

Frequency of hypotension with hyperbaric vs sequential administration of plain & hyperbaric bupivacaine for spinal anesthesia in patients undergoing cesarean section

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Abstract: -

Background

Hypotension during spinal anesthesia is one of the main concerns in cesarean section and there are very limited studies on the sequential administration of plain & hyperbaric bupivacaine in which the frequency of hypotension proves to be much less than either plain or hyperbaric bupivacaine alone.

Objective

To compare frequency of hypotension with hyperbaric vs sequential administration of plain & hyperbaric bupivacaine for spinal anesthesia in patients undergoing cesarean section

Methodology

This Randomized controlled trial was conducted at Anesthesia Department, Ganga Ram Hospital, Lahore. Total 60 patients presenting to Obstetrics department from the Obstetrics operation theatre of SGRH, Lahore. Patients were randomly divided in two groups by using lottery method. Preoperative assessment was done a day prior to surgery. The patients of both groups were cannulated with two 18G intravenous lines and was preloaded with 10ml / kg of crystalloid solution.

The baseline noninvasive blood pressures, heart rates & oxygen saturations of the patients were recorded. Patients were placed in sitting position & subarachnoid block was given at the L3-L4 or L4-L5 interspace. The patients in Group A was given 12 mg 0.75% hyperbaric bupivacaine Injection in 1.6 ml of solution and the patients in Group B received sequentially 6 mg 0.5% plain bupivacaine i.e 1.2ml of the drug and then 6 mg of 0.75% hyperbaric bupivacaine i.e 0.8 ml of the drug. Patients were immediately turned supine and the operating table was set to a horizontal position. Oxygen was given at a rate of 4 L min⁻¹ & maternal blood pressure was noted, non-invasively every 1 min for 5 min after the subarachnoid block, and then every 5 minutes until the procedure was completed. Each episode of hypotension was noted as per operational definition.

Results:

Mean age of women in Group-A & B was 26.00±2.75 and 25.53±3.10 years. In Group-A 17(56.7%) women suffered from hypotension while in Group-B only 13(43.4%) women suffered from hypotension. in Group-A frequency of hypotension was high but it was not significant statistically. i.e. (p-value=0.302)

Conclusion

Results of this study demonstrate that with the use of Sequential Plain + Hyperbaric bupivacaine frequency of hypotension was less as compared to hyperbaric bupivacaine alone for spinal anesthesia in patients undergoing cesarean section.

Keywords: Cesarean section, Hypotension, Hyperbaric, Sequential, Administration, Plain, Hyperbaric bupivacaine, Spinal anesthesia.

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Introduction:

Spinal anesthesia is popular for the cesarean section because it offers a profound & symmetrical sensory, and motor block of high quality and has many advantages including simplicity, dense blockade, rapid onset, cost effectiveness & there are fewer issues with airway control, and medicines used in general anaesthesia are less likely to cause neonatal depression..(1-3) However, if suitable preventative measures are not implemented, post-spinal hypotension is recorded in 60% of parturients, negating these benefits.(4) Females who are pregnant are more sensitive to local anesthetics and are more susceptible to the effects of sympathetic inhibition.. Nausea, dizziness, light - headedness, decreased cardiac output, decreased utero-placental blood flow and poor foetal oxygenation are all symptoms of persistent hypotension.(5)

To avoid spinal hypotension, a number of techniques have been used. Physical techniques (compressed stockings, left uterine relocation), iv fluids expansion, and the administration of sympathomimetic medications prophylactically are among them.(6) Bupivacaine, a local anesthetic agent, is commonly used for spinal anesthesia as a simple or hyperbaric solution. In the obstetric population, both conventional and hyperbaric bupivacaine solutions have been tested for subarachnoid block.(7)

A study reported the incidence of hypotension found to be 13.9% and 66.7% in the sequential administration of plain and hyperbaric bupivacaine versus hyperbaric bupivacaine alone. The incidence of hypotension was significantly different in both groups. Hence the researchers concluded that the incidence of hypotension can be lowered using sequential administration of plain and hyperbaric injections of bupivacaine for subarachnoid block during cesarean section. The function of plain bupivacaine to produce dense anesthesia of the surgical site, followed by hyperbaric bupivacaine to achieve spread to T5 anesthesia to address visceral pain. (8)

The rationale of the study is that hypotension is a very frequent complication of spinal anesthesia and there are very limited studies on the sequential administration of plain & hyperbaric bupivacaine in which the incidence of hypotension proves to be much less than either plain or hyperbaric bupivacaine alone so I want to confirm the results using a bit higher dose i.e 12mg of bupivacaine in both groups.

Methodology:

This randomized controlled trial was conducted in Department of Anesthesia, Sir Ganga Ram Hospital, FJMC, Lahore. Sample size of 60 cases; 30 cases in each group, is calculated with 80% power of test and 95% confidence interval and taking expected percentage of hypotension i.e. 13.9% with administration of plain and hyperbaric bupivacaine and 66.7% with hyperbaric bupivacaine alone.

Female patients of age range 18-35 years with gestational age 32-40 weeks (through Antenatal record) with Parity<6, singleton pregnancy and ASA 1 & 2 patients were included. ASA3 or 4 patients, multiple pregnancy, females with comorbidities, renal liver cardiac disease, gestational diabetes, any obstetric complications like placentas previa, contraindications to spinal anesthesia were excluded from the study.

After approval of the synopsis by CPSP and hospital ethical committee. Informed consent was obtained. Patients were

randomly divided in two equal groups by using lottery method. Preoperative assessment was done a day prior to surgery.

The patients of both groups were cannulated with two 18G intravenous lines and was preloaded with 10ml/kg of crystalloid solution. The baseline non-invasive blood pressures, heart rates & oxygen saturations of the patients were recorded. Patients were placed in sitting position & subarachnoid block was given at the L3-L4 or L4-L5 interspace.

The patients in Group A was given 12 mg 0.75% hyperbaric bupivacaine Injection in 1.6 ml of solution and the patients in Group B received sequentially 6 mg 0.5% plain bupivacaine i.e 1.2ml of the drug and then 6 mg of 0.75% hyperbaric bupivacaine i.e 0.8 ml of the drug. Patients were immediately turned supine and the operating table was set to a horizontal position.

Oxygen was given at a rate of 4 L min⁻¹ & maternal blood pressure was recorded non-invasively every 1 minute for 5 minutes after the subarachnoid block, and then every 5 minutes until the procedure was completed. Each episode of hypotension was noted as per operational definition. All this information was recorded on the proforma (attached).

Data was analyzed using SPSS 18. Age, parity gestational age and BP was calculated as mean±SD. Qualitative data like the occurrence of hypotension was calculated as frequency and percentage. The frequency of hypotension in both groups was compared by using chi-square test. P-value≤0.05 was considered as significant. The confounding variables were controlled by following exclusion criteria & stratification based on age, gestational age and parity.

Results:

Total 60 patients were enrolled. The mean age of Group A 26.00±2.75 and Group B 25.53±3.10 years. Mean gestational age in Group-A & B was 34.40±9.41 and 39.00±1.70 weeks. In Group-A there were 11(36.7%) women whose parity was 1, 12(40%) women's parity was 2, 7(23.3%) women's parity was 3. Parity status of women in Group-B showed there were 10(33.3%) women whose parity was 1, 15(50%) women's parity was 2, 4(13.3%) women's parity was 3 and there was only 1(3.3%) women whose parity was 4. Table: 1

There was insignificant difference observed between both groups regarding blood pressure changes from baseline and 5 minutes after administration of subarachnoid block (**P>0.05**), except after 2 minutes which was higher in combination group (**P<0.05**).

In Group-A 17(56.7%) & 13(43.4%) in Group-B only 13(43.4%) women suffered from hypotension. However, in Group-A frequency of hypotension was high but it was not statistically significant. i.e. (**p-value=0.302**) In both age groups i.e. 20-25 and 26-30 years no significant association was seen between hypotension & treatment groups. In Age group 20-25 frequency of hypotension in Group-A & B was 50% vs. 40%. While in age group 26-30 years' frequency in Group-A & B was 61.1% & 46.7%.

In preterm and term cases, no significant association statistically was seen between hypotension and treatment groups. In preterm cases, frequency of hypotension in Group-A and in Group-B was 33.3% vs. 53.8%. While in term cases, frequency of hypotension in Group-A and in Group-B was 44.4% and 58.8% respectively.

In all parity group, no statistically significant association was seen between hypotension & treatment groups. In parity 1-2, frequency of hypotension in Group-A & B was 40% vs. 56.5%. While in

parity3-4, frequency of hypotension in Group-A & B was 60% and 57.1%.

Table: 1 Distribution of Age & Gestational Age, Parity

	Treatment Group	
	Group A	Group B
Age	26.00±2.75	25.53±3.10
Gestational Age	34.40±9.41	39.00±1.70
Parity	1.87±0.78	1.87±0.78
1	11(36.7%)	10(33.3%)
2	12(40%)	15(50%)
3	7(23.3%)	4(13.3%)
4	0	1(3.3%)

Table: 2 Comparison of Blood Pressure at Follow up in Treatment Group

		Treatment Group		P value
		Group A	Group B	
Blood Pressure	1	126.37±6.14	120.10±22.02	0.139
	2	113.57±16.16	120.93±6.15	0.023
	3	107.43±15.17	110.13±17.97	0.532
	4	107.80±13.01	108.77±15.34	0.793
	5	113.67±15.98	114.10±10.64	0.902

Table:3 Hypotension in Treatment Groups in relation to Age Group, Gestational Age & Parity

		Hypotension	Treatment Groups		p-value
			Group-A	Group-B	
Age Group	20-25	Yes	6(50%)	6(40%)	0.603
		No	6(50%)	9(60%)	
	26-30	Yes	11(61.1%)	7(46.7%)	0.407
		No	7(46.7%)	8(53.3%)	
Gestational Age	Preterm	Yes	1(33.3%)	7(53.8%)	0.522
		No	2(66.7%)	6(46.2%)	
	Term	Yes	12(44.4%)	10(58.8%)	0.353
		No	15(55.6%)	7(41.2%)	
Parity	1-2	Yes	10(40%)	13(56.5%)	0.252
		No	15(60%)	10(43.5%)	
	3-4	Yes	3(60%)	4(57.1%)	0.921
		No	2(40%)	3(42.9%)	

Discussion:

Over the last several decades, spinal anaesthesia has become a more common caesarean section method in most of the countries. In order to reduce the frequency & severity of hypotension, numerous attempts have been made to change the procedure or dosage of local anaesthetic utilized.(9) The most common adverse effect, however, is spinal-induced hypotension, which occurs in 20 to 100% of patients.(10, 11)

As per findings of this study frequency of hypotension with hyperbaric bupivacaine was 56.7% while with Sequential Plain + Hyperbaric bupivacaine frequency of hypotension was 43.4%. Although with Sequential Plain + Hyperbaric bupivacaine frequency of hypotension was low but the difference in frequency of hypotension with Sequential Plain + Hyperbaric bupivacaine frequency of hypotension and with hyperbaric bupivacaine was not statistically significant. i.e. (p-value=0.302).

Hypotension rates ranged from 4.5 percent to 100 percent in previous research using hyperbaric bupivacaine for spinal anesthesia after caesarean delivery.(11, 12) In an early study by Santos et al.(13) used 7.5 to 10.0 mg of hyperbaric bupivacaine for spinal anaesthetic during caesarean section, and they only had a 4.5 percent hypotension rate, which was readily addressed with a little dosage of ephedrine. In a trial to see if a low dosage (4 mg) of bupivacaine was better than 10 mg of hyperbaric bupivacaine, the frequency of hypotension was found to be 100% in individuals treated with 10.0 mg of bupivacaine.(9)

Cesur et al. When 5 mg of isobaric bupivacaine was followed by 5 mg of heavy bupivacaine for spinal anaesthetic after caesarean delivery, the incidence of hypotension was significantly reduced. They found that using 5 mg of isobaric & 5 mg of hyperbaric bupivacaine, instead of 10.0 mg of hyperbaric bupivacaine reduced maternal hypotension from 67 to 14%.(14)

Some writers have previously claimed that the baricity of bupivacaine has no effect on the rate of onset or sensory duration block for caesarean delivery. Some writers have previously claimed that the baricity of bupivacaine has no effect on the rate of beginning or duration of sensory suppression after caesarean delivery. (15-17)

As part of a combined spinal-epidural operation in caesarean delivery, Vercauteren et al. employed a combination of sufentanil 3.3 mg and plain or hyperbaric bupivacaine 6.6 mg in 2 mL for spinal anaesthesia.(21) According to the findings, Individual variability was observed in plain group, and considerably more patients in plain group had blocks that were either too high or low. Although the ordinary group's hypotension was more severe (21.0%)vs. (6.0%) in hyperbaric group), their total incidence was 13 percent, which was lower than comparable studies used larger dosages.(18)

The volume utilized might be the reason for the plain group's significantly greater incidence of hypotension compared to the hyperbaric group. Volumes in the sequential PHB group are thought to need to be assessed individually, therefore their volume was effectively double that use in our study. Because simple bupivacaine is somewhat hypobaric, using it in the sitting posture for spinal injection can be risky, though it has been used effectively as if it were clinically isobaric.(19)

We considered this theoretical risk since simple bupivacaine is commercially accessible for this reason. If landmarks are unclear, the sitting position helps in the identification of the subarachnoid area, especially in obese parturients. (19)

Apart from Cesur et al, neither any study has been identified to which we could compare our findings on the incidence of hypotension once the hyperbaric & plain versions of bupivacaine are provided sequentially for spinal anaesthesia in patients undergoing caesarean delivery.(20)

Conclusion:

Results of this study demonstrate that with the use of Sequential Plain + Hyperbaric bupivacaine frequency of hypotension was less as compared to hyperbaric bupivacaine alone for spinal anesthesia in patients undergoing cesarean section.

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