A Comparison of the Effect of Phenylephrine Versus Ephedrine on the Arterial Blood Pressure in Women receiving Spinal Anesthesia for Elective Cesarean Section.

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Abstract

Background: Maternal hemodynamic changes are common during spinal anesthesia for cesarean delivery. Many agents are used for treating hypotension. This study compares the effect of ephedrine and phenylephrine on maternal hypotension in spinal anesthesia for cesarean section and their effect on fetal outcome.

Methods: 44 parurients scheduled for elective cesarean section were recruited in this randomized double blinded study. Co-loading with 10 ml/kg of Hartmann's solution started immediately after a standard spinal anesthesia. Parturients were then randomly allocated into two groups.Group E (n = 22) received Ephedrine boluses of 5 mg, and group P (n = 22) Phenylephrine 50 mcg boluses to maintain systolic blood pressure between 80-100% of its baseline values.

Results: Both drugs contolled the blood pressure effectively. Group P required less number of boluses than Group E for blood pressure control. Maternal Bradycardia was more noticed in group P. All neonatal Apgar scores at 5 minutes were ≥ 9. There was no difference in the incidence of nausea and vomiting in both groups.

Conclusion: In combination with rapid co-loading, Phenylephrine is as effective as Ephedrine, when given in intravenous boluses, in controlling spinal anesthesia-induced hypotension in elective cesarean section, with similar neonatal outcome.

Keywords

Phenylephrine, Ephedrine, Spinal Anesthesia, Cesarean section, Hypotension.

List of Abbreviations

ASA	American Society Of Anesthesiologists
BP	Blood Pressure
CNS	Central Nervous System
CS	Cesarean Section
CSE	Combined Spinal Epidural
DA	Ductus Arteriosus
DV	Ductus Venosus
FHR	Fetal Heart Rate
FRC	Functional Residual Capacity
GFR	Glomerulo-Filtration Rate
HR	Heart Rate
IM	Intra Muscular
IV	Intra Venous
IVC	Inferior Vena Cava
LA	Left Atrium
LHV	Left Hepatic Vein
LV	Left Ventricle
MAO	Mono Amine Oxidase
mcg	Micro Gram
mg	Milli Gram
PA	Pulmonary Artery
PDPH	Post Dural Puncture Headache
PO	Per Oral
PV	Pulmonary Vein
RA	Right Atrium
RHV	Right Hepatic Vein
RV	Right Ventricle
SC	Sub Cutaneous
SVC	Superior Vena Cava
UA	Umbilical Artery
UV	Umbilical Vein

List of Figures

List of Tables

Contents

Introduction

Introduction

Maternal hypotension is the most frequent complication of spinal anesthesia in elective cesarean sections, with an incidence approaching 100%. Among its multifactorial aetiology is profound vasodilatation secondary to complete sympathetic denervation that is often accentuated by a variable degree of aortocaval compression. Many strategies are currently used to minimize hypotension including maternal left tilt, leg wrappings[1], sympathomimetic drugs, and intravenous fluid loading whether before (pre-loading) or with (co-loading) induction of spinal anesthesia. Co-loading may be more effective than preloading in terms of reducing the dose of vasopressor prior to delivery.[2]

Historically, ephedrine has been recommended as the best vasopressor in obstetrics because animal studies showed it caused less reduction in uterine blood flow compared with α-agonists. Recent clinical evidence, however, suggests that this is not as important as initially thought.[3]

Ephedrine and phenylephrine have been most investigated. Advantages of ephedrine include familiarity, long history and low propensity for uteroplacental vasoconstriction. Ephedrine, however, has limited efficacy, is difficult to titrate, causes maternal tachycardia and depresses fetal pH and base excess.[4] Advantages of phenylephrine include high efficacy, ease of titration and the ability to use liberal doses to maintain maternal blood pressure near normal and then prevent nausea and vomiting without causing fetal acidosis.[5,6] Phenylephrine, however, may decrease maternal heart rate.[7]

The purpose of this study is to compare maternal haemodynamic changes and fetal outcome in subjects allocated randomly to receive ephedrine or Phenylephrine for treatment of hypotension during spinal anesthesia for elective cesarean section.

Literature review

- **Physiologic Changes of Pregnancy**
- **Neuaxial Anesthesia in Cesarean Section**
- **Pharmacology**

Physiologic Changes of Pregnancy

Physiologic Changes of Pregnancy

Maternal physiologic changes in pregnancy occur as a result of hormonal alterations, mechanical effects of the gravid uterus, increased metabolic and oxygen requirements, metabolic demands of the fetoplacental unit, and hemodynamic alterations associated with the placental circulation. Such changes become more significant as pregnancy progresses.[8]

Maternal changes

Cardiovascular System

The cardiovascular system adjusts throughout pregnancy to meet the changes that occur. Hemodynamic and maternal cardiovascular changes in pregnancy are outlined in Table 1.[9] Although the changes appear to begin in the first trimester, these changes continue into the second and third trimesters, when cardiac output increases by approximately 40% of nonpregnant values. Although this increase in cardiac output is due to an increase in both stroke volume and heart rate, the more important factor is stroke volume, which increases by 20% to 50% at term from nonpregnant values. Changes in heart rate are extremely difficult to reliably quantify, but it is thought that the approximately 20% increase in heart rate is present by the fourth week of pregnancy. Although the normal variability in heart rate does not change in pregnancy, there does appear to be a reduction in the sympathetic component.[10] Tachyarrhythmias are more common, especially later in pregnancy as a result of both hormonal and autonomic factors.[11]