LEG RAISING FOR PREVENTION OF POST-SPINAL HYPOTENSION IN ELECTIVE CESAREAN SECTION

A randomized controlled trial

Thesis Submitted for the Partial Fulfillment of the Master Degree in Anesthesiology

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In The Name Of ALLAH

The Most Beneficent, The Most Merciful

Dedicated to my father `s soul,

the reason for what I became today

Nahed Aly Aiyad

1946 - 2009

List of abbreviations

(PVR)	Pulmonary vascular resistance.	7
(RCT)	Randomized controlled trial.	16
(ROC)	Receiver operator curve analysis.	17
(SBP)	Systolic blood pressure.	5
(ScO_2)	Cerebral Oxygen saturation.	17
(SST)	Supine stress test.	15
(SVR)	Systemic vascular resistance.	5
(SVRI)	Systemic vascular resistance index.	7

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Abstract

Background

Maternal hypotension is a common complication after spinal anesthesia for cesarean section (CS). In this study we investigated the role of passive leg raising (PLR) as a method for prevention of post-spinal hypotension for cesarean section (PSHCS).

Methods

One hundred and fifty full term parturients scheduled for elective CS were included in the study. Patients were randomized into two groups: passive leg raising group , PLR (, n=75) and Control group , group C (n=75). Spinal block was performed in sitting position after administration of 10mL/Kg Ringer's lactate as fluid preload. After successful intrathecal injection of local anesthetic, Patients were positioned in the supine position. Leg elevation was performed for PLR group directly after spinal anesthesia and maintained till skin incision. Intraoperative hemodynamic parameters (Arterial blood pressure and heart rate), intra-operative ephedrine consumption, incidence of PSHCS, and incidence of nausea and vomiting were reported.

Results

PLR group showed lower incidence of PSHCS (34.7% Vs 58.7 %, P=0.005) compared to the control group. Arterial blood pressure and heart rate readings were comparable between both groups, however, PLR showed less ephedrine consumption (4.9±7.8 mg Vs 10±11 mg, P=0.001).

Conclusion

PLR performed immediately after spinal block reduces the incidence of hypotension in parturients undergoing elective CS.

Keywords

Hypotension, spinal anesthesia, cesarean section, passive leg raising.

Introduction

Introduction

Spinal anesthesia is the popular route of anesthesia in parturients for cesarean delivery [1]. Maternal hypotension is a common complication after spinal anesthesia resulting in adverse maternal and fetal outcomes [2][3]. Many methods have been reported for prediction, prevention, and management of post-spinal hypotension in cesarean delivery (PSHCD) [4][5].

In this review we are giving an updated summary for the cardiovascular changes in pregnancy, PSHCD; recent updates in prediction, prevention and management. Gaps in literature, areas of unclear evidence, as well as future thoughts are also highlighted.

Aim of the work

Maternal hypotension is common after spinal anesthesia for cesarean section (CS) with an incidence (60-70%) [88][69]. Post-spinal hypotension in Cesarean section (PSHCS) has been associated with many maternal and fetal complications [88]. PSHCS is mainly due to decreased vascular tone leading to decreased systemic vascular resistance and decreased venous return [69]. Thus, measures used for prevention and management of PSHCS are mainly concerned by increasing vascular tone (using vasopressors) and increasing venous return (by fluid administration and positioning regimens) [88][69][5][89]. Although many measures have been reported for prevention and management of PSHCS [5][89], However; no single method succeeded to decrease the incidence of PSHCS into a clinical satisfactory level [5].

Passive leg raising (PLR) creates an increase in venous return by translocation of blood from lower extremities to the thorax. Thus, PLR leads to increased stroke volume (SV) and consequently cardiac output (CO) [90]. PLR was previously used as a first aid maneuver in acute circulatory collapse [91], it has been also considered as a popular method for detection of fluid responsiveness [41]. The evidence for a possible role for PLR in prevention of PSHCS is unclear. In this study, we investigated the efficacy of PLR after spinal block in prevention of PSHCS.

Review of literature

Post-spinal hypotension in cesarean delivery: Physiological background

Maternal Cardiovascular Changes During Pregnancy

The physiologic alterations of the cardiovascular system function to support fetal growth and metabolism, by significantly increasing uterine perfusion and also to prepare the parturient for blood loss at delivery.

Table 1: Changes in Cardiovascular System

Parameter	Change	Amount (%)
Blood volume	Increased	35-40
Plasma volume	Increased	50
RBCs volume	Increased	20
Heart rate	Increased	20-30
Stroke volume	Increased	20-50
Cardiac output	Increased	30-50
Contractility	Variable	+/- 10
Central venous pressure	Unchanged	
Pulmonary capillary wedge pressure	Unchanged	
Systemic vascular resistance	Decreased	20
Systemic blood pressure	Slight decrease	Mid-trimester 10-15 mmHg then rises
Pulmonary vascular resistance	Decreased	30
Pulmonary artery pressure	Slight decrease	

Blood Volume:

Both the intravascular and extravascular fluid volumes increase substantially during pregnancy. Much of the average 12.5 kg weight gain during pregnancy is attributed to the increase in the intravascular and extravascular fluid volumes. Significant increases in maternal blood volume occur, with plasma volume increasing 55% from 40 mL/kg to 70 mL/kg and red blood cell volume increasing approximately 17% from 25 mL/kg to 30 mL/kg [6,7] (Fig. 1-1).

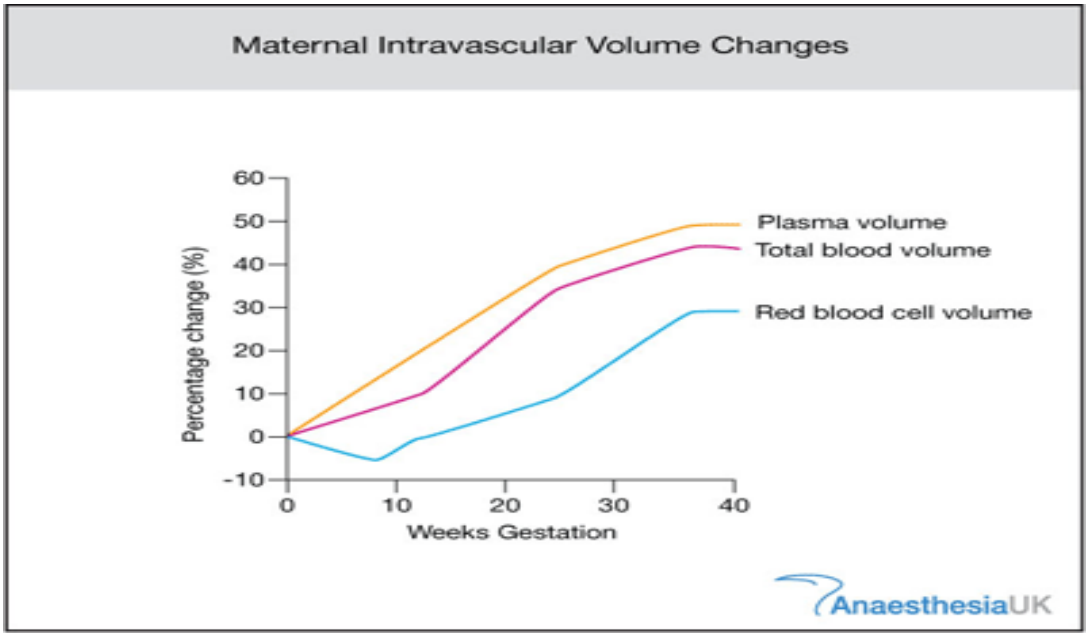

Figure 1: Changes in intravascular fluid volume (blood volume), plasma volume, and erythrocyte volume during progression of normal pregnancy.

This increase in volume begins in the first few weeks of gestation, rises sharply in the second trimester, peaks early in the third trimester and decreases slightly by term [6] . The rise in plasma volume is likely achieved by a decreased osmotic threshold for thirst and alterations in arginine vasopressin metabolism [8]. A large portion of the increased blood volume perfuses the gravid uterus and 300 to 500 mL of blood may be forced back into the maternal circulation with contractions during labor [7,9]. Blood volume returns to prepregnancy values at approximately 7 to 14 days postpartum