COMPARISON OF TWO DIFFERENT SPINAL DOSES OF 0.75% BUPIVACAINE CAUSING MATERNAL HYPOTENSION IN ELECTIVE CAESAREAN SECTION

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ABSTRACT

Objective: To compare the frequency of maternal hypotension between spinal doses of 7.5 mg and 15 mg of 0.75% hyperbaric bupivacaine in elective caesarean section.

Study Design: Quasi Experimental Study.

Place and Duration of Study: The study was conducted in Department of Anesthesiology, Combined Military Hospital Kharian, from 11th May 2016 to 10thNov 2016.

Methodology: A total of 130 cases were selected for the study and equally divided in two group (A or B) after approval by ethics committee of hospital via using the random numbers table. In group A, 7.5 mg of 0.75% of bupivacaine administered at L3-4 in subarachnoid space after confirmation of CSF withdrawal, while in group B, 15mg of 0.75% of bupivacaine at the same space have been introduced, hence both groups were preloaded with Hartmann's solution @15ml/kg body weight.

Results: In our study, out of 130 cases (65 in each group), mean age was calculated as 28.97 ± 2.52 years in group-A and 29.15 ± 2.52 years in group-B, frequency of maternal hypotension was recorded as 47 (72.31%) in group-A and 61 (93.85%) in group-B while 18 (27.69%) in group-A and 4 (6.15%) had no hypotension, *p*-value calculated with 0.001 indicating a significant difference between these groups.

Conclusion: The frequency of maternal hypotension was significantly lower with spinal doses of 7.5 mg and when compared with 15 mg of 0.75% hyperbaric bupivacaine in elective caesarean section.

Keywords: Elective caesarean section, Maternal hypotension,Spinal anesthesia, Spinal doses of 7.5 mg and 15 mg of 0.75% hyperbaric bupivacaine.

INTRODUCTION

General anaesthesia is no longer a choice of technique for caesarean section because of its associated high risk of maternal morbidity and mortality. Instead, spinal anaesthesia has become the safest technique for the last two decades for caesarean section. Spinal anaesthesia is also preferred over epidural anaesthesia due to the case of maneuver, prompt onset, effective sensory and motor block and low failure rate[1]. However, the spinal anaesthesia is associated with some systemic toxicities which are the major complication of spinal anaesthesia[2]. One of the commonest systemic complication of spinal anaesthesia is maternal hypotension with reported high incidence[3]. Maternal hypotension may results in decreased blood flow to the uterus and through placenta to the fetus. Impaired placental circulation may affect vital organs of the fetus, fetal well-being & the neonatal outcome. Nausea, vomiting and dizziness are also associated with hypotension which may interfere with the surgery[4].

Hyperbaric bupivacaine is one of the commonly administered spinal anaesthetic agents for caesarean section that is associated with significant maternal hypotension[5]. The magnitude of problem is very high with conventional dose of 12-15 mg hyperbaric bupivacaine with reported incidence of 69% to 80%[6]. Adjusting the appropriate dose of hyperbaric bupivacaine will produce effective surgical anaesthesia with minimal maternal and neonatal side effects[7]. There is some evidence that

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reducing the dose of hyperbaric bupivacaine for spinal anesthesia has significant advantages over a conventional dose technique. It has principally favorable effect on maternal hemodynamic stability as well as greater maternal satisfaction due to reduced motor block of shorter duration[8]. In 2010, Mebazaa *et al*, carried out a study to compare the efficacy and adverse effects of low dose spinal bupivacaine (7.5 mg) with conventional dose (10mg) for elective caesarean section which revealed 23% reduction in the incidence of maternal hypotension in the low dose group as compared to conventional group (68% vs 88%; *p*=0.03)[9].

The objective of study was to evaluate whether the administration of 7.5mg of 0.75% hyperbaric bupivacaine was helpful than 15mg of 0.75% hyperbaric bupivacaine in reducing maternal hypotension in spinal anaesthesia during caesarean section in local population. The results which obtained from this study will help us for preventing hypotension in these patients who undergoes for elective caesarean section under regional anaesthesia and to avoid harmful medication like volume overload and use of vasopressors for correction of drug induced hypotension.

METHODOLOGY

The quasi experimental study was carried out in Combined Military Hospital, Kharian (Pakistan) between 11th May 2016 to 10th Nov 2016 after approval by thehospital ethical committee. Sample size was calculated by WHO sample size calculator with level of significance 0.05%, confidence level 95%, Power of test 80%, anticipated population 1 proportion 88%, anticipated population 2 proportion 68% and sample size n=130 (65 in each group)[9].

All patients between the age group of 25-35 years, having ASA physical status I & II undergoing elective cesarean section were selected. All patients selected in sample were (assigned on number from 1 to 130). A computer generated random number table was used, first 3 number of random no table was used to place first 65 sample patients in group A, while remaining 65 sample patients in group B were placed. After taking necessary information of the patient as name, age, serial number, hospital record number, address and phone number of each patient with consent was noted as per study requirement. All patients were equally divided in two groups (A or B) by using the random numbers table. In all cases, spinal anaesthesia was administered under the guidance and supervision of consultant anaesthesiologist.

While the exclusion criteria was; patients with uncontrolled systemic disease (hypertension or diabetes mellitus), cases of emergency caesarean section and patients having known allergy to hyperbaric bupivacaine.

Group A (7.5mg bupivacaine group n=65) Cases of this group were administered 7.5mg of 0.75% hyperbaric bupivacaine through interspace between lumber 3 & 4 spines. Group B (15mg bupivacaine group n=65) Cases of this group were administered 15mg of 0.75% hyperbaric bupivacaine through interspace between lumber 3 & 4 spines. Both groups were preloaded with Hartmann's solution 15ml/kg body weight. Spinal anaesthesia was given by injecting 0.75% hyperbaric bupivacaine through interspace between lumber 3 & 4 spines with 25 gauge Quincke spinal needle. Blood pressure was recorded immediately before and 03 minutes after administration of spinal anaesthesia.

The datawas analysed SPSS 21 and SPSS (Statistical Package for the Social Sciences) version 21. Mean and standard deviation (SD) was used to describe results of quantitative data. Frequency and percentage was used to describe qualitative data. Post stratification Chi square test/fishers exact was applied to compare the difference of hypotension between two groups. The *p*-value of <0.05 was considered statistically significant.

RESULTS

A total of 130 cases fulfilling the inclusion/exclusion criteria were enrolled to compare the frequency of maternal hypotension

between spinal doses of 7.5 mg and 15 mg of 0.75% hyperbaric bupivacaine in elective cesarean section.

Age distribution of the patients was done, it shows that 44 (67.69%) in goup-A and 48 (73.85%) in group-B were between 25-30 years of age while 21(32.31%) in group-A and 17(2.15%) in group-B were between 31-35 years of age, mean ± sd was calculated as 28.97±2.52 in group-A and 29.15 ± 2.52 years in group-B.

Mean gestational age of the patients was 39.58 ± 1.66 in Group-A and 39.55 ± 1.63 years in group-B.

Mean parity of the patients was 2.6 ± 1.26 in group-A and 2.51 ± 1.23 paras in groupB (table-I).

Table-I: Distribution according to age,gestational age and parity wise.

	Group-A (n=65)		Group-B (n=65)	
	No. of patients (%)	Mean ± SD	No. of patients (%)	Mean ± SD
Age (in years)				
25-30	44 (67.69)	28.97 ± 2.52 yrs	48 (73.85)	29.15 ± 2.52 yrs
31-35	21 (32.31)		17 (26.15)	
Gestational Age in wks				
37-40	40 (61.54)	39.58 ± 1.66 wks	41 (63.08)	39.55 ± 1.63 wks
41-42	25 (38.46)		24 (36.92)	
Parity				
1-3	45 (69.23)	2.6 ± 1.26	46 (70.77)	2.51 ± 1.23
>3	20 (0.77)		19 (29.23)	

Mean height, weight and BMI in Group-A was recorded as 5.3 ± 0.87 feet, 69.74 ± 4.28 kg and 28.95 ± 2.51 while 5.5 ± 0.72 feet, 67.41 ± 3.47kgs and 28.74 ± 2.14 BMI in group-B.

Frequency of ASA status of the patients was recorded as 37 (56.92%) in group-A and 41 (63.08%) in group-B had ASA-I while 28 (43.08%) in group-A and 24 (36.92%) in Group-B had ASA-II (table-II).

Frequency of maternal hypotension was recorded as 47 (72.31%) in group-A and 61 (93.85%) in group-B while 18 (27.69%) in group-A and 4 (6.15%) had no hypotension, *p*-value was found as 0.001 viewing a substantialvariance between the two groups (table-III).

DISCUSSION

Spinal anesthesia is one of the modality of neuraxial block techniques in which the local anesthetic agent is injected in to the subarachnoid space so as to block the nerves supplying corresponding structures of the body. It has the advantage in terms of local blockade of sensations thus sparing rest of the body hemodynamics[10-12]. More than 90% of caesarean sections are carried out under regional anaesthesia in developed countries, spinal anaesthesia being used in elective caesarean sections and emergencies in more than 80% and more than 40% of cases, respectively. There is a 33% incidence of hypotension caused by spinal block in the general population (non-expectant mothers). This is greater than 90% in pregnant females (depending on the definition used) ma-

Table-II: Frequency of ASA status of the patients (n=130).

ASA Score	Group-A (n=65)	Group-B (n=65)	*p*-value
	n (%)	n (%)	
I	37 (56.92)	41 (63.08)	0.001
II	28 (43.08)	24 (36.92)	

Table-III: Stratification of maternal hypotension with regards to age gestational age, parity and BMI.

		Maternal Hypotension		*p*-value
Age (in years)	**Group**	**Yes**	**No**	
25-30	A	30	14	<0.001
	B	46	02	
31-35	A	17	04	0.61
	B	15	02	
Gestational age in wks	A	27	13	0.058
	B	35	06	
37-40	A	20	05	1.00
41-42	B	20	04	
Parity	A	30	15	
1-3	B	43	03	0.001
>3	A	17	03	
	B	18	01	0.60
BMI	A	30	12	
<30	B	48	01	<0.001
>30	A	17	06	
	B	13	03	0.71

king this the most frequently occurring adverse effect caused by the intervention described to date. Multiple pregnancies are not considered to be a risk factor for hypotension caused by spinal anaesthesia for caesarean section compared to single pregnancies. It is widely seen that with higher doses of bupivacaine @ 12 and 15 mg, causes peripheral vasodilation which may increase 69% to 80% chances of maternal and neonatal morbidity. Therefore optimal spinal dose of bupivacaine have sought for prevention of these lifesaving risks[13-16].

Maternal hypotension is expected when drug bupivacaine reaches at thoracic T4 level that block sympathetic nerves supplying heart-during subarachnoid block (SAB) technique in a caesarean section. We need to use parenteral medication and may require general anesthesia to control the blood pressure and patient safety, thereby providing a comfortable intra-operative period for the patient and gynecologist, these risks must be avoided. This explained why it was practically inevitable that a patient presents total pharmacological sympathectomy. Spinal anaesthesia-induced hypotension for caesarean section is triggered by many factors, including.

Reduce peripheral vascular resistance (PVR), venous return (VR) and cardiac output CO) due to sympathetic block, bradycardia can be seen due to low VR in extensive blocks[17].

Aortocaval compression is mostly in third trimester cause hypotension by mechanical phenomena of the pregnant uterus especially in supine position.

An autonomicimbalancein pregnant mother that may cause relative sympathetic hyperactivity which is more vulnerable for hypotension during SAB[18].

It should not be forgotten that these patients are, occasionally, submitted to very prolonged periods of fasting.

In our study, frequency of maternal hypotension was recorded as 47 (72.31%) in group-A and 61 (93.85%) in group-B while 18 (27.69%) in group-A and 4 (6.15%) had no hypo-tension, *p*-value was calculated as 0.001 viewing a substantial difference between the two groups.

A previous study conducted in 2010, Mebazaa *et al* compared the efficacy and adverse effects of low dose spinal bupivacaine (7.5 mg) with conventional dose (10mg) for elective caesarean section which revealed 23% reduction in the incidence of maternal hypotension in the low dose group as compared to conventional group (68% vs 88%; *p*=0.03)[9].

The main aim of lowe dose spinal drug bupivacaine is to decrease maternal side-effects (hypotension, intraoperative nausea/vomiting and PONV), short stay in recovery room, and improve maternal satisfaction[10]. However, such a strategy could compromise the adequacy of anaesthesia, and require supplementary analgesia, with possible neonatal consequences and may require conversion to general anaesthesia, a situation known as a risk factor for anaesthesia-related maternal morbidity and mortality[11-12]. But in our study we did not record any neonatal consequences. In this regard a local study[13] evaluated the interval of time required for the maximal sensoryblock along with hemodynamic variations of pulse and blood pressure after spinal anesthesia among Pakistani women undergoing elective Caesarean Sections and concluded that 1.6ml of 0.75% injection bupivacaine injected via spinal needle in thesubarachnoid space at the level of L3-L4 is sufficient to provide an adequate T4 sensory block.

In a previous study[14], the use of low dose bupivacaine (7.5 to 10 mg) may not cover the analgesic effect as whole, the patient could feel pain atabout 71%, so adjuvants were used with local anesthetic to improve the analgesic effect, this effect was not included in our study being the limitation of our research which may be done in coming trials. However, the addition of opoids drugs like (tramal 30mg, sufentanil 5.0 µg) and clonidine 75µg with bupivacaine provided adequate anesthesia and postoperative analgesia, butmay produce side effects like Clonidine caused

more perioperative sedation and extended time to motor block recovery. Pruritus was evident with the use of opioids.

CONCLUION

"Spinal dose of 7.5mg of 0.75% hyperbaric bupivacaine caused less maternal hypotension as compared to 15mg of 0.75% hyperbaric bupivacaine in the cases of caesarean section" was justified and these results were helpful for enabling us to prevent significant hypotension in patients with elective caesarean section under spinal anaesthesia as well as to avoid harmful medication like volume overload and use of vasopressors for correction of drug induced hypotension[15-18].

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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