
Hemodynamic effects of different angles of lateral tilt in full-term pregnant women before and after spinal anesthesia: A before & after study

*Thesis presented for partial fulfillment of Master degree in
anesthesiology*

Presented by
Rimon Soryal Adly
M.B.B.Ch

Under Supervision of

Prof. / Tarek Abd Elhalim Kaddah

Professor of anesthesiology, intensive care and pain
management, Faculty of medicine
Cairo University

Assistant Prof. / Sabah Abd Elraoof

Assistant Professor of anesthesiology , intensive care and pain
management, Faculty of medicine,
Cairo University

Dr. / Ahmed Mohamed Ibrahim Hasanin

Lecturer of anesthesiology, intensive care and pain
management, Faculty of medicine
Cairo University

*Faculty of Medicine
Cairo University
2015-2016*

Acknowledgement

First and foremost, thanks are due to the GOD the most kind and merciful.

Words will never be able to express my deepest gratitude to all those who helped me during preparation of this study.

*I gratefully acknowledge the sincere advice and guidance of Prof. Dr. **Tarek Abdelhalim Kaddah** Professor of Anesthesiology, Faculty of Medicine, Cairo University, for his constructive guidance, encouragement and valuable help in accomplishing this work.*

*I am greatly honored to express my deep appreciation to Prof. Dr. **Sabah Mohamed Abdelraouf** Assistant Professor of Anesthesiology, Faculty of Medicine, Cairo University, for her continuous support, sincere supervision, direction and meticulous revision of this work.*

*I am really thankful to Dr. **Ahmed Mohamed Ibrahim Hasanin** Lecturer of Anesthesiology, Faculty of Medicine, Cairo University, for his great help, advice, precious time, kindness, and moral support.*

*I am really thankful to Dr. **yassmin Salah** lecturer of Anesthesiology , faculty of medicine , cairo university , for her kind support , precious time and great help.*

*And special thanx to Dr. **Reham Fouad** lecturer of Obstetrics and Gynaecology , faculty of medicine , cairo university , for her great help , kind support and precious time.*

Rimon SoryL Adly

Abstract

this Study is to investigate the effect of left lateral tilting on maternal hemodynamics after spinal anesthesia. left lateral tiling (15 degree) for full term parturients after spinal block increased CO and MAP. Parturients with increased CO and heart rate after tilting are more vulnerable to intraoperative hypotension.

Keywords

MAP,CO,SV,SVR,

Index

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List of abbreviations

- (ABP) : Arterial blood pressure
- (BMI) : body mass index.
- (BNP) : Brain natriuretic peptide .
- (BP) : blood pressure .
- (BPM) : Beat Per Minute.
- (CO) : cardiac output.
- (CS) : cesarean section.
- (GDFT) : goal directed fluid therapy.
- (HRV) : heart rate variability.
- (IVC) : inferior vena cava
- (MAP) : mean arterial blood pressure.
- (NIRS) : Near-infrared spectroscopy.
- (PBPC) : positional blood pressure change.

(PE) : Phenylephrine.

(PI) : perfusion index.

(PLR) :Passive leg raising.

(PSHCD) : post-spinal hypotension in cesarean delivery.

(PVI) : plethysmographic variability index.

(RCT) : Randomized controlled trial

(ROC) : Receiver operator curve.

(ScO2) : Cerebral Oxygen saturation.

(SST) : Supine stress test.

(SVR) : systemic vascular resistance.

(SVRI) : systemic vascular resistance index.

(VAS) : visual analogue scale.

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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]. Many methods have been reported for prediction, prevention, and management of post-spinal hypotension in cesarean delivery (PSHCD) [3].

This review is 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

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Aortocaval compression by the gravid uterus has been classically mentioned as a cause of supine hypotension syndrome in full term pregnant women [4]. Aortocaval compression has been also mentioned as a possible cause of post-spinal hypotension in parturients undergoing cesarean section (CS)[4]. The effect of left lateral uterine displacement on maternal hemodynamics was previously reported in non-anesthetized full term pregnant women with no clear evidence [5]. The effect of different tilt angles on patient cardiac output during anesthesia was not well investigated. Under anesthesia, additional factors might affect the hemodynamic status such as: muscle relaxation, vasodilatation, and fluid administration. According to the latest Cochrane database reviews, evidence of inadequate about the value of tilting the operating table or using a wedge in CS [5]. The aim of this work is to investigate the effect of different angles of lateral tilt on the maternal hemodynamics before and after spinal anesthesia.

Maternal changes during pregnancy

Post-spinal hypotension in cesarean delivery: Physiological background

Maternal Changes during Pregnancy

Normal pregnancy involves major physiological and anatomical adaptation by maternal organs. It is important that anesthetists involved in the care of the pregnant woman understand these changes, to provide safe maternal anesthetic care which is compatible with safe delivery of the baby [6].

Pregnancy affects virtually every organ system. Many of these physiological changes appear to be adaptive and useful to the mother in tolerating the stresses of pregnancy, labor and delivery [7].

The maternal physiologic changes during pregnancy contribute to increased anesthetic risk for both the mother and fetus.[7]

Cardiovascular changes:

Changes in blood volume

Expansion of the plasma volume and an increase in red blood cell mass begin as early as the fourth week of pregnancy, peak at 28 to 34 weeks of gestation, and then plateau until parturition. [8]

Plasma volume expansion is accompanied by a lesser increase in red cell volume the plasma volume increases by 40% to 50%, whereas the red cell volume goes up by only 15% to 20%. As a result, there is a mild reduction in hematocrit, with peak hemodilution occurring at 24 to 26 weeks. Blood volume in pregnant women at term is about 100mL/kg [8].

Changes in vascular resistance and blood pressure

Blood pressure (BP) typically falls early in gestation and is usually 10 mmHg below baseline in the second trimester, declining to a mean of 105/60 mmHg. In the third trimester, the diastolic blood pressure gradually increases and may normalize to non-pregnant values by term [9].

The factors responsible for the vasodilatation are incompletely understood, but one of the major findings is decreased vascular responsiveness to the pressor effects of angiotensin II and norepinephrine. Several additional mechanisms for the fall in vascular resistance have been proposed [10]:

1-Increased endothelial prostacyclin.

2-Enhanced nitric oxide production.

3-Reduced aortic stiffness.

Many pregnant patients will complain of symptoms suggestive of cardiovascular disease at term, including shortness of breath, palpitations, dizziness, edema, and poor exercise tolerance. Physical examination of the term pregnant woman may also be abnormal when compared with the pre pregnant state, with auscultation commonly revealing a wide, loud, split first heart sound, an S3 sound, and a soft systolic ejection murmur. The heart is displaced to the left and upward during pregnancy because of the progressive elevation of the diaphragm by the gravid uterus. The electrocardiogram of normal parturients may include: benign dysrhythmia, reversal of ST, T, and Q waves, and left axis deviation [11].

Pregnancy has numerous effects on cardiac evaluation, including changes in the electrocardiogram, chest radiograph, and echocardiogram. Although these minor changes occur in healthy pregnant women at term, symptoms and signs such as chest pain, syncope, severe arrhythmias, systolic murmur more than grade 3, or diastolic murmur suggest severe disease and warrant further investigation [12].

Changes in Cardiac Output

The cardiac output rises 30 to 50 % (1.8 L/min) above baseline during normal pregnancy; one-half of this increase occurs by 8 weeks of gestation.

The elevation in cardiac performance results from changes in three important factors that determine cardiac output [13]: