(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

A comparison of intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anaesthesia for caesarean section

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ABSTRACT:

Background: Spinal anaesthesia is the method of choice for caesarean section, especially in case of elective procedures. The present study was conducted to compare intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anaesthesia for caesarean section.

Materials & Methods: 94 parturients posted for elective caesarean section (CS) under SAB (subarachnoid block) were randomly divided into 2 groups of 47 each. Group I received boluses of intravenous norepinephrine 8 µg and group II received mephentermine 6 mg for SAIH.

Results: The number of requirement of doses were 1 time seen in 4 in group I and 18 in group II, 2 times seen 10 in group I and 13 in group II, 3 times seen 16 in group I and 10 in group II, 4 times seen 9 in group I and 6 in group II, 5 times seen 5 in group I and 6 times seen 3 in group I. The difference was significant ($P< 0.05$). A non- significant difference was observed in change in systolic and diastolic blood pressure in both groups ($P> 0.05$).

Conclusion: Intravenous norepinephrine was comparable with mephentermine in maintenance of blood pressure.

Key words: Blood pressure, Mephentermine, Norepinephrine

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This article may be cited as: Singh B, Datyal S. A comparison of intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anaesthesia for caesarean section. J Adv Med Dent Scie Res 2015;3(1):246-249.

INTRODUCTION

Spinal anaesthesia is the method of choice for caesarean section, especially in case of elective procedures, because it avoids the most common risks associated with general anaesthesia, such as aspiration, difficult intubation and negative effects of general anaesthetics on the foetus.[1] However, certain side effects may also result from spinal anaesthesia, the most common being hypotension caused by the preganglionic sympathetic block. Spinal block-induced sympatholysis leads to vasodilatation and consequently causes hypotension in mothers. A decrease in systolic pressure can compromise uterine blood flow and foetal circulation, and thus cause foetal hypoxia and acidosis.[2]

Spinal anaesthesia induced hypotension (SAIH) is reported in 80% parturients during cesarean section (CS) because of anaesthetic blockade up to T4 level.[3] Severe and sustained SAIH is detrimental to both mother and baby. The choice of the most effective management strategy for SAIH during CS continues to be one of the main challenges in obstetric anaesthesia. Many techniques and various vasopressors have been tried and studied for SAIH, but no single method was found to be adequate or superior.[4]

Mephentermine (a mixed sympathomimetic with mainly indirect β stimulation) is one of the most commonly used drugs in India. It has been shown to be as effective and safe as ephedrine for SAIH. Norepinephrine, a potent α-agonist and a weak β-agonist, commonly used in septic shock has been showing promising results in many studies for SAIH with respect to maternal haemodynamic stability.[5] The present study was conducted to compare intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anaesthesia for caesarean section.

MATERIALS & METHODS

The present study comprised of 94 parturients posted for elective caesarean section (CS) under SAB (subarachnoid block). All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. They were randomly divided into 2 groups of 47 each. Group I received boluses of intravenous norepinephrine 8 µg and group II received mephentermine 6 mg for SAIH. Parameters such as systolic blood pressure (SBP), diastolic blood pressure (DBP), Apgar score and maternal complications were analysed. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Comparison of parameters

Parameters	Group I	Group II	P value
Age (years)	24.5	25.3	0.11
Height (cm)	154.2	156.1	0.16
Weight (Kgs)	62.4	63.1	0.12
Duration of surgery (mins)	45.3	46.2	0.07
APGAR score			
At 1st minute	7.21	7.28	0.92
At 5 minutes	9.02	9.05	0.94

Table I shows that mean age in group I was 24.5 years and in group II was 25.3 years, height was 154.2 cm in group I and 156.1 cm in group II, weight was 62.4 Kgs in group I and 63.1 Kgs in group II, duration of surgery was 45.3 minutes in group I and 46.2 minutes in group II, APGAR score at 1st minute was 7.21 in group I and 7.28 in group II and at 5 minutes was 9.02 in group I and 9.05 in group II. The difference was non-significant (P> 0.05).

Table II Number of boluses of norepinephrine and mephentermine administered

Frequency	Group I	Group II	P value
1 time	4	18	0.02
2 times	10	13	0.12
3 times	16	10	0.05
4 times	9	6	0.04
5 times	5	0	0.01
6 times	3	0	0.06

Table II shows that number of requirement of doses were 1 time seen in 4 in group I and 18 in group II, 2 times seen 10 in group I and 13 in group II, 3 times seen 16 in group I and 10 in group II, 4 times seen 9 in group I and 6 in group II, 5 times seen 5 in group I and 6 times seen 3 in group I. The difference was significant (P< 0.05).

Table III Comparison of systolic blood pressure

Minutes	Group I	Group II	P value
5	120.2	120.6	0.12
10	118.4	116.4	
20	116.4	114.8	
25	106.8	102.4	
30	104.2	98.4	
40	100.5	100.6	
50	102.7	104.2	
60	118.4	120.6	

Table III shows non- significant difference in change in systolic blood pressure in both groups (P> 0.05).

Table IV Comparison of diastolic blood pressure

Minutes	Group I	Group II	P value
5	70.6	72.4	0.14
10	68.0	70.2	
20	66.8	68.4	
25	64.2	66.2	
30	60.8	64.6	
40	64.6	66.2	
50	68.4	68.4	
60	70.8	72.0	

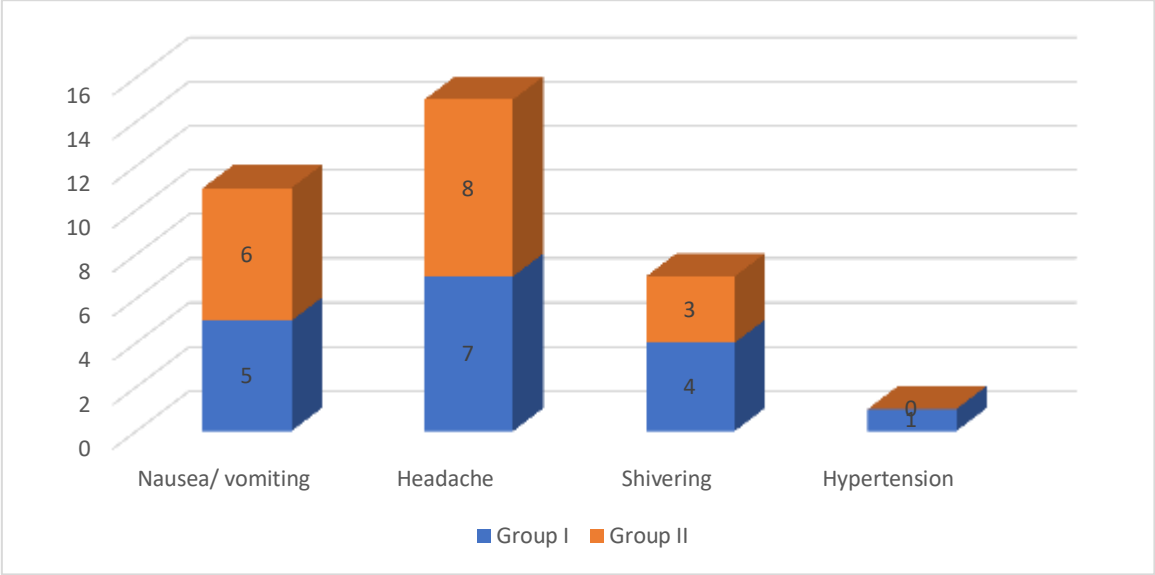
Table IV shows non- significant difference in change in diastolic blood pressure in both groups (P> 0.05).

Table V Side effects

Side effects	Group I	Group II	P value
Nausea/ vomiting	5	6	0.17
Headache	7	8	0.15
Shivering	4	3	0.12
Hypertension	1	0	0.06

Table V, graph I shows that side effects reported were Nausea/ vomiting seen 5 in group I and 6 in group II, headache seen 7 in group I and 8 in group II, shivering seen 4 in group I and 3 in group II and hypertension seen in 1 in group I. The difference was non- significant (P> 0.05).

Graph I Side effects



DISCUSSION

Hypotension during caesarean section performed under spinal anaesthesia has been the subject of medical research for more than 50 years. The incidence of hypotension during spinal anaesthesia for caesarean section varies in different studies, ranging from 7.4% to 74.1%.[6] Spinal anaesthesia causes hypotension via several pathophysiological mechanisms, the most significant being rapid onset of sympatholysis due to increased sensitivity of nerve fibres to local anaesthetics during pregnancy. The level of blockage of the sympathetic chain is connected to the degree of cranial spread of the local anaesthetic within the subarachnoid space, it is often difficult to predict and usually reaches several dermatomes above than the sensory block level.[7] Higher sensitivity to local anaesthetics combined with aortocaval compression of the pregnant uterus are the main reasons for increased incidence and higher levels of hypotension in pregnant women, compared to non-obstetric patients.[8] Pregnant women also exhibit an increased level of sympathetic activity compared to parasympathetic activity. Sympatholysis therefore leads to a higher degree of peripheral vasodilatation and a predominance of parasympathetic activity, consequently reducing the venous return and cardiac pre-load, and resulting in bradycardia, nausea and vomiting. The reduced pre-load in turn results in reduced cardiac output (CO), leading to systemic hypotension. This state is further aggravated by aortocaval compression.[9] The present study was conducted to compare intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anaesthesia for caesarean section.

In present study, mean age in group I was 24.5 years and in group II was 25.3 years, height was 154.2 cm in group I and 156.1 cm in group II, weight was 62.4 Kgs in group I and 63.1 Kgs in group II, duration of surgery was 45.3 minutes in group I and 46.2 minutes in group II, APGAR score at 1st minute was 7.21 in group I and 7.28 in group II and at 5 minutes was 9.02 in group I and 9.05 in group II. Mohta et al[10] compared 5µg norepinephrine with 5mg ephedrine to prevent SAIH in lower limb orthopaedic surgery and coronary artery disease patients undergoing knee arthroscopy. They found that norepinephrine is more effective compared with ephedrine in the maintenance of blood pressure and has less adverse effects on HR in patients. These results are in agreement with the results obtained in our study although we conducted our study in parturients.

We found that number of requirement of doses were 1 time seen in 4 in group I and 18 in group II, 2 times seen 10 in group I and 13 in group II, 3 times seen 16 in group I and 10 in group II, 4 times seen 9 in group I and 6 in group II, 5 times seen 5 in group I and 6

times seen 3 in group I. Ganeshanavar et al[11] conducted a comparative dose-response analysis and revealed relative potency for norepinephrine: phenylephrine when given as a bolus for restoring BP in SAIH in obstetric patients to be 13.1:1.0 and found that phenylephrine 100µg was equivalent to norepinephrine 8 µg, although in the previous dose-finding study bolus injection of 6µg norepinephrine was reported effective. Therefore, we derived the relative potency of norepinephrine vs. mephentermine and used 8µg norepinephrine and 6mg mephentermine as equipotent doses.

We found a non- significant difference in change in systolic and diastolic blood pressure in both groups. We observed that side effects reported were Nausea/ vomiting seen 5 in group I and 6 in group II, headache seen 7 in group I and 8 in group II, shivering seen 4 in group I and 3 in group II and hypertension seen in 1 in group I. Nausea and vomiting occur significantly more frequently during spinal anaesthesia for caesarean section compared to non-obstetric surgery, and are primarily caused by hypotension. Acute hypotension reduces cerebral perfusion, induces transient brainstem ischemia and activates vomiting centres. This may also result in transient cerebral hypoxia connected with a significant decrease in maternal cerebral blood volume, cerebral oxygen saturation and oxygenation, as shown in studies conducted with near-infrared spectroscopy (NIRS).[12]

CONCLUSION

Authors found that intravenous norepinephrine was comparable with mephentermine in maintenance of blood pressure.

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