Spinal Anesthesia in Preeclamptic Parturients

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ABSTRACT

In this prospective cohort study, we compared the incidence and severity of spinal anesthesia (SA) associated hypotension in preeclamptics (n=25) versus healthy parturients (n=25) undergoing cesarean delivery. After proper preloading, SA was administered with 0.75% hyperbaric bupivacaine. Blood pressure (BP) was recorded before performing SA (baseline BP), and then after SA, every 2 minutes for 30 minutes, and thereafter, every 5 minutes up to completion of surgery. The preeclamptic patients had a less frequent incidence of clinically significant hypotension, which was less severe and required less ephedrine. The risk of hypotension was significantly less in preeclamptic patients than that in healthy patients. Spinal anesthesia seemed to be a useful and safe option, and alternative to epidural anesthesia, in preeclamptic patients in setting of large patient turn up for cesarean deliveries.
Key words: Preeclampsia, parturients, spinal anaesthesia

INTRODUCTION

Cesarean delivery is a common method of terminating pregnancy in preeclamptic patients, more common when the later becomes severe. Anesthesiologists are more likely to encounter a difficult airway in a severely preeclamptic patient. Furthermore the hazards related to the hemodynamic consequences of laryngoscopy and tracheal intubation in a severely preeclamptic patient are very much obvious[1]. So, general anesthesia in such patients may be resorted to only when regional anesthesia is contraindicated. Although spinal anesthesia has been usually avoided in these patients because of the risk of precipitous fall in BP and severe hypotension, and epidural anesthesia preferred, several studies are now available that show that the hemodynamic effects of spinal and epidural anesthesia are almost similar[1,2,3,4]. Recent studies have indicated that SA may be an appropriate anesthetic choice for women with severe preeeclampsia having a cesarean delivery[5]. Furthermore, owing to its simplicity, reliability and rapidity, SA may be considered as an alternative to GA for emergency cesarean delivery in preeclamptic women who have been adequately prepared with judicious amount of IV preload[5].

METHODS

After proper approval from Hospital ethics committee and informed consent from the patients, the study was conducted in Sharif Medical and Dental College, Lahore from December 2009 to June 2010. The study included 25 preeclamptic patients posted for routine and emergency LSCS. Another 25 normal patients were studied as control. Severe preeclampsia was defined as per criteria of Davy and MacGillivary[6], as systolic blood pressure (SBP) greater than 160 mmHg, and diastolic blood pressure (DBP) greater than 110mmHg or both. After each case enrollment, the next normotensive patient scheduled for LSCS was administered spinal anesthesia and selected as a control. Patients with chronic hypertension, diabetes or coagulopathy were not included in the study.

All patients were preloaded with lactated Ringer's solution, about 1000ml before the anesthesia was administered. The preloading was done with patient in left lateral position and continuous monitoring of heart rate (HR) and blood pressure (BP). Baseline BP and HR were calculated as mean of 3 consecutive measurements 2 minutes apart. Spinal anesthesia was administered, with patient in sitting position, after skin infiltration with 3ml of 2% lignocaine, with a 25 gauge pencain spinal needle in L3-4 vertebral interspace. Hyperbaric bupivacaine, 0.75% (2ml) was injected intrathecally and the patient returned to supine position with left uterine displacement. A 10-15 degree head down tilt was used to facilitate upward spread of local anesthetic.

We recorded maternal BP and HR every 2 minutes for first 30 minutes, and every 5 minutes thereafter up to completion of surgery. We defined spinal hypotension as fall of greater than 30% mean arterial pressure (MAP) from baseline, considering that a decrease of 20% in MAP is usually a therapeutic goal in severe hypertension[1], and used IV ephedrine in installments of 5-6mg to treat hypotension, the dose was repeated after 2-3 min if

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necessary. We also studied variables including demographic data, gestational age and Apgar scores.

RESULTS

We studied 25 preeclamptic patients and 25 health controls. The results of the comparative study are depicted in table A. Demographic variables, gestational age an Apgar score in two study groups are compared in table B. The statistical analysis of the data was done by using test statistics student's t-test for difference of means. These tests were further referenced for p-values for their significance. All tests were two sided, and p-value less than 0.05 were considered statistically significant. Mean baseline values of SBP, DBP, and MAP were more in preeclamptic group. There was a significant decrease in all the 3 variables in both groups following administration of spinal anesthesia. It is evident from table A that magnitude of decrease in SBP was similar in both groups, whereas that of decrease in SBP and MBP was significantly smaller in preeclamptic patients. Preeclamptic patients had significantly less incidence of clinically significant hypotension that made use of IV ephedrine necessary than normal patients (Table A). Baseline values of HR were similar in the 2 groups and the incidence of HR changes did not differ significantly among the study groups, albeit, the magnitude of increase in HR was larger in healthy patients.

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

Data are mean ±standard deviation, P-value <0.05 is statistically significant

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

Data are mean±SD, P-value <0.05 is statistically significant

DISCUSSION

It is obvious from this study that preeclamptic patients experience less hypotension following spinal anesthesia than healthy parturients. Though magnitude of fall in SBP was similar in the 2 study groups that of fall in DBP and MAP were significantly less in preeclamptic patients, including severe preeclamptic parturients, than healthy controls.

As changes in MAP reflect changes in both SBP and DBP over a course of time and because it is usually used in study of patients with severe preeclampsia to evaluate the effects of regional anesthesia on BP in these patients[2,3,4], we did chose MAP as primary study variable instead of SBP. However special attention was paid when SBP decreased significantly from baseline and IV ephedrine used immediately to avoid any harmful effect of hypotension on uteroplacental blood flow in healthy parturients.

It has been believed that severely preeclamptic patients may carry a high risk with use of spinal anesthesia owing to possibility of severe hypotension with maternal and fetal consequences[12] because of reduced plasma volume [13] and of need to limit IV fluids to avoid iatrogenic pulmonary edema[14] , so use of spinal anesthesia has not been popular in preeclampsia. At present several prospective and retrospective studies are available that clearly show that properly administered spinal anesthesia induces a similar incidence and severity of hypotension in patients with severe preeclampsia as epidural anesthesia[2,3,4]. In our study, we administered spinal anesthesia safely in preeclamptic parturients, including severe preecclamptics. Furthermore incidence and severity of hypotension were less in preeclamptic patients compared to healthy controls in our study. We didn't encounter any case of iatrogenic pulmonary edema with judicious preloading in preeclampsia in this study.

Several factors might have contributed to our observed findings. One obvious factor should be significantly decreased gestational age in preeclamptics at the time of LSCS. Indeed, healthy parturients, at term or near term, carrying a larger fetus may be at increased risk of aortocaval compression. One more contributing factor may be altered physiology regarding regulation of BP in preeclampsia. BP is regulated via vascular tone by sympathetic and endothelial pathways. Sympathetic activity increases the vascular tone. As sympathetic over activity has been suggested in preeclampsia[7], this may contribute to their hypertension. The sympathetic outflow to vessels may be altered in both preeclamptic and healthy parturients by spinal anesthesia. Regarding the endothelial pathway, the endothelium regulates the vascular tone via endothelium-related vasodilator system that is altered in preeclampsia, decreasing the role of endothelial-dependent relaxation of small resistance vessels[8,9,10]. Furthermore, preeclampsia is characterized by an increased production of numerous circulating factors with a potent presser effect on one hand, and by an increased sensitivity of blood vessels to presser drugs because of endothelial damage, on the other hand. These two phenomena contribute to the widespread vasoconstriction seen in preeclamptic patients[11], are not altered by spinal anesthesia, and could maintain a vascular tone that, ultimately, contributes to limit decrease in BP following intrathecal block in preeclamptic patients. The increased sensitivity of blood vessels to the vasoconstrictive effect of presser agents in preeclampsia may explain easy restoration of BP to baseline with smaller doses of ephedrine in preeclamptics compared to healthy patients in our study.

Although MAP decreased more in healthy parturients, 5-minute Apgar score didn't differ significantly between the study groups. This shows that even though MAP did fall to a larger extent, uteroplacental blood flow was not impaired significantly in healthy parturients.

CONCLUSION

From our this prospective study, we draw the conclusion that incidence and severity of hypotension following spinal anesthesia is less in preeclampsia compared to healthy parturients, and use of spinal anesthesia, when properly administered and monitored, is a safe alternative to epidural anesthesia in preeclamptic patients including severe preeclampsia. Furthermore, in the setting of huge patient turn up, as in our hospital where we conducted our present study, spinal anesthesia owing to its simplicity, reliability and quicker onset may save lot of time and so may be more practical method of anesthesia in preeclamptic parturients in such a setting.

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