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PROPHYLACTIC INTRAVENOUS INFUSION OF EPHEDRINE DURING SPINAL ANAESTHESIA FOR CAESAREAN SECTION

Anaesthesiology

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ABSTRACT

Introduction: The study has been undertaken to determine the effect of prophylactic intravenous infusion of ephedrine in ameliorating spinal-induced hypotension

Materials and Methods: Eighty parturient scheduled for caesarean section were randomly allocated into two groups of 40 patients each: Group 1 received injection ephedrine 10 mg bolus whenever the systolic blood pressure is increased by 20% from the baseline reading. Group 2 received injection ephedrine as infusion. 50 mg was added to 500 ml lactated ringer solution

Results: It was observed that ephedrine infusion prevents early hypotension and if it occurs it is seen in lesser number of patients. Early treatment of hypotension reduces the risk of foetal depression

Conclusion: It can be concluded from this study that both the methods, bolus and infusion of ephedrine are effective in treating maternal hypotension after spinal anaesthesia for caesarean section.

KEYWORDS

Caesarean Section, Hypotension, Intravenous Ephedrine, Spinal Anesthesia

INTRODUCTION

Obstetric anaesthesia and analgesia are associated with many unique and different problems for the anaesthesiologist. Beside these important physiologic changes in mother during term further complicate the decision in choosing a particular technique of anaesthesia for operative interventions. Rapid advances in drug and technique have definitely reduced the maternal and foetal morbidity and mortality

Subarachnoid block, epidural block and the conventional general anaesthesia are the only technique which are commonly employed and have received wide spread acceptance. Hazards of spinal anaesthesia have been often magnified while administering general anaesthesia requires high degree of skill and competence. Aspiration of gastric contents in emergency situation is ever present risk leading to serious consequences. Looking to this, many workers strongly advocate regional anaesthesia in obstetrics. It is now well known that both form of anaesthesia have their merits and demerits. However, during the last decade choice has rising in favour of regional and epidural has replaced spinal. The extensive use of spinal (80%) in this country and even in British and America (42%) practice has led to the belief that spinal/ epidural carries less risk to the mother and foetus.

Hypotension following spinal analgesia is always present and poses problem in over 50% of patient where hypotension goes to alarming levels. the usual measures to treat hypotension have been- (1) displacing the uterus in the left side preventing compression of Vena cava,(2) Trendelenburg position to improve venous return, (3) prophylactic and therapeutic of vasopressor,(4) preloading with intravenous fluid.

The hypotension in pregnant women during spinal anaesthesia is due to paralysis of sympathetic nerve with consequent decrease venous return and cardiac output. This is accentuated by hypovolemia and compression of Vena cava by gravity uterus.

Most of the authors have advocated the use of vasopressor as it is the only quick and effective means in severe hypotension. Different vasopressors have been used with success. Phenylephrine, aramine, levarterenol, ephedrine, mephenteramine have been used though the use of vasopressin has been criticized by few as it causes uterine artery construction reducing the placental perfusion. Many authors have advocated the prophylactic use of vasopressors especially ephedrine as it has least effect on uterine blood flow (Fox et al 1979)[1], (Moya and Smith, 1962)[2] and foetus.

Various drugs like phenylephrine, mephenteramine have been used. These are effective in returning the maternal blood pressure to normal but are not effective in improving the uterine blood flow. Various studies in the pregnant patient indicate that when ephedrine was used to correct a spinal hypotension the foetal deterioration, which has already occurred was arrested. There was usually an improvement in foetal oxygenation, carbon dioxide elimination and fixed acid excretion with the restoration of maternal arterial pressure. It is interesting that in the same patients correction of hypotension with ephedrine was associated with improved pulmonary ventilation and a fall in pco_2.

In our hospital spinal anaesthesia is the preferred technique of anaesthesia for Caesarean Section. It is commonly employed and is the first choice unless some contraindication factors are present. Mephenteramine is the vasopressor most commonly employed to treat the hypotension during spinal for Caesarean Section. It has been giving good result but was never used prophylactically. Interest was aroused on going through some encouraging report on prophylactic use of ephedrine.

It was therefore decided to study the use of ephedrine prophylactically in Caesarean Section under spinal anaesthesia.

METHODS AND MATERIALS

This study was carried out in Late Shri Lakhi Ram Memorial Medical College, Raigarh, Chhattisgarh and study was undertaken on 80 parturient who underwent lower segment caesarean section.

The cases selected there in the age group of 18 to 40 years belonging to ASA group I and II. Cases who were considered fit for spinal analgesia where included in the study. Patient suffering from gross systemic disorder and complicated obstetrical patient such as severe anaemia, toxaemia, hypertension and diabetes were not included. Patient suffering from cardiovascular disorders like, valvular disease, ischaemic heart disease and hypertension were also not included as these are contraindicated factor for spinal anaesthesia.

In the pre-operative examination attention was given to look for such disorder. History of drug intake like corticosteroid, insulin, antihypertensive, diuretic was obtained and if positive the cases where not considered for inclusion. Patient with coagulopathies were also excluded. Obese patients are also not considered because of the Technical difficulties in doing successful lumbar puncture.

Patient randomly allocated to one of the group according to the use of vasopressor for treating the hypotension following spinal anaesthesia. These patients were divided into groups, designated as group 'A' and group 'B'.

Group A: Consisted of 40 patients who received injection ephedrine 10 mg bolus whenever the systolic blood pressure is decreased by 20% from the baseline reading.

Group B: Consisted of 40 patients who received injection ephedrine as infusion. 50 mg was added to 500 ml lactated ringer solution. This infusion was run so that within first 2 minutes after spinal 100 ml had gone giving 10 mg of ephedrine. Ones the systolic blood pressure was stabilized at 90-100% baseline systolic blood pressure ephedrine infusion were stopped and IV line kept on with ringer lactate. If systolic blood pressure is decreased by 20% from baseline a bolus injection 10 mg was given. The aim was not to allow hypotension more than 20% of baseline.

The time of fall of blood pressure was noted and the number of ephedrine injection was recorded.

An intravenous cannula size 18G was inserted into one of the vein of right forearm. All the patients of both the group where given ringer lactate 15 ml/kg body weight within 20 minute before performing subarachnoid block.

All the patient of both the group were placed on the operative table and a wedge, length 56 centimetre, breadth 30 cm, thickness at one end 2.5 centimetre and other end 10 cm consists of a piece of sarbo rubber covered by anti-static rubber, was placed under right buttock for left uterine displacement as described by Crawford, Burton and Davis[3] (1972). Three recording of blood pressure were done and mean value was taken as baseline blood pressure and pulse rate were also recorded. This reading was used for comparing the subsequent changes in blood pressure and pulse rate.

All the patients were given subarachnoid block. Patient where placed in left lateral position with one assistant maintaining the position keeping lower Limb flexed and neck flexed to maintain the flexion of spine as much as possible.

Lumbar puncture was performed using 25G for spinal needle by mid line approach. In all the cases for both group injection bupivacaine 0.5% heavy 2.2 ml was used for the block. After the injection of bupivacaine patients were placed supine and wedge was placed under right buttock. Trendelenburg tilt of 5 was given so as to achieve the height of analgesia at least up to T-6. Once the analgesia was set the obstetrician was allowed to proceed with the surgery. All patient breathed oxygen 2 litres given through nasal cannula.

Through the surgery the blood pressure was recorded by multipara monitor. Pulse rate was recorded by pulse oximeter. The recording where done at 1 minute interval till the delivery of baby. Induction delivery interval was recorded and status for baby was assessed by Apgar scoring.

Blood pressure and pulse rate recorded just before induction of anaesthesia designated as '0' time served as baseline reading for subsequent comparison. The study was completed after the delivery of baby. Observation recorded in a proforma designed for the study. Result where analysed statistically for significance.

OBSERVATION

The observations of the present work are based on the study of 80 female patients at term that underwent lower segment caesarean section under spinal anaesthesia. Ephedrine was employed to treat hypotension in all these patients divided into two groups.

Table 1: Patient Characteristic

Patient Characteristics	Group TP (n=40) (Mean ± SD)	Group IM (n=40) (Mean ± SD)	P VALUE
Age (Years)	25.12 4.32	23.903.86	>0.05
Weight (Kg)	53.10 7.54	54.50 10.25	>0.05
Height (cm)	156.00 2.69	155.40 3.46	>0.05
ASA Physical Status (I/II)	14/26	12/28	>0.05

As shown in table 1, patient characteristics in terms of age, weight, height and ASA physical status were comparable among the two groups of patients.

PARITY

In group A and group B majority of patients were second para, 37.5% and 35% respectively. Primiparas were equally distributed 22.5% in both groups.

INDICATION OF CAESERIAN SECTION

Majority of the cases in the present work were done as emergency section in both the group

Table 2: Showing type of operation

Nature of operation	Group A		Group B	
	Cases	%	Cases	%
Emergency cases	36	90%	35	87.5%
Elective cases	04	10%	05	15.5%

APGAR SCORE

The Apgar score at one minute was 8 in all the cases in both groups. These patient presented late in hospital. Most of them had cord prolapse, prolonged obstructed labour or bleeding pervaginum.

INDUCTION-DELIVERY INTERVAL

The shortest interval was 5 minutes and longest was 20 minutes. The mean I-D interval in group A was 12.8 minutes and in group B was 11.05 minutes.

EPHEDRINE REQUIREMENT

Mean ephedrine requirement in group A was 15.3 mg while group B mean requirement was 14.75 mg.

Table 3: No of Ephedrine Bolus Required

Time (Minutes)	Group A No of Bolus			Group B No of Bolus		
	One	Two	Three	One	Two	Three
1	-	-	-	-	-	-
2	10	-	-	-	-	-
3	12	1	-	3	-	-
4	2	-	-	2	-	-
5	2	-	1	1	1	-
6	-	1	-	2	1	-
7	-	5	-	2	-	-
8	-	1	-	1	1	1
9	-	1	-	-	-	-
10	-	2	-	1	2	-
11	-	-	-	-	-	-
12	-	-	-	1	-	-
13	-	-	-	-	-	-
14	-	-	1	-	-	-
15	-	-	1	-	-	-
Total No of Cases	26	11	3	13	5	1

Three cases required three bolus injection, 11 cases required two bolus injection and 26 cases required one bolus injection in group A.

One case required three bolus injections, 5 cases required 2 bolus injection and 13 cases required 1 bolus injection in group B.

This differences between two groups was statistically significant ($p<0.05$)

Systolic Blood Pressure

Table 4: Mean Systolic Blood Pressure

Time (Minutes)	No of Cases		Mean Systolic Blood Pressure	
	Group A	Group B	Group A (Mean ± SD)	Group B (Mean ± SD)
0	40	40	119.4	120.3
1	40	40	109.60	119.2
2	40	40	102.20	118.2
3	40	40	101.50	116.4
4	40	40	10710.48	115.6
5	40	40	108.7	115.4
6	40	39	109.3	114.2
7	40	38	109.4	113.4
8	40	37	111	114.0
9	39	34	11110.17	114.8
10	38	31	110.7	114.1
11	24	17	112.47.91	116.3
12	23	16	112.8	114.1
13	17	11	110.47.56	115
14	17	8	110.48.13	119.4
15	12	7	109.8	120
16	6	2	110.57	105
17	6	2	111.33	105
18	5	2	112	105
19	3	1	111.33	108
20	2	0	115.00	-

DISCUSSION

The main aim of study was to study the effectiveness of ephedrine infusion given prophylactically and compare it with bolus. Kang et al[4] (1982) had used the similar protocol while Gutsche[5] (1976) used ephedrine 50 mg intramuscularly before spinal anaesthesia and 10-20 mg i.v. if blood pressure falls below 100 mm hg.

Age, weight, nature of surgery and spinal technique were comparable in both the group. Height of analgesia varied from T6-T7 in most of the study.

Baseline blood pressure and pulse rate were also comparable in both the group. Slight tachycardia was observed in all the cases and this was expected as majority were in labour and contribution of anxiety cannot be ruled out.

In present study the hypotension occurred in 65% cases of group A and 32.5% cases of group B. This clearly indicates that the prophylactic infusion of ephedrine significantly reduced the hypotension incidence. It is reasonable to assume that incidence would have been even higher if fluid pre load and left uterine displacement had not been used. This observation confirms the findings of Moya and Smith[2] (1970) and Datta et el[6] (1982).

In group A fall in blood pressure as seen by mean reading of 119.4 from baseline decreased to 102.2 and 101.5 mm Hg at 2nd and 3rd minute. Subsequently also decrease in blood pressure were found to be significant up to 15 minutes. In group B mean systolic pressure was 120.3 and decreased to 114.1 mm Hg till 12 minutes. This observation clearly shows that it either maintained the blood pressure or fall was less than 20% of baseline.

There were no significant changes in diastolic pressure in both the group. The mean value at different period is quite close to the baseline values. In majority of the studies the changes in diastolic pressure has not been described which itself shows that the changes are insignificant.

Changes in pulse rate were also not significant in both groups. Transient rise in pulse rate was seen after bolus ephedrine injection. Kang et al[4] (1982) also observed similar finding.

There was significant difference in the requirment of bolus doses of ephedrine between the two groups of this study. Twenty six out of forty patients in group A required first bolus dose of ephedrine. Majority (24) requiring within 2-3 minutes. This was in contrast to group B where only 13 out of 40 patients required bolus dose at 3 minutes and as late as 10 minutes. This shows that prophylactic infusion ephedrine was quite effective in preventing hypotension. Requirement of second bolus dose was in 11 patients of group A compared with 5 of group B. Three cases required third dose in group A and only one patient in group B.

The mean dose of ephedrine required however was not greatly different in two groups. Group A required 15.3 mg while it was 14.75 mg in group B. Kang et al[4] in a similar study like the present one also did not find any significant difference.

The role of left uterine displacement and fluid pre loading cannot be ignored. It would be interesting to study the use of prophylactic ephedrine in absence of above method.

In the present work 80% to 90% of patients were in labour. The influence of labour was pointed out by Clark and Thompson[7] (1976) who reported lesser incidence of hypotension in early labour. It may be due to pumping effect of 300 ml of blood with each uterine contraction into maternal circulation.

The Apgar score of babies was quite good and at 1 minute were 8 in all the patients of both the group. Under regional anaesthesia excluding all other maternal and foetal factors, the degree and period of hypotension is the key factor in determining the well-being of foetus. In this work hypotension was not allowed beyond 20% of systolic blood pressure and if occurred was promptly treated.

The induction delivery interval was almost same in both groups. The mean I-D interval was 12.8 minutes and 11.05 minutes in group A and B respectively.

The objection against the prophylactic use of ephedrine is the maternal hypertension due to vasoconstriction which may cause uteroplacental perfusion leading to deterioration of foetus (Greiss & Wilkey[8])
Schnider et al[9] (1968) in their investigation observed that ephedrine improved foetal oxygenation and carbon dioxide elimination with restoration of maternal arterial pressure. Ephedrine also arrested the foetal deterioration which already occurred. Hughes and Coworkers[10] (1985) measured ephedrine in umbilical cord venous blood and correlated with increase in FHR but the amount of ephedrine in foetal blood was not deleterious and is observed this to be the drug of choice in obstetrics.

CONCLUSION

It can be concluded from this study that both the methods, bolus and infusion of ephedrine are effective in treating maternal hypotension after spinal anaesthesia for caesarean section. Infusion prophylaxis however was safe and effective as it maintained blood pressure in majority of cases. It prevent early fall of blood pressure. Fewer numbers of patients require one or two bolus ephedrine injection compared to bolus treatment. It did not cause maternal tachycardia and hypertension and did not affect foetal recovery.

The infusion prophylaxis of ephedrine can be employed safely in normotensive healthy patients undergoing caesarean section under spinal anaesthesia.

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