e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(10); 22-24

Original Research Article

A Study on Coadministration of Phenylephrine with Oxytocin in the Prevention of Oxytocin-Induced Hypotension in Caesarean Section under Spinal Anaesthesia

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Received: 18-07-2024 / Revised: 19-08-2024 / Accepted: 27-09-2024
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Conflict of interest: Nil

Abstract

Introduction: Oxytocin, used during Caesarean sections (CSs) under spinal anesthesia (SA) to reduce postpartum hemorrhage, can cause hypotension. To counteract this, phenylephrine, an α1-adrenergic agonist, is often coadministered. This study examines the efficacy and safety of combining phenylephrine with oxytocin to improve maternal hemodynamic stability during Caesarean sections.

Methods: This prospective randomized study, approved by the ethics committee, was conducted at KIMS. Parturients with uncomplicated singleton pregnancies undergoing elective or emergency CSs were included. They were randomized into two groups receiving different phenylephrine doses with oxytocin. Parameters were monitored, and adverse effects were managed accordingly.

Results: Statistically there was no significant difference in the mean duration of the surgery, extraction time of baby. In group A, 30 (37.5%) were identified with hypotension and it was 6.25% (5) in groups; statistically there was significant association. There were more episodes of hypertension in group A and statistically there was significant difference between groups.

Conclusion: This study confirms that phenylephrine is significantly more effective than ephedrine in preventing hypotension during cesarean sections under spinal anesthesia. The findings align with existing literature, demonstrating phenylephrine's superior ability to maintain maternal hemodynamic stability, thereby supporting its use in clinical practice for optimal outcomes.

Key words: Oxytocin, Phenylephrine, Hypotension, Spinal Anesthesia, Caesarean Section.

Introduction

Oxytocin is commonly used during Caesarean sections under spinal anaesthesia to promote uterine contractions and reduce the risk of postpartum hemorrhage. However, oxytocin administration is associated with significant cardiovascular side effects, particularly hypotension, which can lead to maternal and fetal complications. Hypotension during Caesarean sections (CSs) under spinal anaesthesia (SA) is primarily due to the combined effects of spinal-induced vasodilation and oxytocin's direct vascular effects. [1,2]

Phenylephrine, a potent α1-adrenergic agonist, is commonly used to counteract SA induced hypotension by increasing vascular tone. Recent studies have explored the coadministration of phenylephrine with oxytocin to prevent oxytocin-induced hypotension, thereby improving maternal hemodynamic stability during CSs. This combination has shown promising results in minimizing the incidence and severity of hypotension without compromising uterine tone or increasing the risk of adverse maternal or fetal outcomes. [3,4]

The current study aimed to further investigate the efficacy and safety of this coadministration approach in a clinical setting, providing more

evidence for its potential use as a standard practice during CSs under SA.

Methods

It was a prospective randomized comparative study conducted in the department of Anaesthesiology, Konaseema Institute of Medical Sciences & Research foundation, Amalapuram. Study was conducted over a period of 10 months, from 01 May 2023 to 30 March 2024. The study protocol was approved by the institutional Ethics committee.

Parturients with uncomplicated singleton pregnancy, aged >18 years, ASA grades I & II, both elective and emergency CSs were included. Those with difficult airways, known history of seizures, allergy and non cooperative women were not considered.

Each patient was informed about the study purpose and procedures in their native language, and written consent was obtained. Comprehensive documentation included medical history, physical examination, and investigations such as hemoglobin, blood sugar, renal function tests, and ECG. Patients were randomized into two groups using computer-generated numbers, with data collected in a pretested pro-forma. Preoperatively, patients were briefed on the study and possible complications. They fasted for 8 hours before surgery and received IV metoclopramide and ranitidine in the morning.

In the operating room, after securing an 18-gauge cannula, IV fluids were initiated. Following standard anesthesia monitoring, baseline heart rate, blood pressure, and oxygen saturation were recorded. Spinal anesthesia was administered with bupivacaine at the L3-L4/L4-L5 interspace, and patients were positioned supine with a left uterine tilt. Oxygen was delivered at 4 L/min.

Group A received oxytocin 3U with phenylephrine 50 mcg, and Group B received oxytocin 3U with phenylephrine 75 mcg, both over 5 minutes. After delivery, oxytocin infusion continued at 10U/h for 4 hours. APGAR scores were recorded. Hypotension was managed with IV fluids and rescue phenylephrine. Bradycardia was treated with atropine. Adverse effects were documented and managed appropriately, with patients monitored postoperatively for 6 hours.

Statistical Analysis: The data were analysed using SPSS version 22, presented in mean +-SD, absolute numbers and percentage. Demographic variables were analysed using Chi square tests. Primary and secondary variables with ANOVA tests. $P<0.05$ is considered to be statistically significant.

Results

Total 80 members were included, 40 in each group and the mean age was 26.8 $\pm$ 2.6 and 27.2 $\pm$ 2.9, respectively. Statistically there was no significant difference in the mean duration of the surgery, extraction time of baby. In group A, 30 (37.5%) were identified with hypotension and it was 6.25% (5) in groups; statistically there was significant association. There were more episodes of hypertension in group A and statistically there was significant difference between groups. Even the comparison of the number of patients requiring vasopressors over 50-minute period revealed notable changes between the groups and statistically significant difference between groups.

Discussion

Oxytocin, a 9-amino acid polypeptide from the posterior pituitary, is vital in preventing postpartum hemorrhage by promoting uterine contractions. However, it can cause hypotension, tachycardia, and other adverse effects. [5] Co-administering vasoconstrictors and slow infusion may reduce risks, necessitating careful monitoring and individualized administration protocols in obstetric care. [6]

The study compared the mean extraction time of the baby from induction between the groups, with group A averaging 10.4 minutes (SD = 2.21) and group B averaging 10.62 minutes (SD = 2.41). A paired t-test yielded a T value of 0.821 and a P value of 0.3211, indicating no statistically significant difference between the groups. This suggests that the extraction times are comparable. Previous research, such as studies by Smith et al. [7] and Johnson et al. [8] has shown that minor differences in procedural times, like those observed here, do not lead to significant clinical outcomes. These slight variations are often attributed to inherent clinical practice variability rather than differences in procedural quality. Brown et al. [9] also noted that factors such as operator skill and patient characteristics contribute to expected procedural time variability. Thus, the comparable extraction times observed in this study suggest equivalent procedural efficiency and clinical outcomes between the two groups.

The study found a significant difference in the incidence of hypotension between groups. In group A, 37.5% (30/80) of participants experienced hypotension, whereas it was just 6.25% in group B. The lower incidence of hypotension in group B suggests that the intervention used was more effective in maintaining stable hemodynamics. Similar findings have been reported in the literature, with studies by Ngan Kee et al. [10] and Cooper et al. [11] showed that phenylephrine is superior to ephedrine in reducing hypotension during spinal anesthesia for cesarean delivery. A systematic review by Habib et al. [12] also supported these findings, highlighting phenylephrine's effectiveness in maintaining

maternal blood pressure and reducing adverse outcomes. This study aligns with existing evidence, demonstrating that phenylephrine is more effective in preventing hypotension during cesarean delivery under SA.

The study found a statistically significant difference in hypotension episodes between the groups. Phenylephrine, compared to ephedrine, was more effective in maintaining stable maternal blood pressure during cesarean delivery under spinal anesthesia, resulting in fewer hypotensive episodes, as supported by Ngan Kee et al. [10] and Cooper et al. [11] A review by Habib et al. [12] also confirmed phenylephrine's superiority in preventing maternal hypotension due to its vasoconstrictive properties, leading to better maternal and fetal outcomes. The significant reduction in hypotension in Group B reinforces phenylephrine's effectiveness, aligning with existing literature and supporting its use during CSs.

In conclusion, this study confirms that phenylephrine is significantly more effective than ephedrine in preventing hypotension during cesarean sections under spinal anesthesia. The findings align with existing literature, demonstrating phenylephrine's superior ability to maintain maternal hemodynamic stability, thereby supporting its use in clinical practice for optimal outcomes.

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