

Comparison Of Spinal Anaesthesia Induced Hypotension In Severely Preeclamptic And Normotensive Parturients Undergoing Caesarean Section

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ABSTRACT

Introduction: Preeclampsia and eclampsia are one of the most common complications of pregnancy. These patients usually require caesarean section for the delivery of fetus. Spinal anaesthesia is commonly used in such patients and hypotension is the most common complication. In this study we compared the spinal anaesthesia induced hypotension in severe preeclamptic and normotensive parturients. **Objectives:** To compare the frequency of spinal anaesthesia induced hypotension in severely preeclamptic parturients with normotensive parturients undergoing caesarean section. **Study Design:** Cohort study. **Setting:** Department of Anaesthesiology, District Headquarter Teaching Hospital, Sargodha. **Duration of Study:** Six months (July 2013 to December 2013). **Subjects and Methods:** Following informed consent, Total 200 patients were selected, 100 severely preeclamptic parturients Group A and

100 normotensive parturients Group B, undergoing caesarean section. Spinal anaesthesia was administered in the sitting position at level of L3-4 or L4-5 interspaces. Maternal systolic and diastolic blood pressure were recorded at 2-min intervals from the time of spinal injection for 20 min and then at 5-min intervals until the end of the surgery. Spinal hypotension was considered if there is 20% decrease of mean BP from the baseline or systolic pressure less than 100mm Hg at any time till the end of surgery.

Results: The incidence of hypotension was significantly less (17.0%) in severely preeclamptic patients as compared with the normotensive parturients (42.0%)

Conclusions: Patients with severe preeclampsia have less chances of hypotension with spinal anaesthesia for elective caesarean delivery than healthy normotensive parturients.

Key Words: Anaesthesia; Obstetrical; Spinal; Preeclampsia; Hypotension.

INTRODUCTION

Pregnancy produces significant hemodynamic changes in order to meet the increased metabolic demands of pregnancy.¹ These hemodynamic changes have many anaesthetic concerns especially in high risk parturients such as preeclamptic patients.

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Spinal anaesthesia leads to peripheral vasodilatation and venous pooling which may cause maternal hypotension. The incidence of hypotension in the pregnant patient in supine position after spinal anaesthesia is as high as 90%.³ Maternal hypotension is associated with distressing symptoms of dizziness, nausea and vomiting and may also interfere with surgical procedure. If uncorrected, due to decreased uterine blood flow, the neonate could be acidotic and may require resuscitation.^{4,5} Preeclampsia and eclampsia is one of the most common complications of pregnancy.⁶ Preeclampsia is a disorder that occurs in pregnancy after twenty weeks of gestation which manifests as

hypertension and proteinuria, may progress to eclampsia and may regress following delivery.⁷ Preeclampsia is a disorder unique to human pregnancy, may involve the maternal cardiovascular, renal, coagulation, and hepatic system, and is associated with increased maternal and fetal morbidity and mortality.⁸ Women with severe preeclampsia commonly require delivery by Caesarean section.⁹ Anaesthetic management of these patients remains a challenge. Although general anaesthesia can be used safely in preeclamptic women, but it is associated with greater maternal morbidity and mortality.¹⁰ Because of the hazards related to management of the difficult airway and hemodynamic consequences of laryngoscopy and tracheal intubation, general anaesthesia is usually chosen only when regional techniques are contraindicated. The optimal anaesthetic technique for caesarean section in severely preeclamptic women remains controversial.¹¹ Severely preeclamptic patients are considered to be at high risk of severe hypotension because of reduced plasma volume and the need to limit IV fluids to avoid iatrogenic pulmonary edema. However several studies have shown that the hemodynamic effects of spinal anaesthesia provide an equally safe and effective option for these patients. However, latest studies prove that patients with severe preeclampsia experience less hypotension as compared with normotensive parturients. The incidence of hypotension in severely pre eclamptic and normotensive pregnant patient is 19.7% and 37.8% respectively.^{12,13} Previously it was considered that severe preeclamptic patients have more chances of spinal anaesthesia induced hypotension. The aim of study was to compare the frequency of hypotension in normotensive and severe preeclamptic parturients undergoing caesarean section under spinal anaesthesia to find out a better approach in the management of preeclamptic patients.

MATERIALS & METHODS

After getting approval from Jinnah Hospital ethical committee and informed written consent about the study procedure, 200 patients presented in the Obstetric ward, fulfilling the inclusion criteria were included in the study. Patients were

divided into two groups. Group-A included severely preeclamptic parturients and Group-B included normotensive parturients undergoing cesarean section. All patients were monitored by continuous ECG (lead II), an automated oscillometric blood pressure system and pulse oximeter. Before the start of the procedure all severely preeclamptic parturients were administered intravenous magnesium sulfate (MgSO₄) 4 g stat, followed by 1 g/h for seizure prophylaxis. Every patient was preloaded with 1000 ml Ringer's solution over 15-20min. Baseline readings of blood pressure were taken by the researcher. Spinal anaesthesia was administered in the sitting position at level of L3-4 or L4-5 interspaces, with 0.75% 15mg hyperbaric bupivacaine using 25 gauge spinal needles. Patients were then immediately turned supine with 15 degree left lateral tilt of operating table to prevent aortocaval compression. All the patients received 5 L/min of Oxygen by facemask. Maternal systolic and diastolic blood pressure recorded at 2-min intervals from the time of spinal injection for 20 min and then at 5-min intervals until the end of the surgery by the researcher. Rescue IV bolus doses of 10mg ephedrine and intravenous fluid were given if hypotension occurred. All the relevant data were recorded on a prescribed proforma. Spinal hypotension was considered if there is 20% decrease of mean BP from the baseline or systolic pressure less than 100mm Hg at any time till the end of surgery.

DATA ANALYSIS

Data obtained was entered into SPSS version 11.0. Mean and standard deviation was calculated for age. Frequency & percentage were calculated for hypotension & chi-square test for comparison as) was applied on outcome variable [Hypotension (yes, no)] as a test of significance. A $P \leq 0.05$ was considered as statistically significant.

RESULTS

The mean age in group A was 26.33 ± 4.22 years and in group B was 27.42 ± 4.16 years. P value is 0.403 which is statistically insignificant. (Table 1) In the distribution of American Society of Anaesthesiologists (ASA) status in group A there were 59.0 % (n=59) patients of ASA class I, and 41.0 % (n=41) patients of ASA class II. In group

B, there were 53.0 % (n=53) patients of ASA class I and 47.0 % (n=47) patients of ASA class II. P value is 0.439 which is also statistically insignificant. (Table 2)

In group A, hypotension occurred in 17.0 % (n=17) of patients where as in group B, hypotension occurred in 42.0% (n=42) of patients. This difference was statistically significant. P value 0.001. (Table 3) (Graph 1)

TABLE 1: Age Distribution of Patients

Age (Years)	Group A (n=100)		Group B (n=100)	
	No of Cases	Percentage	No of Cases	Percentage
21-25	55	55.0	40	40.0
26-30	26	26.0	37	37.0
31-35	15	15.0	18	18.0
36-40	4	4.0	5	5.0
Total	100	100.0	100	100.0
Mean ± SD	26.33 ± 4.22		27.42 ± 4.16	

P Value 0.403

Table 2: Distribution of Patients by ASA Status

ASA Status	Group A (n=100)		Group B (n=100)	
	No of Cases	Percentage	No of Cases	Percentage
ASA I	59	59.0	53	53.0
ASA II	41	41.0	47	47.0
Total	100	100.0	100	100.0

P value 0.439

Table 3: Frequency of Hypotension

Hypotension	Group A (n=100)		Group B (n=100)	
	No of Cases	Percentage	No of Cases	Percentage
Yes	17	17.0	42	42.0
No	83	83.0	58	58.0
Total	100	100.0	100	100.0

DISCUSSION

Sympathetic blockade induced hypotension may occur in up to 80 % - 100 % of pregnant women given spinal anaesthesia for caesarean section especially when hyperbaric solutions were used.¹⁴ Severely preeclamptic patients were previously believed to be at high risk of severe hypotension, with maternal and fetal consequences because of reduced plasma volume and the need to limit IV fluids to avoid iatrogenic pulmonary edema.^{15,16,17}

Our study shows that the frequency of hypotension is less in patients with severe preeclampsia undergoing spinal anaesthesia for cesarean section as compared with healthy parturients (17% vs 42%).

Our results are comparable to Sikov et al who compared frequency of hypotension under spinal anaesthesia in severe preeclamptic and normotensive patients. The incidence of hypotension in severely preeclamptic and normotensive pregnant patient was 19.7% and 37.8% respectively.^{12, 13}

Aya GM et al showed that the severely preeclamptic patients had a less frequent incidence of clinically significant hypotension (16.6% versus 53.3%; $P = 0.006$), which was less severe and required less ephedrine. The results of our study were quite comparable with the study conducted by Aya GM et al.¹⁸

We considered mean arterial blood pressure as the study variable to measure the degree of hypotension because its time course reflects changes in both SBP and DBP. MAP has been used in studies designed to evaluate the effect of regional anaesthesia technique on blood pressure, including in the study of patients with severe preeclampsia.^{19,20} In other studies, although

systolic blood pressure is used to determine hypotension, it has not been shown whether SBP or mean BP should be considered more accurate in the appreciation of the effect of hypotension on uteroplacental blood flow. Therefore, we were specifically considering changes in mean BP, special attention was given to the decrease in MBP.

Currently, several retrospective and prospective studies show that epidural and spinal anaesthesia induces a similar incidence and severity of hypotension in patients with severe preeclampsia.¹⁹ In this study, spinal anaesthesia was safely administered to patients with severe preeclampsia. Furthermore, the incidence and the severity of hypotension were less in severely preeclamptic patients. In severe preeclamptic patients, low incidence of hypotension is due to the factor related to the regulation of Blood Pressure. Blood Pressure is regulated via vascular tone by sympathetic and endothelial pathways. Sympathetic activity increases the vascular tone. Because sympathetic hyperactivity was shown in preeclampsia this could contribute to hypertension.²¹ The sympathetic outflow to vessels may be altered by spinal anaesthesia in both preeclamptic and healthy parturients. Concerning the endothelial pathway, the endothelium regulates the vascular tone via endothelium-related vasodilator systems that are altered in preeclampsia, decreasing the physiologic role of endothelial-dependent relaxation of small resistance vessels.²² In addition, preeclampsia is characterised by an increased production of numerous circulating factors with a potent pressor effect on one hand and by an increased sensitivity of blood vessels to pressor drugs because of endothelial damage on the other hand. These two phenomena contribute to the widespread vasoconstriction observed in preeclampsia are not altered by spinal anaesthesia, and could maintain a high vascular tone that, finally, contributes to limit the decrease in BP during spinal block in preeclamptic patients.²³

CONCLUSION

Patients with severe preeclampsia have less chances of hypotension with Spinal anaesthesia

for elective caesarean delivery than healthy normotensive parturients.

REFERENCES

1. Hill CC, Pickinpaugh J. Physiological changes in pregnancy. *Surg Clin N Am.* 2008 ; 88: 391 – 401
2. Macarthur A. Solving the problem of spinal - induced hypotension in obstetric anaesthesia . *Can J Anesth* , 2002 ; 49 : 536 – 9
3. Mercier FJ, Bonnet MP, De la Dorie A. Moufouki M, Banu F, Hanaf A. Et al. Spinal anaesthesia for caesarean section: fluid loading, vasopressors and hypotension *Ann Fr Anesth Reanim* 2007; 26: 688 – 93
4. Reynolds F, Seed PT. Anaesthesia for caesarean section and neonatal acid - base status: a meta - analysis. *Anaesthesia* 2005 ; 60 : 636 – 53
5. Birnbach DJ , Soens MA . Hotly debated topics in obstetric anaesthesiology 2008. a theory of relativity . *Minerva Anesthesiol* 2008 ; 74 : 409 – 24
6. Aziz R, Mahboob T. Pre-eclampsia and lipid profile . *Pak J Med Sci* 2007; 23:751- 4
7. Henke VG , Bateman BT , Leffert LR . Spinal anaesthesia in severe preeclampsia . *Anesth Analg* 2013 ; 117 : 686 – 93
8. Steegers EA , Von Dadelszen P , Duvekot JJ , Pijnenborg R . Preeclampsia . *Lancet* 2010 ; 376 : 631 – 44
9. Grujic I, Milasinovic L. Hypertension, pre-eclampsia and eclampsia—monitoring and outcome of pregnancy. *Med Pregl* 2006; 59: 556 - 9.
10. Okafor UV , Ezegwui HU, Ekwazi K. Trends of different forms of anaesthesia for caesarean section in South-eastern Nigeria. *Int J Gynecol Obstet* 2009; 29: 392-5
11. Rasooli S, Parish M, Mahmoodpoor A, Moslemi F, Sanaie S . Effect of Spinal Low Dose Bupivacaine-Sufentanyl for Cesarean Section in Preeclamptic Parturients on Neonatal Outcome. *Shiraz E-Medical Journal* 2009; 10: 4
12. Sikov, N, Bozinovska V. Spinal anaesthesia for caesarean section in preeclampsia: *Eur J Anaesthesiol* 2006; 23: 182

13. Ishrat HM, Raja AT. Spinal anesthesia in preeclamptic parturients. *Int J Anesthesiol* 2007; 14:2
14. Ayorindine BT, Buczkowski P, Brown J, et al. Evaluation of pre-emptive intramuscular phenylephrine and ephedrine for reduction of spinal anaesthesia-induced hypotension during caesarean section. *Br J Anaesth* 2001; 86: 372–6
15. Bosio PM, Wheeler T, Anthony F, et al. Maternal plasma vascular endothelial growth factor concentrations in normal and hypertensive pregnancies and their relationship to peripheral vascular resistance. *Am J Obstet Gynecol* 2001; 184: 146–52.
16. Ueyama H, He YL, Tanigami H, et al. Effects of crystalloid and colloid preload on blood volume in the parturient undergoing spinal anesthesia for elective cesarean section. *Anesthesiology* 1999; 91: 1571–6.
17. Vedernikov YP, Belfort MA, Saade GR, Garfield RE. Inhibition of cyclooxygenase but not nitric oxide synthase influences effects on the human omental artery of the thromboxane A2 mimetic U46619 and 17beta-estradiol. *Am J Obstet Gynecol* 2001; 185: 182–9
18. Aya AG, Mangin R, Vialles N, et al. Patients with severe preeclampsia experience less hypotension during spinal anesthesia for elective cesarean delivery than healthy parturients: A prospective cohort comparison. *Anesth Analg*. 2003; 97: 867–72.
19. Hood DD, Curry R. Spinal versus epidural anesthesia for cesarean section in severely preeclamptic patients: a retrospective survey. *Anesthesiology* 1999; 90: 1276–82
20. Ramanathan J, Vaddadi AK, Arheart KL. Combined spinal and epidural anesthesia with low dose of intrathecal bupivacaine in women with severe preeclampsia: a preliminary report. *Reg Anesth Pain Med* 2001; 26: 46–51
21. Visser W, Wallenburg HC. Central hemodynamic observations in untreated preeclamptic patients. *Hypertension* 1991; 17: 1072–7.
22. Vedernikov YP, Belfort MA, Saade GR, Garfield RE. Inhibition of cyclooxygenase but not nitric oxide synthase influences effects on the human omental artery of the thromboxane A2 mimetic U46619 and 17beta-estradiol. *Am J Obstet Gynecol* 2001; 185: 182–9.
23. Visser W, Wallenburg HC. Central hemodynamic observations in untreated preeclamptic patients. *Hypertension* 1991; 17: 1072–7.

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