

Original Article

SPINAL ANESTHESIA FOR CESAREAN SECTION IN PREECLAMPSIA

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Abstract

Background: Pregnancy-induced hypertension constitutes a major cause of morbidity and mortality in developing nations and it complicates about 6–8% of pregnancies. Severe preeclampsia poses a dilemma for the anesthesiologist especially in emergency situations where caesarean deliveries are planned for uninvestigated or partially investigated parturients. The choice of anesthesia in preeclamptic mothers undergoing Cesarean delivery has been debated for years. General as well as regional anesthetic techniques are equally acceptable for cesarean delivery in pregnancies complicated by preeclampsia. Currently, the safety of regional anesthesia technique is well established and they can provide better obstetrical outcome.

Objective: To study the outcome and elaborate the hemodynamic changes associated with spinal anesthesia in preeclampsia.

Methods: The study was carried out in comilla medical college hospital and private clinics in comilla among preeclamptic women who underwent Lower Segment Caesarean Section (LSCS) under spinal anesthesia between January 2013 and July 2017. Both emergency as well as elective cases were included in the study. Patients' records were studied and analyzed. The drug used for spinal anesthesia was hyperbaric Bupivacaine 0.5%. Subarachnoid block was performed in either L3-L4 or L2-L3 intervertebral segment with patient sitting up. Spinal needle 25G was used. The hemodynamic response (systolic blood pressure, diastolic blood pressure, heart rate) and SpO₂ were observed.

Results: Total of 310 cases was included in our study. Age ranged from 17 to 37 years. The duration of surgery ranged from 25mins to 100mins. According to observation, both systolic and diastolic blood pressure dropped to minimum within the initial 10 minutes of spinal anesthesia. Heart rate fluctuation was minimal with an initial small drop within 10 minutes of spinal anesthesia. Similarly, SpO₂ also showed a subtle decline within 20 minutes of spinal anesthesia.

Conclusion: Our study finds spinal anesthesia as a preferred method taking into account the relatively stable and better hemodynamic stability, convenience in procedure and rapid and predictable anesthesia and no risks of sudden critical hypotension.

Key Word : Cesarean Section, Preeclampsia, Regional Anesthesia, Spinal Anesthesia

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Introduction

Preeclampsia is a multisystem disorder of pregnancy associated with significant maternal, foetal and neonatal morbidity and mortality¹. It has been described as the triad of new onset hypertension (BP $\geq 140/90$ mm Hg, new onset proteinuria >0.3 gm/day and new-onset nondependent edema during pregnancy, usually after 20 weeks². The annual mortality rate in patients with preeclampsia is estimated to be 50,000 world-wide³.

The choice of anesthesia in preeclamptic mothers undergoing Caesarean delivery has been debated for years. General as well as regional anesthetic methods are equally acceptable for caesarean delivery in pregnancies complicated by preeclampsia. 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. Similarly, an exaggerated pressor response to intubation may increase the maternal plasma catecholamine concentration, which in turn impairs the uteroplacental blood flow^{4,5}. Currently, regional anaesthesia is preferred in these patients because it avoids maternal complications and improves uteroplacental blood flow and neonatal outcome⁶.

Selection of regional anesthesia is another aspect where the results for epidural and spinal have been equivocal. Both of these techniques have their unique benefits and risks. The expertise and skill involved and higher failure rate of epidural limit its frequent use. On the other hand, significant maternal hypotension is believed to be more likely with spinal compared with epidural anesthesia⁷. Despite the convenience in administration, rapid onset of regional blockade and fairly predictable course of anesthesia, spinal anesthesia is controversial only in terms of hemodynamic compromise that it is believed to cause in preeclampsia. Several studies have been carried out which have concluded spinal anesthesia more preferable than epidural anesthesia in preeclampsia.

Methods

The prospective study was carried out in Comilla Medical College hospital and private clinics in Comilla among preeclamptic women who underwent Lower Segment Caesarean Section (LSCS) under spinal anesthesia between January 2013 and July 2017. Both emergency as well as elective cases were included in the study. Patients' records were studied

and analyzed and relevant information were taken into account.

Patients with signs and symptoms of impending eclampsia such as headache, visual disturbances, epigastric pain and convulsions were excluded from this study. Patients with coagulation disorders, history of allergy to local anaesthetics, placental abruption, placenta praevia, HELLP syndrome, renal diseases, cardiac diseases, multiple pregnancies and local infection were also excluded.

All patients were premedicated with oral Ranitidine 150mg and oral metoclopramide 10mg, two hours prior to surgery. Antihypertensive medications were continued. On arrival to operating room, patient's baseline heart rate and blood pressure were recorded before any invasive procedure. Intravenous line was established using an 18G cannula and an infusion of Hartmann's solution @ 10ml/kg was started with within 30 minutes before surgery and it is continued as an intraoperative fluid. Oxygen was given via face mask at the rate of 5L/minute.

Spinal anaesthesia was performed using a 25G spinal needle at the level of L3-L4 or L2-L3 interspace with the patient in sitting up position. After observing the free flow of CSF 2.5mL of 0.5% hyperbaric bupivacaine with 25 μ g fentanyl was injected into the subarachnoid space. The hemodynamic response (systolic blood pressure, diastolic blood pressure, heart rate) and SpO₂ were observed every 5 minutes interval after the administration of spinal anesthesia for one hour. Whenever hypotension (fall in systolic BP $>30\%$ from baseline) occurred it was treated with intravenous ephedrine 5mg. Total number of such interventions was documented.

All patients had their bladder catheterized during surgery and for 12 hours postoperatively. Maintenance fluid was given at a rate of 100mL/h. After delivering the baby 10 units Oxytocin in 100mL I/V fluid was given over 30mins. The patients were followed up for 24 h with routine postoperative monitoring and care in the postsurgical ward. The newborn babies were assessed by pediatrician.

Results

Total of 310 cases were included in our study. Age ranged from 17 to 37 years (mean 25.13, SD \pm 4.5). The duration of surgery ranged from 25min to 100min (mean 53.21, SD \pm 13.3). However, we limited our observation 5 min before performing spinal till one hour of spinal anesthesia.

Table 1: The gravida and parity frequency

Gravida	Frequency	Percent
Primi	172	55.48 %
G2	96	30.96 %
G3	38	12.25 %
G4	4	1.29 %
Total	310	100%

Systolic and diastolic blood pressures and heart rates were monitored preoperatively, and every 5 minutes after subarachnoid block was performed. Similarly, SpO₂ was monitored continuously and every 5 min readings were recorded.

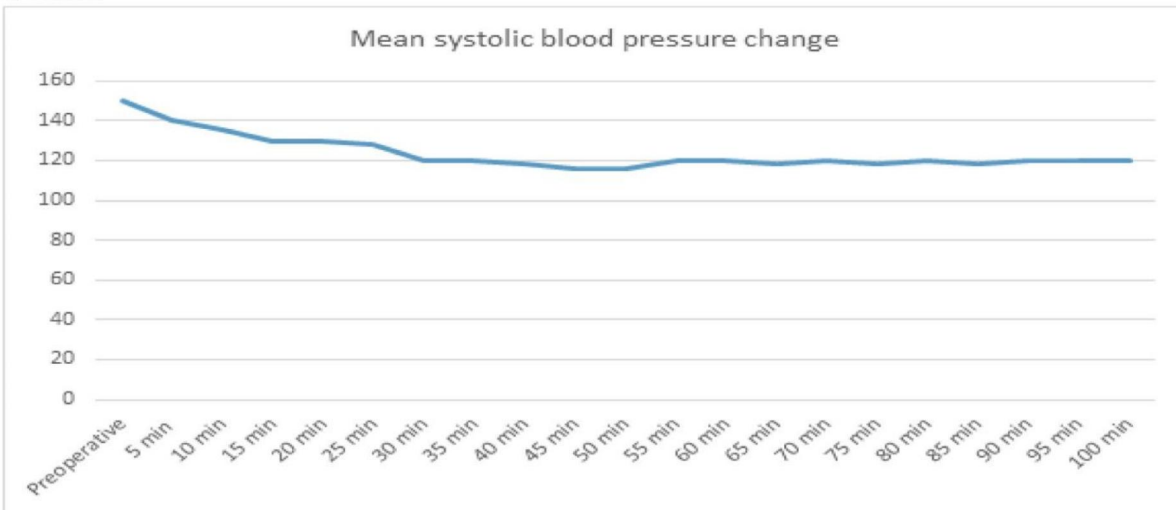


Figure I: Mean systolic blood pressure change over one hour of spinal anesthesia

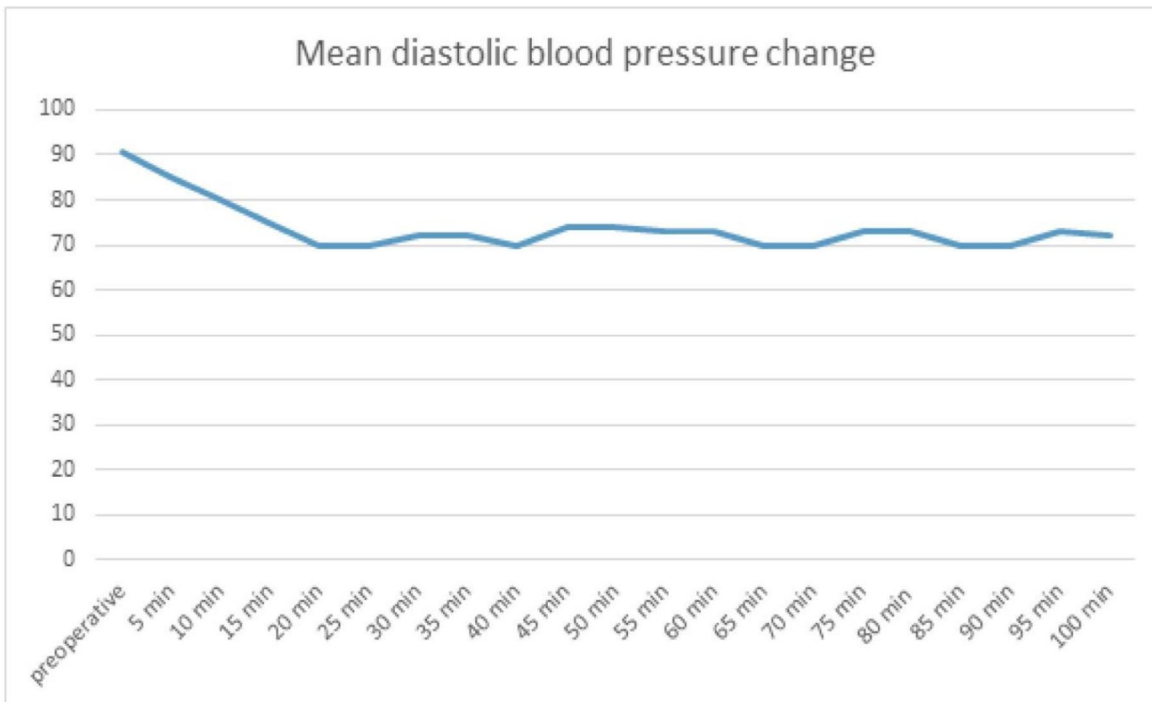


Figure II: Mean diastolic blood pressure change over one hour of spinal anaesthesia

According to our observation, both systolic and diastolic blood pressure dropped to minimum within the initial 10 minutes of spinal anesthesia. After the initial 10 minutes of spinal anesthesia, both systolic and diastolic pressure followed an overall constant reading. This might be because of the intravenous fluids alone or due to the effect of pressor agents.

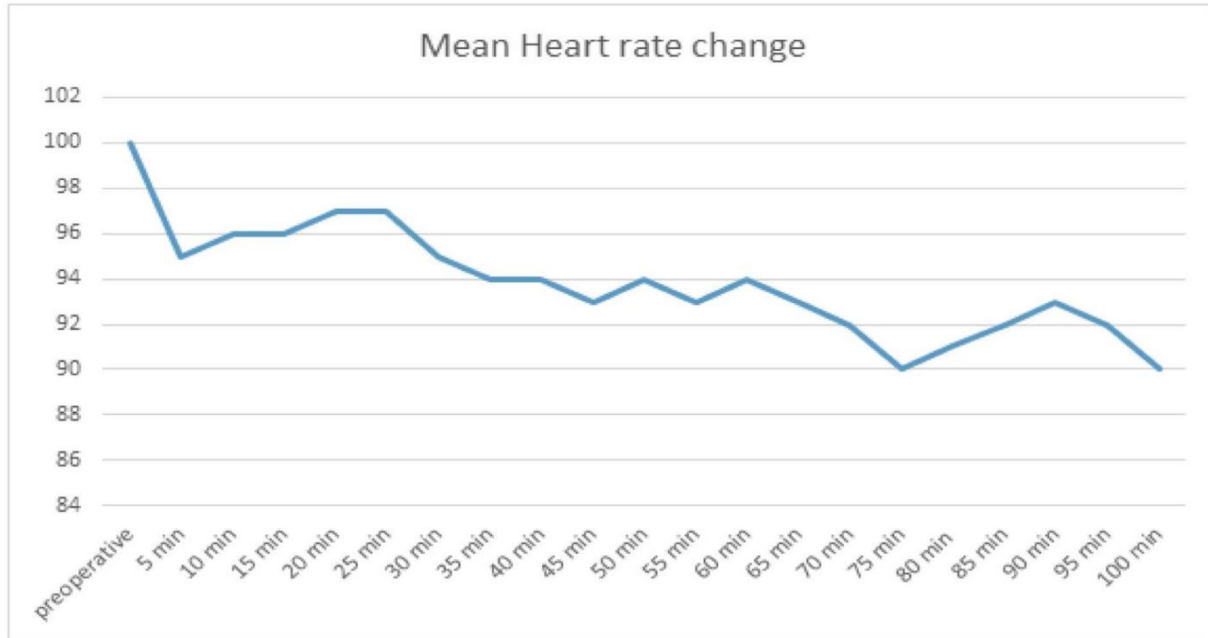


Figure III: Heart rate change over one hour of spinal anesthesia

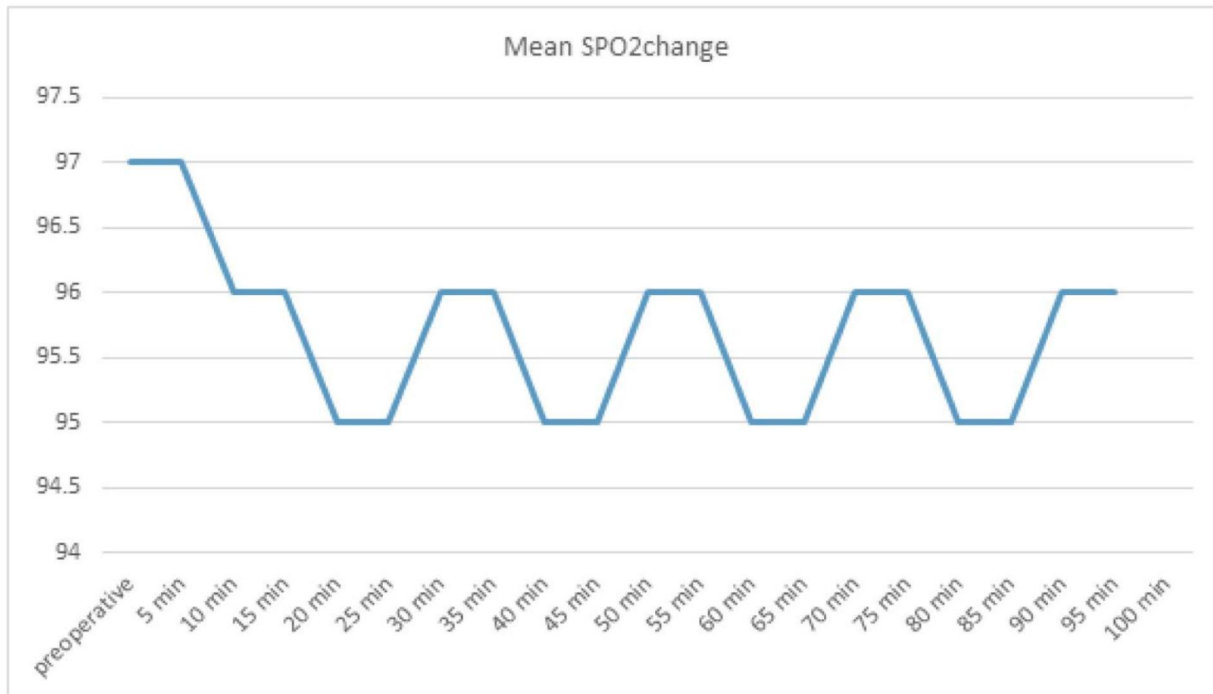


Figure 3: SpO₂ change over one hour of spinal anesthesia

Discussion

Preeclampsia is one of the leading causes of maternal morbidity and mortality and occurs in 3-5% of all pregnancies worldwide. Maternal and neonatal outcome depend on gestational age at onset, severity of the disease and presence of preexisting medical conditions⁸. Anesthesia for Cesarean delivery in patients with preeclampsia has been a debated issue over years. General anaesthesia is riskier in preeclampsia because of accentuated airway edema and narrowing of glottis causing difficult intubation, hypertensive response to laryngoscopy and intubation, decreased intervillous blood supply, and increased risk of aspiration and prolongation of neuromuscular blockade in those who received magnesium sulphate⁹. Regional anaesthesia is preferred to general anaesthesia for caesarean section considering the risks and benefits to the mother and foetus. Compared to epidural anaesthesia, spinal anaesthesia is more reliable, has early onset of blockade, provides better quality anaesthesia and has less risk of local anaesthetic toxicity¹⁰. In one randomized study, comparison of general and regional anesthesia for cesarean delivery in pregnancies complicated by severe preeclampsia, it was found that maternal hypotension resulting from regional anesthesia could be managed without excessive IV fluid administration¹¹.

Spinal anaesthesia may theoretically cause a higher incidence of hypotension than epidural anaesthesia, because of sudden sympathetic blockade causing significant reduction in venous return due to venodilatation in the lower part of the body. This is further worsened in pregnancy by aorto-caval compression. However this hypotension following spinal anaesthesia can be easily treated and is short lived and has not been linked to clinically significant differences in outcomes¹². In a large prospective study, it was found that even though the incidence of hypotension was more in the spinal group, the duration of hypotension was short and easily treatable¹³.

In our study there were both systolic and diastolic blood pressure dropped in the initial 10 minutes of spinal anesthesia. After the initial 10 minutes of spinal anesthesia, both systolic and diastolic pressure followed an overall constant reading. Heart rate fluctuation was minimal with an initial drop within 10 minutes of spinal anesthesia and remained almost constant over the one hour duration. Similarly, SpO₂ also showed a subtle decline within 20 minutes of spinal anesthesia and then remained fairly constant.

Another prospective study comparing haemodynamic effects of spinal anaesthesia for caesarean section in

normotensive parturients and in those with severe preeclampsia, the preeclamptics had less hypotension and less vasopressor requirement. In normal pregnancy there is increased synthesis of prostaglandins and nitric oxide which act as vasodilators and there is increased dependence on sympathetic vasoconstriction for vascular tone. Sympathetic blockade after spinal anaesthesia is associated with sudden and excessive hypotension. In preeclampsia vascular endothelial damage occurs, which produces increased amount of endogenous vasopressors like thromboxane and endothelin. So even after spinal anaesthesia, vascular tone is maintained preventing excessive fall in blood pressure. In normal pregnancy there is reduced sensitivity to exogenous vasoconstrictors leading to increased vasopressor requirement to reverse the hypotension. In preeclampsia there is an increased sensitivity to vasoconstrictors and so less vasopressor is required¹⁴.

As far as the expertise and convenience is concerned, spinal anesthesia finds a better place than epidural. As of now, it has been well established that spinal anesthesia is a better option than epidural or general anesthesia. A retrospective study carried out by Chan and colleagues concluded spinal anesthesia as the method of choice for preeclamptic women. They did a 5 year retrospective survey of anesthesia for caesarean section for mild/ moderate and severe preeclampsia including 121 cases of non-labouring preeclamptic patients receiving spinal or epidural anesthesia for caesarean section. Comparisons were made of the lowest blood pressures recorded before induction of anaesthesia, during the period from induction to delivery and the period from delivery to the end of operation. The decrease in blood pressure was similar after spinal and epidural anaesthesia. There was no difference in maternal or neonatal outcome¹⁵. It is recommended that a regional anaesthetic technique should be used whenever possible in preference to general anesthesia. General anesthesia is preferable when regional techniques are contraindicated or where they have been unsuccessful².

Studies have suggested that spinal anesthesia does not cause a very rapid fall in blood pressure in preeclamptic patients as is seen in normal pregnancy¹⁶. This might be due to the fact that failure to vasodilate is a common factor in preeclampsia⁸. A study by Dyer et al have found Spinal anesthesia in severe preeclampsia to cause insignificant changes in cardiac output further emphasizing the use of spinal anesthesia in preeclamptic patients¹⁷. Another Prospective cohort study carried out by Aya AGM et al has also concluded that the incidence of hypotension is

less in patients with severe preeclampsia undergoing spinal anesthesia for cesarean delivery, as compared with healthy parturient. In addition, the magnitude of the decrease in mean BP is smaller in severely preeclamptic patients¹⁶. In another study by Aya AGM et al compared the risk between patients with severe preeclampsia and healthy women undergoing preterm cesarean delivery. It was found that the risk of hypotension in the preeclamptic group was almost 2 times less than that in the preterm group concluding that preeclampsia-associated factors, rather than a smaller uterine mass, account for the infrequent incidence of spinal hypotension in preeclamptic patients¹⁸. In addition to fairly stable hemodynamics, spinal anesthesia has another important implication regarding cost especially in third world countries.

Conclusion

With the recent studies establishing the fact that spinal anesthesia is a safer option for preeclamptic patients, our study also finds spinal anesthesia as a preferred method taking into account the relatively stable hemodynamics, convenience in procedure and rapid and predictable anesthesia. Moreover, it is a method of choice for a developing country like Nepal where resources and expertise are limited. However, future prospective studies involving a large number of patients and comparison with various other methods of anesthesia are needed to further establish the safety and utility of spinal anesthesia over other anesthetic methods in preeclamptic patients.

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