

ORIGINAL ARTICLE

Comparison of Hemodynamics Effect between Phenylephrine and Ephedrine in Caesarean Section after Spinal Anesthesia

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ABSTRACT

Aim: To compare the frequency of hypotension between phenylephrine and ephedrine groups after spinal anesthesia for cesarean delivery.

Study design: Single-blind randomized clinical study

Place and duration of study: Department of Anesthesia, Pain Management and Surgical ICU Civil Hospital, Karachi from 1st January 2019 to 30th June 2019.

Methodology: All patients with age between 18 to 35 years having weight range 50kg to 70kg with American Society of Anesthesiologist (ASA) physical classification of I and II with Singleton Pregnancy assessed on ultrasound and gestational age 37 to 42 weeks assessed on previous dating scan were enrolled.

Results: The mean age was 26.48±3.05 years, mean weight was 60.07±5.10 Kg, mean height 1.53±0.05m and mean BMI was 27.37±5.01 Kg/m² respectively. Hypotension was found in 13(17.10%) patients. Comparison of hypotension with phenylephrine and ephedrine shows that frequency of hypotension was found lower (15.4%) in patients who used phenylephrine as compared to the patients who used ephedrine (p=0.006).

Conclusion: Significant difference was observed in hypotension between phenylephrine and ephedrine groups after spinal anesthesia for cesarean delivery.

Keywords: Hypotension, cesarean delivery, phenylephrine and ephedrine groups, spinal anesthesia

INTRODUCTION

C- sections are frequently performed with spinal block because of the rapid onset of action, sensory and motor blockage, as well as the reduced risk of toxicity from the local anesthetic¹. When it comes to obstetric patients, hypotension is likely the most common consequence associated with neuraxial anesthesia². Because of the loss of sympathetic tone and the physiological predisposition of pregnant women to hypotension, peri-operative hypotension during spinal anesthesia for C-section is common³. If no preventative actions are done, the risk of developing hypotension increases to more than 80% of the population⁴.

Maternal hypotension is characterized by unpleasant measures such as nausea, vomiting and light headedness. More importantly, when hypotension is severe and prolonged, it might impair uterine and intervillous blood flow, resulting in fetal acidosis and neonatal depression respectively⁵. There are a variety of techniques that are now being used to reduce hypotension, including maternal left tilt, leg wrappings, sympathomimetic medications, and intravenous fluid loading, either before (pre-loading) or concurrently with (co-loading) the induction of spinal anesthesia⁶. The use of vasopressors with preloading is a critical approach for preventing hypotension during regional anesthesia. During spinal anesthesia for caesarean delivery, phenylephrine and ephedrine are both used to maintain maternal arterial blood pressure (BP). However, they differ in their hemodynamic effects on the mother, as well as their effects on the uteroplacental circulation and the umbilical cord gas levels⁷.

Traditionally, ephedrine, "which has strong β -adrenergic effects and weaker α -adrenergic effects," should be recommended in this situation. However, this is being challenged because of potential complications such as supraventricular tachycardia, tachyphylaxis and most importantly fetal acidosis. Phenylephrine, α -adrenergic agonist, can be used to prevent and cure hypotension in pregnant women and their babies. Furthermore, phenylephrine reduces the incidence of nausea and vomiting, as well as the incidence of fetal acidosis, but it may cause maternal bradycardia in some cases⁸. The treating maternal hypotension with phenylephrine has fewer risks of depressing fetal pH than treating the same condition with ephedrine⁷.

Kee et al⁹ reported that the incidence of maternal hypotension was 1(4%) in phenylephrine group and 8(32%) in ephedrine group. Typically, either medicine is administered alone. Combining of both medications in the same syringe has been described earlier⁶⁻⁹.

There have been no previous studies that have systematically evaluated the effect of varying the proportions of the medications in such combination treatments. As a result, this study will provide local literature for phenylephrine and ephedrine, and can use more effective drug in this population, which can help better management of hypotension caused by spinal anesthesia in the future.

MATERIALS AND METHODS

This study was conducted at the Department of Anesthesia, Pain management and surgical ICU Civil Hospital, Karachi from 1st January 2019 to 30th June 2019 29-05-2021 and comprised 76 patients. They were divided in two groups; Group P received phenylephrine and group E received ephedrine. Age between 18 to 35 years, weight range 50-70kg, American Society of Anesthesiologist (ASA) physical status, classification of I and II, women scheduled for elective cesarean section under spinal anesthesia, singleton pregnancy assessed on ultrasound and gestational age 37 to 42 weeks assessed on previous dating scan were included. Patients with cardiovascular or cerebrovascular disease, pregnancy-related hypertension disease, known fetal abnormalities or twin pregnancies were excluded from participating in the study. All patients who met the inclusion criteria were chosen from a pre-operative anesthetic assessment clinic one day before surgery and admitted to the operating room. When the patient arrived in the operating room, he or she was allowed to rest undisturbed in the supine position for a few minutes before an ECG, pulse oximeter, and NIBP were administered. SBP was measured at a baseline. A consultant with at least two years of experience administered spinal anesthesia after completing all aseptic procedures. The anesthesia was administered between the L3-4 or L4-5 intervertebral spaces and 0.5% hyperbaric bupivacaine 10 mg was injected intrathecally using an 18-gauge needle by a consultant with at least two years of experience. Immediately following spinal anesthesia, phenylephrine was infused at a rate of 50g/min in each group, and ephedrine 5 mg was administered I/V in group E at the same time. In order to avoid

Received on 29-05-2021

Accepted on 11-09-2021

surpassing 1,000mL of Hartmann solution, Co was added. It was necessary to administer the phenylephrine at a rate of 50g/min for 15 minutes in order to record the hemodynamic parameters. Systolic BP was measured at the start, then every minute for the next 10 minutes and finally at the end of the 15-minute period. Hypotension was defined as a reading of systolic blood pressure that was less than or equal to 20% lower than preop level at the time of the procedure. The data was analyzed through SPSS-17. The hypothesis was tested by Chi-square test and a p value ≤ 0.05 was considered significant.

RESULTS

Majority of the patients 50(65.80%) were presented with >25 years of age with mean age was 26.48 ± 3.05 years. There were 42(55.30%) patients with $\leq 30 \text{ Kg/m}^2$ of body mass index and mean BMI was $27.37 \pm 5.01 \text{ Kg/m}^2$. There were 46(60.50%) patients with ASA status I and 30(39.50%) patients with ASA status II. The hypotension was found in 13(17.10%) patients (Table 1). The average weight, height and systolic blood pressure were $60.07 \pm 5.10 \text{ Kg}$, $1.53 \pm 0.05 \text{ m}$, $106.63 \pm 6.88 \text{ mmHg}$ respectively (Table 2). The hypotension was found in 2(15.4%) patients who used phenylephrine as compared to the patients who used ephedrine 11(84.6%) and statistically the difference was significant ($p=0.006$) (Table 3)

Table 1: Demographic information of the patients (n=76)

Variable	No.	%
Age (years)		
≤ 25	26	34.20
> 25	50	65.80
Body mass index		
≤ 30	42	55.30
> 30	34	44.70
ASA status		
I	46	60.50
II	30	39.50
Hypotension		
Yes	13	17.10
No	63	82.90

Table 2: Descriptive of the patients (n=76)

Variable	Mean \pm SD
Weight (kg)	60.07 ± 5.10
Height (m)	1.53 ± 0.05
Systolic blood pressure (mmHg)	106.63 ± 6.88

Table 3: Comparison of hypotension within group (n=76)

Group	Hypotension		P value
	Yes	No	
Phenylephrine	2(15.4%)	36(57.1%)	0.006
Ephedrine	11(84.6%)	27(42.9%)	
Total	13 (100%)	63 (100%)	

DISCUSSION

If prophylactic measures were not taken, the incidence of hypotension increases to more than 80% of the population⁴. Maternal hypotension is characterized by unpleasant symptoms such as nausea, vomiting, and dizziness among other things. More importantly, when hypotension is severe and prolonged, it can impair uterine and intervillous blood flow, resulting in fetal acidosis and neonatal depression respectively.⁵ It was discovered in a quantitative and comprehensive review that treating maternal hypotension with phenylephrine has fewer risks of depressing fetal pH than treating the same condition with ephedrine⁷. In the present study, hypotension was found lower 2(15.4%) in patients who used phenylephrine as compared to the patients who used ephedrine 11(84.6%), statistically significant ($p=0.006$) difference was found (Table 3).

Both epinephrine and phenylephrine have a long history of use as adjuvants in the administration of local anesthesia. As a result, both drugs will increase the intensity and prolong the duration of sensory and motor anesthesia^{107–109}, allowing for the administration of lower dosages of local anesthetic in a dose-dependent manner ($0.1\text{--}0.6 \text{ mg}$)¹⁰.

Using a combination of decreased clearance of spinal local anesthetic through vasoconstriction and direct analgesic actions on spinal cord a-adrenergic receptors, vasoconstrictors may function to relieve pain in the spinal cord. Unfortunately, the reality is that their usefulness for ambulatory spinal anesthesia because of propensity to prolong recovery from sensory and motor block, as well as the ability to urinate as compared with anesthetic benefits¹¹.

Patient's recovery milestones and time to discharge were delayed by 106 minutes following the administration of 0.2 mg epinephrine to 60mg, 2% isobaric lidocaine during outpatient knee arthroscopy¹². Similar effects are observed with bupivacaine¹³ and procaine¹⁴.

Despite the fact that the use of epinephrine is not associated with an elevated risk of TNS¹⁵, it has been linked to a case of cauda equina syndrome in one study¹⁶. The usage of phenylephrine has been associated with an increased risk of TNS (10-fold increase)¹⁷.

CONCLUSION

Following spinal anesthesia for cesarean delivery, a statistically significant difference in hypotension was seen between the phenylephrine and ephedrine groups.

Conflict of interest: Nil

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