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Perioperative Hemodynamic Response and Vasopressor Requirement During Spinal Anaesthesia for Cesarean Section in Healthy and Pre-Eclamptic Patients

KEYWORDS: Hypotension ,Pre-eclampsia, Vasopressor, Bupivacaine

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ABSTRACT ***OBJECTIVE:*** *To assess hemodynamic response and vasopressor requirement during spinal anaesthesia for cesarean section in healthy and Pre-eclamptic patients.To assess neonatal outcome using APGAR scores.*

*I**NTRODUCTION:** In normal pregnancy, there is increased synthesis of prostaglandins (PGs) and nitric oxide, which act as vasodilators. Maintanance of vascular tone is highly dependent on sympathetic vasoconstriction. Immediately after spinal anaesthesia there is high degree of fall in BP.*

***METHODS**: We enrolled a total 60 patients, 30 healthy (control group) and 30 Pre-eclamptic (BP > 140/90 mmHg) parturients (study group) above 20 years of age, undergoing elective cesarean section in the study. After preloading with 10 ml/kg of ringer lactate solution, spinal anesthesia was given with 10 mg of hyperbaric bupivacaine. Systolic blood pressure (SBP), Diastolic blood pressure(DBP), Mean arterial pressure (MAP) and heart rate(HR) were recorded. Apgar score was noted at 1 and 5 min after birth. Mephenterimine administered in 6 mg bolus dose when MAP decreased more than 20% of baseline.*

***RESULT:** The number of episodes of hypotension was more in normotensive group as compared to pre-eclamptic patients. Neonatal outcome was also comparable.*

***DISCUSSION:** In pre-eclampsia, there is increased amount of endogenous vasopressors like thromboxane and endothelin, because of which pre-eclamptics tend to maintain their vascular tone after spinal anaesthesia as compared to healthy patients. This prevents excessive fall in Blood pressure .*

***CONCLUSION:**Pre-eclamptic patients are more hemodynamically stable, with reduced need of vasopressor under spinal anesthesia.Neonatal outcome was comparable and good in both the groups in respect to Apgar score at 1 and 5 min after birth .*

INTRODUCTION

Pre-eclampsia is a major cause of maternal and perinatal fetal mortality in the developing countries.[1] Better control of the perioperative hemodynamic changes can lead to reduction in perioperative morbidity and mortality in obstetric patients.[2.]Spinal anesthesia is often the preferred technique of anesthesia for cesarean delivery[3]. Although there is some controversy, it has been reported that it is suitable for use in pre-eclamptic patients,[4,5] even in cases with a nonreassuring fetal heart rate (HR) pattern[6].

In pre-eclamptic patients regional technique are considered to be relatively safer as compared to general anesthesia. In current clinical practices epidural anesthesia is generally preferred. Spinal anesthesia has again gained some popularity. Although it is commonly believed

that a sudden and extensive sympathetic blockade following spinal anesthesia will result in severe hypotension, which would lead to placental hypoperfusion and fetal asphyxia.[7-10]

Parturients with pregnancy induced hypertension may present to the labor and delivery unit with or without a prior diagnosis of preeclampsia and may pose a significant anesthetic challenge. The administration of general anesthesia (GA) in such high risk parturients may cause exaggerated cardiovascular response to intubation leading to cerebral hemorrhage and edema, cardiovascular decompensation causing pulmonary edema; thereby increasing morbidity and mortality in both mother and child. [5],[6] Similarly, an exaggerated pressor response to intubation may increase the maternal plasma catecholamine concentration, which in turn impairs the uteroplacental blood flow. [7],[8],[9]

Our aim was to assess hemodynamic response and vasopressors requirement during spinal anaesthesia for cesarean section in healthy and Pre-eclamptic patients and also to assess neonatal outcome using APGAR scores. The present study was initiated to further validate the safety of spinal anesthesia in pre-eclamptic patients.

METHODOLOGY

This prospective randomized control trial was conducted at Dr D Y Patil Medical College, Pune from August 2015 - October 2015. After obtaining clearance from the hospital ethical committee ,a written informed consent was obtained from patients before commencing the study. All patients were subjected to preanaesthetic evaluation. Study was conducted on 60 patients posted for cesarean section whose age was above 20 years .Patients with BP

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>160/110 mmHg, ASA grade III & IV and Patients with contraindications for spinal anesthesia were excluded.

All patients were divided into 2 equal groups of 30 each.

Group C : 30 patients (Control group)-Normotensive patients with B.P<140/90

Group P: 30 patients (Pre-eclamptic group) with B.P>140/90

Patient characteristics, including age, height, weight, and gestational age and baseline vitals were recorded for all patients. All patients received injection ranitidine 100 mg and injection metoclopramide 10 mg , 30 minutes prior to surgery. Patients were preloaded with 10 ml/kg body weight of ringer lactate solution prior to the spinal anesthesia. Spinal anesthesia was performed in the sitting position using a 26G Quincke's needle in the L3-L4 or L4-L5 interspace through midline approach under all aseptic conditions. Intrathecally all patients received 2 ml of 0.5% hyperbaric bupivacaine. Patients were then placed in supine position immediately after subarachnoid block. A wedge was placed under the right hip to prevent aortocaval compression. Surgery was started as soon as the upper level of sensory block reached T8 level. After spinal anesthesia SBP, DBP, MAP and HR were recorded every 3 min for first 30 min and every 5 min thereafter until the end of cesarean section. Hypotension (MAP < 20% of the baseline) was treated with injection Mephentermine 6 mg i.v. Bradycardia (HR < 50 beats/min) was treated with injection atropine 0.6 mg i.v. Mephentermine use and total dose were recorded for each patient. Newborn APGAR scores were assigned by neonatologists not participating in the study.

STATISTICAL DATA ANALYSIS

Parametric data was presented as mean ± standard deviation. The unpaired Student's t-test was used for comparison between group data. P value of < 0.05 was considered statistically significant.

RESULTS:

We enrolled 60 patients, (30 patients in Control group and 30 patients in Pre-eclamptic group) in each group in our study . The demographic profile of the patients in both the groups with regards to age, weight and height, showed no statistical significant difference between the two groups (*P*>0.05) as showen in figure 1.

FIGURE 1: Comparison of age,height, weight of the patients of both the groups

DEMOGRAPHIC CHARACTERISTICS	Group C (n=30)	Group P (n=30)	P value
Age (years)	25.97 ± 3.45	26.07 ± 2.07	0.82
Weight (Kg)	59.43 ± 3.83	61.10 ± 3.86	0.078
Height (cm)	155.4 ± 3.56	155.7 ± 4.52	0.39

Hemodynamic Parameters	Group C (n=30)	Group P (n=30)	
SBP (mmHg)	111.79 ± 10.15	136.99 ± 6.44	P<0.05
DBP (mmHg)	66.69 ± 5.87	83.24± 5.67	P<0.05
MAP (mmHg)	82.16 ± 6.46	101.14 ± 5.83	P<0.05
HEART RATE	110.43 ± 4.52	110.61 ± 4.70	P>0.92

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FIGURE 2:

The SBP, DBP, and MAP all decreased from the baseline in both the groups following SAB, but minimum recorded SBP, DBP, and MAP in normotensive group were lower than the parturients with pre-eclampsia, which was statistically significant shown below in figure(2-6)

FIGURE 3:

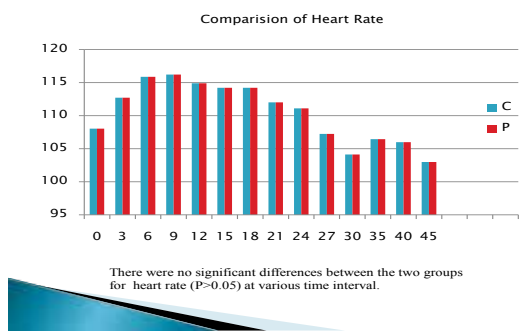


FIGURE 4:

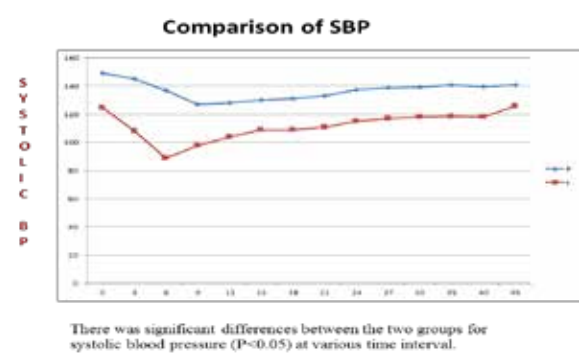
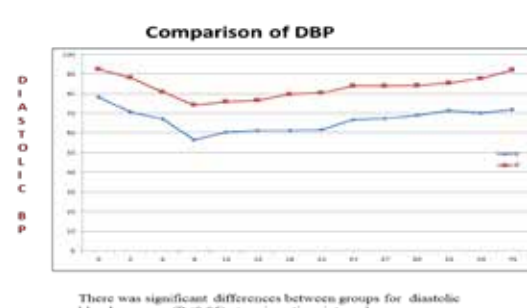


FIGURE 5:



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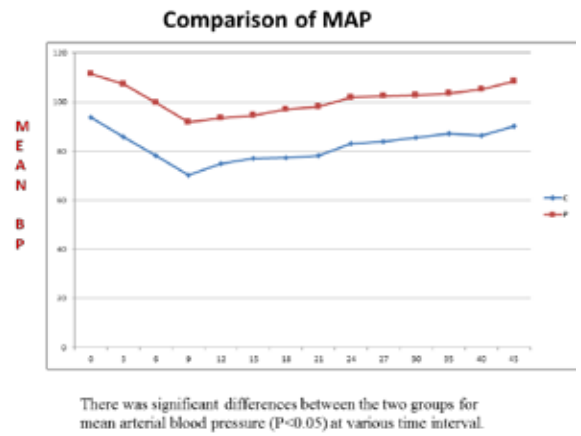


There was significant differences between the two groups for mean arterial blood pressure (P<0.05) at various time interval.

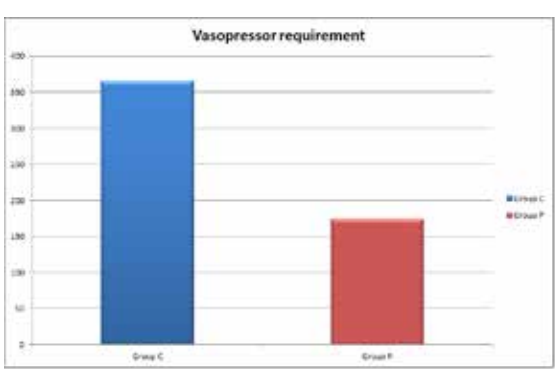
FIGURE 6:
Comparison of number of hypotensive episodes in both the groups. From figure 7 it is clear that number of hypotensive episodes was much more in control group P as compared to group P which was statistical significant (*P*>0.05).

FIGURE 7:

Hypotensive episodes in both groups

Number of hypotensive episodes	Group C (n=30)	Group P (n=30)
0	4	13
1	5	9
2	11	5
3	7	2
4	2	1
5	1	0

FIGURE 8:



Mephentermine consumption in both the groups, which was statistically significant (p<0.05)

Figure 8 clearly shows that vasopressor (Mephenterimine) requirement was much more higher in group C as compared to group P and was statistically significant (p<0.05)

FIGURE 9:

OBSERVATIONS AND RESULTS :

NEONATAL OUTCOME	Group C (n=30)	Group P (n=30)	P value
1-minute APGAR	8.25 ± 1.0	7.79 ± 1.13	0.20
5-minute APGAR	9.20 ± 0.76	8.79 ± 0.85	0.12

- There were no significant differences in APGAR Score (P>0.05) in both the groups

Figure 9 shows comparison of neonatal outcome in both the groups. It is clear from Figure 9 that there was no statistical significant (*P*>0.05) difference in neonatal outcome in both the groups.

DISCUSSION

In past Epidural Anaesthesia was preferred over Subarachnoid Block for pre-eclamptics undergoing cesarean section due to the fear of sudden and extensive sympathetic block in them after SAB leading to dangerous hypotension compromising mother and fetus. Large volumes of intravenous fluids administered to treat this hypotension were another concern because of the possibility of developing iatrogenic pulmonary edema. Since then, several authors have compared the efficacy of SAB and EA in pre-eclamptics and found comparable hemodynamic effects in both the groups with similar fetal outcomes.

Vishalputra *et al.*, compared the hemodynamic effect of SAB and EA in severe pre-eclamptics and found episodes of significant hypotension (SBP < 100 mmHg) were transient in both the groups with comparable neonatal outcome. Thus, they concluded that the use of SAB in severe preeclampsia was safe.[16]

After establishing SAB, blood pressure decreased in both the groups from the baseline, but the minimum SBP, DBP, and MAP recorded during the observation period were always higher in the pre-eclamptic group (136.99 ± 6.44 , 83.24± 5.67 , 101.14 ± 5.83, respectively) in comparison with normotensive group (111.79 ± 10.15, 66.69 ± 5.87 , 82.16 ± 6.46 , respectively),which was statistically significant (*P* < 0.05). From figure 7 it is clear that number of hypotensive episodes and mephenterimine was much more in control group C (healthy) as compared to group P (pre-eclamptics) which was also statistically significant (*P*>0.05). Pre-eclamptics needed significantly less Mephenterimine to treat hypotension [Figure 8].

our study results corroborates with the study of Aya *et al.*, in2003,[17] comparing the incidence and severity of hypotension and ephedrine consumption in 30 pre-eclamptics and 30 healthy parturients. They found that SAB induced hypotension was 6 times less in pre-eclamptics group and they required significantly less ephedrine to treat it. Other studies too have reported similar results.[18-19]

In normal pregnancy, increased synthesis of endogenous vasodilators like prostaglandins (PGs) and nitric oxide (NO) produces a vasodilated state, and there appears an increased dependence on sympathetic vasoconstriction for control of vascular tone. This explains the sudden and ex-

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cessive hypotension after sympathetic blockade produced by SAB in them.[9]

In pre-eclampsia, vascular endothelial damage occurs, which produces increased amount of endogenous vasopressors like thromboxane and endothelin that are responsible in

maintaining vessel tone. Sympathetic block following SAB does not alter this vascular response, limiting the excessive fall of BP in pre-eclamptics.[10,20-21]

CONCLUSION

In the present study, hypotension following spinal anesthesia administered for cesarean section was significantly less in pre-eclamptics than in healthy pregnant women. In addition, Mephenterimine requirements were also less in pre-eclamptic parturients as compared to normal healthy patients and neonatal outcome was also comparable between the two groups.

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