Original Article

"COMPARISON OF HAEMODYNAMIC EFFECTS OF UNILATERAL VERSUS BILATERAL SPINAL ANAESTHESIA IN INGUINAL HERNIORRHAPHY"

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ABSTRACT

INTRODUCTION: Conventional spinal anesthesia has been used since 1899 and the most common side effect associated with it is hypotension. Unilateral spinal anesthesia has emerged over time as an alternative to the standard technique and offer benefits in terms of minimal haemodynamic disturbances primarily by limiting the degree of sympathetic block. Patient satisfaction and home readiness is compareable to the bilateral spinal anesthesia.

OBJECTIVES: To compare frequencies of hypotension with unilateral versus bilateral spinal anesthesia in patients undergoing inguinal herniorrhaphy.

STUDY DESIGN: Randomized controlled trial

SETTING: Department of Anesthesia and Intensive Care, Punjab Medical College and affiliated hospitals, Faisalabad.

DURATION OF STUDY WITH DATES: Study was carried out over a period of six months from 20-12-2011 to 19-06-2012.

SUBJECTS AND METHODS: A total of 130 patients (65 patients in each group) were included in this study. In Group-A, patients received bilateral spinal anesthesia and in Group-B, patients received unilateral spinal anesthesia.

RESULTS: Mean age of the patients was 33.5±2.5 and 34.3±3.1, in group-A and B, respectively. Mean height was 160.5±10.3 and 161.9±10.1 cm in group-A and B, respectively. In group-A mean weight was 69.8±09.4 kg and in group-B, 71.6±10.8 Kg. Hypotension developed in 16 patients (24.6%) of group-A and 5 patients (7.7%) of group-B.

CONCLUSION: In this study, it was found that unilateral spinal anesthesia is associated with stable cardiovascular profile and, therefore, is a valuable technique in high- risk patients.

KEY WORDS: Unilateral anesthesia, Bilateral anesthesia, Hypotension.

INTRODUCTION

Spinal anesthesia is an evergreen technique whereby rapid and intense surgical anesthesia can be achieved through injection of small

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doses of local anesthetic drugs into the subarachanoid space. Dr. August Bier was the first person to report the intrathecal administration of cocaine, in 1899. Spinal anesthesia is a simple technique which can be considered adequately safe because incidence of serious complications is low[1].

Over the last decade the hypebaric solutions have become the drug of choice for unilateral spinal anesthesia. As unilateral spinal block induced with them offers economic benefits in terms of lesser requirement for intravenous fluid therapy intraoperatively and shorter hospital stay resulting from rapid recovery of sensory and motor function[2].

For the surgical procedures involving one lower extremity unilateral spinal anesthesia is a good choice as it limits the block only to the surgical side. Haemodynamic adverse effects like hypotension and bradycardia are less provided small doses and hyperbaric anesthetic solutions are used[3].

The determinants for unilateral subarachanoid block are the small drug dose, slow speed of injection into cereberospinal fluid and finally the lateral decubitus position of the patient[4]. The higher the level of sympathetic blockade,the greater will be the magnitude of hypotension and bradycardia[5].

Spinal anesthesia results in a decrease in sympathetic outflow (T1-L2) and a relative predominance of parasympathetic nervous system and thus results in heart rate fluctuations, which if marked will lead to hypotension[6].

The minimal haemodynamic disturbances observed with unilateral spinal anesthesia makes it a good choice for high risk and elderly patients[7].

The dilatation of venous capacitance vessels resulting from loss of sympathetic outflow is the major cause of hypotension in conventional spinal anesthesia. This effect can be minimized by t h e use of unilateral spinal anesthesia[8].

Levobupivacaine, bupivacaine and ropivacaine, all can be used to induce unilateral spinal block. The time of onset of sensory block, the depth of block and the home readiness were all comparable when hyperbaric solution of these drugs were used[9].

In a study, it was established that incidence of hypotension was 22.4% in the patients who received bilateral spinal anesthesia and 5% in those who received unilateral neuraxial blockade[10].

Almost 98% of inguinal herniorrhaphies are performed in bilateral spinal anesthesia rather than unilateral spinal anesthesia, the reason is that the later is more time consuming, compared to standard spinal anesthesia and the patient's cooperation is essential. The rationale of this study is to determine whether haemodynamic disturbances are less with unilateral spinal anesthesia as compared to bilateral spinal anesthesia or not and to choose a better technique which provides economic benefit and offers less side effects.

OBJECTIVES

Objective of the study was:
To compare frequencies of hypotension with unilateral versus bilateral spinal anesthesia in patients undergoing inguinal herniorrhaphy.

OPERATIONAL DEFINITIONS

Effects were compared in terms of hypotension. Blood pressure was recorded before giving spinal anesthesia, then every 10min throughout the operation and then every 20min for a total period of 1 hour.

Hypotension

It was defined as fall in systolic blood pressure of 30% from baseline after 1 hour. It was measured by non-invasive blood pressure monitoring.

Unilateral Spinal Anesthesia

Spinal block having more effect on one lower limb or one half of lower abdomen as compared to other.

Bilateral Spinal Anesthesia

Spinal block involving both the lower limbs equally or having uniform effect on lower abdomen.

HYPOTHESIS

Unilateral spinal block produces less hypotension as compared to bilateral spinal block.

MATERIAL AND METHODS

STUDY DESIGN
Randomized controlled trial

SETTING
Department of Anesthesia and Intensive Care, Punjab Medical College and affiliated hospitals, Faisalabad.

DURATION OF STUDY
Study was carried out over a period of six months from 20-12-2011 to 19-06-2012.

SAMPLE SIZE
By using WHO sample size calculator for two proportions, sample size was calculated as 65 patients in each group.

Level of significance 5%
Power of the test 90%
P1 = 22.4%[10]
P2 = 5%[10]

SAMPLING TECHNIQUE
Non-probability, consecutive sampling.

SAMPLE SELECTION
Inclusion Criteria

- Patients undergoing elective inguinal herniorrhaphy.
- Age group 25 - 40 years.
- ASA grade-I (patient with no other systemic disease)
- ASA grade-II (patients with some mild systemic disease but no functional limitations).

Exclusion Criteria

-Patients undergoing emergency procedures.
-surgical
-Patients with disease or injuries of vertebral column.
-Patients with neurological deficits.
-Coagulopathy.
-Skin or soft tissue infection in lumbar area
-ASA grade-3 (patient with severe disease, some functional limitations) systemic.
-ASA grade-4 (patient with severe systemic disease that is a constant threat to life).

DATA COLLECTION

130 cases of elective herniorraphy were identified from all the surgical units of Allied and DHQ hospitals. Patients who fulfilled the inclusion criteria like age between 25 to 40 years of age, ASA grade 1, ASA grade-2, comparable weight and height, were selected for study. Informed consent (explaining risks and benefits, purpose and procedure of study) was taken from selected patients. The demographic information like name, age, registration number, was noted.

Using random number table generated by computer, patients were randomly allocated to two groups: **Group-A** Patients who received bilateral spinal anesthesia **Group-B** Patients who received unilateral spinal anesthesia.

Group-A patients were lied supine for 15 minutes after receiving spinal anesthesia. While group B patients were lied in lateral decubitus position, with surgical side down, for 15 minutes after receiving spinal anesthesia and then turned supine.

All patients were visited a night before operation. A rapport was made with the patient. Procedure was explained and discussed with each patient. Blood pressure, which was variable of interest, was recorded at that time. Blood pressure was recorded before giving spinal anesthesia and then every 10 minutes after giving spinal anesthesia throughout the operation and then every 20 minutes for a total period of 1 hour. Blood pressure was recorded with the help of electronic blood pressure recording apparatus and results were recorded as, whether hypotension occurred or not. All the information was recorded on attached proforma.

DATA ANALYSIS

Data was analyzed using SPSS (version 13).

1. Mean and standard deviation was calculated for quantitative variable i-e age, weight, height, blood pressure.
2. Frequency and percentages were presented for qualitative variable i-e hypotension.
3. Chi square test was applied to compare hypotension.
4. P valve < 0.05 was considered significant.

RESULTS

A total of 130 patients (65 patients in each group) were included during the study period of six months from 20-12-2011 to 19-06-2012.
Group-A received bilateral spinal anesthesia and group-B was given unilateral spinal anesthesia.
Most common age group in both groups was 31-35 years and least age group was 36-40 years old. Mean age of the patients was 33.5±2.5 and 34.3±3.1, in group-A and B, respectively (Table-1). Mean height of the patients was 160.5±10.3 and 161.9±10.1 cm in group-A and B, respectively. In group-A mean weight was 69.8±09.4 kg and in group- B, 71.6±10.8 Kg (Table-2). Hypotension developed in 16 patients (24.6%) of group-A and 5 patients (7.7%) of group-B (Table-3).

Table-1
Distribution of patients by age

Age (Year)	Group-A Bilateral spinalanesthesia		Group-B Unilateral spinal anesthesia	
	No.	%	No.	%
25-30	21	32.3	18	27.7
31-35	34	52.3	32	49.2
36-40	10	15.4	15	23.1
Total	**65**	**100.0**	**65**	**100.0**
Mean± SD	**33.5±2.5**		**34.3±3.1**	

Table-2
Mean values of height and weight

Variables	Group-A Bilateral spinalanesthesia		Group-B Unilateral spinal anesthesia	
	Mean	SD	Mean	SD
Height (cm)	160.5	10.3	161.9	10.1
Weight (Kg)	69.8	09.4	71.6	10.8

Table-3
Distribution of patients by haemodynamic effect

Hypotension	Group-A Bilateral spinalanesthesia		Group-B Unilateral spinal anesthesia	
	No.	%	No.	%
Yes	16	24.6	05	07.7
No	49	75.4	60	92.3
Total	**65**	**100.0**	**65**	**100.0**

Chi Square = 6.87

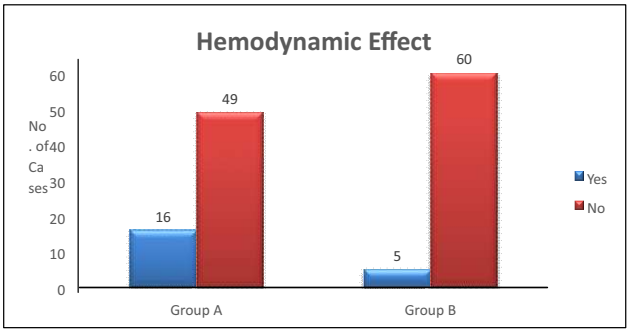

Figure-1: Hemodynamic effect

DISCUSSION

Spinal anesthesia is usually selected for surgeries on lower extremity because of its simplicity and reliability. However a number of complications are associated with it like hemodynamic disturbances, post-dural puncture headache, urinary retention, neurological symptoms[11].
Administration of low dose of hyperbaric local anesthetic agent into the cerebrospinal fluid and keeping the surgical side in dependant position results in asymmetrical distribution of block to the operative side. This technique helps in minimizing some of the complications associated with standard technique. Unilateral spinal block provides advantages of better cardiovascular stability, less need for urinary bladder catheterization and early recovery of motor function of the anesthetized lower limb[11].
Slow speed of injection of local anesthetic drug is an important determinant for the achievement of a unilateral spinal block. Hyperbaricity of a drug is lost if it is injected at a

higher velocity thus resulting in bilateral distribution of the drug. The direction of the tip of spinal needle should be towards dependant side to achieve maximum drug concentration and thus the dense block[12].

The most common serious side effects from spinal anesthesia are hypotension and bradycardia and if untreated can lead to cardiac arrest[13]. Hypotension occurs due to sympatholysis resulting from spinal block, leading to loss of tone of venous capacitance vessels and drop in central venous pressure. Blockade of cardioaccelerator fibers leads to bradycardia[13].

Level of blockade of sympathetic nervous system, depletion of intravascular volume , advanced age are well known risk factors for the development of hypotension during spinal anesthesia. The young healthy patients as compared to old sick patients are more prone to develop bradycardia after spinal anesthesia. Blockade of cardioaccelerator fibers, use of beta-receptor blocking drugs and vagal stimulation are also risks factors for development of bradycardia. The incidence of hypotension is about 3 times to that of bradycardia[14].

Prevention rather than treatment of hemodynamic disturbances is emphasized in patients undergoing spinal anesthesia [15].Prophylactic measures include pre-hydration with intravenous fluids or administration of vasoactive agents. Colloid fluids are more effective in preventing hypotension and are required in approximately half dose as compared to crystalloids[16]. A potential means for prophylaxis of hypotension is by manipulation of spinal anesthesia to achieve a predominantly unilateral block.Unilaterality can be maximized if patient remains in unilateral position for 20 min,with the use of small dose of local anesthetic and the Whitacre needle. Use of ropivacaine instead of bupivacaine further reduces incidence of hypotension. Unilateral spinal block technique has been identified as a useful anesthetic technique for patients undergoing day-case surgeries one one limb or one side of lower abdomen as it offers better patient satisfaction in terms of quality of analgesia and rapid regression of motor block[17].

Karpel et al in 2009[18] conducted a study on fifty four patients to find out the hemodynamic safety profile of unilateral subarachanoid block in comparison to the conventional spinal anesthesia. Unilateral spinal block was administered with low dose of hyperbaric local anesthetic agent. This technique is simple yet it requires longer prepration time as compared to bilateral spinal anesthesia. They reached a conclusion that unilateral spinal anesthesia provides better intraoperative hemodynamic stability in addition to good analgesia[18].

Chohan et al in 2002[7] conducted a study on high risk patients undergoing spinal anesthesia for surgical proceedures.. They concluded that unilateral spinal block is a good choice in critically ill patients to achieve anesthesia on one lower limb with minimal cardiovascular side effects[7].

In current study, hypotension was developed in 24.6% of patients who received standard bilateral spinal anesthesia and 7.7% of patients who received unilateral spinal anesthesia ($p < 0.008$).

Our results are comparable with a study carried out by Imbelloni et al. They observed that hypotension was not a problem in unilateral spinal anesthesia[19]**.** Similar results were observed in another study by Park et al[20].

It was observed in this study that unilateral spinal anesthesia is associated with a more stable cardiovascular profile as compared to the conventional spinal anesthesia. A similar study conducted by Khan et al in 2010, found more haemodynamic stability in patients who received unilateral spinal anesthesia but their results were not significant statistically[21] Rao and Naqvi demonstrated that unilateral block could be a more useful concept in older age group and in the patients with compromised autonomic nervous system[22].

Casati et al compared the haemodynamic changes between unilateral and bilateral spinal block and observed rate of hypotension 5% and 22.4%, respectively. This shows significant difference between unilateral and bilateral spinal block which is comparable with our findings[10].

CONCLUSION

In this study, it was found that unilateral spinal anesthesia is associated with stable

cardiovascular profile and, therefore, is a valuable technique in out patients surgical proceedures.

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When Imam Ali, marching at the head of his army towards Syria, reached Ambar, the landlords of the place came out to meet him in zeal of their love, faithfulness and respect, no sooner had they seen Imam Ali they got down from their horses and started running in front of him. Imam Ali asked the reason of their strange actions. They replied that it was their custom to show their love and respect in that way. Imam Ali replied: "By Allah, by your action you do no good whatsoever to your rulers but you tire yourself and put yourself in toils in this world and in trouble in the next. How unfortunate is that exertion, which brings harm here and in the Hereafter and how useful is that ease which keeps you in comfort in this world and away from the Hell in the next.

Hazrat Ali (Karmulha Wajhay)