ORIGINAL RESEARCH

Effect of different doses of Intravenous phenylephrine with oxytocin on the prevention of oxytocin-induced hypotension in Lower Segmentcaesarean section (LSCS) under spinal anaesthesia: A randomised comparative study

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ABSTRACT

Background: One of the main causes of maternal mortality among pregnant women is postpartum hemorrhage (PPH). It is clear that uterine atony is the primary cause of death in roughly 45% to 55% of cases. The present study assessed effect of administration of different doses of phenylephrine with oxytocin on the prevention of oxytocin induced hypotension in caesarean section under spinal anaesthesia.**Materials & Methods:** 60 females were divided into 3 groups of 20 each. Group I patients received oxytocin 3U and phenylephrine 50 µg diluted to 10 cc with normal saline as an infusion over 5 minutes, group II patients received oxytocin 3U and phenylephrine 75 µg diluted to 10 cc infusion over 5 minutes and group III patients received oxytocin 3U and normal saline diluted to 10 cc infusion over 5 minutes. In each group, the following variables were measured and compared: height, weight, sensory block, length of operation (minutes), time spent extracting the infant from induction and skin incision (minutes), incidence of hypotension, and dose of rescue vasopressor administered. **Results:**The mean age in group I was 26.2 years, in group II was 26.4 years and in group III was 25.1 years. The mean height was 163.2 cm in group I, 162.5 cm in group II and 165.1 cm in group III. The mean weight was 67.4 kgs in group I, 68.2 kgs in group II and 66.5 kgs in group III. The difference was non- significant (P> 0.05). The duration of surgery was 46.3 minutes in group I, 47.2 minutes in group II and 45.8 minutes in group III. Extraction time of baby from induction was 11.8 minutes, 11.9 minutes and 12.4 minutes and extraction time of baby from skin incision was 7.5 minutes, 8.4 minutes and 8.5 minutes in group I, II and III respectively. The difference was non- significant (P> 0.05). Dose of rescue vasopressor given (µg) was 40.3, 8.7 and 87.2. Incidence of hypotension was seen in 11, 4 and 15 group I, II and III respectively. MAP before oxytocin infusion was 82.2, 83.2 and 78.2 and MAP after oxytocin infusion was 67.2, 76.9 and 66.9 in group I, II and III respectively. **Conclusion:**In contrast to phenylephrine 50 µg and oxytocin 3U during caesarean sections performed under spinal anesthesia, the results indicated that co-administration of phenylephrine 75 µg and oxytocin 3U lowers the incidence of oxytocin-induced hypotension.

Keywords: caesarean section, oxytocin, spinal anaesthesia

INTRODUCTION

One of the main causes of maternal mortality among pregnant women is postpartum hemorrhage (PPH). It is clear that uterine atony is the primary cause of death in roughly 45% to 55% of cases.[1] Hypotension may result from the use of spinal anesthesia (SA) during pregnancy. The use of uterotonic drugs to lower maternal mortality is common. One powerful uterotonic drug that can be used to stop postpartum

hemorrhage is oxytocin.[2,3] Similar to SA, oxytocin consumption can also result in oxytocin-induced hypotension. The oxytocin receptors in the heart and blood arteries are what cause the hypotension in this syndrome.[4]

Phenylephrine, mephentermine, crystalloids, and ephedrine can all be used to prevent the hypotension caused by SA and oxytocin. Phenylephrine has the primary effect on blood pressure regulation. Phenylephrine is mostly administered by bolus dosage and infusion.[5] Phenylephrine affects the body via increasing cardiac output, heart rate, and decreasing systemic vascular resistance. The use of phenylephrine considerably reduces the incidence of nausea, vomiting, and hypotension. In contrast to ephedrine, it also improves fetal arterial perfusion.[6,7]

AIM & OBJECTIVES

The present studyassessed effect of administration of different doses of phenylephrine with oxytocin on the prevention of oxytocin-induced hypotension in caesarean section under spinal anaesthesia.

MATERIALS & METHODS

Study design

The present study was a prospective randomised, double-blinded study.

Study place

This study was conducted in the Department of Anaesthesiology at Index Medical College, Hospital and Research Centre, Indore, Madhya Pradesh, India.

Study period

The study was carried out from January 2021 to \December 2021.

Study population

The current study included 60 Parturients females posted for elective and emergency lower segment caesarean section (LSCS) and all parturients with uncomplicated singleton pregnancy.

Ethical consideration

The study was approved by the research and ethical committee of the Index Medical College, Hospital and Research Centre, Indore Madhya Pradesh.

Inclusion Criteria

- Patients to give written informed consent.
- All patients with age ranged 18- 36 years.
- Parturients with uncomplicated singleton pregnancy were included in the study
- Available for follow-up.

Exclusion Criteria

- Uncooperative patients or patients who did not give consent and unable to attend follow-up
- Parturients with a history of allergic reactions to hyperbaric Bupivacaine or phenylephrine, those with a skin infection at the injection site,
- Parturients with Pregnancy-Induced Hypertension (PIH)/eclampsia/preeclampsia,
- Parturients with a history of blood coagulopathies, cardiovascular instability, and those with hepatorenal impairment
- Parturients with an increased risk of atony or excessive bleeding (known placenta praevia, multiple gestation, abnormal presentations, prolonged labour, PPH).

Procedure

After obtaining informed written consent from the parturients, a detailed preanaestheticcheckup was conducted. The patients were then randomly divided into three equal groups, each comprising 20 parturients.

Group I: patients received oxytocin 3U and phenylephrine 50 µg diluted to 10 cc with normal saline as an infusion over 5 minutes,

Group II: patients received oxytocin 3U and phenylephrine 75 µg diluted to 10 cc infusion over 5 minutes and

Group III(Control Group): patients received oxytocin 3U and normal saline diluted to 10 cc infusion over 5 minutes.

Before spinal anaesthesia was administered, all patients in each group received premedication in the form of an intravenous injection of 50 mg ranitidine and 10 mg metoclopramide.Using a 25 G Quincke spinal needle and a 2.2 mL dosage of 0.5% hyperbaric bupivacaine, the patients in each group received spinal anaesthesia while in the left lateral position, focusing on the L3-L4 space.

The induction time was noted. The patients were put back in the supine position shortly after the induction, and a wedge was positioned beneath the right buttock to achieve a 15-degree tilt. Using a simple face mask, oxygen inhalation started at a rate of 5 L/min, and Ringer's lactate solution was used intravenously at a rate of 10 mL/min for the duration of the procedure.

Vital signs, including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR), and oxygen saturation (SpO2), were recorded just after the delivery of the baby, and these readings

were considered as the baseline for the present study.

After the baby was delivered, 500 mL of Ringer's lactate solution was used to start an oxytocin infusion at a rate of 10 U/hour. This infusion continued until the surgery was completed. Using a syringe pump and a separate intravenous line, 3 U of oxytocin and 50 mcg or 75 mcg of phenylephrine diluted in 10 mL of normal saline (NS) were given over a period of five minutes.

Following intravenous phenylephrine and Oxytocin 3U co-administration, intraoperative vitals were taken every two minutes for ten minutes and then every five minutes until the procedure was completed. In each group, the following variables were measured and compared: height, weight, sensory block, length of operation (minutes), time spent extracting the infant from induction and skin incision (minutes), incidence of hypotension, and dose of rescue vasopressor administered.

Statistical Analysis: Results were tabulated and statistically analysed by using IBM SPSS (statistics package for socialistic sciences) version 22.0. The baseline value for evaluating the impact of oxytocin on haemodynamic parameters was the haemodynamic values obtained immediately prior to the baby's extraction. The Shapiro-Wilk test was used to determine whether the continuous variable distribution was normal. Analysis of variance (ANOVA) was utilised to determine the significance between the three groups of participants for continuous variables where the values displayed a normal distribution, and the paired t-test was employed for intragroup comparison. Continuous variables were compared between groups using post hoc analysis with Bonferroni correction. When values had a skewed distribution, the Kruskal-Wallis test was used for intergroup comparison. On a categorical scale, the significance of the study parameters was determined using the chi-square/Fisher's exact test.A value of $P < 0.05$ was considered statistically significant.

RESULTS

Table 1: Baseline characteristics

Parameters	Group I (n=20)	Group II (n=20)	Group III (n=20)	P value
Age (years)	26.2±4.75	26.4±3.25	25.1±4.05	0.85
Height (cm)	163.2±1.69	165.5±1.25	162.1±1.05	0.94
Weight (Kgs)	67.4± 1.95	68.2±1.45	66.5±1.50	0.38

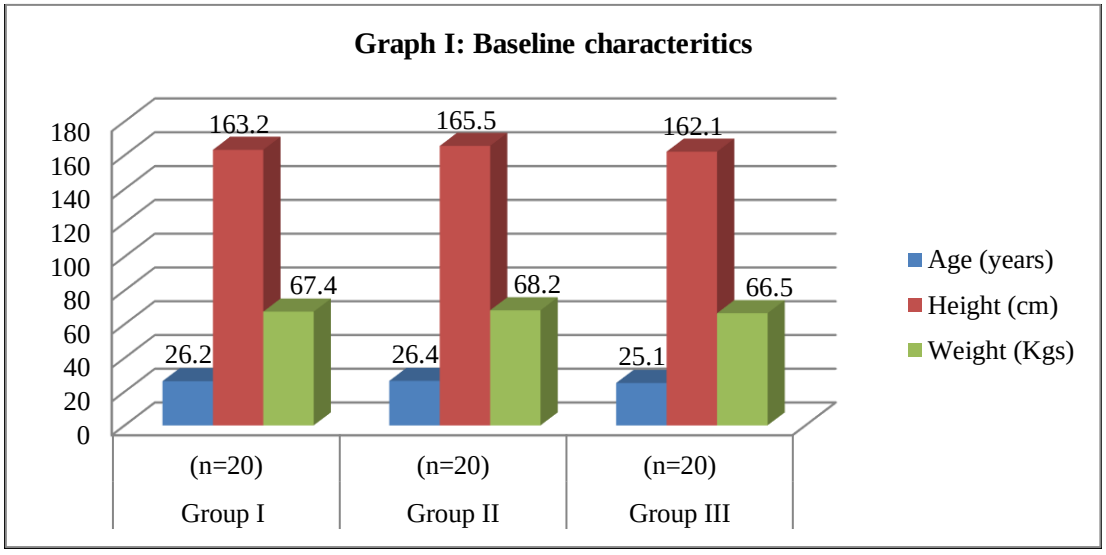


Table 1 and graph I, shows that the mean age in group I was 26.2 years, in group II was 26.4 years and in group III was 25.1 years. The mean height was 163.2 cm in group I, 165.5 cm in group II and 162.1 cm in group III. The mean weight was 67.4 kgs in group I, 68.2 kgs in group II and 66.5 kgs in group III. The difference was non- significant (P> 0.05).

Table 2: Comparison of parturients according to duration of surgery, duration from induction to delivery and skin incision to delivery

Parameters	Group I (n=20)	Group II (n=20)	Group III(n=20)	P value
Mean duration of surgery (min)	46.3±1.25	47.2±1.05	45.8±1.0	0.45
Extraction time of baby from induction (min)	11.8±1.03	11.9±1.05	12.4±0.50	0.61
Extraction time of baby from skin incision (min)	7.5±1.02	8.4±1.12	8.5±1.05	0.78

Table 2, graph II shows that the duration of surgery was 46.3 minutes in group I, 47.2 minutes in group II and 45.8 minutes in group III. Extraction time of baby from induction was 11.8 minutes, 11.9 minutes and 12.4 minutes and extraction time of baby from skin incision was 7.5 minutes, 8.4 minutes and 8.5 minutes in group I, II and III respectively. The difference was non- significant (P> 0.05). Distribution of parturients according to age, weight, height, duration of surgery, duration from induction to delivery and skin incision to delivery among all groups

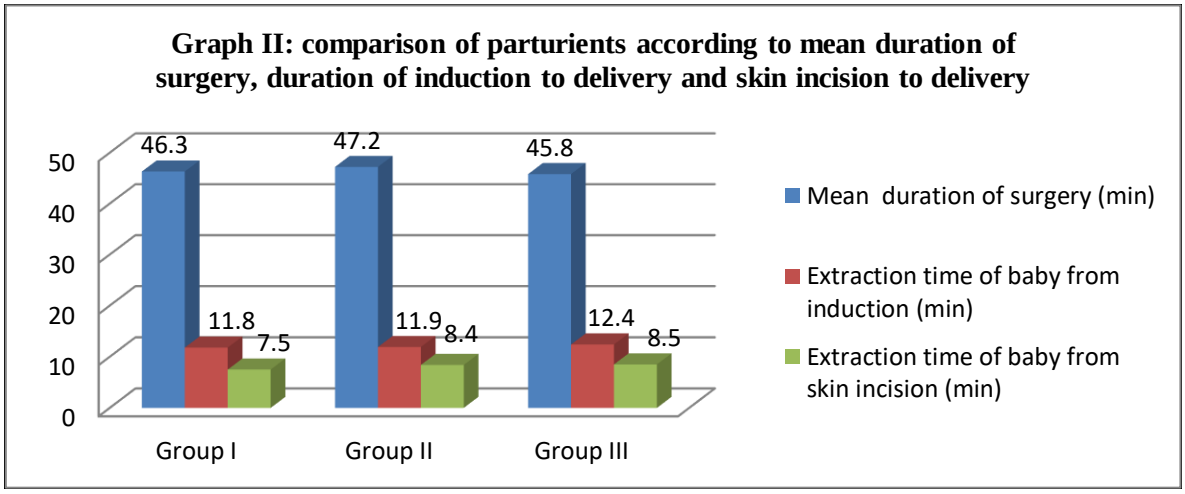


Table 3: Distribution of lowest MAP and mean time with lowest MAP among all groups of participants after oxytocin infusion.

Variables	Group I	Group II	Group III	P value
MAP before oxytocin infusion	82.2±2.67	83.2±2.87	78.2±3.05	0.50
Lowest MAP after oxytocin infusion	67.2±4.10	76.9±4.95	66.9±5.75	<0.001
Time at which lowest MAP recorded after oxytocin infusion(min)	9.05±2.69	9.40±2.82	10.95±4.60	0.41

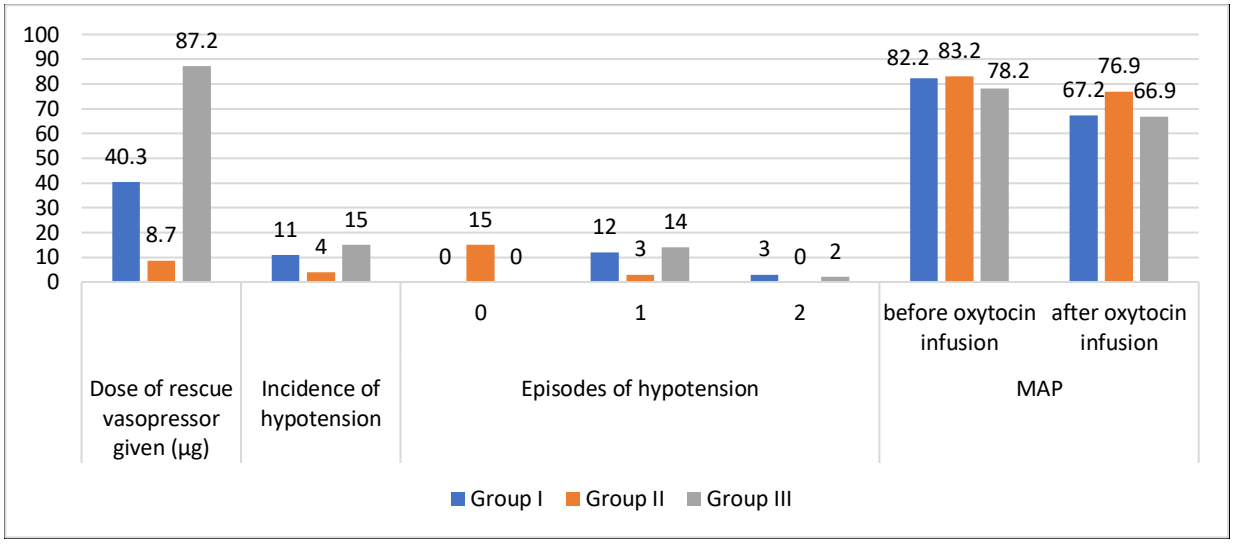
MAP= Mean Arterial Pressure

Table 3 and graph IIIshowed that MAP before oxytocin infusion was 82.2, 83.2 and 78.2 and MAP after oxytocin infusion was 67.2, 76.9 and 66.9 in group I, II and III respectively. The lowest MAP, as well as the mean time (9 and 10 min) at which the lowest MAP (post-baby extraction) after oxytocin infusion, was statistically significant (p<0.001).

Table 4:Distribution of the incidence and total number of hypotension episodes among participants in all groups.

Variables	Group I (n=20)	Group II (n=20)	Group III (n=20)	P value
Incidence of hypotension	11	4	15	<0.001
Total episodes of hypotension	12	3	14	<0.001

Table 4 and graph III showed that the incidence and total episodes of hypotension in parturients were statistically significant among all three study groups (p<0.05).The incidence of hypotension was significantly higher in Group III 15 (Control, 75%) compared to Group I (55%) and Group II (20%), respectively. Group II had 14 episodes of hypotension more than Group I (12) and Group II (3). It was observed that Group III (Control) had the highest number of total episodes (14), and Group II had the least number of total episodes (3) of hypotension.



Graph III: Assessment of MAP and hypotension

Graph II shows that dose of rescue vasopressor given (µg) was 40.3, 8.7 and 87.2 in group I, II and III respectively.

DISCUSSION

The posterior pituitary produces the 9-amino acid polypeptide known as endogenous oxytocin. the drug's exogenous form.[8,9] Oxytocin is the preferred uterotonic because of its significant uterotonic impact, which lowers blood loss from the placental attachment site and lowers the risk of postpartum hemorrhage.[10] Phenylephrine reduces the effects of Oxytocin-induced hypotension and reflex tachycardia when given infusion alongside Oxytocin in titrated doses.[11,12,13]

Rumboll CK et al.[14] found thatmaternal hypotension and tachycardia were not prevented by IV phenylephrine 50 µg given immediately prior to 3 U oxytocin during an elective caesarean section, but co-administration of phenylephrine 80 µg with 2.5 U oxytocin resulted in oxytocin-induced decreases in SVR and increases in heart rate and cardiac output.[9]

In 90 parturients having LSCS under spinal anesthesia, Gangadharaiah R et al.[15] examined the effects of two distinct phenylephrine dosages (50 mcg and 75 mcg) in avoiding hypotension brought on by oxytocin. The present study assessed effect of administration of different doses of phenylephrine with oxytocin on the prevention of oxytocin-induced hypotension in caesarean section under spinal anaesthesia.

We observed that the mean age in group I was 26.2 years, in group II was 26.4 years and in group III was 25.1 years. The mean height was 163.2 cm in group I, 162.5 cm in group II and 165.1 cm in group III. The mean weight was 67.4 kgs in group I, 68.2 kgs in group II and 66.5 kgsin group III. Dokaniya S et al.[5] conducted a prospective randomised double-blinded study to compare the effect of intravenous bolus of phenylephrine, Ephedrine, and Mephentermine for the maintenance of haemodynamic status and its inference on foetal outcome in 60 parturients undergoing LSCS under spinal anaesthesia. They concluded that intravenous bolus mephentermine is as effective as phenylephrine and Ephedrine in the prevention of the incidence of maternal hypotension during spinal anaesthesia for caesarean section.

We observed that the duration of surgery was 46.3 minutes in group I, 47.2 minutes in group II and 45.8 minutes in group III. Extraction time of baby from induction was 11.8 minutes, 11.9 minutes and 12.4 minutes and extraction time of baby from skin incision was 7.5 minutes, 8.4 minutes and 8.5 minutes in group I, II and III respectively. Dose of rescue vasopressor given (µg) was 40.3, 8.7 and 87.2. Incidence of hypotension was seen in 11, 4 and 15 and episodes of hypotension was 0 seen in 15 in group II, 1 seen in 12, 3 and 14 and 2 seen in 3, 0 and 2. MAP before oxytocin infusion was 82.2, 83.2 and 78.2 and MAP after oxytocin infusion was 67.2, 76.9 and 66.9 in group I, II and III respectively. Chikara et al.[16] found mean age in lacteted ringer solution group was 25.27 years and in hydroxyethyl starch group was 26.19 years. The mean spinal uterine incision time was 15.88 in lactated ringer solution group and 17.18 inhydroxyethyl starch group. There was 443 ml and 479mlmean blood loss in groups respectively. There was significant difference in

systolic blood pressure, heart rate in both groups. There was no significant difference in the incidence of maternal nausea and vomiting, as well as APGAR scores at 1 and 5 min.

Mohta M et al.[17], comparing the efficacy of 100 µg, 125 µg, and 150 µg dosages of phenylephrine to treat post-spinal hypotension in elective caesarean sections, found no significant differences between the three groups.

LIMITATIONS OF THE STUDY

The study sample size was small and duration of the study was short. SBP, DBP, and MAP non-invasive measures were used to evaluate haemodynamic changes. A more accurate demonstration of the haemodynamic changes in the three groups may have been obtained by invasive blood measures, which were not carried out.

CONCLUSION

Authors found that in contrast to phenylephrine 50 µg and oxytocin 3U during caesarean sections performed under spinal anesthesia, the results indicated that co-administration of phenylephrine 75 µg and oxytocin 3U lowers the incidence of oxytocin-induced hypotension.

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