IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 2 Ser. 6 (February. 2019), PP 13-18
www.iosrjournals.org

A Clinical Comparative Study between Phenylephrine and Mephentermine for Management of Hypotension during Spinal Anesthesia in Caesarean Section

Dr. K.Raja Sekhar[1], Dr. Ramesh Kalapala [2],Dr B Annapurna Sarma[3]dr. S.S.Sravan Kumar[4]

[1]*M.D Associate professor. Department of anaesthesia, Guntur Medical College and General hospital, Guntur*
[2]*M.D Assistant professor. Department of anaesthesia, Guntur Medical College and General hospital, Guntur*
[3]*M.Dprofessor. Department of anaesthesia, Guntur Medical College and General hospital, Guntur*
[4]*Post graduate, Department of anaesthesia, Guntur Medical College and General hospital, Guntur*
Corresponding Author: Dr. K.Raja Sekhar

Abstract: *Maternal Hypotension during spinal anesthesia is an undesirable and it causes detrimental maternal and fetal effects. Numerous methods have been tried to minimize hypotension which include fluid preloading, left uterine displacement and use of vasopressor drugs. This study was aimed at comparing the efficacy of IV mephentermine and phenylephrine for maintenance of arterial blood pressure during spinal anesthesia.*

Materials and methods*: Sixty American society of anaesthesiologist (ASA) type I and type II patients between the age group of 18 to 35 years undergoing elective as well as emergency caesarean section under spinal anesthesia who developed hypotension after subarachnoid block were selected and randomly allocated into two groups of 30 each to receive Group P – phenylephrine 100mcg, Group M – mephentermine 6mg as bolus IV and repeated if required*

Results: *The umbilical arterial pH was comparable in both groups. On inter group comparison the rise of systolic blood pressure at 2,4,6,and 8 minutes post study drugs were less in mephentermine group when compared to phenylephrine group (p <0.05)*

Conclusion: *Both vasopressors are effectively maintained arterial blood pressure during spinal anesthesia for caesarean section.These two drugs didn't have any adverse effects on the fetus. Though phenylephrine has quicker peak effect when compared to mephentermine and causes reduction in heart rate which may be advantageous in cardiac patients and patients in whom tachycardia is undesirable.*

Date of Submission: 28-01-2019 Date of acceptance: 11-02-2019

I. Introduction

Spinal anesthesia was introduced into clinical practice by German surgeon Karl August Beir in 1893 (1). Maternal hypotension is an undesirable consequence of spinal anesthesia for cesarean delivery as it causes detrimental maternal and fetal effects (2). It has be estimated to occur in approximately 30% to 90% of cases (3). Maternal hypotension produces unpleasant symptoms such as nausea, vomiting and lightheadedness. More importantly, when severe and sustained, hypotension can impair uterine and inter-villous blood flow and ultimately result in fetal acidosis and neonatal depression. Preventive measures include fluid preload, left lateral tilt, and use of vasopressors. (4).

Phenylephrine, α- adrenergic agonist, can be used for prevention and treatment of maternal hypotension. Moreover, phenylephrine reduces the incidence of nausea and vomiting as well as fetal acidosis, but it may cause maternal bradycardia. (5)

Mephentermine is having direct and indirect sympathomimetic action and probably the increase in arterial blood pressure is chiefly by increased cardiac output. This may be favorable for placental circulation. (6) We have studied the bolus phenylephrine and mephentermine for maintenance of arterial pressure during spinal anesthesia in caesarean section.

AIMS and OBJECTIVES:

To compare the efficacy of mephentermine and phenylephrine for maintenance of blood pressure effectively in cesarean section under spinal anesthesia.

II. Materials and methods

After approval from institutional ethical committee of the college and informed consent from each patient was taken, we studied 60 ASA I and II patients' singleton full term pregnant patients aged between 18to 35 years undergoing elective as well as emergency caesarean section who developed hypotension after subarachnoid block (SAB). This study was done at Guntur Medical College (GMC) attached to Government General Hospital (GGH), Guntur, during 2018 September to 2019 January.

Patients having resting blood pressure more than 140/90 mmhg, history of hypertension, pre eclampsia, hyperthyroidism, and having coexisting neurologic, cerebrovascular disorder (asymmetric septal hypertrophy, angina, etc), renal, metabolic, psychiatric disorder, glaucoma or occlusive vascular disorder were excluded. Those patients having history of hypersensitivity to local anesthetic and any contraindications to spinal anesthesia or having known fetal abnormalities were not included.

Hypotension is defined as fall in systolic pressure >20% from the baseline or a value less than 90 mm hg.

Patients were randomly divided into two groups

Group P(N= 30), who received IV bolus phenylephrine 50 mcg

Group M (N = 30), who received IV bolus mephentermine 6mg

Under strict aseptic conditions, with patient in lateral position lumbar puncture was done at L3-L4 interspinous space with 25G quincke needle. 2ml of 0.5% Bupivacaine (heavy) injected into subarachnoid space after free flow of CSF. Patient was turned to supine position and after 5 minutes wedge was placed under right flank. They were preloaded 15ml/kg lactated ringer solution. Oxygen was administered via face mask at 5L/min until umbilical cord was clamped. Injection Oxytocin 10 units in 5% dextrose was given after clamping the umbilical cord.

Pulse rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), were recorded for baseline values. The same parameters were recorded after subarachnoid block, then at every 2 minutes for 20 minutes and thereafter every 5 minutesupto 30 minutes. Whenever, hypotension (fall in SBP > 20% from the base line value or a value less than 90mmhg) occurs the study drug was given IV bolus and repeated whenever required. The number of boluses were noted. Injection Atropine o.6mg IV was given if patient develops bradycardia (heart rate <60 /min).

The sensory block was assessed by pin prick method 5 minutes after subarachnoid block.

The changes in maternal heart rate, systolic blood pressure, diastolic blood pressure for initial 30 minutes after spinal block. Sensoryblock level, incidence of nausea and vomiting, fetal umbilical arterial blood gas analysis were recorded. The data were presented as mean ± standard deviation by using student t test. P < 0.05 wasconsidered significant

III. Results

Both groups were comparable in demographic data such as age, body weight, and height and base line parameters, median level of sensory block.

These two groups were comparable in skin incision to delivery time and uterine incision to delivery time and APGAR score at 1 and 5 min.

Table 1: Patients characteristics

	Group P (n=30) (Mean ± S.D)	Group M (n=30) (Mean ± S.D)	P value
Maternal age (yrs)	25.6±4.82	26.42±4.72	0.50
Weight (kgs)	72.16±6.48	69.03±8.26	0.10
Height (cms)	158.62±5.52	162.26±2.05	0.001
Upper level of sensory block	T6	T6	
Skin incision to delivery time (min)	8±2	9±2	0.057
Uterine incision to delivery time (sec)	57±8	62±7	0.01

Table 2: changes in heart rate

Time intervals	Heart rate per min		P
	Group P (n=30)	Group M (n=30)	
Basal value	94±17	92.3±16	0.69
At the time of hypotension (vasopressor given)	108.4±22	106±20	0.66
2 min after vasopressor	90.2±14	102.6±19	0.005
4 min after vasopressor	86.5±16	100.12±22	0.008
6 min after vasopressor	91.6±16	100.16±20	0.07
8 min after vasopressor	95.4±18	98.6±22	0.53
10 min after vasopressor	95.6±16	100.4±18	0.27
12 min after vasopressor	97.2±14	101.7±20	0.31

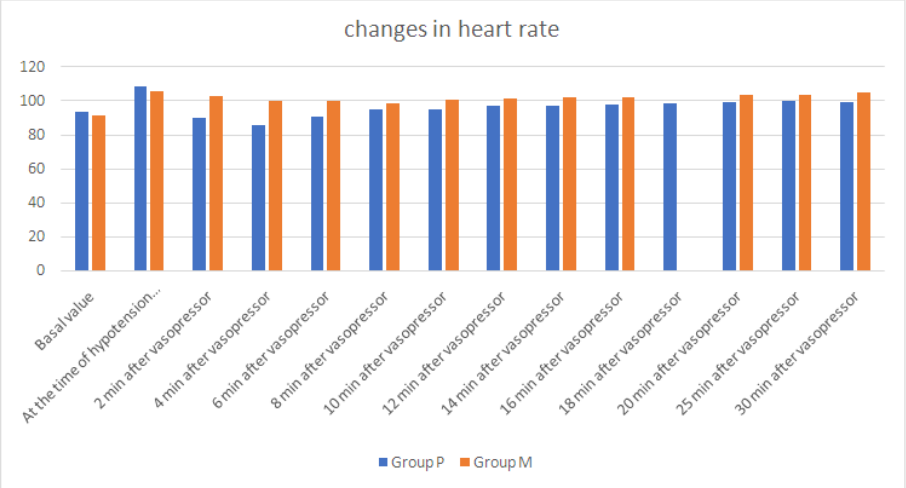
14 min after vasopressor	97.2±12	101.9±18	0.23
16 min after vasopressor	98.1±16	102.4±16	0.30
18 min after vasopressor	98.4±18	102.6±16	0.34
20 min after vasopressor	99.5±12	103.5±18	0.31
25 min after vasopressor	99.7±14	103.6±22	0.41
30 min after vasopressor	99.6±16	105.2±18	0.20

During hypotension, heart rate was raised in both groups. In group P, the mean heart rate during hypotension was 108.4±22. 2 minutes after vasopressor, the heart rate was decreased to 90.2±14 and heart rate was decreased significantly from values at the onset of hypotension till completion of the surgery (table 2).

Within the group these values were highly significant($p<0.001$). Whereas in Group M, the heart rate was raised from its basal value 92.3±16 to 106±20. The heart rate were higher after study drug and remained statistically non-significant from the values at the onset of hypotension till completion of surgery.

There was a significant difference in heart rates between two groups at 2 (p 0.005) and 4 (p 0.008) mins after study drug. (table 2, graph 1)

Graph 1



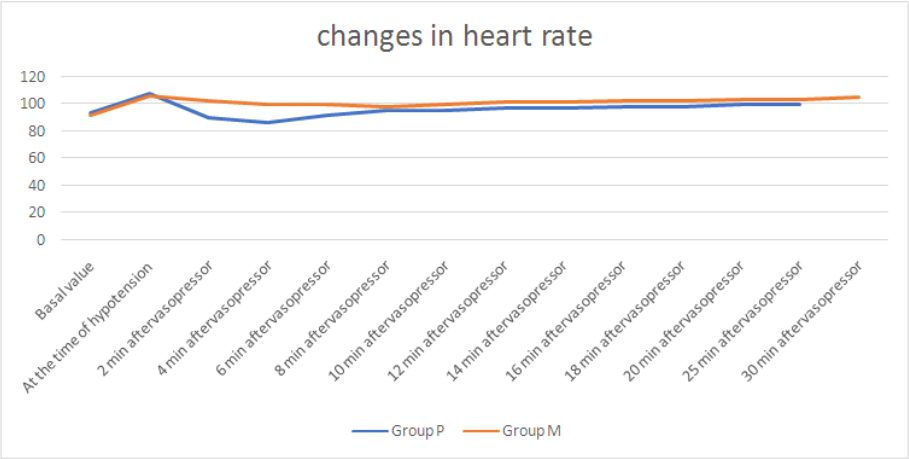


Table 3: Changes in systolic blood pressure (mean ± S.D)

Time intervals	Systolic Blood Pressure in mm hg(mean ± S.D)		P
	Group P (n=30)	Group M (n=30)	
Basal value	125.6±5.8	127.4±4.2	0.17
At the time of hypotension (vasopressor given)	93.4±4.6	94.2±3.8	0.46
2 min after vasopressor	118.5±12	106.4±2	< 0.0001
4 min after vasopressor	122.4±12	110.9±4	< 0.0001
6 min after vasopressor	123.6±12.6	116.8±9.8	0.05
8 min after vasopressor	124.3±10.6	117.2±5.6	0.002

10 min after vasopressor	123.2±8.6	116.2±5.6	0.0004
12 min after vasopressor	123.4±7.4	115.2±7.2	0.0001
14 min after vasopressor	121.3±9.7	116.4±5.6	0.01
16 min after vasopressor	118.4±10.2	117.4±5.4	0.63
18 min after vasopressor	119.4±8.6	117.6±7.3	0.38
20 min after vasopressor	121.7±9.4	118.6±6.2	0.13
25 min after vasopressor	121.7±8.6	118.4±6.4	0.09
30 min after vasopressor	123.4±7.8	120.6±6.8	0.14

The mean base line systolic blood pressure in P and M group were 125.6±5.8mm hg and 127.4±4.2mmhg respectively (p 0.17) which was statistically not significant. There was a statistically significant decrease in blood pressure during hypotension in both groups (table 3). On inter group comparison the rise of systolic blood pressure at 2,4,6,and 8 minutes post study drugs were less in mephentermine group when compared to phenylephrine group (p <0.05)

Graph 2

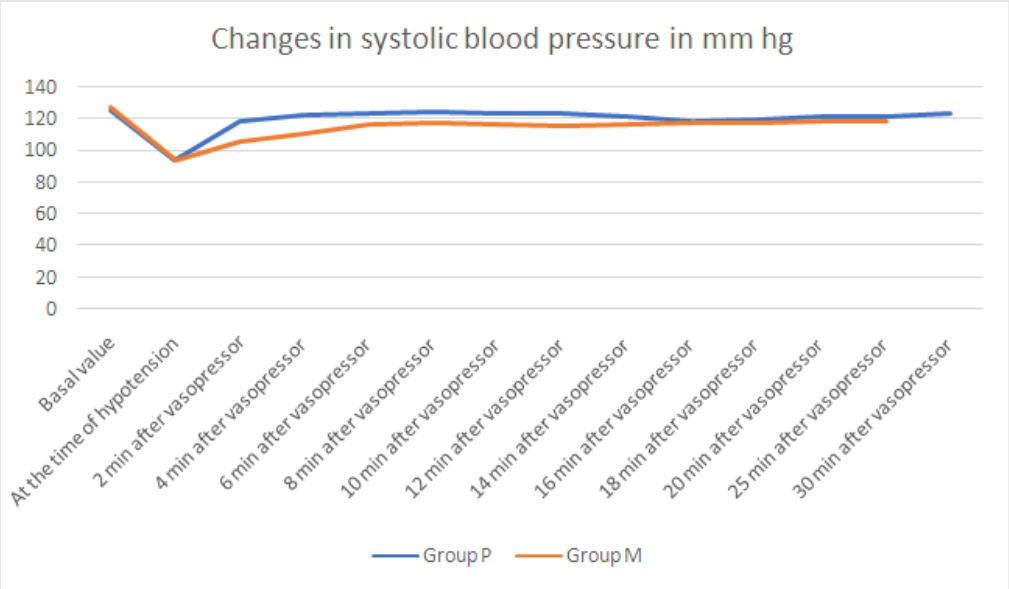


Table 4: Changes in Diastolic Blood Pressure in mm hg

Time intervals	Diastolic Blood Pressure in mm hg(mean ± S.D)		P
	Group P (n=30)	Group M (n=30)	
Basal value	78.4±6.2	78.8±6.8	0.81
At the time of hypotension (vasopressor given)	58.9±4.5	61.5±7.4	0.10
2 min after vasopressor	72.6±9.2	67.8±7.4	<0.05
4 min after vasopressor	74.2±8.9	67.6±6.8	< 0.05
6 min after vasopressor	74.2±7.2	70.5±6.4	<0.05
8 min after vasopressor	74.7±6.8	70.2±4.8	< 0.05
10 min after vasopressor	74.8±7.2	70.3±5.6	0.009
12 min after vasopressor	74.9±7.3	71.3±5.8	0.03
14 min after vasopressor	72.9±5.8	71.6±4.8	0.34
16 min after vasopressor	72.4±5.2	72.6±4.8	0.87
18 min after vasopressor	73.8±5.2	72.8±4.3	0.42
20 min after vasopressor	75.1±5.2	72.6±5.9	0.08
25 min after vasopressor	74.8±4.9	72.4±5.2	0.07
30 min after vasopressor	76.1±4.2	73.8±4.6	0.04

There was no statistically significant difference between two groups in their basal diastolic blood pressure values (p 0.81) On inter group comparison rise of diastolic blood pressure at 2, 4,6 and 8 minute post study drug was significantly less in mephentermine group as compared to phenylephrine group (table 4,graph3).

Graph3

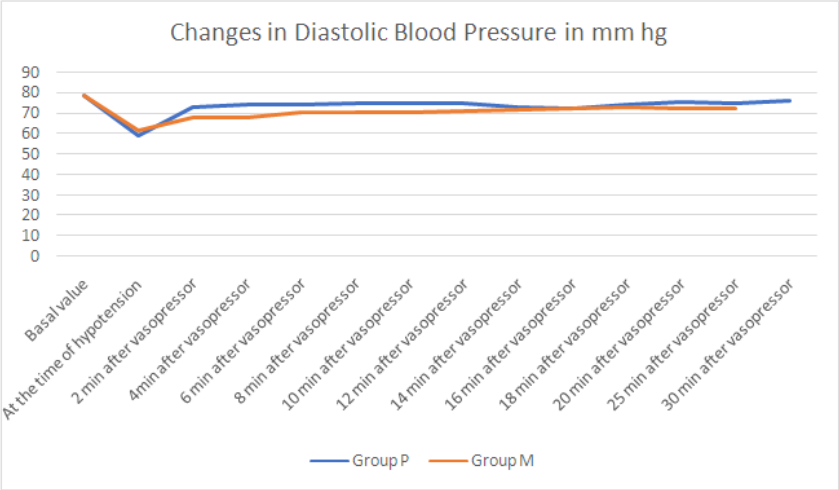


Table 5: Neonatal outcome:

	Group P (n=30)	Group M (n = 30)	P value
Apgar score at			
1 min	8.56±0.5	8.52±0.4	>0.05
5 min	9.8±5.6	9.72±0.3	>0.05
Apgar score <8 at 1 and 5 min	0	0	
Umbilical artery blood gas analysis			
pO2 (mm hg)	11-18 (range)	11-17 (range)	>0.05
pCO2 (mm hg)	49-56 (range)	48-65 (range)	>0.05
HCO_3^-	18-22 (range)	17-22(range)	>0.05
Base deficit (mmol)	0.1-2.4 (range)	0.2-3.3 (range)	>0.05
pH	7.27-7.32	7.26-7.34	>0.05

The APGAR score at 1 and 5 minutes were comparable in both groups. No neonate had an APGAR score of < 8 at 1 and 5 minutes. No case was reported with umbilical arterial pH < 7.20. Other umbilical arterial parameters were comparable but not statistically significant (p > 0.05) (table 5)

IV. Discussion

Caesarean section is one of the oldest operations in the recorded history, however anesthesia for caesarean section is just a century old and is not bereft of controversies. Maternal hypotension is an undesirable consequence of spinal anesthesia for cesarean delivery as it causes detrimental maternal and fetal effects. It has been stated that the percentage decrease in placental perfusion is related to the percentage reduction in maternal arterial pressure and not to the absolute reduction in pressure. For the purpose of this study, hypotension was defined as a decrease in arterial pressure greater than 20% from baseline systolic pressure (7).

Mephentermine has both α and β receptors activity whereas phenylephrine has pure α receptor activity. Thomas and colleagues reported that bolus phenylephrine 100 micro grams is effective in restoring maternal arterial pressure above 100 mm hg (8).

Phenylephrine has peak effect within one minute and mephentermine has its peak effect in 5 minutes (11).

In our study cardiovascular stability was better with phenylephrine. It caused significant reduction in heart rate after the bolus dose which is a consistent effect in phenylephrine treated women in their studies also (9). Phenylephrine lacks the effect on beta receptors. In mephentermine group the heart rate was increased to pre-operative value, our study was very well correlated with Dinesh Sahu etal (10) studies.

In this study both these vasopressors were effectively maintained arterial pressure within 20% limit of baseline value though phenylephrine maintained better in first 6minutes of bolus dose as compared to mephentermine. There was significant effect of vasopressor on fetus in terms of Apgar score at 1 and 5 minutes which are correlated well to the study of Dinesh Sahu and etal.

Moran and colleagues gave phenylephrine 80mcg IV bolus to maintain systolic arterial pressure above 100 mm hg and they observed no adverse neonatal effects in healthy, non-laboring parturient. (12). our studies are very well co-related with Moran and etal studies (table 3)

There was no significant effect of vasopressor on fetal outcome in terms of APGAR score at 1 and 5 minutes. None of the neonate in either of the group had a pH <7.20 (table 5). Ramanathan and colleagues (9) studied in 127 healthy patients undergoing elective caesarean section under epidural anaesthesia. They

concluded that transient maternal hypotension does not affect neonatal acid- base status. Both ephedrine and phenylephrine increase cardiac preload and agent like phenylephrine does not cause fetal acidosis, when used for treating maternal hypotension. Our studies are very well correlated with Ramanathan etal studies. In our study we found only nausea and vomiting as side effects

V. Conclusion

In conclusion, both vasopressors are effectively maintained arterial blood pressure during spinal anesthesia for caesarean section.We found that phenylephrine and mephentermine are effective in IV bolus form in maintenance of arterial pressure within 20% limit of baseline. These two drugs didn't have any adverse effects on the fetus. Though phenylephrine has quicker peak effect when compared to mephentermine and causes reduction in heart rate which may be advantageous in cardiac patients and patients in whom tachycardia is undesirable.

References

[1]. Parameshwara G. spinal, epidural to combined spinal epidural analgesia. The history of central neuraxial block. *Indian journal of anaesthesia*2001;45(6):406.

[2]. Wright RG, Shnider SM. Hypotension and regional anaesthesia. In: Shnider SM, Levison G. editors. Anaesthesia for obstetrics, 3rd ed. Baltimore: Williams and Wilkins; 1993.p. 397-406

[3]. Rasanen, J., Alahuhtat,S., Kangas-Saarelat, T., Jouppilat,R. and Jouppila, P. (1991) The effects of ephedrine and etilefrine on uterine and fetal blood flow and on fetal myocardial function during spinal anaesthesia for caesarean section. *International Journal of Obstetric Anaesthesia*,

[4]. Miller,R.D. (2010) Millers anaesthesia. 7th edition, Churchill Livingstone, Philadelphia.

[5]. Ngan Kee,W.D, Khaw, K.S, Ng, F.F. and Lee, B.b.(2004) Prophylactic phenylephrine infusion for preventing hypotension during spinal anaesthesia for caesarean delivery. *Anaesthesia and analgesia, 98, 815-821.*

[6]. Sahu D, Kothari D, Mehrotra A. Comparison of bolus phenylephrine, Ephedrine and mephentermine for maintenance of arterial pressure during spinal anaesthesia in caesarean section – a clinical study. Indian J anaesth 2003;

[7]. *Corke BC, Dutta S, Ostheiner GW, Weiss JB, Alper MH*. Spinal anesthesia for caesarean section. The influence of hypotension on neonatal outcome. Anesthesia 1982;37:658-662.

[8]. *Thomas DG, Robson SC, Redfern N, Hughes D, Boys RJ*. Randomized trial of bolus Phenylephrine or Ephedrine for maintenance of arterial pressure during spinal anaesthesia for caesarean section. Br J Anaesth 1996;76:61-5.

[9]. Ramanathan S, Grant GJ. Vasopressor therapy for hypotension due to epidural anaesthesia for caesarean section. *Acta Anaesthesioi Scand 1988;32:559-65.*

[10]. Sahu D, Kothari D, Mehrotra A. Comparison of bolus Phenylephrine, Ephedrine, and Mephentermine for maintenance of arterial pressure during spinal anaesthesia in caesarean section- a clinical study. *Indian J Anaesth 2003;47(2):125-8.*

[11]. Sota Omoigui. Drugs. In: Anaesthesia Drugs Handbook. Banglore: Panther Publishers pvt ltd, 2000;146:258,346.

[12]. Moran DH , Dutta S, Perillo M, Laporta RF, Bader A. Phenylephrine in the prevention of hypotension following spinal anaesthesia for caesarean delivery. J. Clin Anaesth 1991;3(4);301-5.

Dr. K.Raja Sekhar. "A Clinical Comparative Study between Phenylephrine and Mephentermine for Management of Hypotension during Spinal Anesthesia in Caesarean Section." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no.2, 2019, pp 13-18.