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COMPARATIVE EFFICACY OF PROPHYLACTIC EPHEDRINE AND PRN EPHEDRINE DURING SPINAL ANESTHESIA FOR CAESARIAN SECTIONS

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Abstract

Background: Hypotension in patients who receive subarachnoid block (SAB) is a potentially serious issue, which is known to lead to significant morbidity if not managed effectively and urgently. In obstetric applications, profound hypotension can potentially lead to serious hypoxia and hypovolemia in the mother and the fetus.

Objective: To determine comparative efficacy of prophylactic ephedrine and prn ephedrine during spinal anesthesia for caesarian sections

Methodology: This comparative study was carried out at the Anaesthesia Department Khyber Teaching Hospital for duration of six months from January 2022 to June 2022. A total of 100 patients were recruited who were scheduled to receive spinal anesthesia for C-section. The patients were categorized into two groups (A and B) 50 patients each. In patients of Group A, ephedrine was used to treat hypotension when indicated, while in Group B, patients received prophylactic ephedrine soon after the subarachnoid block. Hemodynamic changes were recorded and the data was analyzed statistically by using SPSS version 21.

Results: In Group A, the blood pressure dropped in 33 (66 % patients while in group B, hypotension was observed in 9 (18%). This difference was statistically significant ($p<0.001$).

Conclusion: Our study concludes that prophylactic ephedrine is better than prn ephedrine in prevention of hypotension in patients receiving spinal analgesia for C-Section.

Key words: Prophylactic ephedrine; prn ephedrine **;** Caesarian sections; Hypotension

INTRODUCTION

Patients who get subarachnoid block (SAB) may have hypotension, which is a potentially dangerous condition that, if not treated quickly and efficiently, can result in substantial morbidity. In cases of obstetrics, severe hypotension may result in hypoxia and hypovolemia in both the mother and the

fetus. Because placental blood flow and maternal blood pressure are strongly correlated, hypotension can result in both placental hypoperfusion and fetal hypoxia.[1]. Up to 80% of individuals who do not get preventive treatment now have hypotension after SAB[1]. Several approaches have been deemed suitable to avert this issue. Preloading crystalloids or colloids can increase the intravascular volume.This is a standard procedure for elective situations, although it is not a complete defense against hypotension.[2] One or more other possibilities include left uterine displacement (LUD) and the infrequent use of ionotropic support. For many years, ephedrine has been the preferred vasopressor for managing spinal hypotension. However, disagreements persist regarding the most effective way to administer it, including whether to administer it as an infusion or as intermittent boluses, whether to use it as a preventative measure or only as needed to treat hypotension when it arises. The purpose of this study was to assess the hemodynamic control provided by phedrine when taken preventatively vs when it is taken as needed when hypotension occurs.

METHODOLOGY

A double blind, randomized, comparative trial was conducted at the Anaesthesia Department Khyber Teaching Hospital for duration of six months from January 2022 to June 2022.after getting approval from Hospital Ethics Committee and informed consent of the parturients, from January 2021 to June 2021. Thirty-seven obstetric patients scheduled for elective caesarean sections with physical status I or II according to the American Society of Anesthesiologists were randomly assigned to groups A and B, each consisting of thirty patients. Patients using antihypertensives, diabetics, and those with pregnancy-induced hypertension were not allowed to participate. Additionally, research participants with pre-eclampsia and eclampsia were not allowed.The study excluded patients with significant fetal distress, cord prolapse, abruptio placentae, placenta previa, coagulopathy (platelet count < 80,000), fixed cardiac output (mitral stenosis or aortic stenosis), and severe fetal distress since SAB is contraindicated in these instances. Patients were moved from the ward to the obstetric operating room following the necessary preparatory care.

HR and BP were recorded at baseline. An intravenous line was set up using an 18G IV cannula. As per usual practice, 30 minutes before to the SAB, all patients received 15ml/kg of lactated Ringer's solution. After then, the patients were split into two groups, A and B, in a random sequence. A ± 30% decrease in systolic blood pressure from the baseline measurement was considered spinal hypotension. Hyperbaric bupivacaine 0.75% with dextrose 8.25% (Abocaine SpinalTM - Abbott Laboratories (Pakistan) Ltd®) was used to initiate SAB in the left lateral position. Following a local infiltration of 1 ml of 1% lignocaine, 1.6 ml was administered over the course of 15 seconds at L3–4 with a 25G pencil point needle (Unises Corporation Tokyo, Japan). Individuals in Group B were given prophylactic intravenous ephedrine (15 mg) in conjunction with hyperbaric bupivacaine oxygen therapy The table was then positioned with the patients in a supine posture and tilted to the left. All patients received oxygen using a facemask at a rate of three liters per minute. Initially, BP and HR were taken every two minutes until the baby was delivered. After that, they were taken every five minutes until the procedure was completed. As a maintenance fluid, 5 ml/kg/hr of lactated Ringer's solution was given. After the infant was delivered, all patients received an IV injection of 5 IU of synthetic oxytocin (SyntocinonTM). If hypotension developed in either group, it was managed with an additional 10 mg IV dosage of ephedrine to keep the systolic blood pressure within ±10% of the starting point. Vital signs were kept an eye on when the patients were moved to the post-anesthesia care unit (PACU). Heart rates as well as the systolic, diastolic, and mean arterial pressures were measured. Version 12 of SPSS was used for statistical analysis. Tables with descriptive statistics were displayed. The chi-square test was used to compare the systolic blood pressure mean values. A P-value of less than 0.05 was deemed statistically significant.

RESULTS

The patient demographics and the surgical indications were displayed in Table 1. There was no statistically significant difference seen between the two groups in terms of mean age, body weight, and C-section indications..

Table 1: Comparison of demographic data of mothers in two groups

Demographic data	Group A (n=50)	Group B n=50
Age in yrs (mean ± SD)	32±4	29±4
Body weight in Kgs (mean ± SD)	64±4	65±5
Indications for c-section [N(%)]		
Breech	17(34%)	15(30%)
Feto-pelvic disproportion	16(32%)	22(44%)
Previous c-sections	14(28%)	10(20%)

The baseline hemodynamic parameters in two groups were comparable, with no statistical difference (T able 2).

Table 2: Comparison of hemodynamic parameters in two groups (Mean±SD)

Parameter	Group A (Control Group) n=50	Group B (Intervention Group) n=50
Systolic	118±5 1	119±9
Diastolic	67±11	70±12
Mean	83±12	88±11
Baseline HR	103±12	96±15

There was no statistically significant difference in the total blood loss between the two groups (Table 3). Although Group B utilized a greater total amount of ephedrine (11.2±4 mg compared to 15.7±4 mg), the difference was not statistically significant (Table 3). Compared to the interventional group, the control group had a larger percentage of patients experiencing nausea (7 (14%) vs. 3 (6%). Additional ephedrine was administered, and it quickly alleviated.

Table 3: Comparison of clinical parameters of mothers in two groups

Parameter	Group A (Control Group) n=35	Group B (Intervention Group) n=35
Preload (ml) Mean±SD	945±60	960±75
Total ephedrine (mg)	11.2±4	15.7±4
Patients requiring extra ephedrine (N)	8	6
Blood loss (ml)	180±60	150±60
Nausea (N)	7(14%)	3(6%)

Merely 18% of the patients in Group B were administered extra 10 mg of ephedrine when their systolic blood pressure fell below the designated threshold. When hypotension set in in Group A, patients were given ephedrine; 33 patients (66%) got a rescue dosage of 10 mg ephedrine ($p<0.001$). A tiny percentage of individuals had tachycardia following ephedrine therapy. (Table 4)

Table 4: Comparison of development of hypotension in the groups

Parameter	Group A (Control Group) n=35	Group B (Intervention Group) n=35	Chi-square	P value
Frequency of Hypotension	33(66%)	9(18%)	17	<0.001

DISCUSSION

The most frequent side effect of SAB for cesarean sections is hypotension, which can be dangerous for the mother and the fetus. In cases of obstetrics, severe hypotension may result in hypoxia and hypovolemia in both the mother and the fetus. Because placental blood flow and maternal blood pressure are strongly correlated, hypotension can result in both placental hypoperfusion and fetal

hypoxia.[1]. Instances of hypotension after SAB are currently as high as 80% in individuals who do not get preventive medication.[1]. Numerous techniques are used to avoid this problem. Although preloading with crystalloids or colloids is frequently used for elective procedures, it is not a reliable way to avoid hypotension. [2]. The other measures that are being used are left uterine displacement and vasopressors. Including measures that consistently prevent maternal hypotension may enhance the outcome for both the mother and the fetus. Ephedrine is an alpha and beta stimulant that increases both maternal blood pressure and heart rate. The predominant beta effect of ephedrine increases arterial pressure by increasing cardiac output. Phenylephrine is a purely alpha stimulant that is effective in increasing blood pressure due to vasoconstriction; however, it may cause placental hypoperfusion and reflex maternal bradycardia. [3] Kang YG et al. advised prophylactic intravenous ephedrine infusion during spinal anesthesia for caesarean section.[4] When compared to a single bolus of ephedrine, Simmon L *et al*. demonstrated that a single intravenous bolus of ephedrine at dosages of 15 mg or 20 mg dramatically reduced the incidence of maternal hypotension.[5]. Later research by Loughery JP et al. shown that 12 mg of propylactic ephedrine was a more effective way to prevent spinal hypotension.[6] Berends N et al.'s 2005 study demonstrated that ephedrine used prophylactically is a safe and efficient way to treat and prevent spinal hypotension[7]. Women who received merely a 10 mg prophylactic bolus of ephedrine had an unacceptablely high rate of maternal hypotension linked with spinal anesthesia for caesarean sections, according to Lionel Simon *et al*., without raising the risk of unwanted tachypnea and/or hypertension, increasing the dose of the preventive bolus of ephedrine to 15 mg dramatically decreased the incidence of hypotension. Ephedrine usage comes with a few drawbacks. Even when ephedrine raises mother blood pressure to baseline levels, it does not entirely restore preanesthetic levels of uterine blood flow, and it can cause an unfavorable, dose-related tachycardia in mothers.[8] It has been demonstrated to impact fetal and neonatal heart rate and to cross the placenta.[9]. Those treated with ephedrine have been seen to exhibit a higher proportion of low umbilical artery pH than those treated with either phenylephrine10 or angiotension-II. [11–12 13]. Chan *et al.* compared ephedrine infusion and fluid preload for the prevention of spinal hypotension during caesarean section. There is ongoing debate regarding the optimal course of action for managing maternal hypotension during cesarean sections. Ephedrine outperformed phenylephrine in recovering uterine blood flow and fetal oxygenation in gravid sheep after ritodrine infusion and epidural anesthesia-induced hypotension, as demonstrated by McGrathe et al. (2014). In a comparison of ephedrine and phenylephrine infusions during spinal anesthesia, Hall et al. (2015) found that angiotension-II was a better option than ephedrine in preventing maternal tachycardia and fetal academia, although it is not easily accessible. Therefore, in obstetrics, ephedrine continues to be the preferred vasopressor. When we combined intermittent boluses of ephedrine prn with preventive doses of 15 mg, we observed that the former was more effective in regulating maternal hypotension ($p < 0.001$).

CONCLUSION

Our study concludes that prophylactic ephedrine is better than prn ephedrine in prevention of hypotension in patients receiving spinal analgesia for C-Section

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