



CODEN [USA]: IAJPBB

ISSN : 2349-7750

INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

<http://doi.org/10.5281/zenodo.4048667>Available online at: <http://www.iajps.com>

Research Article

SPINAL ANESTHESIA HYPOTENSION IN PREECLAMPTIC VERSUS HEALTHY PARTURIENTS

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Article Received: July 2020

Accepted: August 2020

Published: September 2020

Abstract:

Aim and Methods: In this prospective cohort study, we compared the incidence and severity of spinal anesthesia (SA) hypotension in subjects with pre-eclampsia ($n = 25$) with healthy deliveries ($n = 25$) undergoing caesarean section. After an appropriate preload, SA was administered with 0.75% hyperbaric bupivacaine. Blood pressure (BP) was recorded prior to SA (Basal BP), then after SA, every 2 minutes for 30 minutes, and then every 5 minutes until surgery was completed.

Place and Duration: In the Anesthesiology and Obstetric and Gynecology department of Bahawal Victoria Hospital, Bahawalpur for one-year duration from May 2019 to May 2020.

Results and Conclusion: Patients with pre-eclampsia had less clinically significant hypotension which was less severe and required less ephedrine. The risk of developing hypotension was significantly lower in patients with pre-eclampsia than in healthy patients. Spinal anesthesia appeared to be a useful and safe alternative to epidural anesthesia in patients with pre-eclampsia when a large patient presented for caesarean section.

Keywords: pre-eclampsia, childbirth, spinal anesthesia.

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Please cite this article in press Maher Sajawal Sultan Sumra *et al*, Spinal Anesthesia Hypotension In Preeclamptic Versus Healthy Parturients, Indo Am. J. P. Sci, 2020; 07(09).

INTRODUCTION:

Caesarean section is a common method of terminating pregnancy in patients with pre-eclampsia, more common when the later becomes severe. Anesthesiologists are more likely to encounter difficulties in the airways in patients with severe pre-eclampsia. Moreover, the dangers of the hemodynamic consequences of laryngoscopy and tracheal intubation in a patient with severe pre-eclampsia are very obvious. Thus, general anesthesia in such patients can only be used if local anesthesia is contraindicated. Although spinal anesthesia has usually been avoided in these patients due to the risk of a spike in blood pressure and severe hypotension, and epidural anesthesia has been preferred, there are currently several studies showing that the hemodynamic effects of spinal and epidural anesthesia are almost similar. Recent studies have shown that SA may be a suitable anesthetic for women with severe pre-eclampsia by caesarean section. Moreover, due to its simplicity, reliability, and speed, SA can be considered as an alternative to GA for urgent caesarean section in women with pre-eclampsia who have been properly prepared with a reasonable amount of IV preload.

METHODS:

Following appropriate approval by the hospital's ethics committee and informed patient consent, the study was conducted at the Anesthesiology and Obstetrics and Gynecology department of Bahawal Victoria Hospital, Bahawalpur for one-year duration from May 2019 to May 2020. The study included 25 patients with pre-eclampsia referred to routine and emergency LSCS. Another 25 normal patients were tested as controls. Severe pre-eclampsia was defined according to the Davy and Mac-Gillivray criteria as systolic blood pressure (SBP) greater than 160

mmHg and diastolic blood pressure (DBP) greater than 110 mmHg, or both. After each case was recorded, another patient with normal blood pressure enrolled in LSCS was given spinal anesthesia and selected as a control group. Patients with chronic arterial hypertension, diabetes or coagulopathy were not included in the study. All patients were pretreated with lactated Ringer's solution approximately 1000 ml prior to administration of anesthesia. Preload was performed with the patient in the left lateral position and continuous monitoring of heart rate (HR) and blood pressure (BP). Baseline BP and HR were calculated as the mean of 3 consecutive measurements 2 minutes apart. Spinal anesthesia was administered to the patient in a sitting position, after skin infiltration with 3 ml of 2% lignocaine, with a 25 G spinal needle in the L3-4 intervertebral space. An intrathecal injection of hyperbaric bupivacaine 0.75% (2 ml) was performed and the patient returned to her supine position with displacement of the left uterus. A head tilt of 10-15 degrees is used to facilitate the upward spread of the anesthetic. We recorded maternal BP and HR every 2 minutes for the first 30 minutes and then every 5 minutes until surgery was completed. We defined spinal hypotension as a decrease in mean arterial pressure (MAP) of more than 30% from baseline, taking into account that a 20% reduction in MAP is the usual therapeutic target for severe hypertension and we used intravenous ephedrine in 5-6 mg increments in the treatment of hypotension, the dose was repeated after 2-3 minutes if necessary. We also examined variables including demographics, gestational age, and Apgar scores.

RESULTS:

We studied 25 patients with pre-eclampsia and 25 health checks. The results of the comparative study are shown in Table A.

Table A: Changes in BP and HR after spinal anesthesia

Variable	Healthy (n=25)	Preeclamptic (n=25)	P value
SBP			
Baseline (mmHg)	130.0±7.5	165.0±18.0	<0.001
Lowest after SA (mmHg)	100.5±15.2	124.6±20.0	<0.001
Decrease from baseline at the lowest value(%)	-22.62±12.1	-24.48±11.0	0.456
DBP			
Baseline (mmHg)	88.5±9.5	106.7±11.2	<0.001
Lowest after SA (mmHg)	62.5±15.2	82.7±12.9	<0.010
Decrease from baseline at the lowest value(%)	-29.5±15.3	-21.0±11.5	0.010
MAP			
Baseline (mmHg)	101.2±7.6	122.8±10.0	<0.001
Lowest after SA (mmHg)	72.5±15.0	95.5±16.5	<0.001

Decrease from baseline at the lowest value(%)	-28.06±13.4	-22.23±12.7	0.045
HR			
Baseline (mmHg)	90.6±16.3	100.7±19.9	0.061
Lowest after SA (bpm)	74.6±12.3	80.6±16.6	0.064
Decrease from baseline at the lowest value(%)	-19.44±9.3	-19.2±11.7	0.984
Highest after SA(bpm)	105.2±15.8	109.8±19.4	0.378
Increase from baseline at the highest value(%)	17.1±12.1	9.9±12.1	0.047

Demographic variables, gestational age and Apgar score in the two study groups are compared in Table B.

Table B: Maternal and neonatal characteristics

Variable	Healthy (n=25)	Preeclamptic (n=25)	P value
Age	32.50±6.5	30.70±5.8	0.394
Weight (kg)	73.80±12.40	75.80±11.50	0.584
Gestational age (weeks)	37.0±2.0	33.2±1.9	<0.001
Height (cm)	162±6.3	162.4.2	0.870
Ephedrine dose (mg)	11.7±6.5	6.5±1.2	0.0007
Apgar score (5 min) median range	10(8-10)	10(8-10)	0.486

Statistical analysis of the data was performed using the student's t-test statistic for the difference of mean. These tests were referred to below for the p-values due to their importance. All tests were two-tailed and p values less than 0.05 were considered statistically significant. Mean baseline SBP, DBP, and MAP values were greater in the pre-eclampsia group. There was a significant decrease in all 3 variables in both groups after the administration of spinal anesthesia. Table A shows that the magnitude of the decrease in SBP was similar in both groups, while the decrease in SBP and MBP was significantly less in patients with pre-eclampsia. Patients with pre-eclampsia had a much lower incidence of clinically significant hypotension that required IV ephedrine than normal patients (Table A). The baseline HR values were similar in the 2 groups, and the frequency of HR changes did not differ significantly between the groups, although the magnitude of the increase in HR was greater in healthy subjects.

DISCUSSION:

It is clear from this study that patients with pre-eclampsia experience less hypotension after spinal anesthesia than normal labor. Although the magnitude of the decrease in SBP was similar in the 2 study groups, the decrease in DBP and MAP was significantly less in patients with pre-eclampsia, including severe pre-eclampsia deliveries, than in healthy subjects. Since changes in MAP reflect changes in both SBP and DBP over time, and because it is typically used in the study of severe pre-eclampsia to evaluate the effect of regional anesthesia on BP in these patients, we chose MAP as the primary variable of the study. instead of SBP. However, special attention was paid when SBP was

significantly reduced from baseline and intravenous ephedrine was administered immediately to avoid any deleterious effects of hypotension on uteroplacental flow in healthy births. It is believed that patients with severe pre-eclampsia may be at high risk with spinal anesthesia due to the possibility of severe hypotension with maternal and fetal consequences due to decreased plasma volume and the need to restrict intravenous fluids to avoid iatrogenic pulmonary edema and therefore should be used. Spinal anesthesia is not common in pre-eclampsia. Several prospective and retrospective studies are currently available which clearly show that when used correctly, spinal anesthesia produces a similar frequency and severity of hypotension in patients with severe pre-eclampsia as epidural analgesia. In our study, we safely administered subarachnoid anesthesia in pre-eclampsia, including severe pre-clamptic states. In addition, in our study, the incidence and severity of hypotension were lower in patients with pre-eclampsia compared to healthy controls. In this study, we encountered no case of iatrogenic pulmonary edema with reasonable pretension in pre-eclampsia. Several factors could have influenced our observations. One obvious factor should be the significant reduction in the gestational age in pre-eclampsia during LSCS. Indeed, healthy women in labor, born at or near labor, carrying a larger fetus may be at an increased risk of aortic and vein compression. Another factor may be the change in blood pressure physiology in pre-eclampsia. Blood pressure is regulated by vascular tone through the sympathetic and endothelial pathways. Sympathetic activity increases vascular tone. As excessive sympathetic activity has been suggested in pre-eclampsia, this may contribute to hypertension.

Sympathetic outflow into the blood vessels can be altered in both pre-eclampsia and healthy deliveries by spinal anesthesia. In terms of the endothelial pathway, the endothelium regulates vascular tone through an endothelial-bound vasodilator system that is altered in the pre-eclampsia state to diminish the role of endothelial-dependent relaxation of small vessels. Moreover, pre-eclampsia is characterized on the one hand by an increased production of many circulating factors with a high depressant effect and, on the other hand, by an increased sensitivity of the blood vessels to pressure drugs due to endothelial damage. These two phenomena contribute to the widespread vasoconstriction seen in patients with pre-eclampsia, are not altered by spinal anesthesia, and may maintain vascular tone that ultimately reduces the reduction in blood pressure following intrathecal block in patients with pre-eclampsia. The increased sensitivity of blood vessels to the vasoconstrictor effects of oppressive drugs in preeclampsia could explain the easy recovery of BP to baseline with lower doses of ephedrine in pre-eclampsia compared to healthy subjects in our study. Although MAP decreased more in healthy births, the 5-minute Apgar score was not significantly different between the treatment groups. This shows that although MAP decreased to a greater extent, blood flow through the uterus and placenta was not significantly impaired in healthy births.

CONCLUSION:

From this prospective study, we conclude that the incidence and severity of hypotension following spinal anesthesia is lower in pre-eclampsia compared to healthy deliveries, and that if properly administered and monitored, spinal anesthesia is a safe alternative to epidural in patients with pre-eclampsia, including severe pre-eclampsia. Moreover, in a situation where a large patient appears, such as in our hospital where we conducted this study, spinal anesthesia, due to its simplicity, reliability and faster onset, can save a lot of time and can be a more practical method of anesthesia in preeclampsia in such an environment.

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