ABSTRACT

OBJECTIVE: To compare the effects of prophylactic ephedrine infusion and crystalloid preloading on spinal induced hypotension during elective caesarean section.

STUDY DESIGN: A Randomized control trial.

PLACE AND DURATION: Department of Anesthesiology at Holy Family Hospital Rawalpindi from 1st Jan 2012 to 30th Jun 2012.

METHODOLOGY: One hundred and fourteen parturient participated in this randomized control trial and were randomly divided into the two groups A and B. Patients were preloaded with Ringer lactate 500 ml in crystalloid preloading group (Group B) prior to Subarachnoid Block (SAB) while in Ephedrine infusion group (Group A) patients were not preloaded, and were given prophylactic ephedrine infusion after SAB. Maternal hypotension was studied in each group.

RESULTS: The incidence of hypotension was significantly lower in the Ephedrine infusion group (22.81%) as compared with the crystalloid preloading group (80.70%).

CONCLUSION: This study results indicate that ephedrine infusion is more efficacious in preventing maternal hypotension during spinal anesthesia for elective cesarean section.

KEYWORDS: Ephedrine infusion, Crystalloid, Hypotension, Caesarean Section.

INTRODUCTION

A cesarean section may be defined as the delivery of an infant through incision in the abdominal and uterine wall. In the past decade the frequency of birth by cesarean section has dramatically increased. In the United States the incidence which was 3-8% in the past is now 9-30% depending upon the geographic region and population characteristics. General anesthesia is usually avoided in favor of regional anesthesia and is given only when there is a contraindication or in emergent cases when the Neuraxial block is not possible. Regional anesthesia techniques are preferred because of significantly lower incidence of gastric aspiration, failed intubation and depressant effects of anesthetic agents on the newborn baby. Subarachnoid blocks for cesarean section can cause hypotension in up to 80% of cases if prophylactic preventive measures are not taken. Hypotension is due to decreased preload and decreased contractility of the heart. Decrease in preload is secondary to sympathectomy causing dilatation of capacitance vessels. Aortocaval compression also aggravates the maternal hypotension.

Hypotension in parturient compromises the uteroplacental blood flow, impairs fetal oxygenation and thus a poor fetal outcome. Nausea vomiting, dizziness altered consciousness often accompany hypotension.

As far as the efficacy of crystalloids and ephedrine regarding prevention of maternal hypotension under spinal anesthesia during elective cesarean section is concerned great controversy exists. According to a study hypotension occurred in 70% of patients in fluid preload group and 40 % in ephedrine infusion group. In another study the incidence of hypotension was 80% in preloading group compared to only 26.67% in patients who received ephedrine infusion. Although proven to be better in these studies ephedrine infusion is still not used in the tertiary care setups due to ease of the conventional drug.

Commonly used vasopressors include Ephedrine and Phenylephrine. Commonly used vasopressor Ephedrine is a naturally occurring sympathomimetic amine which is now produced synthetically. It acts directly and indirectly as an agonist at α and β receptors increasing heart rate and cardiac output and maintains blood pressure. Lactated Ringer’s solution (Crystalloid) classical isotonic, balanced electrolyte solution with electrolytes in the same concentration as in blood. To compare the effects of prophylactic ephedrine infusion and crystalloid preloading on spinal induced hypotension during elective caesarean section.

METHODOLOGY

This randomized control trial was conducted at Department of Anesthesiology Holy Family Hospital Rawalpindi from 1st Jan 2012 to 30th Jun 2012. Using the Consecutive non-probability sampling 114 patients were divided into two groups. Inclusion criteria included young patients age between 20-40 years in ASA class 1 (healthy individuals) and 2 (patients with mild systemic disease), who were undergoing elective cesarean section and...
had singleton pregnancy. While patients exclusion criteria had patient refusal, ASA classification 3 and 4, Obesity (BMI >35) or patients undergoing emergency surgeries. Contraindications to spinal anaesthesia like local sepsis, raised ICP, coagulopathy and stenotic heart valves were all included in the exclusion criteria.

After approval from hospital ethical committee, 114 parturient according to the aforementioned criteria were recruited after taking written informed consent. Patients will be randomly divided in group A and B by computer generated table of random numbers. Monitoring included Heart Rate, ECG, Pulse oximeter, Noninvasive blood pressure (NIBP). Baseline blood pressure, heart rate and oxygen saturation were taken. The patient in preloading group (Group - B) received 500 ml of Ringer Lactate, infused rapidly over a period of 15-20 min before institution of spinal block. Patient in ephedrine group (Group - A) did not receive any fluid till administration of spinal block.

Ephedrine infusion prepared in 0.9% Normal saline in a concentration of 1mg/ml was started prophylactically in ephedrine infusion group(group A) at rate of 5 mg/min for the first 2 min and then at the rate of 1 mg/min i.e. 60 micro drops/min for next 18 min. All patients in both the groups were given infusion of ringer lactate after spinal block at the rate of 7 ml/kg for the first 20 min and after that according to the need of the patient. Surgery was allowed to start when the adequate level of block at is achieved. Vital monitoring was continued in patients during the surgery. Maternal Hypotension in both groups was treated promptly with ephedrine 5 mg IV bolus repeated if necessary.

Data Analysis: All data was analyzed using the SPSS version 15. Mean ±SD was calculated for quantitative variables like age and BMI. Frequency and percentage was presented for qualitative variables like gender, maternal hypotension & use of emergency medicine. Chi-square test was used to determine the frequencies of maternal hypotension in the two groups. P value less than 0.05 was considered significant.

RESULTS

There was no statistical difference in the mean of height, weight, age and BMI. Frequency and percentage of hypotension was calculated for Qualitative variables like Maternal Hypotension and Use of Emergency Drugs.

In total 59 patients developed hypotension which turns out to be 51.8 %. Emergency drugs were used in all these patients to treat hypotension. That is why the frequency and percentage was the same as that of hypotension. The rest 55 (48.2%) patients remained stable.

Comparison of maternal hypotension in both the groups: While observing the results of this study it was clearly evident that the Ephedrine infusion significantly reduced the incidence of hypotension. In Group A: Ephedrine Group 13 patients i.e. 22.81% patient had hypotension but 44 i.e. 77.19% patients were saved from it. In Group B: In Crystalloid Preloading Group 46 i.e. 80.70 % patient had hypotension while only 11 i.e. 19.30% patients were saved from hypotension by crystalloid preloading. P value was found to 0.00 which was significant.
Spinal anesthesia for elective as1 well as the emergency cesarean section is on the rise10. Spinal anesthesia has its own advantages and disadvantages. Advantages include the simplicity of the technique, speed of induction, reliability, minimal fetal and maternal exposure to the anesthetic agents, an awake parturient who can experience the birth of her baby and minimal risk of aspiration. While on the other hand hazards include a very high incidence of hypotension, intrapartum nausea and vomiting, risk of post dural puncture headache and a limited duration of action.

Following the induction of sub arachnoid block for the cesarean delivery the incidence of hypotension is up to 80% if no prophylactic preventive measures are taken. Thus it is the most frequently seen complication. Kundra and colleagues incidence of hypotension in fluid preloading group was 80% in the preloading group and 26.67% in the ephedrine group11. This was comparable to my study in which I preloaded the patient with crystalloid fluids before the induction of anesthesia. There is a school of thought who go for co-load of fluids after the induction of anaesthesia17.

In our study we defined hypotension as a decrease in the systolic blood pressure greater than 20% below the baseline reading. Various studies done in the past have used slightly different definition of hypotension. These include reduction in systolic blood pressure of 30%16, systolic blood pressure less than 100 mmHg and an arterial blood pressure 20% below the baseline blood pressure17.

Variations in these results is because of differences in the methods of Blood pressure monitoring and differences in the definitions of hypotension14. We defined hypotension as a decrease in the systolic blood pressure while F Brende and Colleagues defined hypotension as a decrease in the MAP of more than 20 %. Loughrey monitored the Systolic blood pressure and considered a 20% decline in the blood pressure as hypotension, similar to my study. Loughrey also considered a 100 mmHg pressure as a cut off limit for hypotension17. On the other hand we considered 90 mmHg systolic blood pressure as a cut off point for hypotension. Thus different studies have different cut off values. The reason for setting different cut of values seems to be arbitrary. When we were setting our cut off values for hypotension, we considered recent studies and our own observation and experience regarding when to take action during the operative procedure.

Emmet and colleagues found that the patients receiving Ephedrine had 14-37% less frequency of hypotension. The author of this review studies the medical literature between 1966-2000 for RCTs16. These review compared ephedrine with a Control group for the prevention of hypotension in parturient. In this review the RCTs which were included compared ephedrine to controls like no intervention, IV crystalloid boluses and placebo. Differences of this Meta-analysis and my results could be because we were using ephedrine infusion and in this meta-analysis ephedrine was used in the form of IV and IM injections.

Contrary to our study in which I preloaded the patient with crystalloid fluids before the induction of anesthesia. There is a school of thought who go for co-load of fluids after the induction of anaesthesia17.

Various methods have been used as prophylaxis or treatment of hypotension after the subarachnoid block. These include patient positioning, preloading with fluids and use of vasopressors19. The main drawback of preloading with crystalloids is that 75% of any crystalloids transfused will diffuse into the interstitial space20, other problems of excessive fluid loading as indicated by studies is haemodilution, decreased oxygen carrying capacity and increase in the chances of pulmonary oedema. Crystalloids do this by decreasing the normal osmotic pressure20. Keeping the above mentioned reasons in mind and considering the volume of preloading used by recent studies we decided that 500 ml of Lactated Ringer
would be a safe volume for the patients. It is a well-known fact that a significant number of parturient who have spinal anesthesia will experience hypotension which can adversely affect both the mother and newborn. The prophylactic measures are useful specially the vasopressors. The obstetric anesthetist should not be reluctant in using either of the prophylactic interventions to control hypotension and it’s related other signs and symptoms. Bhagat et al in his study looked at the effects of preloading alone, Ephedrine IV alone and combination of preloading and IV Ephedrine for the prevention of hypotension. He found that a combination of preloading and ephedrine IV was more effective than any of the measures taken alone. An important thing here is that according to him preloading alone was least effective. This finding was consistent with my finding as well that crystalloid preloading was not a very affective prophylactic measure for the prevention of hypotension for elective cesarean section under spinal anesthesia.

CONCLUSION

In conclusion prophylactic intravenous infusion of ephedrine was found to be safe and effective in patients undergoing elective cesarean section under spinal anesthesia for maintenance of maternal blood pressure close to baseline levels.

REFERENCES

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