

## Comparison of haemodynamic changes in unilateral and conventional spinal anaesthesia

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### Abstract

**Objective:** The aim of the study was to compare the haemodynamic changes in unilateral and conventional spinal anaesthesia.

**Study design:** Quasi experimental

**Place and duration of surgery:** This study was conducted in Anaesthesia Department of Lyari General Hospital Karachi over a period of 6 months from March 2008 to August 2008.

**Patients and methods:** In this study hundred patients, which were on operation theatre list for inguinal herniorrhaphies, were divided into two groups. Group I (n=50) received spinal anaesthesia in sitting position and group II (n=50) received spinal anaesthesia in lateral decubitus position with the operating side being dependent. There was no significant difference in age and weight of the patients. Data from the patients was recorded on a proforma. The comparison was made between group I and group II. The changes in heart rate, systolic and diastolic blood pressures were compared at various time intervals.

**Result:** Out of 100 patients, 70 patients belonged to ASA-I and 30 patients belonged to ASA-II. The comparison was made between group I and group II. The changes in heart rate, systolic and diastolic blood pressures were compared at 10 minutes, 20 minutes, 30 minutes, 50 minutes and 80 minutes after taking baseline readings. The base line readings were not significantly different statistically. Mean heart rate, systolic and diastolic blood pressures significantly reduced from base line in both the groups but these changes in variables were insignificant in both the groups.

**Conclusion:** Haemodynamic stability is slightly more in unilateral spinal anaesthesia but results are statistically insignificant.

**Key Words:** Spinal Anaesthesia, Inguinal Herniorrhaphy, Heart Rate, Blood Pressure

### Introduction:

In anaesthesia practice, the role of neuraxial anaesthesia is gaining more and more importance with the passage of time. There is a big list of surgeries which can be performed under this form of anaesthesia. With the advancement in drugs and equipment, the use of local anaesthetic technique is increasing day by day.

According to some studies, neuraxial block is efficient in reducing the postoperative morbidity and mortality. It has been claimed that neuraxial block reduces the incidence of venous thrombosis, pulmonary embolism, bleeding and transfu-

sion requirements, cardiac complications, vascular graft occlusion, pneumonia and respiratory depression following upper abdominal surgeries<sup>1</sup>. It has also been involved in sympathectomy mediated increase in tissue blood flow and suppression of neuroendocrine response.

Spinal anaesthesia is associated with some disadvantages as well. Hypotension and bradycardia occur fairly common during this technique which are treated by administering fluids, vasopressors and anticholinergics. These treatment modalities may result in fluid overload, hypertension and tachycardia which are not desirable

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especially in elderly and in patients with coronary artery disease.

Spinal anesthesia is widely used for inguinal hernia repair, providing a fast onset and effective sensory and motor blockade. The unilateral spinal anaesthesia, which can also be used for inguinal hernia repair, results in restricted autonomic block<sup>2</sup> and is helpful in high risk patients. Limiting the block at the operative side (unilateral spinal anaesthesia) using hyperbaric solutions, direction of needles, and lateral decubitus position maintained for a certain period has been proposed as a means to obtain a high-quality and long-duration analgesia, mainly on the operative side.<sup>3-5</sup>

In orthopaedic cases unilateral spinal anaesthesia may also be advantageous providing more profound and longer lasting block with less cardiovascular effects.

#### Patients and methods

This Quasi experimental study was conducted in anaesthesia department of Sindh Govt Lyari General Hospital, Karachi after approval from competent authority, over a period of 6 months from March 2008 to August 2008. Hundred patients belonging to ASA I and II, undergoing inguinal herniorrhaphy, were included. Informed consent was taken from the patients at pre-anaesthetic visit. Following patients were included and excluded.

Inclusion criteria:

1. ASA I and II
2. Age between 20-50 years
3. Both males and females
4. Elective cases

Exclusion criteria:

1. Refusal from patient
2. History of local anaesthetic allergy
3. Emergent cases
4. Patients with coagulation abnormalities
5. Infection at lumbar puncture site

These 100 patients were divided into two groups: Group I and group II. Group I (n=50) received spinal anaesthesia in sitting position and group II (n=50) received spinal anaesthesia

in lateral decubitus position. The procedure was explained to the patients and informed consent was taken at pre-anaesthetic visit. Patients were reassured, upon arrival in operation theater, to reduce their anxiety.

In group I, after gaining intravenous access, monitors were applied; base line readings of heart rate and blood pressure were taken. Ringer lactate was used to preload the patients which was given according to body weight of the patient. After explaining the procedure and taking all aseptic precautions, interspinous space between L3 and L4 was identified and skin overlying was infiltrated with 2 % lidocaine. 25 G spinal needle was then introduced between interspinous space L3 and L4 and after confirming its intrathecal position by observing clear outflow of CSF, 1.5 ml of 0.75% bupivacaine was injected. After removing spinal needle, sterile dressing was applied and patient was put in spine position. Blood pressure and heart rate readings were taken after 10 minutes, 20 minutes, 30 minutes, 50 minutes and 80 minutes.

In group II, patients received spinal anaesthesia in lateral decubitus position with the operating side being dependent. After Intravenous access, application of monitors and preloading with Ringer lactate, patient was put in lateral decubitus position. A 25 gauge spinal needle was introduced into interspinous space L3 –L4 after infiltrating the skin with 2 % lidocaine. After confirmation of intrathecal placement a reduced dose of 0.8 ml of 0.75% injected slowly. Patients were kept in decubitus position for 10 minutes and then turned to supine position.

Blood pressure and heart rate readings were taken after 10 minutes, 20 minutes, 30 minutes, 50 minutes and 80 minutes.

Statistical analyses:

The data was collected on the proforma and was analyzed by statistical package for social sciences (SPSS) version 10. Mean and standard deviation of the quantitative variables like age, duration of surgery, systolic blood pressure, diastolic blood pressure and heart rate for both groups, were determined. Repeated measure ANOVA was applied to compare within subject and between

groups difference for each group. Independent sample t test was used to compare percentage changes in mean heart rate, systolic and diastolic blood pressures between groups.  $p < 0.05$  was considered significant.

**Results:**

In this study, hundred patients were divided into two groups. Group I (n=50) received spinal anaesthesia in sitting position and group II (n=50) received spinal anaesthesia in lateral decubitus position. The average age of the patients was  $34.9 \pm 12.9$  years. The base line mean heart rate, systolic and diastolic blood pressures are also presented in Table 1. Comparison of base line characteristics between groups are presented in Table 2. Average age, baseline heart rate, systolic

and diastolic blood pressures were not statistically significant between groups.

Haemodynamic changes (mean Heart rate, systolic and diastolic blood pressure) occurring after 10 minutes, 20 minutes, 30 minutes, 50 minutes and 80 minutes were compared between groups in Table 2. The base line mean heart rate was  $79.8 \pm 11.05$  per minutes in conventional spinal anaesthesia and  $76.27 \pm 13.11$  per minutes in unilateral spinal anaesthesia. Mean heart rate significantly reduced from the base line ( $P < 0.0001$ ) in both groups while mean heart rate was not statistically significant between groups ( $P > 0.1$ ).

The base line systolic blood pressure (SBP) was  $133.38 \pm 20.7$  mmHg in conventional spinal anaesthesia and  $132.6 \pm 18.1$  mmHg in unilateral spinal anaesthesia. Mean SBP significantly reduced from the base line ( $P < 0.0001$ ) in both groups while mean SBP was not statistically significant between groups ( $P > 0.31$ ).

The base line diastolic blood pressure was  $74.6 \pm 9.9$  mmHg in conventional spinal anaesthesia and  $75.3 \pm 6.90$  mmHg in unilateral spinal anaesthesia. Mean DBP significantly reduced from the baseline ( $P < 0.0005$ ) in both groups while mean DBP was not statistically significant between groups ( $P > 0.34$ ).

Table 1: Overall characteristics of study variables (n=100)

Characteristics	Mean±SD	95%CI	Median (IQR)	Min-Max
Age(years)	34.9±12.9	32.4-39.6	35(21)	20-50
Base Line Heart Rate(per minute)	78.1±12.1	77.7-84.5	81(15)	57-110
Base line systolic blood pressure (mmHg)	133.1±19.3	132.9-143	133(21.3)	85-185
Base line diastolic blood pressure (mmHg)	75.0±8.1	73.3-77.9	75(11)	52-93

Data presented in mean±standard deviation

Table 2: Comparison of haemodynamic data between groups I and II with respect to time

	Time Interval (min)	Group I		Group II		P-value
		n	Mean ± SD (mm of Hg)	n	Mean ± SD (mm of Hg)	
Heart rate (beats per min)	Base line	50	79.8±11.05	50	76.27±13.11	0.65
	10	50	76.15±12.90	50	78.9±14.12	0.89
	20	50	77.33±14.93	50	73.54±14.43	0.33
	30	50	69.81±12.90	50	68.72±12.80	0.24
	50	50	72.55±10.77	50	68.35±13.47	0.88
	80	03	61.10±10	2	63.00±14.9	0.06
Systolic Blood Pressure (mm of Hg)	Base line	50	133.38±20.7	50	132.6±18.1	0.96
	10	50	120.47±20.7	50	120.89±19.4	0.77
	20	50	115.29±24.3	50	119.61±19.3	0.51
	30	50	114.51±23.5	50	118.29±18.1	0.85
	50	50	115.10±15.4	50	115.49±13.8	0.84
	80	03	116.10±9.1	2	123.17±2.83	0.39
Diastolic Blood Pressure (mm of Hg)	Base line	50	74.6±9.9	50	75.3±6.90	0.36
	10	50	68.87±11.1	50	69.33±11.1	0.81
	20	50	63.60±11.7	50	67.85±10.7	0.34
	30	50	61.83±14.4	50	66.47±10.4	0.16
	50	50	64.35±1.2	50	67.41±10.6	0.29
	80	50	64.35±1.2	50	67.41±10.6	0.29

**Discussion:**

Several groups have described the use of unilateral spinal anaesthesia to limit the extent of spinal block to the dermatomes involved, although, possibilities and practicality of limiting a spinal block to the operative site is controversial. Cardiovascular stability<sup>3,6</sup> and patient discharge<sup>7,8</sup> in surgeries have shown positive findings. The efficacy of unilateral spinal anaesthesia in producing more haemodynamic stability with varying outcomes has been shown in various studies. Since the distance between nerve roots in lumbar region is 15 mm which may help in restricting the block unilaterally. Patients posture during and after injecting anaesthetic dose and volume, anaesthetic speed of administration and anaesthetic baricity are possibly the main factors responsible. The reason for inducing unilateral block is to prevent haemodynamic changes and

to improve patient's comfort. In our study, we divided the patients into two groups each having 50 patients.

Group I patients received spinal anaesthesia in sitting position while group II patients were given spinal anaesthesia in lateral decubitus position with the surgical side being dependent. The main factors responsible in achieving a unilateral spinal anaesthesia are dose, volume of the local anaesthetic agent, baricity, speed of injection and the time period the patient is left in lateral decubitus position before turning into supine position.

A reduced dose of bupivacaine 0.8 ml was used as compared to the 1.5 ml which was given to group I patients.<sup>9</sup>

The rate of drug administration is at 1ml per 20seconds. Faster injections can cause turbulent patterns of flow<sup>10</sup> resulting in more anaesthetic distribution towards the non dependent side.

The most important factor in achieving a unilateral block is the time patient is left in the lateral decubitus position. Patients were kept for 10 minutes in lateral position after intrathecal injection. The preferential distribution is lost upon switching to supine position. Sumi et al<sup>11</sup> demonstrated that lateral decubitus position produced preferential intrathecal distribution of local anaesthetic solution towards the dependent side.

Lateral decubitus position appears to provide haemodynamic stability which might reflect less sympathetic blockade. Sumi et al observed no severe hypotension or bradycardia in patients who were kept in lateral position for 20 minutes. Similarly, Meyer et al observed insignificant decrease in mean arterial pressure in patients who were kept in lateral decubitus position after spinal anaesthesia.

There are a number of studies which favor unilateral spinal anaesthesia in order to achieve haemodynamic stability. It appears that in these

studies patients were placed in lateral decubitus position for longer period of time. In our study, we kept the patient in lateral position for 10 minutes which has probably caused these insignificant haemodynamic changes between the two groups.

#### Conclusion:

It was concluded that patients with unilateral spinal anesthesia showed more hemodynamic stability as compared to those patients with conventional spinal anesthesia.

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#### References:

1. Kleinman W, Mikhael M. Regional anaesthesia and pain management: Spinal epidural and caudal blocks. In Morgan GE. Clinical anaesthesiology. 4th ed Editors. New York: Mc Graw hill companies; 2006:289-323.
2. Chohan U, Afshan G, Hoda MQ, Mehmood S. Haemodynamic effects of unilateral spinal anaesthesia in high risk patients. J Pak Med Assoc. 2002 ;52(2):66-9.
3. Casati A, Fanelli G. Unilateral spinal anaesthesia: state of the art. Minerva Anestesiologica 2001; 67: 855-62.
4. Kuusniemi KS, Pihlajamaki KK, Pitkanen MT. A low dose of plain or hyperbaric bupivacaine for unilateral spinal anaesthesia. Reg Anesth Pain Med 2000; 25: 605-10.
5. Dobrydnjov I, Axelsson K, Thorn S-E, et al. Clonidine combined with small-dose bupivacaine during spinal anaesthesia for inguinal herniorrhaphy: a randomised double-blinded study. Anesth Analg 2003; 96: 1496-503.
6. Casati A, Fanelli G, Aldegheri G, Colnaghi E, Casaletti E, Cedrati V, Torri G. Frequency of hypotension during conventional or asymmetric hyperbaric spinal block. Reg Anesth Pain Med. 1999 ;24(3):214-9.
7. Fanelli G, Borghi B, Casati A, Bertini L, Montebugnoli M, Torri G. Unilateral bupivacaine spinal anaesthesia for outpatient knee arthroscopy. Italian Study Group on Unilateral Spinal Anaesthesia. Can J Anaesth. 2000 ;47(8):746-51.
8. Borghi B, Stagni F, Bugamelli S, Paini MB, Nepoti ML, Montebugnoli M, Casati A. Unilateral spinal block for outpatient knee arthroscopy: a dose-finding study. J Clin Anesth. 2003 ;15(5):351-6.
9. Dobrydnjov I, Axelsson K, Thörn SE, Matthiesen P, Klockhoff H, Holmström B, Gupta A. Clonidine combined with small-dose bupivacaine during spinal anaesthesia for inguinal herniorrhaphy: a randomized double-blinded study. Anesth Analg. 2003 ;96(5):1496-503.
10. Bourke DL, Sprung J, Harrison C, Thomas P. High injection speed overwhelms other maneuvers for controlling the spread of spinal anaesthesia. Anesth Analg. 1995 ;81(2):427-8
11. Sumi M, Sakura S, Koshizaki M, Saito Y, Kosaka Y. The advantages of the lateral decubitus position after spinal anaesthesia with hyperbaric tetracaine. Anesth Analg. 1998 ;87(4):879-84.