
CLINICAL INVESTIGATIONS

USE OF PHENYLEPHRINE AS VASOPRESSOR OF CHOICE TO PREVENT HYPOTENSION FOLLOWING SPINAL ANAESTHESIA IN LSCS

V Pinto^{1*}, NS Jaysundara², AB Abeysundara³, SU Ekanayake²

¹*Consultant Anaesthetist, Senior lecturer, Department of Anesthesiology, Faculty of Medicine, University of Peradeniya*

²*Temporary Lecturers, Department of Anesthesiology, Faculty of Medicine University of Peradeniya, Sri Lanka*

³*Registrar in Anesthesiology, General Hospital Kandy*

* *Corresponding author: Department of Anaesthesiology, Faculty of Medicine, University of Peradeniya, E-mail:vasantipinto@yahoo.com*

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Background and Justification:

Hypotension after spinal anaesthesia for Caesarean section has an incidence of up to 80% without prophylactic management. Preventive measures include fluid preload, lateral tilt, and use of vasopressors. Ephedrine remains the most extensively studied vasopressor to treat hypotension, but its position has been challenged because of potential complications that include supraventricular tachycardia, tachyphylaxis and fetal acidosis. In most countries phenylephrine has been recommended routinely for the management of hypotension. Advocates of phenylephrine claim better fetal acid-base status, and similar efficacy in blood pressure control, but its use is associated with bradycardia. Comparative studies use the equivalent doses of each drug, with doses chosen on their ability to treat hypotension, but different choices have yielded different results, and there is no consensus found on dose equivalence. A recent review of randomized trials on the use of vasopressors with spinal anaesthesia analyzed seven studies, and concluded that clinical effects were similar in both drugs in terms of prevention and treatment of hypotension. Use of phenylephrine is not yet very popular in Sri Lanka.

Objective:

This study was designed to determine whether Phenylephrine can be substituted to Ephedrine as a vasopressor of choice to prevent hypotension associated with LSCS in Sri Lankan patients and the Sri Lankan theater set up.

Methods

The study was carried out as a prospective randomized double blinded study. Study group was selected according to the inclusion and exclusion criteria and carried out in the obstetric theater of the Teaching Hospital Peradeniya. Two groups were identified as case and control and the sample size was 30 from each category. The patients included in the study were asked to select an envelop containing the details of the vasopressor to be used.

The subjects who were getting phenylephrine were taken as the case subject. Cases received intravenous infusion of Phenylephrine 20-40ml/hr in the strength of 100µg/ml and it was started immediately after spinal injection and titrated to maintain systolic blood pressure near baseline value.

Controls were given Ephedrine with the evidence of drop of blood pressure only. Ephedrine was given as 5mg boluses.

The investigator collected data during the surgery. These included the blood pressure, heart rate, ECG changes, maternal complaints, data to assess the staff satisfaction and also to assess the maneuverability of use of Phenylephrine in the OT setup. Eg: - infusion pump

Results

In total, 60 mothers who were undergoing elective caesarian section were recruited to the study. As shown in the table-1 mean age, Height and Weight of Ephedrine group was 34.9yrs, 156.4cm, 68.1kg. In the Phenylephrine group the values are 30.9yrs, 155.5cm, 68.9kg. No significant difference was found.

Table 1

	Ephedrine	Phenylephrine
Age	34.9	30.9
Height	156.4cm	155.5cm
Weight	68.1kg	68.9kg

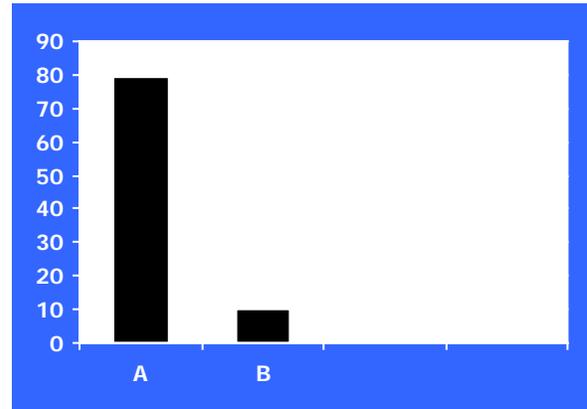
More than 30% drop of the preoperative systolic pressure was taken as hypotension

(Table 2, Fig 1) In Ephedrine group 79.16% showed drop of blood pressure which needed ephedrine boluses, in contrast to 10% in the Phenylephrine group ($Z=2.24$).

Table 2

Blood pressure drop(mmHg)	No of Patients Ephedrine	No of Patients Phenylephrine
<10	4	8
10 - 20	2	19
20 - 30	5	2
30 - 40	11	1
>40	8	0

Fig 1A - Ephedrine 79.16% B – Phenylephrine 10%



Fetal out come in both groups were more or less the same (Table 3)

Table 3

		Ephedrine	Phenylephrine
In 1 min	<5	6.66%	10%
	5 - 10	93.33%	90%
In 5 min	<5	3.33%	0
	5 - 10	96.66%	100%

Regarding maternal complaints, (Table 4) ,in the Ephedrine group there were no complaints from 30% (⁹) of mothers. 43.33% (¹³) complained of having headache during the procedure and 26.66% (⁸) complained of nausea and vomiting during the procedure. ($Z=1.96$). In Phenylephrine group there were no complaints from 90% of mothers and only 10% complained of having headache during the procedure.

Table 4

	Ephedrine	Phenylephrine
No complaint	30%	90%
Headache	43.33%	10%
Nausea	26.66%	0
Vomiting		

Staff satisfaction was taken during the surgery and it was rated 1 to 5 (Chart 1). Out of 30 instances 26 times phenylephrine was rated as 5 (Table 5)

Table 5

	Ephedrine	Phenylephrine
1	0	0
2	11	0
3	10	1
4	8	3
5	1	26

We have used 28 Ephedrine vials in our study that cost around SLR 3080. 11 vials of Phenylephrine were used at a cost of SLR 3575. One vial of phenylephrine was used at least for 3 patients.

Round up of results

1. There is a significant difference of cardiovascular stability in the phenylephrine Group
2. No difference in fetal outcome was found between the two groups.
3. A significant proportion of less maternal side effects in the Phenylephrine group.
4. Proportionately high ranking with the OT staff regarding the maneuverability of phenylephrine infusion.

Discussion

Most strategies for decreasing the incidence of hypotension during spinal anesthesia for cesarean delivery have not proved to be reliable. Although early work suggested that intravenous prehydration with crystalloid solutions was effective ¹⁴, this has been questioned in more recent articles ^{10, 13, 15}. Use of colloid solutions may be more effective than crystalloids ^{7, 19}, but the benefits are still limited, and infusion of large volumes of colloid may have other risks, including fluid overload, decreased oncotic pressure, and anaphylactoid reactions ¹⁸. Compression of the lower limbs has been described as an alternative technique but is not convenient and is not popular ¹⁹.

Traditionally ephedrine has been recommended in this role.

A number of other studies have recently reported on the use of (alpha) agonists in obstetrics ^{4, 7, 11, 14, 15..}

The Cochrane collaboration published in the Cochrane database of systematic reviews 2008 revealed that there is no significant difference in

management of hypotension between ephedrine and phenylephrine. Also it revealed that high rate of doses of ephedrine cause increase in hypertension and incidence of tachycardia. Despite early reports suggesting that use of agonists was associated with adverse fetal effects ^{6, 21}; more recently performed comparative studies have shown that agonists are associated with better fetal acid-base status and maternal nausea and vomiting than ephedrine ².

Regarding phenylephrine, studies show that prophylactic phenylephrine infusion at LSCS is better than phenylephrine boluses to prevent hypotension during surgery. ⁴.

Phenylephrine stimulated post synaptic alpha receptors resulting in rise in intense arterial peripheral vasoconstriction. That causes marked increase in blood pressure. This can lead to reflex bradycardia, but increase coronary blood flow. The onset of hypotension after IV administration is very rapid.

The drug gets metabolized in the liver and GIT. The drug can be given as an IV continuous infusion 100micg/min. The overdose can cause severe hypertension, vomiting, ventricular extrasystole, paroxysms of ventricular tachycardia and sensation of fullness in head.

The results of this study further support of the use of phenylephrine as a first-line vasopressor in obstetrics.

Although the difference in the incidence of fetal outcome between groups was not statistically significant, our sample size was small, and many studies done using a bigger sample group show that there is a significant different between fetal out come in the two groups.

Conclusion

With the evidence of recent studies showing that giving phenylephrine infusion is a simple, safe and effective method of maintaining blood pressure during spinal anaesthesia in LSCS, this study confirmed our clinical impression that starting a prophylactic infusion of phenylephrine immediately after the induction of spinal anesthesia for cesarean delivery would be effective at reducing the incidence, frequency, and severity of hypotension.

Our study also shows that phenylephrine is a better alternative vasopressor for the Sri Lankan setup. It is not an expensive alternative

because as we have shown above, the cost is almost the same for both drugs.

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