Original Article

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A Comparative Study of Intravenous Norepinephrine and Mephentermine for Maintenance of Blood Pressure During Spinal Anesthesia for Caesarean Section

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Abstract

Background: To compare intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anesthesia for caesarean section. **Subjects and Methods:** Our randomized study conducted among ninety- two subjects of American Society of Anaesthesiologists physical status (ASA)–II and singleton term pregnancy posted for elective caesarean section. Subjects were randomized into 2 groups of ratio of 1:1. Group norepinephrine (N) received 8μg intravenous norepinephrine and group mephentermine (M) received 6mg mephentermine. **Results:** A non- significant difference in systolic blood pressure at different intervals of time was observed between group N and M (P> 0.05). A non-significant difference in diastolic blood pressure at different intervals of time was observed between group N and M (P> 0.05). Adverse events recorded were nausea/vomiting in 8 in group N and 9 in group M, headache in 10 in group N and 11 in group M, shivering in 5 in group N and 4 in group M and hypertension 1 in group N. A non- significant difference was observed between two groups (P> 0.05). **Conclusion:** Intravenous norepinephrine is better than mephentermine in terms of controlling blood pressure.

Keywords: Caesarean Section, Mephentermine, Norepinephrine, Spinal Anesthesia

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Introduction

Spinal anaesthesia induced hypotension (SAIH) is reported in 80% parturients during caesarean section (CS) because of anaesthetic blockade up to T4 level.[1] 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.[2] Many techniques and various vasopressors have been tried and studied for SAIH, but no single method was found to be adequate or superior.[3]

Numerous pressor agents have been tried to counteract the hypotensive effect of subarachnoid block, usually by vasoconstriction and also by increasing the cardiac output.[4] In practice, the most commonly used drugs are the sympathomimetic agents which exert their effects through the adrenergic receptors, either acting directly or indirectly by inducing the release of noradrenaline which further acts on these receptors.[5,6]

Mephentermine (a mixed sympathomimetic with mainly indirect β stimulation) is one of the most commonly used drugs in our institute and India. It has been shown to be as effective and safe as ephedrine for SAIH.[7,8] 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.[9] However, looking at limited published literature on comparison of norepinephrine and mephentermine for management of SAIH.[10] The present prospective, double-blind and randomised trial was conducted with the aim to compare intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anesthesia for caesarean section.

Subjects and Methods

The present randomized study comprised of ninety- two subjects of American Society of Anaesthesiologists physical

status (ASA)–II and singleton term pregnancy posted for elective caesarean section. Institutional Review and ethical committee approval was sorted. All enrolled subjects' written approval was also obtained. Parturients with pregnancy-induced hypertension (PIH), CVDs, diabetes mellitus were excluded from the study.

Subjects were randomized into 2 groups of ratio of 1:1. Group norepinephrine (N) received 8μg intravenous norepinephrine and group mephentermine (M) received 6mg mephentermine. Parameters such as baseline systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), peripheral oxygen saturation (SpO_2) and electrocardiogram (ECG) were recorded. Statistical analysis was done by SPPP software. The numerical variables were compared between the groups by Student's unpaired t-test.

Results

Table 1: Demographic profile of subjects

Variables	Group N	Group M	P value
Age (years)	24.6	24.2	>0.05
Height (cm)	156.2	154.4	>0.05
Weight (Kg)	63.2	63.7	>0.05
Duration of surgery (min)	46.8	46.1	>0.05
APGAR score 1^{st} min	7.12	7.68	>0.05
5^{th} min	9.04	9.12	>0.05

Mean age of patients was 24.6 years in group N and 24.2 years in group M, height was 156.2 cm in group N and 154.4 in group M, 63.2 kg in group N and 63.7 kg in group M, duration of surgery was 46.8 minutes in group N and 46.1 minutes in group M, APGAR score at 1^{st} minute was 7.12 in group N and 7.68 in group M and 9.04 in group N and 9.12 in group M at 5^{th} minute. A non- significant difference was observed between parameters (P> 0.05) [Table 1].

A non- significant difference in systolic blood pressure at different intervals of time was observed between group N and M (P> 0.05) [Table 2, Figure 1].

A non- significant difference in diastolic blood pressure at different intervals of time was observed between group N and M (P> 0.05) [Table 3, Figure 2].

Adverse events recorded were nausea/vomiting in 8 in group N and 9 in group M, headache in 10 in group N and 11 in group M, shivering in 5 in group N and 4 in group M and hypertension 1 in group N. A non- significant difference was

Table 2: Comparison of systolic blood pressure between two groups

Parameters	Group N	Group M	P value
SBP mm Hg at 5 minutes	110.2	110.4	>0.05
10 minutes	112.6	112.8	
30 minutes	114.6	116.2	
45 minutes	118.5	120.2	
60 minutes	116.4	112.4	
75 minutes	116.2	112.0	
90 minutes	114.6	110.2	
120 minutes	112.8	108.6	
150 minutes	110.4	108.2	
180 minutes	112.0	106.2	
210 minutes	112.6	108.4	

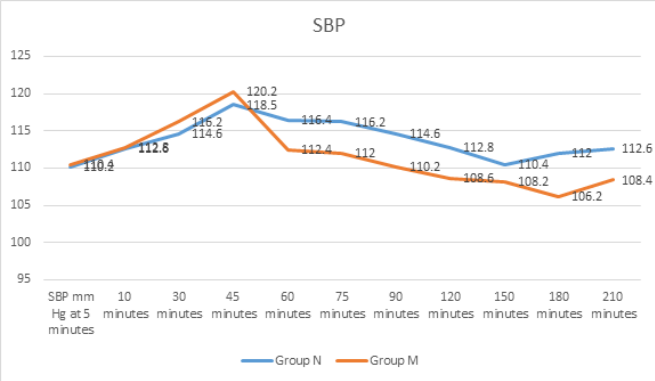

Figure 1: ?

Table 3: Comparison of diastolic blood pressure between two groups

Parameters	Group N	Group M	P value
DBP mm Hg at 5 minutes	98.2	96.2	>0.05
10 minutes	98.0	90.4	
30 minutes	97.6	90.2	
45 minutes	96.4	88.4	
60 minutes	88.2	86.4	
75 minutes	86.2	84.4	
90 minutes	84.0	82.6	
120 minutes	82.2	80.4	
150 minutes	78.4	78.8	
180 minutes	78.6	78.0	
210 minutes	80.2	80.0	

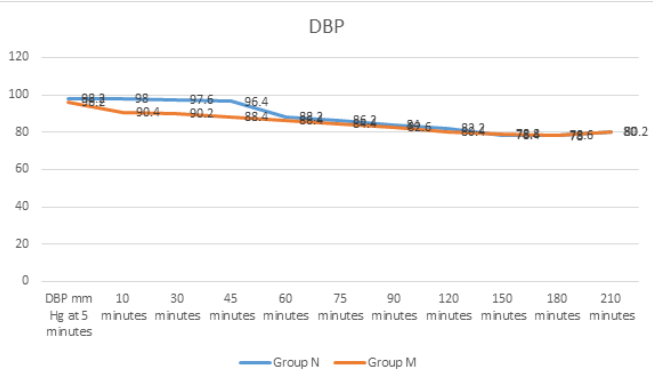

Figure 2: ?

Table 4: Recoding of adverse events

Adverse events	Group N	Group M	P value
Nausea/Vomiting	8	9	>0.05
Headache	10	11	>0.05
Shivering	5	4	>0.05
Hypertension	1	0	>0.05

observed between two groups (P> 0.05) [Table 4].

Discussion

This was a randomized study conducted among ninety-two subjects. We compared intravenous norepinephrine and mephentermine for maintenance of blood pressure during spinal anesthesia for caesarean section. Regional blocks such as spinal, epidural, and a combination of spinal/epidural blocks have gained widespread popularity among the surgical fraternity.[11,12] Although subarachnoid block is highly efficient with less drug doses, it has some limitations such as hypotension, lesser control over level of blockade, and limited duration of anesthesia.[13–15] The incidence of hypotension can be as high as 70%–80% when pharmacological prophylaxis is not used. Despite numerous attempts to restrict this incidence, it continues to be a cause of concern to the anesthetist.[16–18]

Our study showed that mean age of patients was 24.6 years in group N and 24.2 years in group M, height was 156.2 cm in group N and 154.4 in group M, 63.2 kg in group N and 63.7 kg in group M, duration of surgery was 46.8 minutes in group N and 46.1 minutes in group M, APGAR score at 1^{st} minute was 7.12 in group N and 7.68 in group M and 9.04 in group N and 9.12 in group M at 5^{th} minute. Shah et al,[17] compared the effect of intermittent intravenous boluses of norepinephrine and frequently used mephentermine for management of SAIH in caesarean section (CS). 256 parturients posted for elective CS under SAB were randomly allocated into Group-N and Group-M (n = 84) using chit system, who received boluses of intravenous norepinephrine 8μg and mephentermine 6mg for SAIH, respectively. Systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), Response %, Apgar score and maternal complications were analysed. The changes in SBP and DBP were comparable in both the groups. It was significantly low after SAB compared to baseline and significantly high compared to 1st hypotensive value in both the groups throughout the study period (<0.0001). HR was comparable for initial 10 min, thereafter it was significantly high in Group-M (<0.0001) till 40 min. Response % after the first bolus was significantly high in Group-N (59.30n $\pm$ 29.21 vs 39.78 $\pm$ 25.6; P = <0.0001).

Our study revealed that a non- significant difference in systolic blood pressure (mm Hg) at different intervals of time was observed between group N and M. At 5 minutes was 110.2 and 110.4, at 10 minutes was 112.6 and 112.8, at 30 minutes was 114.6 and 116.2, at 45 minutes was 118.5 and 120.2, at 60 minutes was 116.4 and 112.4, at 75 minutes was 116.2 and 112.0, at 90 minutes was 114.6 and 110.2, at 120 minutes was 112.8 and 108.6, at 150 minutes was 110.4 and 108.2, at 180 minutes was 112.0 and 106.2 and at 210 minutes was 112.6 and 108.4. Kaur et al,[19] conducted a study in which subarachnoid block were allocated into three groups to receive bolus phenylephrine, ephedrine, and mephentermine. Thirty-four hypotensive events (average 1.03 events/patient) took place in mephentermine group. In phenylephrine group, a total of 53 hypotensive events took place. On an average, the group had a total of 1.61 hypotensive events per patient. No hypotensive event took place in ephedrine group after the first bolus of drug (average 1 event/patient). Mean heart rate in phenylephrine group was significantly lower as compared to the other two groups (P < 0.001).

Our study demonstrated that there was a non- significant difference in diastolic blood pressure at different intervals of time between group N and M. Adverse events recorded were nausea/vomiting in 8 in group N and 9 in group M, headache in 10 in group N and 11 in group M, shivering in 5 in group N and 4 in group M and hypertension 1 in group N. Ngan Kee et al,[20] compared norepinephrine to phenylephrine for maintaining SBP under spinal anaesthesia in CS with a computer-controlled closed-loop feedback system and noted higher response% which is well correlated with our finding. The higher response percentage with norepinephrine and requirement of frequent boluses in our study could be because of the faster onset of action and shorter half-life of norepinephrine compared to mephentermine.

Conclusion

Results of the study showed that intravenous norepinephrine is better than mephentermine in terms of controlling blood pressure.

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