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A Comparative Study of Pre Emptive Intra Muscular Phenylephrine And Ephedrine to Prevent Hypotension During Spinal Anaesthesia in Caesarean Section.

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Abstract:
Introduction: *Hypotension following spinal anaesthesia is the most common complication in patients undergoing lower segment caesarean section (LSCS). Numerous techniques have been used to prevent spinal hypotension including crystalloids, colloids and vasopressors. In this study we evaluated the effects of intra muscular phenylephrine and ephedrine in prevention of hypotension when given pre emptively 10 min prior to induction of spinal anaesthesia in patients undergoing LSCS.*
Material And Methods: *In this study 90 ASAI and II patients assigned to undergo LSCS were randomly allocated to three groups of 30 each. Group P received intra muscular injection of Phenylephrine 1 mg ,Group E received Inj. Ephedrine 30 mg IM and Group C received Inj. 0.9 % Normal saline 1 ml IM . Mean arterial pressure, heart rate, complications and requirement of rescue ephedrine was monitored for all patients.*
Results: *Control of mean arterial pressure was better in Group P when compared to Group E. The rescue ephedrine requirement was found to be more in group E. On comparing the complications, the incidence of nausea and vomiting was comparable in both group P and E where as tachycardia was found more in group E and bradycardia was observed more in group P.*
Conclusion: *Pre-emptive use of both intramuscular phenylephrine and ephedrine was found to be effective in prevention of spinal anesthesia induced hypotension in patients undergoing LSCS. However, phenylephrine appears to be a better vasopressor as compared to ephedrine.*
Keywords: *Phenylephrine, Ephedrine, Spinal anaesthesia, Hypotension, LSCS.*

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I. Introduction

Spinal anaesthesia is the most popular technique used for obstetric anaesthesia worldwide.[1] Like any other anaesthetic technique, it is not devoid of complications, the most common being hypotension which has been reported in as many as 85% of the patients.[2] Hypotension is associated with nausea, vomiting, dizziness , may interfere with surgical procedure and can cause fetal bradycardia and acidosis.[3] Hypotension after spinal can be managed with crystalloids, colloids and vasopressors including phenylephrine, mephentermine and ephedrine.[4] Phenylephrine is a selective alpha1 agonist and has negligible beta action. It raises blood pressure by vasoconstriction. Phenylephrine is effective as a vasopressor in restoring maternal arterial pressure during spinal anaesthesia and does not have detrimental effects on the fetus. It will not cause tachycardia.[5] Ephedrine stimulates alpha and beta adrenergic receptors. I.V administration of ephedrine results in increase in systolic and diastolic blood pressure, heart rate and cardiac output.[5] However maternal hypotension can be prevented using pre emptive techniques like preloading with fluids, proper positioning , left uterine displacement and administration of vasopressors.[6] In this study we evaluated the effects of intra muscular phenylephrine and ephedrine in prevention of hypotension when given pre emptively 10 min prior to induction of spinal anaesthesia in patients undergoing Lower segment caesarean section (LSCS).

II. Material And Methods

This prospective randomised controlled clinical study was conducted after approval from ethical and scientific committee of hospital and after detailed history, clinical examination, informed and written consent of all parturients, 90 ASA I and II patients aged 18 to 36yrs., who were to undergo elective or emergency caesarean section under spinal anaesthesia were included in study. Patients with gross spinal abnormality, localized skin sepsis, hemorrhagic diathesis, neurological disorders, known hypertensive, diabetic mellitus, cardiac, pulmonary, hepatic or renal disorders , toxemia of pregnancy were excluded.

All patients were evaluated thoroughly by the anesthesiologist. The anesthetic and surgical procedure was explained to the patient. Baseline pulse rate, systolic, diastolic and mean arterial pressure was recorded. Patients were randomly allocated to three groups of 30 each; using computer generated random allocation technique and received intra muscular injection of the following:

Group P: Inj. Phenylephrine 1 mg IM

Group E: Inj. Ephedrine 30 mg IM

Group C: Inj. 0.9 % Normal saline 1 ml IM

An 18 gauge IV cannula was placed in the non dominant hand and all patients were preloaded with 500 ml of Ringer's lactate solution. ECG, NIBP, SPO2, Urine output was monitored. Under all aseptic precautions spinal anesthesia was given by 26 G Quincke needle, in sitting position using median approach at L2-3 or L3-4 inter space with 2 ml of 0.5% hyperbaric Bupivacaine. Patients were made to lie down in supine position and a wedge was placed under right hip for 15° left tilt. Mean arterial pressure was recorded every 2 min for 20 min and every 5 min thereafter till the end of surgery. Hypotension was defined as more than 25% decline of Mean arterial pressure from baseline.

MAP = (SBP + 2DBP)/3

If patients developed hypotension rescue ephedrine 6 mg I.V. was given. If patient developed bradycardia (PR < 60 min) it was treated with Inj Atropine 0.6 mg I.V.

Statistical analysis of Age, Weight, Height, Baseline MAP, Baseline HR, Mean arterial pressure was done using ANOVA (Analysis of Variance).

III. Results

All groups were similar demographically and there was no significant difference with respect to age, weight and height (Table 1).

Table 1: Demographic Data

Variable	Group P Mean ± SD	Group E Mean ± SD	Group C Mean ± SD	P Value	SS
Age(yrs)	24.05±3.64	23.60±3.48	23.85±4.13	0.931	NS
Weight (kg)	57.10±6.00	57.60±5.99	61.50±9.67	0.131	NS
Height (cm)	152.10±2.51	151.20±3.37	153.05±3.32	0.176	NS

SS – statistical significant; NS – Non significant

Table 2: Baseline Values

Values	Group P	Group E	Group C	P value
Baseline MAP	85.2±6.31	88.2±6.22	88.2±6.22	0.340
Baseline PR	93.70±15.84	91.75±20.47	94.80±19.95	0.875

Baseline MAP and pulse rate was statistically similar in all the three groups.

Table 3: Mean Arterial Pressure

MAP (mm Hg)	Group P	Group E	Group C	Overall P value	Significance		
					P-E	P-C	E-C
0 minute	85.2±6.31	88.2±6.22	87.43±7.35	0.20	0.07	0.21	0.66
2 minutes	73.9±6.93	75.65±10.88	65.75±10.47	<0.001**	0.04*	<0.001**	<0.001**
4 minutes	84.30±7.56	76.05±11.03	60.85±11.74	<0.001**	<0.001**	<0.001**	<0.001**
6 minutes	82.10±6.19	77.9±11.39	58.25±6.25	<0.001**	0.08	<0.001**	<0.001**
8 minutes	87.95±7.42	79.15±11.08	67.59±7.85	<0.001**	<0.001**	<0.001**	<0.001**
10 minutes	71.95±8.23	125±205.90	70.18±8.24	<0.001**	0.003**	0.049*	0.047*
12 minutes	74.3±9.82	80.65±9.79	72.58±8.62	<0.001**	<0.001**	0.052	0.001**
14 minutes	72.4±7.42	79.25±8.75	73.58±5.82	<0.001**	<0.001**	0.49	0.041*
16 minutes	71.75±6.05	78±8.34	71.52±6.28	<0.001**	<0.001**	0.91	0.042*
18 minutes	72.9±6.53	77.3±9.60	72.62±7.85	<0.001**	0.04*	0.39	0.045*
20 minutes	75.7±9.66	74.85±9.77	71.89±6.25	<0.001**	0.74	0.07	0.09
25 minutes	75.25±6.99	76.1±7.84	73.59±5.80	<0.001**	0.66	0.09	0.08
30 minutes	76.55±3.99	79.1±5.21	74.52±8.26	<0.001**	0.04*	0.12	0.11

ANOVA and post hoc-tukey test

* Significant

** Highly significant

Significant difference in MAP between the groups P and E was recorded where MAP of patients in group P was significantly higher than MAP of patients in group E ($p < 0.05$). Statistically significant difference was found in group P-C and E-C where Phenylephrine and Ephedrine lead to better control of MAP as compared to control group.

Table 4: Complications

Complications	P		E		Control	
	Frequency	%	Frequency	%	Frequency	%
Nausea	3	10%	2	7%	10	33%
Vomiting	1	3%	1	3%	8	27%
Tachycardia	0	0%	10	33%	3	10%
Bradycardia	6	20%	0	0%	4	13%
Rescue Ephedrine requirement	3	10%	5	17%	25	83 %

IV. Discussion

Maternal hypotension after spinal anaesthesia is a common complication in Caesarean section. Careful positioning and volume preloading with intravenous crystalloids or colloid solution has been a standard practice for prevention of hypotension, but these are not complete measures. Vasopressors are used to correct the vasodilatation which is the main cause of reduction in arterial blood pressure. The percentage reduction in maternal arterial pressure is more important than the absolute reduction in pressure. The use of IV vasopressors for treatment of hypotension during caesarean section is well established.[7, 8]. However the use of IM vasopressors before spinal anaesthesia in LSCS is also found to be helpful in controlling maternal hypotension.

Varathan et al in their study observed that preloading with crystalloid along with prophylactic IM ephedrine 15mg effectively prevents hypotension during cesarean section under subarachnoid block.[9] Ayorinde and colleagues in their study concluded that pre-emptive IM. phenylephrine 4 mg and ephedrine 45 mg reduce the severity of hypotension and the total dose of rescue I.V. ephedrine during spinal anaesthesia for Caesarean section.[6] Fu-Qing Lin et al in their Meta analysis on Prophylactic use of ephedrine and phenylephrine observed that both are effective in preventing maternal hypotension during C-section under spinal anesthesia, however phenylephrine was superior to ephedrine in treating hypotension and route of administration did not affect the result.[10] In our study we found that control of mean arterial pressure was best in Group P when compared to Group E which is relatively better than control group. The rescue ephedrine requirement was found to be maximum in control group followed by group E.

On comparing the complications the incidence of nausea and vomiting was comparable in group P and group E where as tachycardia was found more in group E and bradycardia was observed more in group P. Limitation of present study was small number of study patients; hence a large randomized clinical trial is required to confirm the study results. These study findings could be confirmed and explored further by comparing the effects of the study drugs in preventing spinal anaesthesia induced hypotension in other patient populations and in the patients undergoing other surgical procedures

V. Conclusion

From the study result pre-emptive use of intramuscular phenylephrine and ephedrine was found to be effective in prevention of spinal anesthesia induced hypotension, nausea and vomiting in patients undergoing LSCS. However, phenylephrine appears to be a better vasopressor as compared to ephedrine in control of mean arterial pressure.

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