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A CLINICAL COMPARATIVE STUDY OF INTRAVENOUS NOREPINEPHRINE AND MEPHENTERMINE FOR MAINTENANCE OF BLOOD PRESSURE DURING SPINAL ANAESTHESIA FOR CAESAREAN SECTION

Anaesthesiology

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ABSTRACT

Background and Aims: Hypotension in caesarean section under spinal anaesthesia has deleterious effects on both mother and the baby, thus its prompt treatment is required to avoid any adverse outcomes. Aim of our study is to assess the hemodynamic effects of norepinephrine and mephentermine, its neonatal outcome as well as maternal complications. **Materials and Methods:** A prospective, single blinded randomized control study was carried out on 100 parturients of ASA grade II undergoing elective cesarean section delivery under spinal anaesthesia. Two groups, Group N (n=50) received inj norepinephrine 8mcg and Group M (n=50) received inj mephentermine 6mg. Hemodynamic parameters were recorded upto 60 minutes. **Results:** SBP of both the groups were comparable upto t5(p 0.05) then it became statistically extremely significant (p 0.0001). DBP of both the groups were statistically significant at t1 and t5 and after that it became extremely significant (p 0.0001). HR of both the groups were comparable initially(p0.05), then remained statistically extremely significant till t40(p 0.0001) and then again became comparable. Neonatal outcomes and maternal complications were comparable in both the groups. **Conclusion:** Norepinephrine is better than Mephentermine in terms of maintaining blood pressure in parturients undergoing elective cesarean section under spinal anaesthesia.

KEYWORDS

Spinal Anaesthesia, Hypotension, Norepinephrine, Mephentermine

INTRODUCTION

Out of all the regional anaesthetic techniques, spinal anaesthesia has gained immense popularity among anaesthesiologists as it is easy to administer with less doses,has less stress response and has early patient recovery. Generally for caesarean section deliveries, spinal anaesthesia is preferred as it has less airway complications like risk of aspiration[1] which is common in pregnancy due to decreased tone of lower esophageal spinchter, risk of difficult ventilation and intubation. Spinal anaesthesia also has lower risk of uteroplacental drug transfer to the baby which is associated with general anaesthesia . Though spinal anaesthesia has many benefits, it has limitations too, like hypotension, bradycardia etc.. Hypotension following administration of spinal anaesthesia is the most common complication which occurs due to sympatholysis and it needs immediate correction. Various measures have been taken to reduce the incidence of hypotension in parturients undergoing caesarean section delivery under spinal anaesthesia like careful positioning of the mother by left uterine displacement[2], elevation of lower limbs[3], preloading or coloading the patient with crystalloid or colloids [4],[5],[6]. The present study is designed to compare the effects of mephentermine and norepinephrine on maternal hemodynamics after administration of spinal anaesthesia during caesarean section deliveries. Mephentermine is a mixed sympathomimetic with mainly indirect βstimulation whereas, norepinephrine is a potent α agonist and a weak β agonist[7].

AIMS AND OBJECTIVES OF THE STUDY ARE AS FOLLOWS:

1) To assess the hemodynamic effects of the study drugs
2) To assess the neonatal outcome
3) To assess the maternal complications,if any,caused by the study drugs.

MATERIALS AND METHODS

Study Design:

The study was designed as a prospective, randomized single blinded study.

Place Of Study:

Department of Anaesthesiology and Critical care, Silchar Medical College and Hospital, Silchar ,Assam The study was done after obtaining institutional ethical committee clearance.

Study Population:

The study is conducted on parturients undergoing elective cesarean section delivery under spinal anaesthesia in Silchar Medical College .

Duration Of Study:

One year w.e.f 1st June 2021 to 31st May 2022.

Sample Size:

To observe minimum of 5 point difference in BP between two procedure with pooled SD of 8, a total of 40 samples was required and considering a maximum of 20% drop out (40*20/100=8) at total of 48 samples was required to detect 80% power at 5 % level of significance. 100 cases; two groups N and M of 50 each

Group-N: Inj Norepinephrine 8mcg i.v
Group-M: Inj Mephentermine 6mg i.v

Patient Selection:

Inclusion Criteria:

1) parturients of age group 20-38 years
2) weight 40-80kgs
3) height 150cms or more
4) ASA grade II

Exclusion Criteria:

1) Refusal to informed consent
2) Patients having: severe systemic diseases, hypothyroidism, pre-existing neurological diseases, cerebrovascular diseases, cardiovascular diseases, renal diseases, metabolic diseases, psychiatric diseases, glaucoma or occlusive vascular disorders, diagnosed with eclampsia /pre-eclampsia,known fetal anomalies , history of allergy to local anaesthetics, history of intake of drugs like MAO inhibitors
3) Patients who received atropine, uterotonics other than oxytocin

Pre Anesthetic Assessment:

On the day prior to surgery, a thorough clinical examination of the patient has been done along with perioperative history.The patients have also been explained about the procedure and written informed consent has been taken from the patient and her relatives. All the patients are kept nil per orally for atleast 6hours prior to surgery. On arrival to the operation theatre, the patients have been connected to all the standard monitors and baseline reading of oxygen saturation, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, ECG are taken. Intravenous access is achieved with a 18G cannula and iv fluid has been started. All the patients have been preloaded with 500 ml of ringer's lactate solution before the procedure.. the patients are premedicated with inj pantoprazole 40mg and inj ondensatron 4mg.

Technique:

Under all aseptic and antiseptic conditions, 2.5ml of hyperbaric 0.5% injection bupivacaine has been drawn in a 5ml syringe. In another 2ml syringe, local anaesthetic injection has been drawn.The patient has been kept in left lateral decubitus or sitting position. The back of the

patient is prepared with two coats of povidone iodine solution which is kept for atleast 3minutes and then cleaned with rectified spirit. The back is then dried with dry gauge pieces, skin towel placed following which a skin wheal was raised with a local anaesthetic solution. Using a 25 G Quinke's spinal needle, lumbar puncture was done in L3-L4/L4-L5 intrathecal space. After confirmation of free flow of CSF, inj bupivacaine 0.5% heavy 2.2 to 2.3 ml is injected into the subarachnoid space. After administration of the drug , the patient has been kept in supine position and face mask oxygenation done at 6litre /min via a face mask.

Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure , oxygen saturation all are recorded at 1min, 5min, 10 min, 15 min, 20 min, 25 min, 30 min, 40 min, 50 min, and at 60 min of surgery. Hypotension is defined as mean arterial blood pressure less than or equal to 20% of baseline value.

Bradycardia is defined as heart rate less than or equal to 20 % of baseline value.

Bolus intravenous injection of study drugs has been given through vasopressor labelled syringe on development of hypotension and it's effect has been recorded.

- Group N(n=50) received 8mcg bolus of iv inj norepinephrine
- Group M (n=50) received 6mg bolus of iv inj mephentermine.

The incidence of nausea, vomiting, shivering, headache, bradycardia has been recorded.

After the delivery of the baby, 10 units of oxytocin has been infused in 500ml of ringer's lactate solution and titrated according to need. The pediatrician assessed the Apgar Score of every neonate at 1min and 5 min after delivery.

Statistical Analysis:
Statistical analysis has been done using Graphpad instat 3 software. Data are expressed as means and standard deviation(SD). Fishers exact test used for analysis of contingency table. For qualitative data ANOVA test and for quantitative data unpaired t test has been used with p value reported at the 95% confidence interval(CI). Microsoft Word and Microsoft Excel are used to generate graphs, tables etc.

RESULTS AND OBSERVATIONS :
Mean age of group N is 25.44 yrs ± 4.854 and that of group M is 26.32 yrs ± 4.377 p value is found to be 0.34. Mean height of group N is 163.76 cms ±2.925 and that of group M is 163.64 cms ± 2.891, p value is found to be 0.84.Mean body weight of group N is 64.22 kgs ± 3.164 and that of group M is 63.32kgs ±3.437. p value is found to be 0.176.Duration of surgery in group N is 55.5(min) ±1.111 and in group M is 55.28(min) ± 1.642, p value is 0.434 .Mean baseline SBP for group N is 119.62mm Hg ± 8.139 and that for group M is 118.88mm Hg ±7.626, p value is 0.64 .Mean baseline DBP for group N is 74.72mmHg ±6.999 and that for group M is 76.32 mmHg ± 6.403, p value is found to be 0.24.Mean baseline heart rate for group N is 86.5 bpm ± 3.164 and that for group M is 84.62 bpm ± 7.225, p value is 0.95.Mean baseline spo2 for group N is 98.68 % ±1.13 and that for group M is 98.3% ± 1.11. p value is found to be 0.09. All these values are statistically non significant.

In our study, fall in SBP has been seen in both the groups after administration of spinal anesthesia. After 1st bolus of vasopressor, rise in SBP was seen in both the groups. But the rise is higher in group N as compared to group M (mean SBP for group N is 101.32 mmHg ± 3.443 , mean SBP for group M is 98.76 mmHg ± 2.421, p value < 0.0001)

Here, we have also observed fall in DBP in both the groups. And after the 1st bolus of vasopressor, DBP for both the groups has also increased (DBP for group N is 59.5 mmHg ± 4.577 and that for group M is 55.62 mmHg ±2.641 , p value is < 0.0001)

Systolic blood pressure of both the groups were higher than the systolic blood pressure of the first hypotensive episode but was less than the baseline systolic blood pressure most of the times. At time interval t15, t20 , t50 and t60 SBP of group N was found to be higher than the baseline SBP of that group.Throughout the study period, diastolic blood pressure of both the groups were higher than the diastolic blood pressure of the first hypotensive episode but was always less than the baseline diastolic blood pressure.

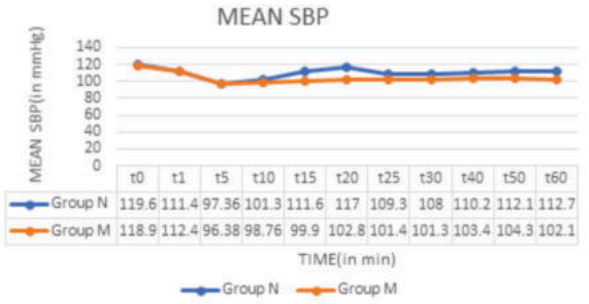

Figure: Line Diagram Showing Comparison Of Mean Systolic Blood Pressure (In Mmhg) Of Both The Groups

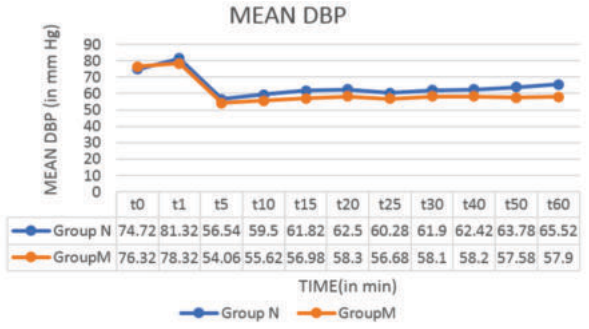

Figure: Line Diagram Showing Comparison Of Mean Diastolic Blood Pressure (in Mmhg) Of Both The Groups

After the first bolus of vasopressor, heart rate was significantly higher in group M compared to group N (HR for group M is 93.92 bpm ± 7.477 and that for group N is 81.4 bpm ± 6.312, p < 0.0001. Heart rate of group N was always lower than the baseline value throughout the study period and more than baseline value in group M(most of the times).

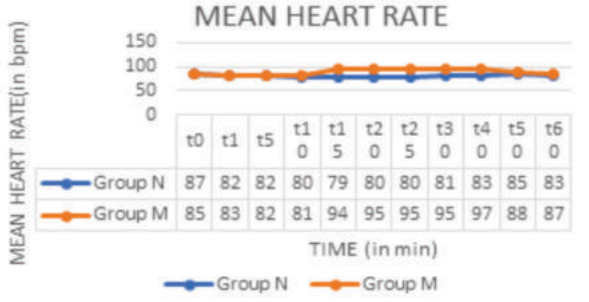

Figure: Line Diagram Showing Comparision Of Mean Heart Rate (In BPM) Of Both The Groups

The oxygen saturation was comparable among both the groups at all preset time intervals with no statistical significance.

Neonatal Outcome:
APGAR Score at 1min for group N was found to be 7.66 with SD 0.478 and for group M it was 7.58 with SD 0.498. p value is 0.41 which is statistically not significant.APGAR Score at 5min for group N was found to be 8.60 with SD 0.494 and that for group M was 8.62 with SD 0.490. p value is 0.839, which is statistically not significant.APGAR Score was comparable between two groups and no statistical significance has been found.

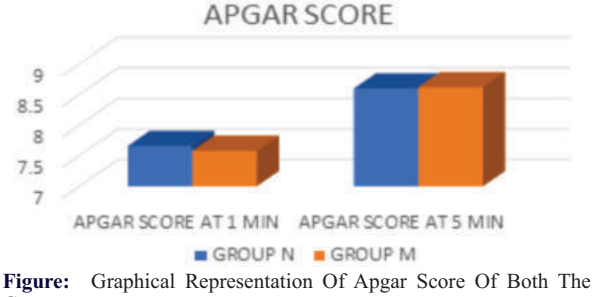

Figure: Graphical Representation Of Apgar Score Of Both The Groups

Maternal Side Effects:
Out of 50 parturients, 3 in group N and 4 in group M complained of nausea and vomiting. 4 from both the groups complained of shivering. 1 from group M and none from group N compained of headache.There was no incidence of bradycardia in any group.The incidence of maternal side effects were comparable in both the groups and were not statistically significant.

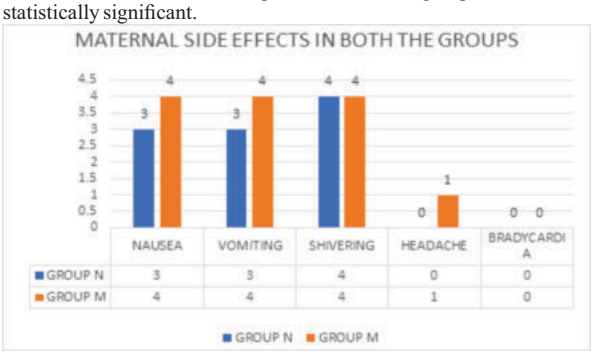

Figure: Showing Comparison Of Maternal Side Effects In Both The Groups

In the present study, 4% parturients of Group N needed bolus inj norepinephrine one time, 28% needed two times , 42% needed three times, 20 % needed four times and only 6% needed five times.Whereas in group M, 46% needed bolus inj mephentermine one time, 34% needed two times, 14% needed three times, 6% needed four times , thus we see that maximum number of parturients of Group N required three boluses of inj norepinephrine to treat SAIH and maximum number of parturients of Group M required single bolus of inj mephentermine . This frequent requirement of boluses of norepinephrine could be because of faster onset of action and shorter half life of norepinephrine compared to mephentermine.

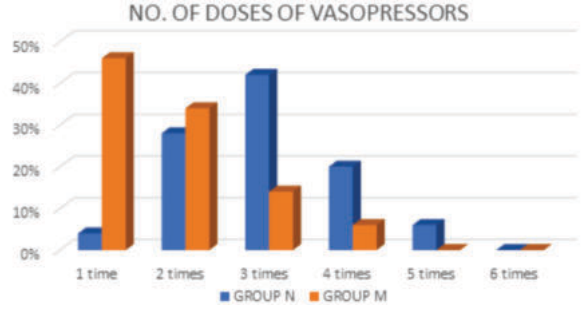

Figure: Showing Comparison Of Number Of Doses Of Vasopressor In Both The Groups

DISCUSSION:
Pratibha Jain Shah et al.[8] in their comparative study between norepinephrine and mephentermine for maintenance of blood pressure during spinal anesthesia for LSCS found that after 1st bolus of vasopressor, rise in SBP was seen in both the groups, however rise in SBP and response% was significantly high in norepinephrine group than mephentermine group . The result of this study is comaparable with our study.

From the prospective, double blinded randomized study of Gangan Deep Singh et al.[9] where they included 92 parturients undergoing elective cesarean section delivery under spinal anesthesia, they found that there is non significant difference between SBP and DBP of group N (receiving 8mcg of norepinephrine) and group M (receiving 6 mg of inj mephentermine) at different time interval. In our study we have found that there is significant difference between the hemodynamic variables.

Manu et al.[10] found that there was fall in SBP and DBP from baseline level after administration of spinal anaesthesia till 15min in both the groups then started increasing till 60min.

The heart rate of our study is comparable with the results of the study of Pratibha Jain Shah et al[8]. where they found that heart rate was comparable at baseline and for initial 10 min after intrathecalblock between both the groups and then it was statistically higher in Group M than Group N until 40 min.

CONCLUSION
From our study we conclude that though both norepinephrine and mephentermine are effective in maintaining blood pressure during spinal anesthesia, iv norepinephrine is better than iv mephentermine as it maintained higher mean SBP and DBP throughout the study period and also maintained stable maternal heart rate. Neither of these two drugs has any adverse effect on fetal outcome or any significant maternal side effects.

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