON STUDY OF HEMODYNAMIC STABILITY, EFFECT AND COMPLICATION OF UNILATERAL SPINAL ANESTHESIA AND CONVENTIONAL SPINAL ANESTHESIA IN LOWER LIMBSURGERY

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Received date: 03 October 2023

Revised date: 24 October 2023

Accepted date: 13 November 2023



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ABSTRACT

Background: Unilateral spinal anesthesia is an anesthetic technique in which the block of the sensory, motor and sympathetic function affected one side of the body, offers the advantage of the conventional spinal anesthesia with less side effect and cost. Aim of the study. Comparison of the hemodynamic stability, complication and effect of the unilateral and conventional spinal anesthesia. Method: Two groups of patients randomly selected, each one consists of 30 patients ASAI and ASAI, who had been admitted to have a lower limb surgery. Group (C) had a conventional spinal anesthesia which performed by administration of 2.5ml of hyperbaric bupivacaine 0.5% with 25G spinal needle, the patient in a sitting position and after induction placed in a supine position. Group (U) had a unilateral spinal anesthesia by 1.5ml of hyperbaric bupivacaine 0.5% with 25G spinal needle, the position was lateral decubitus position with the target limb is downward, the duration of that position was 20 min then turned to the supine position. Result: The demographic data was similar between the two groups, Group (U) had less decrease in mean arterial pressure and pulse rate during the operation than group (C). The complications of spinal anesthesia (nausea, vomiting, headache and shivering) and need for vasopressor was significantly less in group (U), The time to the onset of sensory and motor block was shorter in the (C) group. Conclusion: Unilateral spinal anesthesia with a low dose (7.5 mg), limited Volume (1.5 cm³) technique, had more hemodynamic stability criteria, Induces sufficient sensory and motor block with an appropriate level of analgesia, less complication incidence and less need for vasopressor use. The technique is therefore suitable for lower-limb surgery. This technique achieves stable hemodynamics, particularly in elderly and ASA class III/IV patients. It also results in rapid recovery and greater, in addition to preventing unnecessary nerve block in the contra lateral limb, And low-cost need.

KEYWORDS: Spinal anesthesia, Unilateral spinal, Lower limb surgery, Bupivacaine.

INTRODUCTION

Unilateral spinal anesthesia is a procedure of spinal anesthesia performed by exclusively unilateral block only affects the sensory, motor and sympathetic functions on one side of the body and offers the advantages of a spinal block without the typical adverse side effects seen with a bilateral block. The lack of hypotension, in particular, makes unilateral spinal anesthesia suitable for patients with cardiovascular risk factors e.g. aortic valve stenosis or coronary artery disease, also the prolonged postoperative stay before home discharge.^[1] The incidence of urinary retention is extremely low.^[2]

Several factors impact the distribution of local anesthetics within the subarachnoid space and subsequent height. Some factors play a major role while others play a minor/negligible role. These factors can be divided into 4 main categories.^[3]

- Characteristics of the local anesthetic medication. These include density, dose, concentration, temperature, and volume.

- Patient characteristics. Including age, height, intra-abdominal pressure, anatomic configuration of the spinal cord, and patient position

during and immediately after injection.

-Technique of injection:

The technique of administering spinal anesthesia can be described as the “4 P’s”: preparation, position, projection, and puncture.

-Characteristics of spinal fluid.^[4,5]

PATIENTS AND METHODS

comparative study, was carried out in Orthopedic, Vascular and Plastic surgery operation theaters of Ghazi Al_Hariri hospital and Madenat Al-Imamain alkadhimain hospital, during the period from December 2018 to September 2019. After obtaining the scientific council of anesthesia and intensive care committee approval, and a written consent from all patients, a 60 patients presented for lower limb surgery were randomly allocated to 2 groups each group consist of 30 patients, group (U) received unilateral spinal anesthesia and group (C) received conventional spinal anesthesia.

Inclusion criteria

- Age: 20_65 years.
- ASA class I and II.
- Wt.: BMI < 35 kg/m².
- Lower limb surgery

Exclusion criteria

- Patients' refusal.
- Patients with significant cardiovascular, neurological disease or other contraindication to spinal anesthesia.
- Patients with history of allergy to drugs used.
- Patient hemodynamic unstable.

In group C, spinal anesthesia was performed with the patient in the sitting position at the L3-L4 interspace using a 25-G Quincke spinal. Needle, 2.5 mL of hyperbaric bupivacaine 0.5% was injected. The patient was then placed in the supine position.

In group U, the patients were placed in the lateral decubitus position with the target limb in the lower position. Also, the L3-L4 inter-vertebral space was detected, spinal anesthesia performed with a 25-G Quincke spinal needle. And, 1.5 mL of hyperbaric bupivacaine 0.5% was. The bevel of the needle pointed downward during the injection. The patients were kept in the lateral position for 18-20min and then placed in the supine position for surgery.

To reduce patient anxiety, 1 mg of midazolam was administered I.V.

Hemodynamic variables (BP, PR) were checked before spinal anesthesia and then every 5 min in both groups.

If mean arterial pressure decreased by more than 20% of baseline or systolic blood pressure 100mmhg or less, and heart rate dropped to less than 50 beats/min, the patient

was considered to suffer from hypotension or bradycardia, respectively. The hypotension was managed by rapid IV infusion of 250 mL of lactated Ringer's solution. Bradycardia was managed using 0.5-1 mg of intravenously administered atropine. If the hypotensive patient did not respond to treatment, ephedrine 5 mg was injected.

To check the level of sensory block, a cold object (iced water bottle) in contact with the skin. And for motor block evaluation Bromage scale was used to.

The clinical data including the onset of sensory and motor block, hemodynamic changes, incidence of complication (nausea, vomiting, headache and shivering) and need for vasopressor use was recorded.

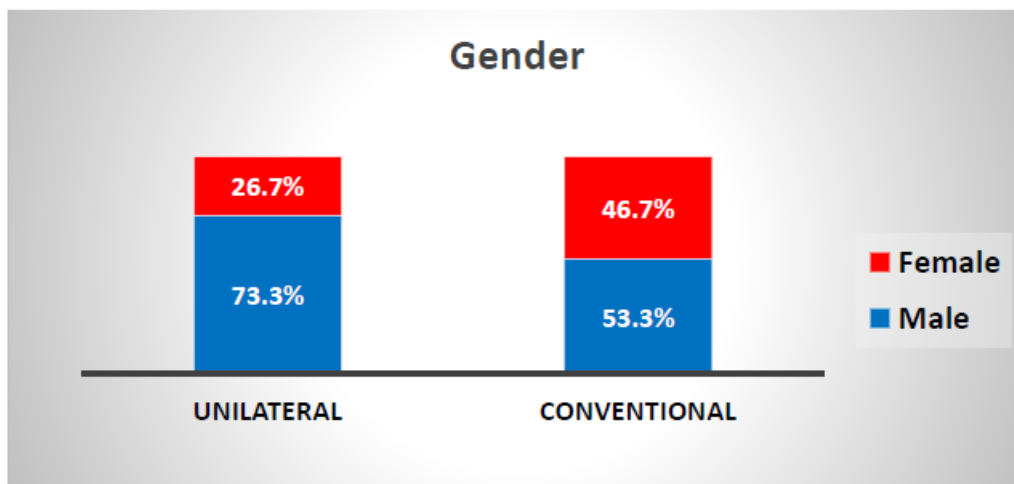
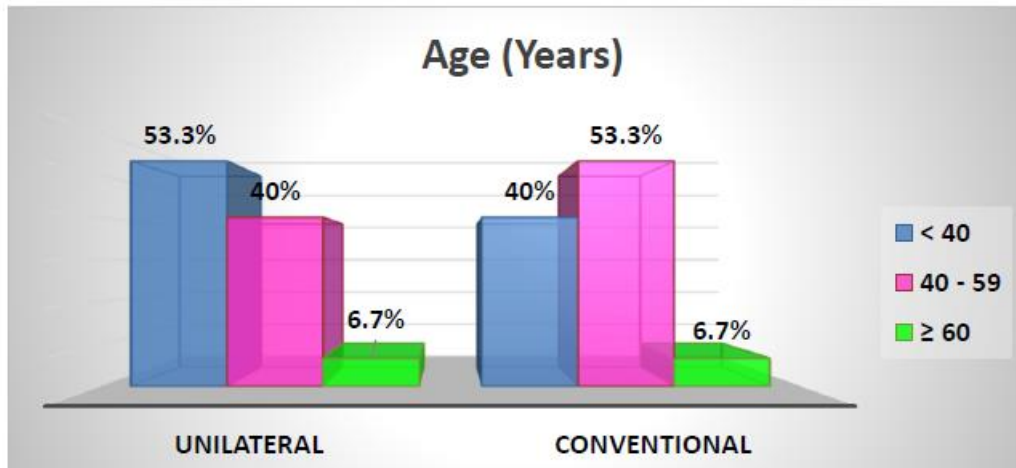
The data analyzed using Statistical Package for Social Sciences (SPSS) version 25. The data presented as mean, standard deviation and ranges. Categorical data presented by frequencies and percentages. Independent t-test (two tailed) was used to compare the continuous variables accordingly. Z-test was used to compare the categorical variables accordingly. A level of P – value less than 0.05 was considered significant.

RESULTS

The distribution of study patients by general characteristics is shown in the figures. Study patient's age was ranging from 26 to 62 years with a mean of 43.23 years and standard deviation (SD) of ± 12.65 years. The highest proportion of study patients in unilateral group was aged < 40 years (53.3%) while in conventional group, it was aged between 40 - 59 years (53.3%).

Regarding gender, the highest proportion of study patients in unilateral and conventional groups was male (73.3% and 53.3% respectively).

Concerning BMI level, the highest proportion of study patients in unilateral and conventional groups was overweighted (53.3% and 60% respectively).



BMI Level	Study Group		Total (%) n= 60
	Unilateral n= 30	Conventional n= 30	
Normal	4 (13.3)	4 (13.3)	8 (13.3)
Overweight	16 (53.3)	18 (60.0)	34 (56.7)
Obese1	10 (33.4)	8 (26.7)	18 (30.0)

In this study, means of MAP after fifteen, twenty and thirty mints were significantly higher in unilateral group than that in conventional group (91.71 versus 80.02 mmHg, P= 0.001; 90.17 versus 83.77 mmHg, P= 0.034;

91.84 versus 84.82 mmHg, P= 0.01 respectively). There were no significant differences (P ≥ 0.05) between study groups in means of MAP in all other times.

Time	MAP in study group (mmHg)		P - Value
	Unilateral Mean ± SD	Conventional Mean ± SD	
Pre induction	99.04 ± 7.86	101.11 ± 8.06	0.319
After 5 mints	89.0 ± 9.09	90.4 ± 9.67	0.566
After 10 mints	89.31 ± 8.16	83.8 ± 12.71	0.05
After 15 mints	91.71 ± 10.07	80.02 ± 14.12	0.001
After 20 mints	90.17 ± 11.47	83.77 ± 11.32	0.034
After 30 mints	91.84 ± 9.55	84.82 ± 10.7	0.01

There were no significant differences (P ≥ 0.05) between study groups in means of heart rate in all other times.

Time	HR in Study Group (beats/mint)		P- Value
	Unilateral Mean ± SD	Conventional Mean ± SD	
Pre induction	87.4 ± 11.82	92.13 ± 13.84	0.16
After 5 mints	91.2 ± 14.28	92.06 ± 14.7	0.818
After 10 mints	90.26 ± 14.55	88.73 ± 13.89	0.678
After 15 mints	89.4 ± 13.76	84.2 ± 14.13	0.154
After 20 mints	91.2 ± 12.01	88.06 ± 11.78	0.312
After 30 mints	89.13 ± 10.6	90.06 ± 13.09	0.763

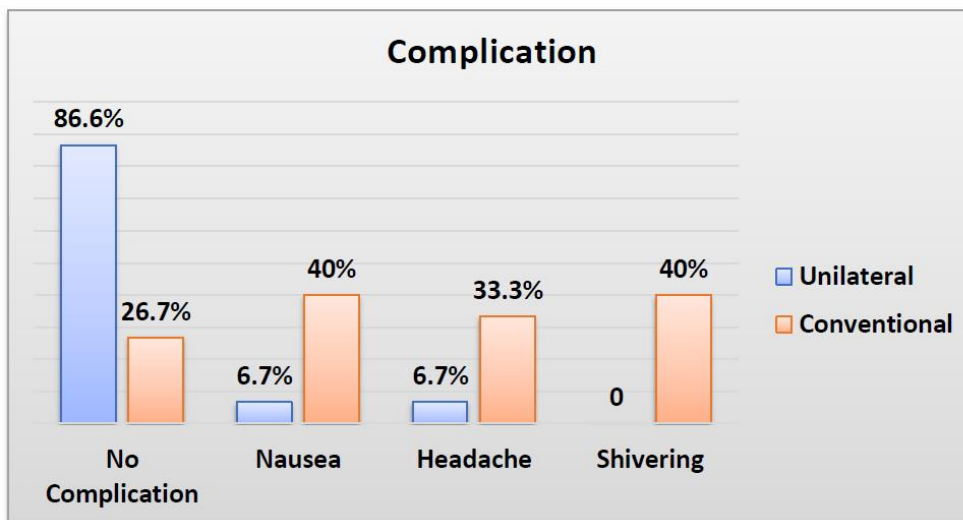
The comparison between study groups by means of sensory and motor onset is shown in table (3.7). In this study, means of sensory and motor onset was

significantly higher in unilateral group than that in conventional group (6.26 versus 4.33 mints. P= 0.001; 8.26 versus 3.93 mints., P=0.001 respectively).

Variable	Study Group		P - Value
	Unilateral Mean ± SD	Conventional Mean ± SD	
Sensory Onset (mints.)	6.26 ± 2.58	4.33 ± 1.68	0.001
Motor Onset (mints.)	8.26 ± 2.50	3.93 ± 1.72	0.001

In this study, 86.6% of unilateral group didn't complain from any complication, while in conventional group,

40% of them were complained from nausea and 40% were complained from shivering.

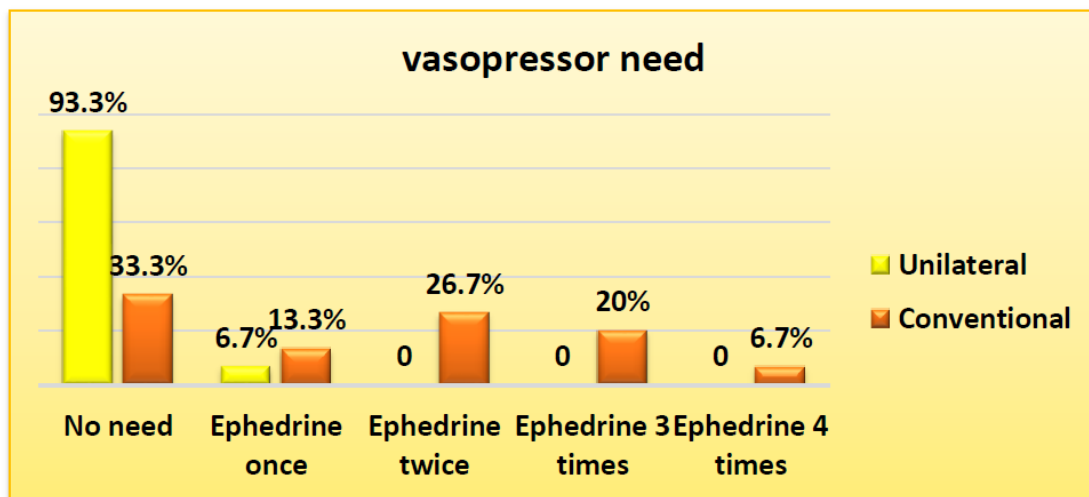


In comparison between study group by complication, we noticed that in unilateral group, most patients didn't complain from complications (26 patients) while in conventional group, the highest proportion of study

patients were complained from complication (22 patients) and this difference was statistically significant (P= 0.001).

Complication	Study Group		Total (%) n= 60	P- Value
	Unilateral n= 30	Convention aln= 30		
Yes	4 (15.4)	22 (84.6)	26 (43.3)	0.001
No	26 (76.5)	8 (23.5)	34 (56.7)	

In this study, most of unilateral group didn't need vasopressor (93.3%), while in conventional group, third of them need ephedrine injection one time.



DISCUSSION

Spinal anesthesia is a preferable anesthetic procedure in lower limb surgery, do decrease incidence of unwanted complication and hemodynamic instability during spinal anesthesia we could use unilateral spinal block by use of baricity criteria of the local anesthetic and patient position during and immediately after performing spinal anesthesia that influence the spinal distribution of the drug.^[6]

Kuusniemi et al. reported that hyperbaric bupivacaine is more effective in achieving unilateral spinal anesthesia than plain bupivacaine. However, determining the optimal time for lateral positioning is difficult when a high dose of hyperbaric bupivacaine (12-20 mg) is used.^[7] The anesthetic drug may migrate even when the patient is placed in the lateral position for 30-60 min. Conversely, if a low dose (5-8 mg) of anesthetic solution is used, putting the patient in the lateral position for 10-15 min may prevent migration of the anesthetic drug. so we use low flow low dose low volume technique in unilateral spinal anesthesia.^[8,9]

In our study blood pressure (systolic, diastolic and map monitored pre induction and every 5 min till 30 min of induction, we chose map to compare between 2 groups and we found that after 10 min there is significant decrease in map in both groups where the decrease in unilateral group is less than conventional, at 15 min (value =0.001) 20 min (0.034) and 30 min (0.01). So, we could consider unilateral spinal anesthesia less incidence of hypotension.

Chohan and Afshan administered unilateral spinal anesthesia prior to lower-limb surgery in elderly patients with ASA classification of III or IV (average age, 60). The authors found no significant hemodynamic changes.^[10] They used hyperbaric bupivacaine 0.5% (1.1-1.8 mL).¹⁴ The hypotension incidence is less in unilateral spinal A because of the sympathetic block is less than conventional spinal anesthesia.

There are no episodes of bradycardia in both groups.

In this study, means of sensory and motor onset duration was significantly higher in unilateral group than that in conventional group (6.26 versus 4.33 mints., $P= 0.001$; 8.26 versus 3.93 mints., $P= 0.001$ respectively).

This result is similar to the study of Seyyed Mostafa Moosavi Tekye, Mohammad Alipour, Mashhad University of Medical Sciences, Mashhad, Iran.^[11]

In comparison between study group by complication, we noticed that in unilateral group, most patients didn't complain from complications (26 patients) while in conventional group, the highest proportion of study patients were complained from complication (22 patients) and this difference was statistically significant ($P= 0.001$).

In this study, most of unilateral group didn't need vasopressor (93.3%), while in conventional group, third of them need ephedrine injection one time. In comparison between study group by vasopressor need, we noticed that in unilateral group, most patients didn't need vasopressor (28 patients), while in conventional group, two thirds of them need ephedrine injection, and this difference was statistically significant ($P = 0.001$).

CONCLUSION

Unilateral spinal anesthesia with a low dose (7.5 mg), limited volume (1.5 cm³) technique, had more hemodynamic stability criteria, Induces sufficient sensory and motor block with an appropriate level of analgesia, less complication incidence and less need for vasopressor use. The technique is therefore suitable for lower-limb surgery. This technique achieves stable hemodynamics, particularly in elderly and ASA class III/IV patients. It also results in rapid recovery, in addition to preventing unnecessary nerve block in the contra lateral limb and low-cost need.

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