

A Prospective Randomized Study Comparing the Effects of Intravenous Bolus Doses of Ephedrine and Phenylephrine for the Maintenance of Blood Pressure in Caesarean Section Under Spinal Anaesthesia.

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ABSTRACT

Background: In most of the obstetric patients undergoing caesarean section, spinal anaesthesia is the most accepted approach. It provides a rapid, intense, definite and better sensory and motor blockade. In spite of this, eighty per cent of patients experience hypotension after spinal anaesthesia. The use of vasopressors (Phenylephrine and Ephedrine) is the mainstay of treatment for hypotension. **Methods:** This is a prospective, randomized and comparative study conducted on 100 obstetric patients undergoing caesarean section in spinal anaesthesia. The patients were divided into two groups (group P and group E) each containing 50 members. When hypotension occurred in patients undergoing surgery, group P was given 40mcg of phenylephrine and group E received 6 mg bolus dose intravenously. The comparison in between the two groups was done by using Student's t test. **Results:** Phenylephrine has proved to be better in raising as well as maintaining the arterial pressure after the block as compared to ephedrine. The administration of phenylephrine showed reduction in heart rate. Neonatal APGAR scores were comparable in both Phenylephrine and Ephedrine groups. **Conclusion:** Intravenous phenylephrine plays a major role in controlling the post-spinal anaesthesia hypotension, without jeopardizing the maternal physiology and foetal outcomes.

Keywords: Caesarean section, Ephedrine, Phenylephrine, Spinal anaesthesia.

INTRODUCTION

The essential requirement for the end result of any pregnancy is the healthy baby with good experience of delivery of the mother. To prevent any maternal or foetal complication, high degree of care is needed for positive outcome.

The pregnancies undergoing Caesarean section are the greater challenges for the anaesthesiologists. In most of the obstetric patients, spinal anaesthesia is the most accepted approach. It provides a rapid, intense, definite and better sensory and motor blockade for Caesarean delivery. In spite of this, studies suggest that eighty per cent of patients experience hypotension after spinal anaesthesia.^[1,2] Various methods like fluid preload and lateral uterine displacement are used to prevent it. Symptoms like dizziness, nausea, vomiting are allied with spinal anaesthesia induced hypotension. This can lead to foetal complication like bradycardia and acidosis.^[3]

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Appropriate and timely management of maternal hypotension is needed for preventing maternal and foetal outcomes. Besides left uterine displacement and volume preloading, quick crystalloid administration also helps in treating hypotension.

But this method is associated with dilutional anaemia leading to pulmonary oedema.^[3] Some studies also recommend other methods like leg compression and Elevation, prophylactic administration of vasopressors including Ephedrine, Mephentermine, Phenylephrine, prophylactic infusion of Angiotensin II7 and Atrial Natri-uretic peptide for treating spinal anaesthesia induced hypotension.^[4,5]

Most studies recommend that use of vasopressors is the mainstay of treatment.^[1-3,6] Ephedrine is supposed to be most widely used agent for this purpose, but can lead to symptoms like maternal tachycardia. The reason behind the tachycardia is the non-selective action of ephedrine on both alpha and beta adrenergic receptors. Hence, there is a requirement for a substitute drug for the management of spinal induced hypotension, which lacks the maternal and foetal complications.^[2]

The other drug, phenylephrine is also recommended for treating hypotension. Since it is directly acting sympathomimetic agent with selective alpha1 adrenergic activity, thus reducing the incidence of maternal tachycardia and foetal acidosis as compared to ephedrine.^[6,7]

Hence, the study was done to compare the efficacy and side effects of intravenous phenylephrine 40 micrograms and Ephedrine 6 milligram in governing the hypotension associated with spinal anaesthesia in obstetric patients undergoing caesarean section.

MATERIALS AND METHODS

This is a prospective, randomized and comparative study conducted on 100 obstetric patients undergoing caesarean section in spinal anaesthesia. Clearance was taken from institutional ethical committee. The patients were informed about the study and written informed consent was taken. With the help of computer generated randomized table, the patients were divided into two groups (group P and group E) each containing 50 members. The patients with cardio-vascular complications, diabetes, severe anaemia, obstetrical complications like ante-partum haemorrhage, pregnancy induced hypertension were excluded from the study.

Initial vitals like heart rate, blood pressure (both systolic and diastolic) and mean arterial pressure was measured. Ringer lactate solution (10 mg/kg) was preloaded intravenously. Then in left lateral position, intrathecally 2 ml of 0.5% hyperbaric

Bupivacaine through 23G Quincke needle at L3-L4 subarachnoid space was given. After this, the position of the patient was changed to supine and oxygen support was given (5 lit/min). The vitals of the patient (heart rate, blood pressure and mean arterial pressure) were measured at every 5 minutes till the end of surgery.

Hypotension is defined as the blood pressure less than 90 mmHg or fall in blood pressure >20% of baseline.^[8] When hypotension occurred in patients undergoing surgery, group P was given 40 mcg of phenylephrine and group E received 6 mg bolus dose intravenously. Parameters like time interval in between spinal block and hypotension, duration of surgery, number of doses of drugs needed to control hypotension and APGAR score of neonate at 1 min and 5 mins after delivery were recorded.

The comparison in between the two groups was done by using Student's t test. 'p' value less than 0.05 was considered as statistically significant.

RESULTS

Table 1: Comparison of demographic profiles of the patients of two groups.

Characteristics	Group P	Group E	P value
Age (years)	25.72±1.44	25.81±1.39	Insignificant
Weight (kg)	58.32±5.43	58.66±5.29	Insignificant
Height (cm)	156.14±1.22	156.29±1.27	Insignificant

The demographic profiles of the patients including age, weight and height of two groups was

comparable and thus statistically insignificant (p<0.05) [Table-1].

Table 2: Comparison of baseline parameters of the patients of two groups..

Parameters	Group P	Group E	P value
Heart rate (HR)	85.61±11.79	86.62±10.68	Insignificant
Systolic blood pressure (SBP)	126.48±8.08	126.92±7.98	Insignificant
Diastolic blood pressure (DBP)	82.84±7.20	84.78±6.98	Insignificant
Mean arterial pressure (MAP)	96.22±6.18	95.62±5.88	Insignificant

The baseline vital parameters (heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure) are comparable in two groups and thus difference is statistically insignificant (p<0.05) [Table-2].

The time interval in between spinal block to development of hypotension in-group P is 3.36±0.82 minutes whereas in group E is 3.48±0.84 minutes. The difference in between two groups is statistically insignificant (p>0.05) [Figure-1].

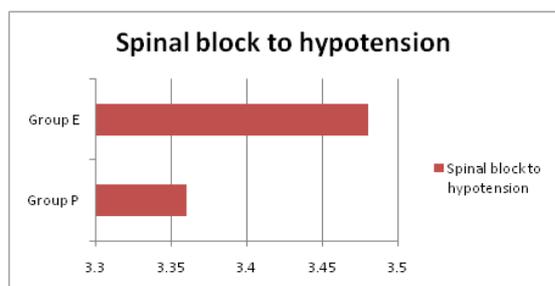


Figure 1: The comparison of time interval (minutes) in between spinal block to development of hypotension.

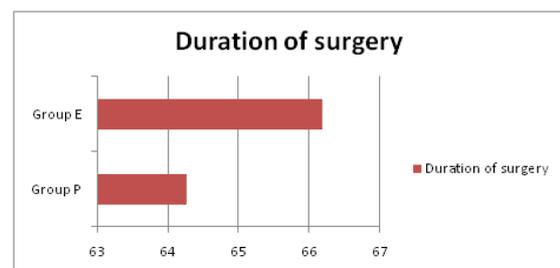


Figure 2: The comparison of duration of surgery (minutes) in between two groups.

The duration of surgery in group P and E are 64.26±8.21 and 66.18±8.10 minutes respectively. The difference in between two groups is statistically insignificant (p>0.05) [Figure 2].

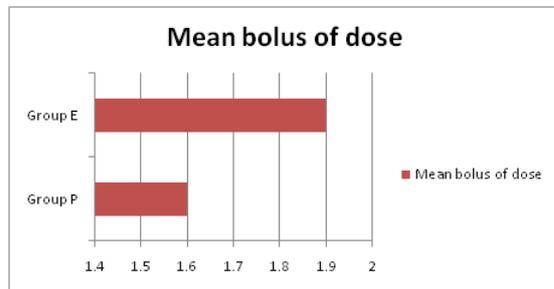


Figure 3: The comparison of mean bolus of dose required to control hypotension.

Group P required average of 1.6 boluses whereas Group E required 1.9 as boluses [Figure 3].

Systolic blood pressure: The basal SBP in group P was 126.48±8.08 and that of Ephedrine group was 126.92±7.98 which was statistically insignificant. The SBP during hypotension after spinal block was 82.48±7.88 in Group P and 82.24±14.72 in Group E, which was found to be statistically comparable (p>0.05). Systolic blood pressure in Group P at 5 minutes after IV bolus was 102.28 mm of Hg while in Group E was 88.62 mm of Hg. This shows a very strong statistical significance as indicated by p value of less than 0.05. Systolic blood pressure in Group P remains high till the end of surgery as compared to Group E.

Diastolic blood pressure: Basal DBP in group P and E were 82.84±7.20 and 84.78±6.98 respectively. The DBP during hypotension after spinal block was found to be statistically comparable (p>0.05). After 5 minutes of giving bolus dose, the DBP in group P was 62.44±5.82 mm of Hg, whereas, in Group E was 56.78±7.46 mm of Hg. This difference is statistically significant (p<0.05). p value is less than 0.05 till the end of surgery, which indicates the difference is significant between the two groups, Group P & Group E.

Mean arterial pressure: It was found that basal MAP in group P was 96.22±6.18 and that of group E was 95.62±5.88. In a similar way, MAP during hypotension was 62.38±5.51 and 60.98±5.22 in Group P and E respectively, which was statistically insignificant. Mean Arterial pressure in Group P at 5 minutes after IV bolus was 78.54±8.34 mm of Hg while in Group E was 72.84±8.76 mm of Hg. This shows a very strong statistical significance (p<0.05).

The apgar score after one and five minutes in both the groups was comparable and thus statistically insignificant (p>0.05) [Table 3].

Table 3: Comparison of Apgar score in two groups.

Apgar score	Group P	Group E	P value
After one minute	9.84±0.69	9.78±0.72	>0.05
After five minutes	9.66±0.52	9.56±0.48	>0.05

DISCUSSION

Hypotension is the commonest adverse effect of spinal block. So the primary aim of the anaesthetist after spinal block is the prevention and treatment of hypotension which is defined as the blood pressure less than 90 mmHg or fall in blood pressure >20% of baseline.^[8] Most studies recommend the preloading with colloid or crystalloid intravenously to prevent the development of post spinal block hypotension.^[6,9] However, the recent researches suggest that use of vasopressors play a major role in controlling hypotension. The combination of preloading and vasopressors is also suggested.^[10,11] Hypotension after spinal anaesthesia occurs due to vasodilation resulting from sympathetic blockage. Thus vasopressors prove to be more helpful in treating hypotension by causing constriction of vessels. It has been shown that the percentage decrease in placental circulation is related to percent of reduction in maternal arterial pressure but not absolute reduction in pressure.^[8,12]

Many studies have established the role of vasopressors in controlling post-spinal hypotension. Ephedrine non-selectively acts on both alpha and beta adrenergic receptors, but phenylephrine selectively binds with alpha adrenergic receptors.^[5,9] Sarvanan M et al also recommended that phenylephrine causes lesser side effects like foetal acidosis as compared to phenylephrine.^[12]

Another study on vasopressors was done by Bhattarai et al, in which the compared the role of three drugs- Phenylephrine, Ephedrine, Mephentermine in controlling post-spinal block hypotension in patients undergoing caesarean section.^[13] The results were similar to present study in which phenylephrine was found to be more helpful in controlling hypotension as compared to other drugs. Neonatal APGAR scores were similar in all the groups, supporting the results of the present study.

CONCLUSION

- The vasopressors play a major role in controlling the post-spinal anaesthesia hypotension, without jeopardizing the maternal physiology and foetal outcomes.
- Phenylephrine has proved to be better in raising as well as maintaining the arterial

pressure after the block as compared to ephedrine.

- The administration of phenylephrine showed reduction in heart rate.
- Neonatal APGAR scores were comparable in both Phenylephrine and Ephedrine groups.

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