

Effects of Ephedrine Infusion for the Prevention of Hypotension during Spinal Anesthesia for Elective LSCS

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Abstract

Spinal anesthesia provides a fast, profound and symmetrical sensory and motor blockade of high quality in patients undergoing LSCS¹. However, the most common serious adverse effect of spinal anesthesia for LSCS is hypotension. Maternal hypotension has detrimental effects on uterine blood flow causing fetal hypoxia and acidosis. Preloading with crystalloids and use of vasopressors is widely recommended to prevent hypotension. We designed a study to determine the effects of ephedrine infusion for control of hypotension in women undergoing elective LSCS. In this observational study 80 parturients in the age group of 20 to 40 years, posted for elective caesarean section and belonging to ASA class 1 and 2 were selected. After preloading with 500 ml of ringer lactate solution, all the patients received spinal anaesthesia with 2ml inj.bupivacaine 0.5% (heavy). Immediately after institution of subarachnoid block the infusion of ephedrine at the rate of 1.25 mg/min via an infusion pump was started and was continued till clamping of the umbilical cord. The incidence of hypotension was 11% which was found to be lower when compared with other studies. Average dose of ephedrine used was 17±2 mg. Average APGAR score in our study were found to be 8 and 9 at 1 and 5 minutes. No neonate had an APGAR score below 7. The incidence of nausea and vomiting was 6% and that of reactive hypertension was 2%. None of the patients had tachycardia, bradycardia or shivering. We concluded that, prophylactic intra-venous ephedrine infusion immediately after spinal anesthesia is a quick, simple, safe and effective technique in preventing hypotension without unwanted side effects such as nausea, vomiting and hypertension in women posted for elective LSCS and can be of great value in routine practice. Being an observation study, comparison with a control group is recommended for comments on efficacy.

Keywords: Cesarean Section, Ephedrine Infusion, Hypotension, Spinal Anesthesia

1. Introduction

Spinal anesthesia offers a fast, profound and symmetrical sensory and motor blockade in patients undergoing cesarean delivery¹. These patients have an increased risk of aspiration, which can be safely avoided by a regional technique. The drugs used in general anesthesia may result in neonatal depression and jeopardise its safety. Besides an awake lady gets an opportunity to make bond with the baby soon after birth. However, the serious adverse effect

of spinal anesthesia for caesarean delivery is hypotension with high reported incidence³. Maternal hypotension has detrimental effects on uterine blood flow leading to fetal hypoxia, acidosis and neonatal depression.

The incidence of hypotension can be lowered by several methods but till date, no single method entirely prevents hypotension^{2,3}. Preloading with large doses of crystalloids and colloids has been widely recommended. But these solutions may not be effective expanders of plasma volume, since 75% of the infused crystalloid

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volume rapidly diffuses into interstitial space and hence the effect is only transient⁴.

Pre-loading with large doses of crystalloid may result in an elevated central venous pressure, pulmonary edema and fetal hypo-oxygenation⁵.

Contemporary articles put emphasis on arterial rather than venous circulation and project reduced systemic vascular resistance as the primary factor for maternal hypotension. Over the last few years, there is an inclination towards use of vasopressors than either crystalloids or colloids alone⁶⁻⁸.

Ephedrine is a potent sympathomimetic drug that has both α and β adrenergic agonist actions and acts both directly and indirectly at the adrenergic nerve endings. It is the most commonly recommended drug to treat hypotension associated with regional anaesthesia in obstetrics. This study is designed mainly to determine the incidence of hypotension in patients receiving ephedrine infusion during cesarean section under spinal anaesthesia. The proposed significance of this study is that if it proves that the administration of ephedrine is beneficial in spinal anaesthesia, then it will enable us to prevent significant hypotension as well as to avoid unnecessary delay in waiting for preloading with fluids. The incidence of hypotension, nausea and vomiting, reactive hypertension, bradycardia, tachycardia and APGAR scores are assessed during the study.

2. Aims and Objectives

- To determine the incidence, severity and episodes of hypotension after spinal anaesthesia in elective LSCS among patients receiving ephedrine infusion.
- To observe the intra-operative adverse effects among the study participants.
- To determine neonatal outcome of the study participants.

3. Material and Methods

3.1 Inclusion Criteria

Women in the age group of 20-40 years for elective LSCS with 39-41 weeks of gestation belonging to ASA I and II category.

3.2 Exclusion Criteria

Parturients with medical complications like valvular heart disease, renal or metabolic disorders, coagulation disorders or diabetes mellitus. Obstetric complications like pre-eclampsia or pre-existing hypertension. Patients having contraindications for spinal anaesthesia or any antenatal evidence of fetal anomalies.

4. Methodology

The present study was conducted in the department of anaesthesia of a medical college and tertiary health care centre after approval from local ethics committee. A total of 80 patients undergoing elective lower segment caesarean section under spinal anaesthesia were included after satisfying the eligibility criteria. Written informed consent was taken from all the study participants. All patients underwent physical examination and were fasted for 8 hours pre-operatively. On the operation table, baseline pulse and blood pressure was recorded. After preloading with 500 ml of ringer lactate solution, all the patients received spinal anaesthesia with 2ml inj. bupivacaine 0.5% (heavy). Immediately after institution of subarachnoid block the infusion of ephedrine at the rate of 1.25 mg/min via an infusion pump was started and was continued till clamping of the umbilical cord. Hemodynamic parameters were recorded at serial intervals. Hypotension is defined as less than 20% of baseline and was managed with rescue boluses of ephedrine. Bradycardia (pulse less than 50 bpm) was treated with 0.2 mg of inj. glycopyrrolate. Infusion was stopped if reactive hypertension occurred.

5. Results

Among the total 80 patients, 81.3% of the patients were between age of 21-25 years. 16.3% patients were in the age group of 26-30 years and only 2.5% patients were below 20 years of age (Figure 1).

Mean baseline pulse rate was 79.9 ± 6 beats per minute. The mean pulse rate varied from the base line between 79.0 to 80.5 beats per minute at the above mentioned time intervals.

The mean baseline systolic blood pressure was 114 ± 8.3 mmHg. There was a gradual fall in systolic BP by 8.69% until 10 minutes after which the systolic blood pressure was in the narrow range between 104-108 mmHg.

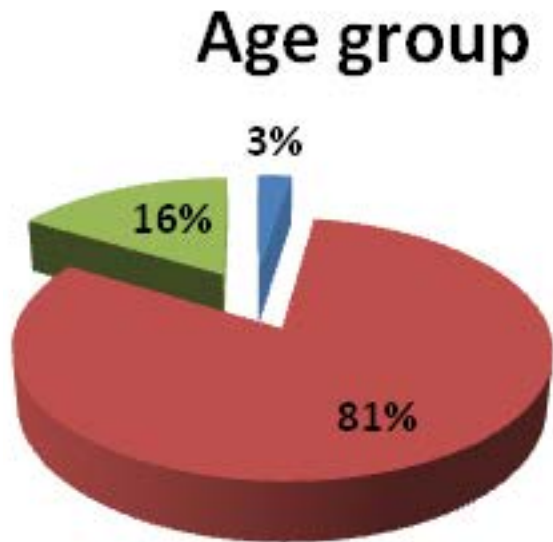


Figure 1. Age distribution.

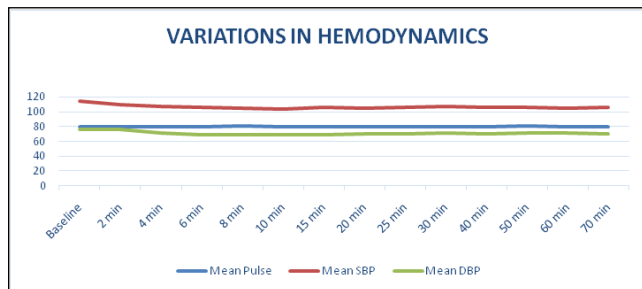


Figure 2. Haemodynamic variations after ephedrine infusion.

The mean baseline diastolic blood pressure was 75.6±5.4 mmHg. There was a fall in diastolic BP by 6.22 % until 4 minutes after which the systolic blood pressure was in the narrow range between 68-72 mmHg (Figure 2).

Table 1. Duration of surgery and infusion, vasopressor administration and side effects

Parameter	Value
Duration of Surgery (Min)	66.4 (±3.5)
Duration of Infusion (Min)	14.1 (±1.6)
Dose of Ephedrine (Mg)	17.6 (±2)
Incidence of Hypotension	11%
Incidence of Nausea and Vomiting	6%
Incidence of Reactive Hypertension	2%

At one minute after birth, 19 neonates (23.8%) had APGAR score of 7.

Table 2. APGAR score at 1 minute after birth

APGAR at 1	N	%
<= 7	19	23.8%
> 7	61	76.3%
Total	80	100.0%

61 neonates (76.3%) had APGAR score above 7. No neonate had APGAR score below 7 (Table 2).

Table 3. APGAR score at 5 minutes after birth

APGAR at 5	N	%
<= 7	1	1.3%
> 7	79	98.8%
Total	80	100.0%

At five minutes after birth, only one neonate (1.3%) had APGAR score of 7; while 79 (98.8%) neonates had APGAR score above 7 (Table 3).

6. Discussion

We have discussed the objectives under following headings:

1. Incidence and severity of hypotension with requirement of rescue doses of ephedrine. In our study 8 patients out of 80 were recorded to have intra-operative blood pressure below 20% of the base-line value at one instance; while 1 patient had 30% fall in blood pressure at one instance. Thus 8 patients had 1 episode each of moderate hypotension while 1 patient had 1 episode of severe hypotension. The total incidence of hypotension was 11%. This result concurs with the study of Gunusen et al.,⁹ where the incidence of hypotension was 10%, and the rate of infusion of ephedrine was 1.25 mg/min which was exactly as our study. This result also correlated with the study of Aragão FF et al.,¹⁰ and Kol IO¹ where it was found that the incidence of hypotension was 10% and 8% respectively in the ephedrine group (Table 1).

The mean dose of ephedrine used in our study was 17.6 +/-2 mg. Similar dose was used by Kansal A¹¹ et al., which was 19.9mg. In the study done by Gulhas N et al.,¹² an average dose of 20.1mg was required for control of maternal blood pressure.

2. APGAR score of the neonate at 1 and 5 minutes after birth- Average APGAR score in our study were found to be 8 and 9 at 1 and 5 minutes. This was compared to the study of Kansal A¹¹ and Gulhas N¹² in which APGAR scores were 8 and 9 at 1 and 5 minutes respectively. In the study done by Kol IO¹ and Aragão FF et al¹⁰ mean APGAR scores were found to be 8 and 10.

3. Incidence of side effect- 5 out of 80 patients developed nausea and vomiting making the incidence 6%. This was comparable with the studies of Kansal A¹¹, Aragão FF et al,¹⁰ and Kol IO¹ which showed the incidence of nausea and vomiting 5%, 9%, and 4% respectively.

2 (2.5%) patients developed reactive hypertension in our study which was comparable to the study of Kol IO¹ where incidence of reactive hypertension was 6%.

Different studies have been done for the control of hypotension with various infusion protocols and route of administration. The potential advantages of the infusion protocol used in our study include better control of maternal blood pressure, low incidence of hypotension. Furthermore, our study showed improved neonatal outcome in a way that no neonate had APGAR score below 7. The mean dose of ephedrine infusion was 17 mg (13mg-22mg) which was found to be lesser when compared with other studies correlating with lower incidence of side effects.

7. Conclusion

80 ASA I and II patients posted for elective LSCS under spinal anesthesia were studied. All patients received inj. ephedrine at the rate of 1.25mg/min immediately after spinal anesthesia until the delivery of the baby. We concluded following facts:

- Incidence of hypotension was 11% which was found to be lower when compared with other studies, indicating better control of maternal SBP.
- Mean dose of ephedrine used was 17 mg.(±1.6mg). 2 patients among the hypotension group required 2 boluses of rescue ephedrine. In rest of the hypotensive patients one rescue dose was enough to restore maternal SBP.

- APGAR scores of the neonates were well maintained and none of the neonate had APGAR score below 7.
- Incidence of nausea, vomiting (6%) and reactive hypertension(2%) was lower when compared to other studies. None of the patients developed shivering, bradycardia or tachycardia.

Thus it can be concluded that, prophylactic intravenous ephedrine infusion immediately after spinal anesthesia is a quick, simple, safe and effective technique in preventing hypotension without unwanted side effects such as nausea, vomiting and hypertension in women posted for elective LSCS and can be of great value in routine practice.

8. References

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