COMPARISON BETWEEN 0.5% AND 0.75% HYPERBARIC BUPIVACAINE GIVEN INTRA-THECALLY IN ELECTIVE CAESAREAN SECTION

Shumaila Ali Rai[1], Aamer Mahmood Malak[2], Chaudary Amjad Ali[3]

[1-3] Department of Anesthesiology, Combined Military Hospital Multan - Pakistan.
Address for Correspondence:
Dr. Shumaila Ali Rai
House No. 2632/13, Street No. 2, Al-Raheem Colony, Nishtar Road Multan - Pakistan.
Email: drshumailarai@yahoo.com
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ABSTRACT

Objective: To determine hemodynamic changes by using 0.75% and 0.50% hyperbaric bupivacaine for spinal anesthesia in caesarean section.

Methodology: In this randomized clinical trial 200 patients of elective cesarean section with primigravida having age 20-40 years were included. Group I patients received 0.5% hyperbaric bupivacaine for spinal anesthesia and Group II patients received 0.75% hyperbaric bupivacaine for induction. In all patients, a total of 10.5 mg dose of hyperbaric bupivacaine was given. Patient's systolic blood pressure (SBP) and heart rate were noted before spinal anesthesia, immediately after anesthesia, after 5 minutes and 10 minutes of anesthesia. Necessity of rescue ephedrine and incidence of nausea/vomiting was noted in all patients.

Results: After 5 minutes of spinal anesthesia, SBP significantly dropped in patients who received 0.75% hyperbaric bupivacaine as compared to patients who received 0.5% bupivacaine 107.95 ±13.49 mmHg vs. 112.76±11.49 mmHg, respectively with p value 0.007. After 10 minutes of anesthesia there was no difference in SBP in both groups. There was significant difference in heart rate after 10 minutes of anesthesia and decrease in heart rate was more in group II (p value 0.006). Nausea/vomiting occurred in 23% patients in group II and in only 1% patients in group I. Rescue ephedrine was given in 21% patients in group I and 35% patients in group II. Level of block was T6 in 25% patients in group I and 47% patients in group II (p value 0.001).

Conclusion: 0.5% hyperbaric bupivacaine was associated with better hemodynamic stability and reduced risk of bradycardia, necessity of rescue ephedrine and nausea/vomiting.

Key Words: Spinal anesthesia, Bupivacaine, Hemodynamic stability

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INTRODUCTION

Spinal anesthesia is associated with significantly less morbidity and risk of death as compared to general anesthesia and is now commonly used in surgeries involving lower abdomen, lower limbs and cesarean section[1]. In cesarean section, it allows the mother to stay awake, avoidance of the risk of failure of endotracheal tube and allows early return to work[2]. It is safe, easy to administer and an effective practice and provides quick and steadfast anesthesia with adequate muscle relaxation[3]. However spinal anesthesia is also not free from risks of hypotension and bradycardia due to sympathetic block during spinal anesthesia. This effect is aggravated in pregnant females due to aorto-caval compression of gravid-uterus[4,5]. There is even a risk of sudden cardiac arrest due to excessive sympathetic blockage[6,7].

Bupivacaine is commonly used for induction of spinal anesthesia during cesarean section. Hyperbaric 0.5% bupivacaine and hyperbaric 0.75% bupivacaine are two commonly used concentrations of bupivacaine. Some studies have compared the effects of hyperbaric 0.5% bupivacaine with hyperbaric 0.75% bupivacaine on hemodynamics and have found no significant differences in both of these drugs and have recommended that 0.5% bupivacaine is better than 0.75% hyperbaric bupivacaine but on the basis of unclear evidences[8,9]. In this study, we determined the hemodynamic changes in patients who were given 0.75 % bupivacaine versus 0.5% hyperbaric bupivacaine for spinal anesthesia in caesarean section.

METHODOLGY

This randomized clinical trial was conducted in Anesthesiology Department of Combined Military Hospital, Multan, from November 01, 2015 to April 30, 2016. Two hundred patients of elective cesarean section with primigravida having age 20-40 years and with gestational age >37 weeks were included. Previously diagnosed cases of diabetes, hypertension, ischemic heart disease, malignancy and BMI >35 Kg/m^2 were excluded. These patients were divided into two equal groups using draw randomization. Group I patients received 0.5% hyperbaric bupivacaine for spinal anesthesia and group II patients received 0.75% hyperbaric bupivacaine for induction.

Sample size was calculated by considering the expected necessity of rescue ephedrine in 56.6% patients who received 0.5% hyperbaric bupivacaine and 30% in patients who received 0.75% hyperbaric bupivacaine[8], power of test 80% and level of significance as 5%, the calculated sample size was 102 patients. However, we took 200 patients to cover for drop outs etc. Proper permission was taken from Institutional ethical committee to conduct this study. Informed consent was taken from the patients after describing the objectives of this study, their voluntary participation and ensuring confidentiality of the provided information.In all patients, a total of 10.5 mg dose of hyperbaric bupivacaine was given. In group I, 2.1 ml of 0.5% bupivacaine was given and in group II, 1.4 ml hyperbaric 0.75% bupivacaine was given. Spinal anesthesia was induced after lumber puncture at the level of lumber vertebra 3 & 4 by using a 25 G Quincke spinal needle and after confirming a free flow for 20 seconds in all quadrants.

Patient's systolic blood pressure and heart rate were noted before spinal anesthesia, immediately after anesthesia, after 5 and 10 minutes of anesthesia. Necessity of rescue ephedrine and incidence of nausea/vomiting was noted in all patients. Bradycardia was defined as decrease in heart rate of more than 20% of the baseline heart rate. Rescue ephedrine (5 mg) was given if the blood pressure decreases >20% of the baseline SBP.

For data interpretation we used SPSS v20. Systolic blood pressure and heart rate were compared using student's t-test. Frequency of nausea/vomiting, rescue ephedrine and block level were compared using chi-square test.

RESULTS

Baseline variables of patients are depicted in Table 1. There was no significant difference between the age and BMI of study participants. Duration of surgery was also the same between the 02 groups. There was statistically significant difference between the baseline systolic blood pressure (SBP) and heart rate of patients of both groups.

After 5 minutes of spinal anesthesia, SBP significantly dropped in patients who received 0.75% hyperbaric bupivacaine as compared to patients who received 0.5% bupivacaine 107.95 ±13.49 mmHg vs. 112.76±11.49 mmHg, respectively with p value 0.007. After 10 minutes of anesthesia there was no difference in SBP in both groups. Heart rate after 5 minutes was 96.38 ±13.46 beats/min in group II as compared to 99.54 ±12.49 beats/min in group I. There was significant difference in heart rate after 10 minutes of anesthesia and decrease in heart rate was more in group II (p value 0.006) as shown inTable 2.

Nausea/vomiting occurred in 23% patients in group II and in only 1% patients in group I. Frequency of bradycardia was not much different between the groups. Rescue ephedrine was given in 21% patients in group I and 35% patients in group II. Level of block was T6 in 25% patients in group I and 47.0% patients in group II (p value 0.001, Table 3).

DISCUSSION

In this study we compared the hemodynamic and adverse effects of 0.5% versus 0.75% hyperbaric bupivacaine. We found significant positive effects of hyperbaric 0.5% bupivacaine on hemodynamics of patients as compared to 0.75% bupivacaine. We found less incidence of adverse effects with 0.5% hyperbaric bupivacaine. In this study, we used same doses of bupivacaine regardless of the height of participants because studies have concluded that there is no effect of height of patients on the required doses of bupivacaine for spinal anesthesia[10-12]. We used 10.5 mg bupivacaine

Table 1: Baseline variables

Variables	Group I (0.5% Hyperbaric Bupivacaine	Group II (0.75% Hyperbaric Bupivacaine	P value
Age (Years)	31.33 ±6.78	30.65 ±5.39	0.43
BMI (Kg/m2)	21.76 ±6.73	21.18 ±6.23	0.53
Duration of Surgery (mins)	49.21 ±6.45	48.15 ±6.96	0.27
Baseline SBP (mmHg)	128.62 ±7.94	127.95 ±9.12	0.58
Baseline Heart Rate (Beats/min)	107.09 ±6.89	108.38 ±7.53	0.21

Table 2: Comparison of systolic blood pressure and heart rate

Variables	Group I (0.5% Hyperbaric Bupivacaine	Group II (0.75% Hyperbaric Bupivacaine	P value
SBP immediately after Induction (mmHg)	128.0 ±7.85	127.66 ±8.83	0.72
SBP after 5 mins (mmHg)	112.76 ±11.49	107.95 ±13.49	0.007
SBP after 10 mins (mmHg)	116.67 ±12.92	115.09 ±11.54	0.36
Heart Rate immediately after Induction (beats/min)	107.89 ±7.39	107.36 ±6.31	0.58
Heart Rate after 5 mins (beats/min)	99.54 ±12.49	96.38 ±13.46	0.087
Heart Rate after 10 mins (beats/min)	93.10 ±18.06	86.57 ±15.19	0.006

Table 3: Comparison of other variables

Variables		Group I (0.5% Hyperbaric Bupivacaine	Group II (0.75% Hyperbaric Bupivacaine	P-value
Nausea/vomiting (%)		1 (1.0%)	23 (23.0%)	<0.001
Bradycardia (%)		3 (3.0%)	8 (8.0%)	0.12
Rescue Ephedrine (%)		21 (21.0%)	35 (35.0%)	0.03
Level of Block (%)	T4	75 (75.0%)	53 (53.0%)	0.001
	T6	25 (25.0%)	47 (47.0%)	

by keeping this fact in mind that doses <10 mg may cause inadequate anesthesia thereby necessitating additional need of analgesics[13,14]. However some authors have concluded that 6-7 mg of bupivacaine is enough to achieve adequate anesthesia for cesarean section[15].

In our study, SPB after 5 minutes of spinal anesthesia significantly dropped in patients with 0.75% bupivacaine administration. SBP was 107.95 ±13.49 mmHg in 0.75% bupivacaine group and 112.76 ±11.49 mmHg in 0.5% bupivacaine group. Goyal et al[16] also found significant difference in SBP. In their study, SBP after 5 minutes of spinal anesthesia was 109.20 ±21.17 mmHg in 0.75% hyperbaric bupivacaine patients and 113.23 ±20.27 in 0.5% hyperbaric bupivacaine patients.

Similarly Amjad et al[9] also did not found any significant difference in hemodynamics of patients. SBP after 3 minutes of aesthesia in their study was 108.30 ±22.16 in 0.5% bupivacaine group and 112.33 ±21.27 mmHg in 0.75% bupivacaine group. The results of these studies are contrary to the results of present study. In our study, heart rate was significantly dropped in group II patients, 86.57 ±15.19 beats/min versus 93.10 ±18.06 beats/min in group I. on the contrary, Sikander et al[8] and Amjad et al[9] did not found any difference in heart rate at any interval between groups. The difference in the results of these studies and the present study may be due to large sample size in our study.

In present study, nausea/vomiting occurred in 23.0% patients with 0.75% bupivacaine and in only 1% patient in group I. In the study by Sikander et al[8], the incidence of nausea/vomiting was 34% in 0.75% hyperbaric bupivacaine group. Studies have reported upto 60% rate of nausea/vomiting after administration of hyperbaric bupivacaine[16].

In our study bradycardia occurred in 3% patients with 0.5% bupivacaine and in 8% patients with 0.75% bupivacaine. Other researchers also found higher rates of bradycardia after 0.75% hyperbaric bupivacaine administration[8,9]. Chari et al[17] found 12% incidence of bradycardia after administration of 0.75% bupivacaine. Incidence of bradycardia was 13.3% in the study of Goyal et al[16]. In our study, rescue ephedrine was given to 35% patients in group II and only 21% patients in group I. Sikander et al also found higher need of rescue ephedrine in 0.75% hyperbaric bupivacaine group[8].

In our study, level of block was >T4 in all patients in both groups; there were 47% patients in block level at T6 in group II and 25% patients in group I. some studies have concluded that level of block >T4 is associated with higher incidence of hypotension and bradycardia[18-20]. But in our study we did not found this effect. Sikander et al[8] also found no effect of level of block on bradycardia and need of rescue ephedrine.

CONCLUSION

0.5% hyperbaric bupivacaine is associated with better hemodynamic stability and reduced risk of bradycardia, necessity of rescue ephedrine and nausea/vomiting as compared to 0.75% hyperbaric bupivacaine.

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CONTRIBUTORS

SAR conceived the idea, planned the study and drafted the manuscript. CAA did statistical analysis and review. AMM designed the research methodology and supervised the study. All authors contributed significantly to the submitted manuscript.