

## Study Treating Spinal Anaesthesia Induced Hypotension in Caesarean Section among Phenylephrine, Ephedrine Comparing the Need for Intravenous Vasopressor Therapy

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Conflict of interest: Nil

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### Abstract:

**Background & Methods:** The aim of the study is to Study treating spinal anaesthesia induced hypotension in caesarean section among phenylephrine, ephedrine comparing the need for intravenous vasopressor therapy. An 18-gauge IV cannula was placed in the non-dominant hand and 500 ml of Ringer's lactate solution was given as a preload. Spinal anaesthesia was given in sitting position at L2-3 or L3-4, with a 25G quinke spinal needle using median approach taking full aseptic precautions. The IM injection of the study medication was given into the left deltoid muscle immediately after the subarachnoid injection.

**Results:** Maximum episodes of rescue ephedrine administration were observed in control group. In comparison with control group, episodes were significantly less in in ephedrine as well as phenylephrine group. Also among ephedrine and phenylephrine groups, the difference between phenylephrine and ephedrine group was not found to be significant.

**Conclusion:** The patients were monitored for hypotension (decrease in MAP>25% of baseline MAP), bradycardia (heart rate<50 beats/minute). The episodes of rescue IV ephedrine were significantly higher in control group as compared to in ephedrine group (p=0.000) and in phenylephrine group (p=0.000). The difference between phenylephrine and ephedrine group was not found to be significant (p=0.461).

**Keywords:** Vasopressor, Spinal, Hypotension, Caesarean & Phenylephrine.

**Study Design:** Comparative Study.

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### Introduction

Satisfactory anaesthesia for lower abdominal, urological and lower limb surgeries and it is often associated with a marked fall in blood pressure during and after anaesthesia due to various factors like diminished cardiac output consequent upon decreased venous return due to blockade of sympathetic nerves arising from T<sub>1</sub>-L<sub>2</sub> leading to dilatation of both resistance and capacitance vessels and lack of propulsive movement on veins. Secondly paralysis of sympathetic nerve supply of heart and adrenal gland leads to subsequent catecholamine depletion and thirdly ischemia and hypoxia of vital centres leading to depression of circulatory system [1].

It is desirable to record the blood pressure every 5-10 minutes but there is considerable difference of opinion as to the extent to which it should be allowed to fall before corrective measure are to be taken [2]. Various drugs and methods like preloading with intravenous fluids (crystalloids/colloids), ephedrine, mephentermine, phenylephrine, metaraminol and even intrathecal ketamine have been studied to prevent hypotension during spinal anaesthesia with varying success [3].

The vertebral column, also known as backbone or spine, is a bony structure found in Vertebrates. The vertebral column is composed of a series of 31 separate bones known as vertebrae. There are seven cervical or neck vertebrae, 12

thoracic vertebrae, and five lumbar vertebrae. The sacrum is composed of five fused vertebrae, and there are two coccygeal vertebrae which are sometimes fused [4].

Spinous processes are generally palpable over the midline. The spinous processes of the cervical and lumbar spine are nearly horizontal while those of the thoracic spine point caudally. This is important for neuraxial blocks when the angle of the needle needs to be directed more cephalad for thoracic as opposed to cervical or lumbar blocks [5&6].

### Material and Methods

The study was undertaken in the department of anaesthesiology, Tertiary Care Centre, India. The study included 270 patients (age 20-35 years) undergoing elective caesarean section under spinal anaesthesia. Pre-anaesthetic check-up was done in all the patients which included:

1. Elucidating history of diabetes, hypertension, asthma, tuberculosis, previous cardiovascular or central nervous system abnormalities, drug allergy, previous surgery, or any other significant history.
2. Examination including pulse, blood pressure, cardiovascular examination, respiratory system examination, spinal abnormalities, other systems.
3. Investigations including haemoglobin, complete blood counts, serum electrolytes, INR, blood sugar, serum urea, serum

creatinine, chest X-ray, ECG as and when applicable.

An 18-gauge IV cannula was placed in the non-dominant hand and 500 ml of Ringer's lactate solution was given as a preload. Spinal anaesthesia was given in sitting position at L2-3 or L3-4, with a 25G quincke spinal needle using median approach taking full aseptic precautions. The IM injection of the study medication was given into the left deltoid muscle immediately after the subarachnoid injection. The time of IM injection was taken as time zero. The spinal injection contained 2.5 ml of Bupivacaine 0.5% heavy, the patient was then placed in supine position, with a 15° left lateral tilt.

### Inclusion Criteria

1. Woman of age between 20-35 years
2. Undergoing elective caesarean section.

### Exclusion Criteria

1. Patients with diabetes, respiratory disease, cardiac disease, epilepsy.
2. Height less than 150 cm
3. Allergic to any drug to be used
4. Any other contraindication for spinal anaesthesia

### The patients were divided into 3 groups-

- Group 1 - Received saline 0.9% IM (S)  
 Group 2 - Received ephedrine 45 mg IM (E)  
 Group 3 - Received phenylephrine 2 mg IM (P)

### Result

**Table 1: Demography of each age group of patients**

Age group (yrs)	Group S	Group E	Group P
20-25	60	57	60
26-30	30	27	30
31-35	00	06	00
TOTAL	90	90	90

**Table 2: Level of sensory analgesia achieved 15 minutes after spinal anaesthesia**

	Group S	Group E	Group P
T <sub>4</sub>	00	00	00
T <sub>6</sub>	69	69	60
T <sub>8</sub>	15	12	21
T <sub>10</sub>	06	09	09
T <sub>12</sub>	00	00	00
Total	90	90	90

Mode value- T<sub>6</sub>

Table shows that maximum number of patients in each group achieved sensory level between T<sub>6</sub>-T<sub>8</sub>.

**Table 3: Incidence of hypotension among the three groups**

	Group S	Group E	Group P
No.(n) of patients with hypotension	57	24	15
Percentage of patients with hypotension	63	26	16

**Table 4: Comparison of various groups with respect to episodes of rescue ephedrine requirement**

	Group S & E	Group S & P	Group E & P
p value	0.000	0.000	0.461
Significance	Significant	Significant	Not Significant

All the patients who developed hypotension, nausea or vomiting were given rescue ephedrine 6mg IV. Many patients required more than one dose of rescue ephedrine to treat hypotension.

Maximum episodes of rescue ephedrine administration were observed in control group. In comparison with control group, episodes were significantly less in in ephedrine as well as phenylephrine group.

Also among ephedrine and phenylephrine groups, the difference between phenylephrine and ephedrine group was not found to be significant.

### Discussion

The mechanism by which spinal anaesthesia causes hypotension has been discussed above. Ephedrine causes restoration of blood pressure mainly by increasing heart rate and contractility (direct  $\beta$ -agonist activity) and also by producing some vasoconstriction (indirect effect) (Critchley LAH et al 1995) [7]. Phenylephrine on the other hand, has predominant  $\alpha$ -agonistic activity and restores the blood pressures by virtue of arterial as well as venous vasoconstriction, leading to increase in both systemic vascular resistance and venous return to the heart.

Hypotension in this study was taken as decrease in MAP by  $>25\%$  of baseline MAP. Episodes of hypotension were mainly observed 5-10 minutes after administration of spinal anaesthesia. Few patients developed hypotension up to 25-30 minutes post spinal administration.

It was observed that incidence of hypotension was significantly less in phenylephrine (16%) and ephedrine (26%) groups as compared to control group (63%) ( $p<0.05$ ). Comparing the incidence of hypotension in phenylephrine group and ephedrine group, although incidence of hypotension was low in phenylephrine group but it was not found to be significant. ( $p=0.351$ ).

In the study done by Ayorinde BT et al (2001) [8], they found that incidence of hypotension was significantly less in phenylephrine 4mg (33%) as compared to control group (70%). Also they found that incidence of hypotension in phenylephrine 4 mg group was 33% as compared to ephedrine 45 mg which had an incidence of 48%, and this difference was not significant statistically [9].

All the patients who developed hypotension, nausea, vomiting intra-operatively were given 6 mg ephedrine IV (rescue ephedrine).

The response to ephedrine administration was seen as an increase in blood pressure and pulse rate and relief from distressing symptoms from nausea and vomiting (if present). The response was seen to be similar in all the three groups. None of the patients developed hypertension ( $>25\%$  increase from baseline MAP) and /or tachycardia (heart rate $>120$  beats per minute).

Some patients require a second dose of rescue ephedrine as their symptoms were not completely treated by the first dose. Time of first dose of rescue was found to be around 5 min after spinal administration in control(S) and ephedrine group (E) but it was around 15 min after spinal administration in phenylephrine group (P) [10].

### Conclusion

The patients were monitored for hypotension (decrease in MAP $>25\%$  of baseline MAP), bradycardia (heart rate $<50$  beats/minute). The episodes of rescue IV ephedrine were significantly higher in control group as compared to in ephedrine group ( $p=0.000$ ) and in phenylephrine group ( $p=0.000$ ). The difference between phenylephrine and ephedrine group was not found to be significant ( $p=0.461$ ).

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