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The Relation between the Time from Induction of Neuraxial Anaesthesia to Delivery and Umbilical Arterial Cord pH at Scheduled Caesarean Delivery

Thesis

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of **Obstetrics and Gynecology**

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List of Abbreviations

Abb.	Full term
AC	*Abdominal circumference*
ALT	*Alanine transaminase*
ASA	*American Society of Anesthesiology*
AST	*Aspartate transaminase*
Be	*Base excess (deficit)*
BMI	*Body mass index*
BP	*Blood pressure*
BPD	*Bi parietal diameter*
CBC	*Complete blood count*
CD	*Caesarean delivery*
CI	*Confidence interval*
CO	*Cardiac output*
CO_2	*Carbon dioxide*
CS	*Caesarean section*
CSA	*Continuous spinal anesthesia*
CSE	*Combined spinal epidural*
CSF	*Cerebrospinal fluid*
DBP	*Diastolic blood pressure*
FL	*Femoral length*
GA	*General anesthesia*
H_2CO_3	*Carbonic acid*
HC	*Head circumference*
HCO_3	*Bicarbonate*
HCS	*Human chorionic somatomamotropin*
HIE	*Hypoxic ischemic encephalopathy*
HIV	*Human immunodeficiency virus*
HPL	*Human placental lactogen*
HR	*Heart rate*
ICP	*Intra cranial pressure*
IV	*Intravenous*
L	*Liter*
LA	*Local anesthesia*

List of Abbreviations cont...

Abb.	Full term
LMP	*First day of last menstrual period*
LUD	*Left uterine displacement*
MAP	*Mean arterial blood pressure*
mcg	*microgram*
mEq	*Milli equivalent*
min	*Minute (s)*
ml	*milliliter*
mmHg	*Millimeter mercury*
mmol	*millimole*
NA	*Neuraxial anesthesia*
NICU	*Neonatal intensive care unit*
NPV	*Negative predictive value*
OR	*Odds ratio*
P-Value	*Power value*
$PaCO_2$	*Partial pressure of carbon dioxide in arterial blood*
PCO_2	*Partial pressure of carbon dioxide*
pH	*Potential (power) of hydrogen*
RLSCS	*Recurrent lower segment caesarean section*
ROC curve	*Receiver operating characteristic curve analysis*
SA	*Spinal anesthesia*
SBP	*Systolic blood pressure*
SD	*Standard deviation*
SVR	*Systemic venous resistance*
Sys BP	*Systolic blood pressure*
VR	*Venous return*

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INTRODUCTION

Today, caesarean delivery accounts for in more than 30% of all births per year; in developed countries the caesarean delivery rate varies between 15% and more than 30%. Since 1970s, a progressive increase in the caesarean delivery rate has been observed worldwide. Selection of an appropriate anesthesia for caesarean section have been discussed since a long time and depends upon surgical indications, emergency status, the maternal status and patient's tendency, and also with regard to its effect on uterine blood flow, with the effects on uterine vascular resistance and placental perfusion pressure can affect the outcome of pregnancy ***(Miller, 2010).***

Spinal anesthesia is the most commonly used technique for planned caesarean delivery owing to the rapid onset of effective anesthesia and avoidance of fetal exposure to anesthetic drugs and of maternal risks from general anesthesia. The major disadvantage of spinal anesthesia is maternal hypotension; Spinal hypotension occurs in up to 74% of planned caesarean deliveries when prophylactic vasopressor infusions are not used and is associated with fetal acidosis ***(Kinsella et al., 2018).***

The association between the degree of decrease in maternal blood pressure (BP) and fetal acidosis is well established. However, the effect of hypotension duration is less well studied. In contrast to an urgent intrapartum caesarean

delivery, fetal distress is not anticipated during a planned caesarean delivery. The time from the administration of spinal anesthesia to the extraction of the fetus is the window of potential fetal compromise ***(Rimsza et al., 2019).***

Both maternal hypotension and prolonged intraoperative time intervals during this predelivery window contribute to adverse neonatal outcome but their relative clinical importance and critical thresholds warrant further investigation ***(Powell et al., 2017).***

Differences in neonatal outcomes with different methods of anesthesia are not clear. After delivery, the first and fifth minute Apgar scoring system is the relatively common criteria for evaluating the clinical status of the infant. Bio-chemically, umbilical cord blood analysis is a gold standard to assess the acid-base status and uterine placental performance. Furthermore, umbilical artery blood values of Be, Hco3, Pco2, pH showed a fetal condition at birth, especially during high-risk pregnancies, and the possibility of fetal depression ***(Kinsella et al., 2018).***

Neuraxial anesthesia-related hypotension and maternal obesity contribute to neonatal and umbilical arterial pH depression by reducing uterine perfusion at caesarean delivery. Obese women have lower umbilical arterial pH at caesarean delivery than lean women. Although some have hypothesized that the weight of the abdominal wall further reduces uterine

perfusion in a supine obese patient awaiting caesarean delivery, the influence of intracorporeal uterine compression in obese patients remains poorly understood ***(Edwards et al., 2013).***

Intraoperative hypotension alone has been reported to independently predict lower neonatal umbilical arterial pH after controlling for maternal obesity. These factors may compound one another because obese women undergoing caesarean delivery have been shown to have greater incidence of intraoperative hypotension ***(Girsen et al., 2014).***

Aim of the Work

This study aimed to evaluate the relation between predelivery time intervals started from end of induction of spinal anesthesia till delivery and neonatal umbilical arterial pH at scheduled term caesarean delivery as a method to evaluate neonatal outcome.