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Comparision of Intravenous Bolus Phenylephrine and Ephedrine for Prevention of Post Spinal Hypotension in Cesarean Sections

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Abstract:
Aims & Objectives: *To compare the efficacy of phenylephrine & ephedrine for prevention of hypotension after subarachnoid block in cesarean sections and to determine the effect on APGAR scores.*
Method of study: *This is a prospective randomized comparative study conducted during one year period in Department of anesthesia, Adichunchanagiri institute of medical sciences, BG Nagara. 60 parturients undergoing cesarean section were allocated in to two groups. Group P (n=30) received 100 mcg phenylephrine and Group E (n=30) received 6mg ephedrine prophylactically immediately after subarachnoid block. A fall in blood pressure more than 20% of baseline was considered as significant hypotension and was treated with 6mg mephentermine. Incidence of hypotension, bradycardia and APGAR scores were measured.*
Results: *There was no difference in preventing hypotension in both the groups. There was significant reduction in heart rate in phenylephrine group. APGAR scores of both the groups were comparable.*
Conclusion: *Phenylephrine and ephedrine were equally efficient in prevention of hypotension after subarachnoid block. Neonatal outcome remains equally good in both the groups.*
Keywords *- Phenylephrine, ephedrine, hypotension, subarachnoid block, cesarean section*.

I. Introduction

Subarachnoid block is the preferred anaesthetic technique for cesarean sections nowadays[1] to prevent general anesthesia related complications like failed intubation, aspiration and depressant effect of general anesthetics on neonates etc. But the incidence of hypotension is 75-85% with this technique which is detrimental to both mother and fetus.[2] For the mother, hypotension is especially associated with nausea and vomiting[3] and in more severe cases there may be risk of decreased consciousness, pulmonary aspiration, respiratory depression, and cardiac arrest. Hypotension can have detrimental effects on neonate, which include decrease in uteroplacental flow, impaired fetal oxygenation with asphyxia and fetal acidosis.[4]

Preventive measures for hypotension include adequate preload (10-15ml/kg), lateral tilt, wedge and use of vasopressors.[5,6] Ephedrine is the preferred vasopressor in cesarean sections. It has both direct and indirect mechanism of action, stimulating mainly beta receptors (b1 and b2), causing increased cardiac output, heart rate and systolic and diastolic blood pressure. But it can cause supraventricular tachycardia, tachyphylaxis & fetal acidosis.[7,8] Recent clinical studies have shown ephedrine to be associated with a dose-related propensity to depress fetal pH and base excess.[4] Phenylephrine, a selective α1 adrenergic agonist is effective as ephedrine in the treatment of spinal hypotension with a better neonatal outcome and fetal acid base status.[7,9] If tachycardia is undesirable phenylephrine may be better than ephedrine. It elevates the blood pressure without increasing the heart rate or contractility. Moran DH et al. compared ephedrine 10mg intravenous bolus and phenylephrine 80mcg intravenous bolus in prevention of post spinal hypotension. They concluded that phenylephrine is as effective as ephedrine in preventing maternal hypotension.[5]

Ngan kee et al. compared phenylephrine infusion of 100 μg/min with bolus administration of it and showed that infusion of phenylephrine can decrease the incidence and severity of hypotension as effective as bolus injections and neonatal outcomes did not differ in both techniques.[10]

Brooker et al. compared the effect of ephedrine and phenylephrine on blood pressure in elective cesarean section under spinal anesthesia and found that both agents were able to maintain systolic blood pressure throughout anesthesia, but mean arterial and diastolic BP were only maintained with phenylephrine.[11]

Loughrey et al. compared simultaneous bolus administration of ephedrine and phenylephrine with bolus ephedrine alone. They concluded that this combination therapy is not superior to bolus injection of ephedrine in stabilizing hemodynamic effects of spinal anesthesia.[12]In view of the above studies with different results, this study has been conducted to compare the efficacy of both the drugs in preventing post spinal hypotension.

II. Materials And Methods

This is a prospective randomized comparative study conducted in Department of anesthesiology, AIMS, BG Nagara after ethical committee's approval. 60 singleton parturients in the age group of 20- 35 yrs of height between 150-170cm, weighing 60- 90kg scheduled for elective or emergency cesarean section and of ASA status 1 were selected. Patients having resting blood pressure >140/90 mm of Hg, history of hypertension/ preeclampsia/ eclampsia, hyperthyroidism, cardiovascular, cerebrovascular, renal disorders, any contraindications to spinal anesthesia or with fetal distress were excluded from the study. Written informed consent was taken from every parturient. All the patients were preloaded with 500ml Lactated Ringer's solution. Basal heart rate, systolic and diastolic blood pressure, mean arterial pressure, spo2 readings were recorded. For all the patients subarachnoid block was performed from L3- L4 or L4-L5 intervertebral spaces using 23-25G Whitacre needle with 9mg(1.8ml) hyperbaric bupivacaine. Patient was immediately placed in supine position with left uterine displacement after subarachnoid block maintaining level of blockade T5-T6. They were randomly allocated into two groups Group P and Group E. Group P (n=30) received prophylactic intravenous bolus dose of Phenylephrine 100mcg immediately after subarachnoid block. Group E (n=30) received prophylactic intravenous bolus dose of Ephedrine 6mg immediately after subarachnoid block. Then systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate, spo2 were measured every 2 minutes for the first 20 minutes of administration of the study drug. Hypotension was considered significant if blood pressure falls to <80% of baseline and was treated with half the intial bolus dose of the study drug. APGAR scores of the neonates at 1st minute and 5th minute were noted. Data was analysed by using student's *t*- test.

III. Results

Most of the patients had age 24-30 years in both the groups. The average age was 24.26±5.1 SD in phenylephrine group, 25.02± 4.67SD in ephedrine group and was insignificant with p value 0.549. Parturients of both the groups were of height 150-160cm with mean 153.5± 6.02SD in phenylephrine group and 152.7±4.32 SD in ephedrine group. Similary, majority of the patients had weight 65-75kg in both groups with average weight of 71.82± 4.32SD in phenylephrine and 69.6±6.12SD in ephedrine group.(TABLE 1) The difference observed in baseline heart rate, systolic, diastolic, and mean blood pressures between two groups was statistically insignificant. There was no significant difference in systolic blood pressures between the two groups throughout the study. Although rise in systolic blood pressure was higher in phenylephrine group than ephedrine group after administration, it was not statistically significant. (TABLE 2, GRAPH 1)

Mean arterial pressures in both the groups showed no significant difference. (TABLE 3, GRAPH 2) There was higher incidence of bradycardia in patients receiving phenylephrine than those receiving ephedrine with p value< 0.001 (TABLE 4, GRAPH 3). In group P, 85% patients did not require rescue boluses of vasopressors while 10% required one and 5% two to maintain systolic pressure within 20% limit of basal value. In group E, 80% did not require, 15% required one and 5% two bolus doses to maintain systolic blood pressure within 20% limit of basal value. APGAR scores did not reveal any significant difference between both the groups. APGAR scores were >8 in both the groups (TABLE 5, GRAPH 4).

IV. Tables And Graphs

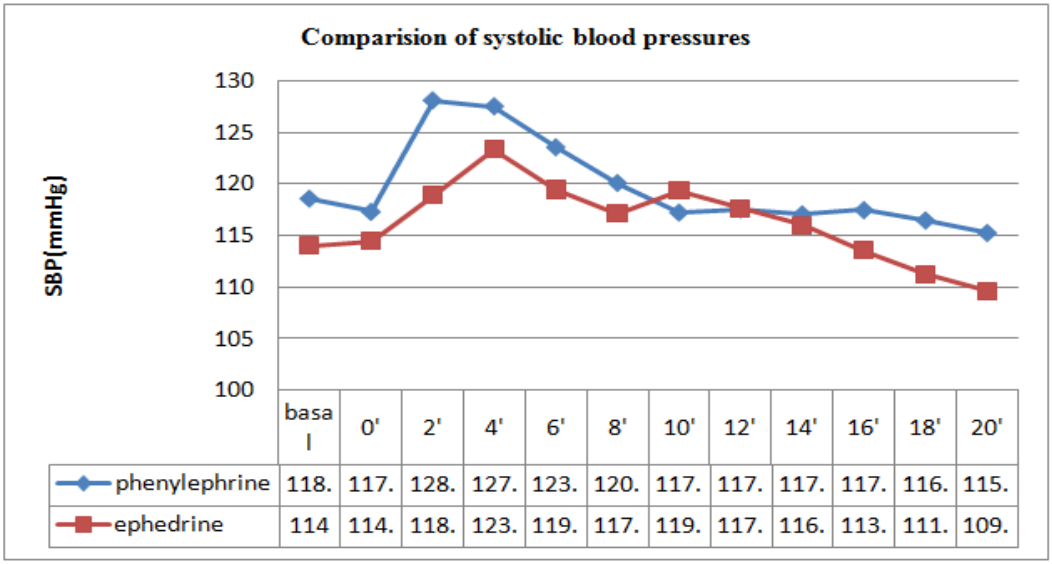
Table 1

	Group P Mean±SD	Group E Mean±SD	't' value	'p' value
Age	24.26±5.1	25.02±4.67	0.60	0.54
Weight	71.82±4.32	69.6±6.12	1.62	0.11
Height	153.5±6.02	152.7±4.32	0.59	0.55

Table 2

Comparision of systolic blood pressures(mmHg) between the two groups				
	Group P Mean±SD	**Group E Mean±SD**	**'t' value**	***P* value**
baseline	118.63±11.38	114.03±8.44	1.77	0.08
0'	117.36 ±9.79	114.93±6.63	1.12	0.26
2'	128.06±9.05	124.93±6.51	1.53	0.12
4'	127.5±9.99	124.7±7.87	1.20	0.23
6'	123.56±10.72	119.5±6.36	1.78	0.07
8'	120.13±11.30	117.2±9.1	1.10	0.19
10'	117.3±10.44	119.39±8.19	0.86	0.39
12'	117.6±4.72	117.67±5.05	0.05	0.95
14'	117.13±7.54	116.06±6.24	0.59	0.55
16'	117.53±7.44	116.6±6.81	0.50	0.61
18'	116.53±8.03	114.23±8.59	1.07	0.28
20'	115.33±8.36	113.66±2.51	1.04	0.28

Graph 1



Graph 2

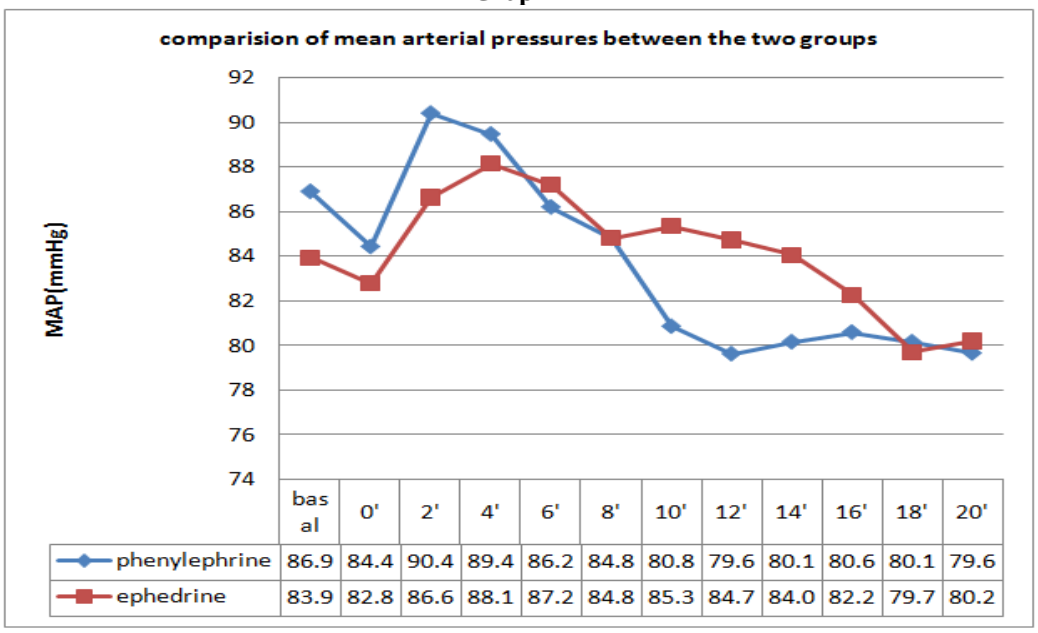


Table 3

Comparision of mean arterial pressures between the two groups				
	Group P Mean±SD	Group E Mean±SD	't' value	P value
baseline	86.9±7.88	83.93±6.02	1.6	0.10
0'	84.43±7.76	82.8±5.4	0.94	0.34
2'	90.4±10.13	86.63±4.81	1.8	0.07
4'	89.46±11.55	88.13±6.41	0.55	0.58
6'	86.2±9.12	87.2±7.05	0.47	0.63
8'	84.8±9.8	84.6±9.7	0.07	0.93
10'	82.86±9.25	85.33±7.98	1.1	0.27
12'	83.63±9.31	84.73±7.96	0.49	0.62
14'	80.16±8.4	80.06±5.11	0.05	0.95
16'	80.6±7.04	82.26±5.73	1.0	0.32
18'	80.16±6.8	79.73±7.01	0.24	0.81
20'	79.66±7.69	80.23±7.48	0.29	0.77

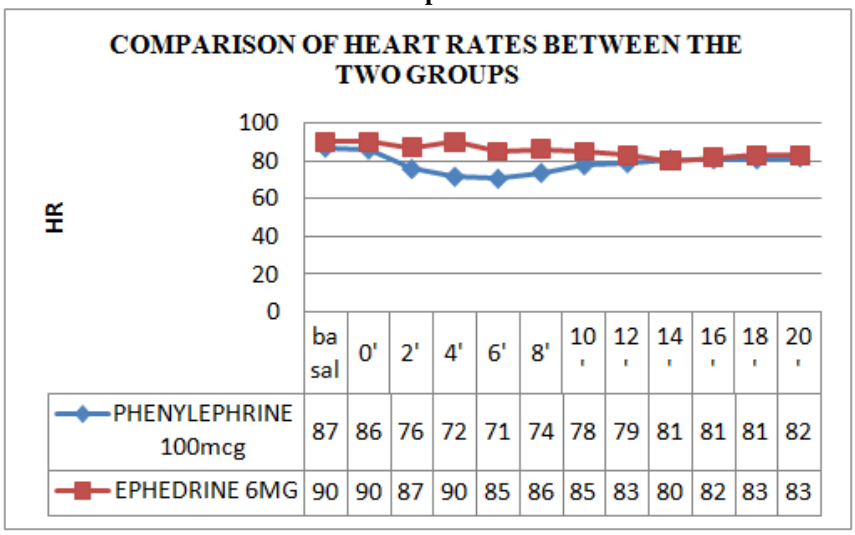
Table 4

Comparision of heart rates(bpm) between the two groups				
	Group P Mean±SD	Group E Mean±SD	't' value	P value
Baseline	89.46±13.09	90±9.71	0.18	0.85
0'	86.96±20	90.53±8.85	0.89	0.37
2'	76.88±14.21	87.26±9.16	3.36	0.0014
4'	72.96±13.02	90±0	7.1	0.0001
6'	71.82±13.28	85.7±9.19	4.7	0.0001
8'	74.82±14.25	86.9±9.54	3.85	0.0003
10'	78.71±14.52	85.96±8.44	2.36	0.0214
12'	79.6±15.02	83.16±8.41	1.13	0.26
14'	81.5±14.18	80.23±16.26	0.33	0.74
16'	81.66±12.46	8233±8.2	0.24	0.80
18'	81.4±12.47	83.76±9.72	0.81	0.41
20'	82.03±11.98	83.1±10.35	0.37	0.71

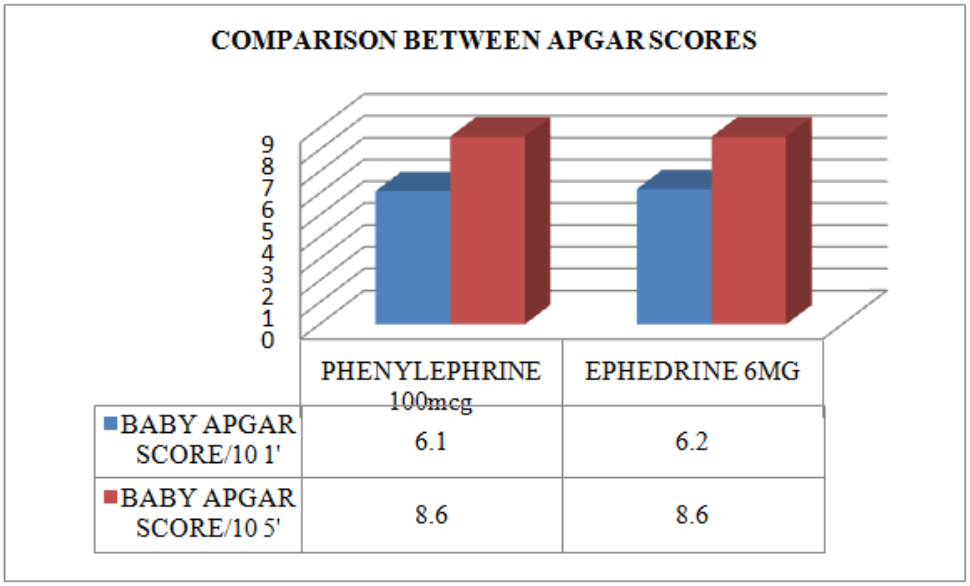
Table 5

Comparision of APGAR scores between the two groups				
	Group P Mean±SD	Group E Mean±SD	't' value	P value
1 min	6.1±0.7	6.2±0.8	0.51	0.60
5 min	8.6±0.4	8.6±0.4	1.00	0.00

Graph 3



Graph 4



V. Conclusion

We conclude from this study that phenylephrine and ephedrine are equally efficient in prevention of hypotension after subarachnoid block in cesarean deliveries. Phenylephrine causes significant reduction in heart rate, which may also be advantageous in cardiac patients and patients in whom tachycardia is undesirable. Neonatal outcome was equally good (APGAR scores >8/ 10) in both the groups.

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