

COMPARISON OF PERI OPERATIVE HEMODYNAMIC STABILITY IN ELECTIVE LOWER SEGMENT CESAREAN SECTION UNDER SPINAL ANESTHESIA WITH 0.5% OR 0.75% INJECTION BUPIVACAINE

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ABSTRACT

Background:

Objective: To compare peri-Operative hemodynamic stability in elective lower segment Cesarean Section under spinal anesthesia with 0.5% or 0.75% injection Bupivacaine.

Methods: This was randomized controlled trial conducted at Department of Anesthesiology Combined Military Hospital Kharian; Study was conducted from November 2023 to February 2024 Total 74 patients (37 in each group) were included in the study. Patients were randomly divided into two groups with the help of random numbers generated through excel. In Group-A patients were administered 0.5% Bupivacaine solution and in Group-B patients were administered 0.75% of Bupivacaine solution. Heart rate (HR), electrocardiogram (ECG), non-invasive blood pressure (NIBP) and pulse oxymetry (SpO₂) readings were taken every three minutes for the first half an hour and every fifteen minutes thereafter. Hypotension, bradycardia was noted down as per standard operational definition. Any side effects/adverse events such as hypotension, bradycardia, nausea and vomiting were documented and managed as per institutional protocol.

Results: Results of this study showed that systolic, diastolic blood pressure and heart rate showed no significant difference between groups at baseline, 10, 20 and 30 minutes respectively. No significant difference was seen between study groups for hypotension (p-value=0.643), bradycardia (p-value=0.691), nausea (p-value=0.235) and vomiting (p-value=0.235) respectively. Frequency of nausea was higher in 0.75% bupivacaine.

Conclusion: Results of this study demonstrate no significant difference between 0.5% and 0.75% bupivacaine for hemodynamic changes as well as for bradycardia, hypotension and nausea/vomiting.

Key Words: Hemodynamic, Elective, Cesarean Section, Spinal anesthesia, Bupivacaine

INTRODUCTION

Spinal anaesthesia has been considered as the most safe and effective technique of anaesthesia for obstetric patients and is used extensively worldwide ⁽¹⁾. The choice of local anaesthetic solution used should be beneficial to the pregnant female and least depressant to the neonate while achieving adequate sensory and motor block for surgery ⁽²⁾. Bupivacaine is the most commonly used local anaesthetic for spinal anaesthesia ⁽³⁾. Despite of being successful and cost effective method of regional anaesthesia, spinal anaesthesia has undesirable side effects including hypotension and bradycardia ⁽⁴⁾.

Hypotension is common in spinal anesthesia and it occurs in approximately 30% of the normal patients and as much as 80-90% in obstetric population ⁽⁵⁾. It is believed to be caused by decrease in systemic vascular resistance or cardiac output as a result of inhibition of resting sympathetic tone. These hemodynamic changes can produce signs such as nausea, vomiting and dyspnea in patients after administration of intrathecal injection.⁽⁶⁾

The baricity of local anaesthetic solutions vary and solutions can be rendered hyperbaric by the addition of dextrose. Hyperbaric solutions are used more frequently than hypobaric and isobaric solutions and are associated with greater hemodynamic instability.⁽⁷⁾

It is observed that with the use of hyperbaric bupivacaine (0.75%) the incidence of hypotension can be 70-90% during the perioperative period.⁽⁸⁾ According to a research by Rofaeel et al., isobaric bupivacaine produced a higher sensory block level during combined spinal-epidural analgesia for vaginal birth than hyperbaric bupivacaine, with no statistically significant changes in the incidence of hypotension.⁽⁹⁾ According to another study conducted on the use of hyperbaric bupivacaine and its correlation on maternal hypotension, it was found that occurrence of spinal hypotension was associated with dose of hyperbaric bupivacaine >10mg. ⁽¹⁰⁾

In a population of patients undergoing emergency cesarean section, factors associated with greater incidence of hypotension were studied. Baseline systolic pressure <120mmHg, absence

of spinal additives, duration of co-loading with crystalloid solution <20mins and speed of administration of local anaesthetic solution <10s were all found to be statically significant in causing hypotension.⁽¹¹⁾

On the contrary, the results of a study have claimed greater hemodynamic fluctuations and more frequent requirement of vasopressor with the use of isobaric bupivacaine as compared to hyperbaric bupivacaine after spinal anaesthesia for elective cesarean section.⁽¹²⁾

Additional research is advised by the literature to ascertain the impact of spinal local anaesthetic baricity on the characteristics of the spinal block and the incidence of hypotension particularly in obstetric patients. Our study was initiated to assess various bupivacaine concentrations and its impact on maternal hemodynamic alterations post-operatively in light of the paucity of publications and contradictory results on this subject.

Objective: The objective of this study is to compare peri-Operative hemodynamic stability in elective lower segment Cesarean Section under spinal anesthesia with 0.5% or 0.75% injection Bupivacaine.

METHODS

This was a randomized controlled trial conducted at Department of Anesthesiology, Combined Military Hospital Kharian. Study was conducted from November 2023 to February 2024. Ethical approval was obtained from the Institutional ethical review board committee.

Sample size of 74 patients (37 in each group) is calculated with 95% confidence interval, 95% power of study and by taking expected mean value of systolic blood pressure with 0.75% and 0.5% Bupivacaine as 111.63 ± 5.96 and 117.16 ± 7.12 mmHg respectively.⁽¹³⁾ Sample selection was done with the help of non-probability purposive sampling technique. Females aged 20-40 years of age with ASA Status II planned to undergo elective caesarean section at term. Females with eclampsia/pre-eclampsia, diabetes mellitus, gestational diabetes mellitus, gestational period of <36 weeks, deranged liver function tests, COPD, congenital anomalies on antenatal ultrasound,

maternal hyper or hypothyroidism cases, deranged renal functions and electrolyte imbalance were excluded from the study. Written and verbal informed consent was obtained from all patients. Patients were randomly divided into two groups with the help of random numbers generated through excel. In Group-A patients were administered 0.5% Bupivacaine solution and in Group-B patients were administered 0.75% of Bupivacaine solution. Prior to surgery, each patient was given an intravenous preload of 10 milliliters per kilogram of body weight of Ringers lactate solution after fasting for 08 hours. After confirming free flow of clear cerebrospinal fluid (CSF) in all four quadrants using a 25 G Quincke spinal needle with the tip directed cranially and no barbitage, the consultant anesthesiologist administered spinal anesthesia to all patients in the same manner following lumbar puncture while they were sitting in the LV3-LV4 intervertebral space for more than 15 seconds. Heart rate, electrocardiogram (ECG), non-invasive blood pressure (NIBP) pulse oxymetry (SpO2) readings were taken every three minutes for the first half an hour and every fifteen minutes thereafter. Hypotension was considered clinically severe when the mean arterial pressure (MAP) dropped more than 20% from its initial levels or dropped below 70 mm Hg. It was administered 6 mg of intravenous ephedrine as part of the treatment, and the total quantity of ephedrine needed was assessed. A heart rate below 50 beats per minute was deemed clinically significant and was treated with 0.6 mg of intravenous atropine. The institution's procedure was followed to record and treat any adverse events, including hypotension, bradycardia, nausea, and vomiting.

DATA ANALYSIS: Data entry and analysis was done with SPSS version 26. Quantitative variables were presented with mean \pm SD and qualitative variables with frequency and percentage. Comparison of hemodynamic parameters will be done with the help of independent sample t-test and side effect will be compared between group with Chi square test. p-value ≤ 0.05 was considered statistically significant.

RESULTS

Table-1 presents systolic, diastolic and hear rate in study groups at baseline, 10 minutes, 20 minutes and at 30 minutes. No significant difference was seen between hemodynamic parameters during the follow up time duration. At baseline mean systolic blood pressure in Group-A and B was 127.73 and 127.76 mmHg while at 30 minute it 140 and 140.97 Mean diastolic blood pressure in Group-A and B was 86.11 and 86.97 mmHg while at 30 minutes it was 84.51 and 95.03 respectively. Mean heart rate at baseline in Group-A and B was 74.38 and 75.38 and at 30 minutes it was 80.59 and 81.59 respectively. Table-2 presents the side effect in both study groups. No significant difference was seen between study groups for hypotension (p-value=0.643), bradycardia (p-value=0.691), nausea (p-value=0.235) and vomiting (p-value=0.235) respectively. Frequency of nausea was higher in 0.75% bupivacaine.

TABLE-1: PATIENTS CHARACTERISTICS IN STUDY GROUPS

	Group-A (0.5%- Bupivacaine) n=37	Group-B (0.75%- Bupivacaine) n=37	p- value
Age	29.45±6.29	27.70±6.09	-
ASA- II Status	26(70.3%)	17(45.9%)	-
Systolic Blood Pressure			
Baseline	127.73±5.03	127.76±5.01	0.982
10 Minutes	121.78±5.16	121.86±5.31	0.947
20 Minutes	119.62±5.06	119.86±5.49	0.843
30 Minutes	140.00±6.00	140.97±5.89	0.484

Diastolic Blood Pressure			
Baseline	86.11±3.41	86.97±3.97	0.318
10 Minutes	84.24±3.47	85.22±4.10	0.274
20 Minutes	86.38±3.51	87.05±4.16	0.453
30 Minutes	84.51±3.53	85.03±4.11	0.566
Heart Rate			
Baseline	74.38±3.06	75.38±3.21	0.174
10 Minutes	81.00±3.17	82.05±3.27	0.163
20 Minutes	78.92±3.34	79.92±3.39	0.205
30 Minutes	80.59±3.35	81.59±3.33	0.202

TABLE-2: SIDE EFFECTS IN STUDY GROUPS

		Group-A (0.5%-Bupivacaine)		Group-B (0.75%-Bupivacaine)		p-value
		n=37		n=37		
		n	%	n	%	
Hypotension	Yes	3	8.1%	2	5.4%	0.643
	No	34	91.9%	35	94.6%	
Bradycardia	Yes	3	8.1%	4	10.8%	0.691
	No	34	91.9%	33	89.2%	
Nausea	Yes	5	13.5%	9	24.3%	0.235
	No	32	86.5%	28	75.7%	
Vomiting	Yes	7	18.9%	7	18.9%	-
	No	30	81.1%	30	81.1%	

DISCUSSION

When deciding on an anesthetic approach for a cesarean section, it is crucial to provide sufficient and safe maternal-fetal anesthesia. The usual protocol for a C-section involves spinal anesthesia and the administration of a variety of local anesthetics and analgesics.⁽¹⁴⁾ Patients having cesarean sections under spinal anesthesia are at an increased risk of hemodynamic complications. An significant factor influencing the effects of spinal blockade is the baricity of the local anesthetic.⁽¹⁵⁾

In this study we compared peri-Operative hemodynamic stability in elective lower segment Cesarean Section under spinal anesthesia with 0.5% or 0.75% injection Bupivacaine. Results of this study showed that systolic, diastolic blood pressure and heart rate showed no significant difference between groups at baseline, 10, 20 and 30 minutes respectively. Consistent with the results of this study a local randomized controlled trial reported no significant difference for systolic blood pressure, heart and mean arterial pressure between 0.5% and 0.75% hyperbaric bupivacaine.⁽¹⁶⁾ Similar findings were reported by another local study in which no significant difference was reported between 0.5% and 0.75% Bupivacaine for hemodynamic changes (systolic, diastolic blood pressure and heart rate).⁽¹⁷⁾ Contrary to these findings Shumaila Ali Rai in her study reported better hemodynamic stability and nausea/vomiting with 0.5% bupivacaine.⁽¹⁸⁾

Physiological changes during pregnancy may aid in the dispersion of bupivacaine in the subarachnoid space, which in turn causes hemodynamic abnormalities during spinal anesthesia with hyperbaric bupivacaine during a caesarean delivery. Aortocaval compression, circulating blood volume, and the extent to which the obstruction has extended all have a role in how often and how severely these alterations occur, which in turn may have negative impacts on the notion and lead to serious maternal morbidity and death.⁽¹⁹⁾ In this study we assessed the most common side effects encountered during C-section with spinal anesthesia. i.e. (Bradycardia, hypotension and nausea/vomiting). In this study no significant difference was seen for side effects

(hypotension, bradycardia, nausea and vomiting) between groups. Contrary to the findings of this study a local randomized controlled trial reported higher frequency of nausea and vomiting with 0.75% hyperbaric bupivacaine.⁽¹⁶⁾ Shumaila Ali Rai in his study reported higher frequency of Bradycardia with 0.75% bupivacaine (8%) as compared to 0.5% bupivacaine (3%)⁽¹⁸⁾. Other studies have also reported higher frequency of Bradycardia with 0.75% bupivacaine.^(16, 20)

CONCLUSION

Results of this study demonstrate no significant difference between 0.5% and 0.75% bupivacaine for hemodynamic changes as well as for bradycardia, hypotension and nausea/vomiting.

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