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RESEARCH PAPER

EVALUATION OF PREEMPTIVE INTRAMUSCULAR EPHEDRINE VS PHENYLEPHRINE IN PREVENTION OF HYPOTENSION INDUCED BY SPINAL ANESTHESIA IN LOWER SEGMENT CAESAREAN SECTION

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ABSTRACT Hypotension is the commonest side effect after giving spinal anaesthesia in Lower segment caesarean section. Many methods have been tried for prevention of hypotension. The present study was planned to compare effects of preemptive Phenyleprine and Ephedrine IM in the patients developing hypotension after spinal block during cesarean section. For this 90 pregnant females with single pregnancy, term gestation and aged between 18-45 years were selected on the basis of predefined criteria and then randomly divided into 3 groups having 30 patients each. In Group A Phenylephrine 4mg IM was given, in Group B Ephedrine 30mg IM was given whereas in Group C IM normal saline was given. In this study measurement of mean systolic and diastolic blood pressures, heart rate, was done at different interval of time along with presence of hypotension and nausea/ vomiting. Results were drawn as per statistical parameters. The fall in systolic blood pressure as well as mean blood pressure was found maximum in Group C, followed by Group B then Group A. There was statistically insignificant fall in diastolic blood pressure in Group A as well as Group B but it was statistically significant in Group C. There was no significant change in heart rate in both Groups A and C in any of the patients whereas there was a significant increase in heart rate in Group B. Maximum patients of hypotension and nausea/vomiting were seen in group C i.e. 70% and 53.3% respectively.

KEY WORDS : Hypotension, Caesarian, Pre-emptive, Phenylephrine, Ephedrine, Spinal Anaesthesia

INTRODUCTION

Caesarean section is one of the commonest surgeries performed in the emergency management in obstetrics. The Challenge of involving two lives makes anesthetists really cautious. There are many views regarding the ideal anaesthetic technique for caesarean section.[1] Regional anaesthesia/Subarachnoid block (SAB) is usually preferred over general anaesthesia in caesarian section to avoid the airway difficulty in pregnant ladies.[2] Hemodynamic changes specially Hypotension is the commonest side effect after giving SAB.[3] Different literatures have reported its incidence of about 80%.[4] Preloading with crystalloid and keeping left lateral position may be helpful in reducing its incidence but still hypotension is the major side effect after spinal anaesthesia. Here Hypotension may be associated with nausea and vomiting, which might cause interference in the surgical procedure.[5] These can further get aggravated by effect of aorto-caval compression in supine position and hypovolemia resulting from loss of blood volume because of decreased sympathetic vasomotor tone.[6] So to combat this, fluid preloading is being used widely; but many of the studies have raised questions on it.[7] Hypotension can also be managed by intravenous bolus dosage of vasopressors eg. Ephedrine. Ephedrine is an indirectly acting sympathomimetic amine, commonly used vasopressor in obstetric anaesthesia. Ephedrine is having both α and β adrenoceptor activities, it has got predominant activity on beta1 receptors, which increase cardiac output and heart rate thus maintains the arterial pressure.[8] Another drug used for the same is Phenylephrine which is an α1 adrenergic agonist. It causes vasoconstriction which may counteract the vasodilatation caused by spinal anaesthesia. It has been found to be safe and effective when given in bolus intravenous or intramuscular doses to patients undergoing caesarean section.[9] Keeping above things in mind this study was planned to compare the efficacy of intramuscular (IM) preemptive Ephedrine, Phenylephrine and a control group in which same amount of placebo normal saline (NS) was given.

Material and Method

The present study was done in department of Anaesthesiology of SGRR Hospital and Medical college, Dehradun. Approval from the ethical committee of the institution was taken and then 90 patients were selected using predefined inclusion and exclusion criteria. These 90 patients were randomly divided into three groups of 30 patients each by using sealed envelope technique. The study drug was given by another anaesthetist who was blind of the type of medications being used. All the pregnant females with single pregnancy, on term gestation between the age limits of 18-45 years were included in the study.

Pregnant females with any contraindications to spinal anaesthesia, having eclampsia, being known case of diabetes mellitus or gestation diabetes mellitus, having history of any cardiovascular or cerebrovascular diseases, having any antenataly detected foetal anomalies were excluded from the study. Following these criteria all the selected pregnant females were divided into three following groups:

GROUP A: Patients receiving intramuscular Phenylephrine 4mg
GROUP B: Patients receiving intramuscular Ephedrine 30mg
GROUP C: Patients receiving intramuscular Normal saline.

First of all patient was taken in the operation theatre then vitals were monitored with the help of non-invasive blood pressure monitoring, pulse oximeter and ECG monitor. For preoperative measurement of baseline systolic arterial pressure, average of two readings (taken two minutes apart) was calculated. An 18G cannula was used for intravenous access through non dominant hand and preloading was done at 10ml/kg body weight with ringer lactate. Afterwards spinal block was given in the left lateral position using 2.2 ml sensoricaine (heavy) in L3-L4 space with the help of a 25G Quincke spinal needle. Just after the subarachaniod block, intramuscular injection of the drug to be investigated was administered in the left vastus lateralis muscle. Particular study medication for each group was prepared to a dose of 2 ml with 0.9% saline and administered by anaesthetist, who was away from involvement in any collection of data or care of the patient. Another anaesthetist, who was blind to identification of any of the study

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medication, managed all the patients during whole study period. In this study serial measurement of mean systolic as well as mean diastolic blood pressures was done and readings were recorded at different time intervals so as to analyze the frequency, onset, time and duration of hypotension. If Mean blood pressure fall was more than 20% of the initial value, rescue doses of intravenous ephedrine 6mg was administered. Any occurance of nausea and vomiting was noted down in all the groups and comparision of its occurance was done. To compute results, the mean and standard deviation of blood pressure and mean changes of values over period of time along with standard deviation were calculated statistically. The SSPE Statistical Software was used for statistical analysis. Paired and unpaired Student't' tests were used and respective 'p' values were calculated.

RESULTS:

While comparing the demographic profile in all groups, no significant difference was seen regarding age, height, weight, BMI etc. (Fig 1)

The ASA distribution was found equal among all the three groups. All patients were found belonging to ASA I group with no pre-existing co-morbid conditions. (Fig 2)

In systolic blood pressure statistically significant decrease was noticed at 4,6,8,12,14,16,18,20,25,30 mins. Beyond 35 mins, no significant difference was found among three groups. In control group, patients had statistically significant decrease in blood pressure which was noticed at 4,6,8,12,14,16,18,20,25,30 minutes. In Phenylephrine and ephedrine group, there was fall in systolic blood pressure but it was statistically insignificant. (Table-1)

In diastolic blood pressure statistically significant decrease was noticed at 4,6,8,10,12,14,16,18 min interval. Beyond 20mins, no significant difference was found among three groups. In Phenylephrine and ephedrine group, there was fall in diastolic blood pressure but it was statistically insignificant. The fall in diastolic pressure followed in control group, patients preloaded with intravenous ringer lactate solution had statistically significant decrease in blood pressure which was noticed at 4,6,8,12,14,16 minutes.(Table-2)

The fall in mean blood pressure followed the same pattern as systolic blood pressure, maximum in control group, lesser in Ephedrine group, and the least in Phenylephrine group. (Table-3)

Statistically significant changes in heart rate was found at 4,6,8,10,12,14,16,18,20,25,30,35,40 min Beyond 45 mins, the figures were comparable in all three groups. Bradycardia was not observed in any group. In both control and Phenylephrine group, there was insignificant change in heart rate in any patient. In ephedrine group, a significant rise was seen in heart rate at 4,6,8,12,14,16,18,20,25,30,35,40 minutes. This can be explained on the basis of β1 action of ephedrine. (Table-4)

In Group A (Phenylephrine), 7 amongst 30 patients had fall of more than 20% in mean arterial pressure and the incidence of hypotension was 23.3%. 13 amongst 30 patients had fall of more than 20% in mean arterial pressure in Group B (Ephedrine) and the incidence of hypotension was found 43.3%. In Group C (Control), 21 out of 30 patients had fall of more than 20% in mean arterial pressure and the incidence of hypotension was 70.00%. Comparing Phenylephrine group with Control group, the incidence of hypotension was 23.3% against 70% and this difference was found statistically highly significant (p<0.000). On comparing Ephedrine group with the Control group, the incidence of hypotension was 43.3% against 70%, this difference was found significant (p<0.037). On comparing Group A (Phenylephrine) with Group B (Ephedrine), the incidence of hypotension was found 23.3% against 43.3% but the difference came to be statistically insignificant (p= 0.085). (Table-5)

In Group A, Group B and Group C, the incidence of nausea and vomiting was 13.33%, 33.33%, 53.33% respectively. Comparing Phenylephrine Group with Control group for nausea and vomiting, patients having these features in Phenylephrine group were 13.33% against 53.3% in Group C. This difference was found statistically significant (p<0.01). On Comparing Group B (Ephedrine) with Group C (Control) for nausea and vomiting, patients having these features in Group B were 33.33% against 53.3% in Group C. The difference was found statistically insignificant (p<0.096). When Phenylephrine Group with Ephedrine group were compared, patients having nausea and vomiting in Group A were 13.33% against 33.3% in Group B. This difference was found statistically significant (p<0.053). (Table-6)

DISCUSSION:

Hypotension is defined as reduction of 20–30% from baseline systolic arterial pressures or 90–100 mm Hg or less absolute values. Hypotension is inevitable after spinal anaesthesia, because it causes sympathetic blockage, which reduces preloading of heart. It still remains a debate whether preemptive use of vasopressors is justified or not In this study vasopressor drugs were given just after giving SAB, as giving it prior to block chances of reactive hypertension are there and reduced perfusion to placenta can occur. Changes in NIBP were observed in the present study, but many studies have observed cardiac output and peripheral vascular resistance to see the effect of vasopressors after SAB.[10,11,12]

In this very study two drugs were compared along with a control group to prevent hypotension by spinal anaesthesia. In previous studies it has been shown that phenylephrine can cause significant bradycardia (HR <60) when given by iv route boluses, but contrary to previous studies in this study none of the patient developed bradycardia it might be due to the overriding chronotropic effect of ephedrine used as bolus, given on hypotension.

Phenylephrine maintains systolic arterial pressure, mean arterial and diastolic blood pressure which is consistant with this study also.[13] On the other hand Ephedrine is not a very efficient vasoconstrictor, it increases Cardiac Output as well as Heart Rate. Patients of Group B (Ephedrine) showed tachycardia, it can be explained by its activity on B1 adrenoceptors.

A previous study comparing Ephedrine 37.5mg IM with placebo (NS) showed improvement in cardiovascular stability in Ephedrine group, but the incidence of hypotension was still in 50% cases. Sternlo and collegue found that when Ephedrine is given as 0.6mg/kg IM, there was found decreased incidence of hypotension in patient undergoing hip joint surgery where spinal block was used.[14] In spite of different population and difference in type of surgery this result is consistent with intra muscular Ephedrine group. The results showed lesser episodes of hypotension, which might be due to earlier administration of Ephedrine.

What should be the ideal time for preemptive drug administration is yet to be ascertained. Many studies have quoted that it takes 10-15 minutes for IM Phenylephrine and Ephedrine to reach their peak effect. The hypotension by SAB is immediate, that's why the incidence of hypotension was found significant in this study yet its severity was reduced.

Table 1- Mean systolic blood pressure values in groups at different time intervals

	SBP (Phenylephirne)	SBP (Ephedrine)	SBP (Control)	P VALUE
	Mean(SD)	Mean(SD)	Mean(SD)	
Baseline	120.93(11.3)	120.1(9.36)	120.53(7.25)	0.944
2MIN	114.9(13.3)	113.3(12.72)	112.03(8.89)	0.643
4 MIN	111.5(18.63)	106.7(12.98)	100.26(13.13)	0.019
6 MIN	113.76(18.68)	102.4(14.32)	98.8(14.38)	0.001
8 MIN	118.26(16.28)	106.5(13.46)	103.36(12.03)	0.000

10 MIN	120.93(14.11)	113.73(10.36)	104.83(10.71)	0.000
12 MIN	124.46(9.94)	116.73(12.98)	108.56(8.69)	0.000
14 MIN	125.1(9.85)	115.4(11.83)	109.8(9.06)	0.000
16 MIN	123.36(9.6)	115.56(11.25)	108.4(9.9)	0.002
18 MIN	121.33(12.68)	114.1(9.36)	112.43(7.44)	0.031
20 MIN	119.23(11.95)	114.3(9.24)	112.06(10.24)	0.020
25 MIN	117.53(10.38)	116.23(8.05)	112.06(9.18)	0.018
30 MIN	119.44(8.29)	116.9(8.71)	112.96(8.9)	0.042
35 MIN	120.84(8.82)	117.69(8.67)	114.75(8.58)	0.356
40 MIN	119.56(8.11)	117.78(8.85)	115.52(8.42)	0.120
45 MIN	122.6(6.02)	119.87(8.59)	115.3(4.59)	
50 MIN	NA	121.42(10.56)	NA	
55 MIN	NA	119.2(9.93)	NA	
60 MIN	NA	113.6(5.68)	NA	

Table 2- Mean diastolic pressure values in groups at different time intervals

	DBP (Phenylephirne)	DBP (Ephedrine)	DBP (Control)	P VALUE
	Mean(SD)	Mean(SD)	Mean(SD)	
Baseline	79.46(8.63)	76.7(8.73)	76.93(7.04)	0.352
2MIN	74.66(9.57)	73.9(9.32)	72.8(7.64)	0.717
4 MIN	73.36(12.55)	69.3(8.7)	66.1(9.81)	0.029
6 MIN	75.1(13.7)	66.3(8.8)	64.56(9.57)	0.001
8 MIN	75.03(12.7)	68.06(10.4)	65.93(6.56)	0.002
10 MIN	74.93(11.82)	72.03(9.64)	65.93(5.97)	0.001
12 MIN	77.56(10.28)	71.6(9.74)	66.96(6.51)	0.000
14 MIN	76.63(5.77)	69.86(7.92)	66.96(5.61)	0.000
16 MIN	76.23(8.1)	70.73(8.01)	66.6(6.81)	0.000
18 MIN	73.5(9.51)	70.33(7.84)	69.9(4.17)	0.000
20 MIN	72.36(9.83)	69.8(7.66)	69.13(6.04)	0.124
25 MIN	72.36(8.63)	72.23(7.61)	69.13(6.08)	0.305
30 MIN	73.93(6.64)	72.23(7.65)	7073(4.35)	0.219
35 MIN	74.48(6.36)	72.57(8.34)	70.86(5.54)	0.166
40 MIN	76.18(6.01)	73.64(6.97)	72(4.83)	0.158
45 MIN	79.4(8.61)	72.25(7.62)	72.6(4.67)	0.108
50 MIN	NA	78.85(9.45)	NA	0.148
55MIN	NA	75.6(6.26)	NA	
60 MIN	NA	75.33(3.05)	NA	

Table3- Mean blood pressure changes in groups at differeent time intervals

	MBP (Phenylephirne)	MBP (Ephedrine)	MBP (Control)	P VALUE
	Mean(SD)	Mean(SD)	Mean(SD)	
Baseline	92.76(9.76)	96.96(8.66)	91.3(6.47)	0.679
2MIN	87.63(10.35)	85.96(10.05)	85.63(7.69)	0.672
4 MIN	82.7(18.46)	81.6(9.92)	77.53(10.77)	0.318
6 MIN	87.4(14.32)	77.5(9.94)	76.03(10.61)	0.001
8 MIN	90(13.31)	80.66(10.98)	78.13(7.35)	0.000
10 MIN	90.06(12.1)	85.56(10.25)	78.76(6.1)	0.000
12 MIN	89.76(17.52)	88.86(13.47)	80.56(6.21)	0.015
14 MIN	92.63(8.93)	86022(10.27)	81.1(5.71)	0.000
16 MIN	91.76(7.66)	85.06(8.01)	80.5(6.8)	0.000
18 MIN	88.96(9.98)	84.36(9.28)	83.73(4.2)	0.031
20 MIN	87.56(10.71)	84.56(7.43)	84.2(6.3)	0.237
25 MIN	84.63(16.35)	85.13(6.66)	82.9(6.01)	0.702
30 MIN	88.89(6.17)	86.96(7.43)	84.56(5.64)	0.041
35 MIN	89.64(5.67)	87.46(7.47)	85.2(5.15)	0.035
40 MIN	90.37(6.22)	88(7.43)	86.14(5.12)	0.129
45 MIN	93.4(6.34)	87.62(7.44)	86.4(3.59)	0.103
50 MIN	NA	93(9.38)	NA	
55MIN	NA	86.8(6.53)	NA	
60 MIN	NA	86.33(1.52)	NA	

Table 4- Heart rate changes in groups at different time intervals

	HR (Phenylephirne)	HR (Ephedrine)	HR (Control)	P VALUE
	Mean(SD)	Mean(SD)	Mean(SD)	
Baseline	92.5(14.17)	96.46(12.25)	97.2(9.41)	0.276
2MIN	90.23(20.56)	99.13(13.36)	97.93(8.33)	0.049
4 MIN	93.56(15.89)	104.1(9.16)	98.8(11.86)	0.007
6 MIN	90.93(17.53)	105.26(15.12)	101.3(15.93)	0.003
8 MIN	91.43(14.92)	105.36(13.08)	101.76(14.05)	0.001
10 MIN	90.16(13.27)	103.73(15.71)	97.73(14.89)	0.005
12 MIN	90.86(12.82)	105.63(16.03)	91.46(13.13)	0.002
14 MIN	91.4(12.52)	103.7(14.46)	90.9(12.71)	0.000
16 MIN	88.86(12.4)	102.63(14.99)	88(11.8)	0.000
18 MIN	87.73(12.25)	101.83(11.78)	85.8(10.26)	0.000
20 MIN	86.13(11.71)	100.83(9.54)	85.7(10.93)	0.000
25 MIN	85.96(12.28)	101.4(9.9)	83.5(10.33)	0.000
30 MIN	86.96(14.58)	99.5(11.39)	82.56(9.92)	0.000
35 MIN	86.89(12.96)	100.76(13.71)	82(8.67)	0.000
40 MIN	84.31(10.84)	103.64(16.9)	82.14(7.83)	0.000
45 MIN	80.4(9.71)	99.87(24.75)	84.2(7.33)	0.073
50 MIN	NA	98.85(25.12)	NA	
55MIN	NA	100.2(27.23)	NA	
60 MIN	NA	98(3)	NA	

Table 5- Intergroup comparision of incidence of hypotension

	Percentage of Hypotension in each group	% within Groups	P value	Significance
Group A	23.3%	Group A versus Group C 46.7%	0.000	Highly significant
Group C	70%			
Group B	43.3%	Group B versus Group C 56.7%	0.037	Significant
Group C	70%			
Group A	23.3%	Group A versus Group B 33.3%	0.085	Not significant
Group B	43.3%			

Table 6-Intergroup comparision of incidence of nausea/ vomiting

	Percentage of nausea/ vomiting in each group	% within Groups	P value	Significance
Group A	13.3%	Group A versus Group C 33.3%	<0.01	Significant
Group C	53.3%			
Group B	33.3%	Group B versus Group C 43.3%	<0.096	Not significant
Group C	53.3%			
Group A	13.3%	Group A versus Group B 23.3%	<0.053	Significant
Group B	33.3%			

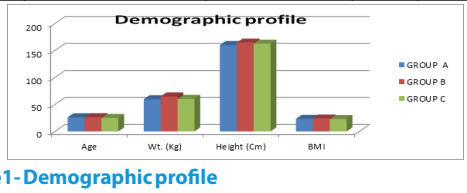

Figure1- Demographic profile

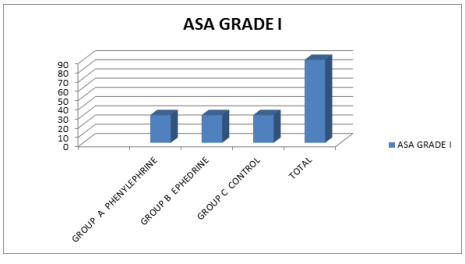

Figure 2- ASA Distribution

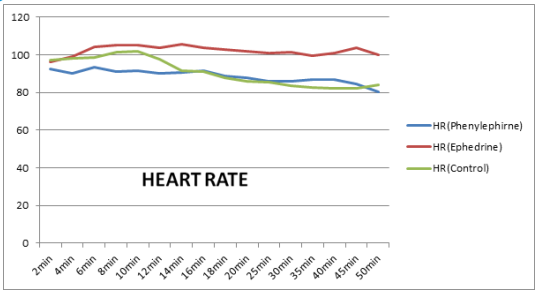

Figure 3 - SHOWING HEART RATE CHANGES IN GROUPS AT DIFFERENT TIME INTERVALS

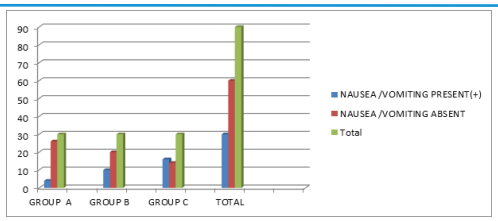

Figure 4 - SHOWING PRESENCE OF NAUSEA/VOMITING IN DIFFERENT GROUPS

CONCLUSION

This study concludes that preemptive use of IM phenylephrine or ephedrine, when given just after spinal anaesthesia reduce the incidence and severity of hypotension which would have been inevitable otherwise as seen in control group. It was evident that Phenylephrine reduces the incidence of hypotension and associated nausea/vomiting even more efficiently than ephedrine. Moreover only a few parameters like systolic, diastolic, mean blood pressure were measured in the present study, whereas the effects of same drugs on cardiac output and systemic vascular resistance is yet to be explored and larger sample trials are further required.

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