

GENERAL VERSUS REGIONAL ANESTHESIA IN ELECTIVE CESAREAN SECTION AND ITS EFFECT ON NEONATAL WELLBEING

By

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ABSTRACT

Background: Cesarean section is associated with increased risks for adverse obstetric and perinatal outcomes. Many factors may contribute in the unfavorable neonatal outcome during cesarean section. The American College of Obstetricians and Gynecologists (ACOG) eventually acknowledged that in certain cases, elective cesarean delivery might be performed provided the physician believed that the procedure would promote the overall health and welfare of the woman and her fetus.

Objective: To compare the effects of general versus spinal anesthesia on neonatal outcome during elective cesarean section.

Patients and Methods: This study was conducted on 100 pregnant women who had elective cesarean section for singleton full term pregnancy in Al-Hussein University Hospital and Al-Shikh Zayd Al-Nahyan Hospital. They were divided into 2 groups (according to anesthesia type), each consists of 50 women: The 1st group (general anesthesia group): was started by Thiopentone 5mg/kg and Succinylcholine 1-2mg/kg then intubation and maintenance by inhalational anesthesia (Isoflurane 0.5%), and after delivery of baby 100µg Fentanyl was given and the 2nd group (spinal anesthesia group): where heavy Marcaine (heavy Bupivacaine) was used; 2-3 ml was injected via spinal needle (pencil-point) gauge 25 in L3-4 or L4-5 without using opioids.

Results: The percentage of delivered neonates who suffered respiratory distress (with or without NICU admission) was significantly higher in the general anesthesia group compared to the spinal anesthesia group [24% in group (A) vs 8% in group (B)]. Also, the percentage of delivered neonates who required NICU admission was significantly higher in the general anesthesia group. There was also increased evidence of respiratory depression in neonates of women who delivered under general anesthesia as shown by the mean of Silverman Anderson retraction, the mean of Downes' score in neonates, the mean of Apgar score at 1 minute and the mean of Apgar score at 5 minutes. There was a statistically significant difference between the two study groups as regards the percentage of male and female neonates in relation to total number of delivered neonates who suffered respiratory distress in each group.

Conclusion: The incidence of neonatal respiratory morbidity and NICU admission occurred more often with the use of general compared to spinal anesthesia in elective cesarean sections. Clinicians considering the use of general anesthesia for a cesarean delivery should be aware of these possible consequences for the infant, for both planned and emergency cesarean sections.

Key words: General, regional anesthesia, elective cesarean section, neonatal wellbeing.

INTRODUCTION

Respiratory distress is a common reason for a neonate seeking medical attention. The clinical features which are tachypnea, intercostals retractions, grunting or cyanosis; could be the manifestations of a variety of etiological causes. Both pulmonary and extra pulmonary causes could present as tachypnea and respiratory distress (*Reuter et al., 2014*).

The birth of a child is preceded by several changes to prepare for transition from intra to extra uterine life. The five major events that establish the lungs as the organ of gas exchange at birth include: clearance of fetal lung fluid, establishment of spontaneous breathing, decrease in pulmonary vascular resistance, release of surfactant and cessation of the right-to-left shunting of venous blood returning to the heart (*Lokesh et al., 2013*).

Several methods of evaluation have been used by anesthesiologists in an attempt to separate out the fetal/neonatal effects of their interventions from concomitant medical and nursing management, and from the influence of pre-existing maternal conditions. The Apgar score assesses five physical signs, traditionally used by anesthesiologists to monitor a neonatal condition: heart rate, respiratory effort, muscle tone, reflex irritability and color at one and five minutes after birth (*Jeganathan et al., 2017*).

When a neonatologist or pediatrician has been summoned to the operating room or labor suite just prior to, or immediately after the delivery of an infant, he or she is focused on the neonate's immediate status. The condition of the neonate at birth is

affected by many factors, such as concurrent maternal obstetric and medical problems, therapeutic interventions, and maternal drug use. In terms of maternal analgesia and anesthesia, factors such as the effects of intravenous opioids and sedatives, adequacy of maternal oxygenation, hemodynamic stability, as well as the direct and indirect effects of regional and general anesthesia are significant. If systemic opioids have been used, it is important to know the type of drug, route of administration, dose, and timing in relation to the time of delivery (*Kalache et al., 2015*).

Following induction of general anesthesia and tracheal intubation, anesthesia is maintained by oxygen, low concentrations of one of the volatile anesthetic agents such as halothane, enflurane or isoflurane, and possibly nitrous oxide. General anesthesia is often administered for cesarean section when there is fetal distress (*David et al., 2017*).

Spinal (intrathecal) anesthesia involves the injection of local anesthetic through a small gauge needle directly into the cerebrospinal fluid of the subarachnoid space, which lies just anterior to the epidural space. The procedure is typically performed by an anesthesiologist. Much smaller volumes of local anesthetic are required in comparison to epidural anesthesia, because the drug is deposited in close proximity to the spinal nerves (*Olawin and Das, 2019*).

The aim of the present work was to compare between the effects of general versus spinal anesthesia on neonatal outcome during elective cesarean section.

PATIENTS AND METHODS

This was a prospective randomized study in which we selected a simple random sample of 100 pregnant women who had elective cesarean sections in Al-Hussein University Hospital and Al-Shikh Zayd Al-Nahyan Hospital, from the 1st of January 2017 to 15th of March 2018. The delivered neonates suffering of respiratory depression were admitted to Al-Hussein and Al-Shikh Hospital neonatal ICU.

All the elective cesarean sections were performed by the same surgeon with the same anesthesia team with fixation of all variables each time apart from the outcome measures of the study. The women participated in this study were divided into 2 equal groups: The 1st group (Group A or general anesthesia group) where induction of anesthesia was started by Thiopentone 5mg/kg and Succinylcholine 1-2mg/kg, then intubation and maintenance by inhalational anesthesia (Isoflurane 0.5%), and after delivery of baby 100µg Fentanyl was given, and the 2nd group (Group B or spinal anesthesia group) where heavy Marcaine (heavy Bupivacaine) was used; 2-3 ml was injected via spinal needle (pencil-point) gauge 25 in L3-4 or L4-5 without using opioids.

The study included full term singleton pregnancy (38-40 weeks) confirmed by both patient dates and 2-Dimensional biometry U/S scanning, age range of cases was 18-35 years, elective cesarean section (primary or repeat cesarean section) and duration from induction of anesthesia till fetal extraction should not exceed 10 minutes.

Women with fetal risk such as congenital anomalies (e.g. congenital heart diseases), or sepsis of the neonates, maternal medical disorders as diabetes mellitus and hypertension, contraindications for spinal anesthesia as disc prolapse, coagulopathies or hypotension, obstetric complications as PROM or antepartum hemorrhage and drug intake by the patient before delivery except vitamins were excluded from the study.

Informed consents were obtained from all the patients involved in the study and details of the procedure were explained to them. All patients involved in the study were subjected to detailed history and detailed physical examination.

Statistical methodology:

Data were statistically described in terms of mean standard deviation (SD), median [IQR: Interquartile range], or frequencies (number of cases) and percentages when appropriate. Comparison of numerical variables between the study groups was done using Student t test for independent samples in comparing normally distributed data and Mann Whitney U test for independent samples when comparing non-normal data. For comparing categorical data, Chi square (x2) test was performed. Exact test was used instead when the expected frequency is less than 5. P values less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

RESULTS

Demographic data among the two study groups as regards maternal age (years), parity, BMI, gestational age (weeks) and neonatal birth weight (kg) (Table 1).

Table (1): Demographic characteristics among the study groups

Parameters	Group (A) (n=50)	Group (B) (n=50)	P-value
Age (years)‡	26.75±5.40	26.67±4.59	>0.05
Parity#	1 (IQR:1)	1 (IQR:2)	>0.05
BMI [wt/(ht) ²] ‡	25.44±3.17	26.04±3.86	>0.05
Gestational age (weeks) ‡	38.19±1.02	38.29±1.00	>0.05
Neonatal birth weight (kg) ‡	3.27±0.40	3.28±0.40	>0.05
Neonatal gender¥			
Males	23 (46%)	26 (52%)	>0.05
Females	27 (54%)	24 (48%)	
Neonatal respiratory distress¥	12 (24%)	4 (8%)	0.046
Neonates suffering respiratory distress¥	n=12	n=4	
Males	8 (66.7%)	3 (75.0%)	>0.05
Females	4 (33.3%)	1 (25.0%)	

Using: ‡ Independent Sample t-test; # Chi-square test; ¥ Mann-Whitney test
Median (IQR): Interquartile range.

There was a statistically significant difference between the two study groups as regards the percentage of delivered neonates who suffered respiratory distress (with or without NICU admission) [24% in group (A) vs. 8% in group (B), p-value= 0.046], also statistically highly significant difference between the two

study groups as regards the percentage of male and female neonates in relation to total number of delivered neonates who suffered respiratory distress in each group [66.7% males vs. 33.3% females in group (A) and 75% males vs. 25% females in group (B)].

Table (1): Percentage of NICU admission, silverman Anderson retraction and downe's score among neonates delivered in group (A) compared to group (B)

	Group (A) (n=50)	Group (B) (n=50)	P-value
NICU admission#	9 (18%)	4 (8%)	0.049
Silverman Anderson retraction‡	1.47±2.17	0.71±1.49	0.037
Downes' score¥	2 (IQR: 2)	1 (IQR: 2)	0.018

Using: ‡ Independent Sample t-test; # Chi-square test; ¥ Mann-Whitney test
Median (IQR): Interquartile range.

There was a statistically significant difference between the two study groups as regards the percentage of delivered

neonates who required NICU admission [18% in group (A) vs. 8% in group (B), p-value= 0.049]. Also, statistically highly

significant difference between the two study groups as regards the mean of Silverman Anderson retraction and the mean of Downes' score in neonates delivered with respiratory distress

[1.47±2.17 in group (A) vs 0.71±1.49 in group (B), p-value= 0.037] and [2 (IQR: 2)] in group (A) vs [1 (IQR: 2)] in group (B), p-value= 0.018] respectively.

Table (2): Apgar score at 1 and 5 minutes in group (A) compared to group (B)

Apgar score	Group (A) (n=50)	Group (B) (n=50)	P-value
Apgar score (1 min.)	6 (IQR: 2)	7 (IQR: 2)	0.022
Apgar score (5 min.)	8 (IQR:1)	9 (IQR:1)	<0.001

Using: Mann-Whitney test; Median (IQR): Interquartile range.

There was a statistically significant difference between the two study groups as regards the median of Apgar score at 1 minute [6 (IQR2)] in group (A) vs [7 (IQR: 2)] in group (B), p-value= 0.022]

and highly significant difference between them as regards the median of Apgar score at 5 minutes [8 (IQR:1)] in group (A) vs [9 (IQR:1)] in group (B), p-value= <0.001].

DISCUSSION

Studies have shown that infants delivered under general anesthesia are more likely to have respiratory depression and require active resuscitation than those delivered under regional anesthesia (Lim et al., 2018). However, with appropriate care the infants are indistinguishable after the first few minutes of life (Reuter et al., 2014).

difference between the two groups as regards the percentage of delivered neonates who required NICU admission.

Mancuso et al. (2010) concluded that all kinds of anesthesia seem to be safe, but loco-regional blockade shows more advantages on the neonatal outcome also when a conversion is necessary.

The question posed regarding the effect of general versus regional anesthesia on neonatal Apgar scores is an interesting one. This subject has been studied by many investigators over the years, most commonly retrospectively and in the setting of elective cases (Abdallah et al., 2014).

Yismaw et al. (2019) concluded that anesthesia type did not seem to influence the short-term outcome of the newborn infants for the elective cesarean deliveries. They believed that both spinal and general anesthesia could be performed in elective term cesarean deliveries without any risk to the newborn infants.

In the present study, we found that there was a statistically significant difference between the two study groups as regards the percentage of delivered neonates who suffered respiratory distress (with or without NICU admission). Also, there was statistically significant

Contradictory to our study, Madkour et al. (2019) concluded that the rates of documented neonatal respiratory morbidity did not relate significantly to the anesthesia mode in an area-based retrospective study of all mothers who underwent elective cesarean section and delivered singleton infants at term

gestation over a three-year period from 1 July 2001 to 30 June 2004.

In the current study, we found that there was a statistically significant difference between the two study groups as regards the mean of Silverman Anderson retraction and the mean of Downes' score in neonates delivered with respiratory distress. Also, there was a statistically significant difference between the two study groups as regards the percentage of male and female neonates in relation to total number of delivered neonates who suffered respiratory distress in each group.

Elfarargy et al. (2020) showed that lower gestational age, cesarean delivery, and male sex are independent risk factors for TTN and neonatal respiratory depression.

Further analysis in the results of our study showed that there was a statistically significant difference between the two study groups as regards the mean of Apgar score at 1 minute and significant difference between them as regards the mean of Apgar score at 5 minutes.

Ateyah et al. (2018) showed that there were significantly increased risks of both intubation and a low Apgar 5 score if the delivery was performed under general anesthesia rather than spinal anesthesia. The current study also agrees with a study done.

Nafie and Ismael (2015) showed no significant difference between the effects of general anesthesia and spinal anesthesia on Apgar score of neonates at 5 minutes interval after birth, born after full term elective cesarean section.

CONCLUSION

The incidence of neonatal respiratory morbidity and NICU admission occurred more often with the use of general compared to spinal anesthesia in elective cesarean sections.

Clinicians considering the use of general anesthesia for a cesarean delivery should be aware of these possible consequences for the infant, for both planned and emergency cesarean sections.

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دراسة مقارنة بين تأثير التخدير الكلي والتخدير النصفي مجتمعاً على الجنين في الولادة القيصرية

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خلفية البحث: ترتبط الولادة القيصرية مع زيادة بعض المخاطر السلبية للولادة وفترة ما بعد الولادة للطفل والأم. وهناك عوامل عديدة قد تسهم في النتيجة الغير مواتية للأطفال حديثي الولادة بعد عمل القيصرية.

الهدف من البحث: مقارنة بين تأثير التخدير الكلي و النصفي على الأطفال حديثي الولادة في الولادة القيصرية الاختيارية من أجل اقتراح توصيات بنوع التخدير.

المریضات وطرق البحث: تم إجراء هذه الدراسة بقسم أمراض النساء والتوليد، مستشفى الحسين الجامعي ومستشفى الشيخ زايد آل نهيان، والتي تضمنت مشاركة 100 من السيدات الحوامل أجريت لهن ولادات قيصرية اختيارية و تم تقسيمهن إلى مجموعتين متساويتين: **المجموعة الأولى:** تم عمل القيصرية تحت تأثير التخدير الكلي باستخدام السيوفنتون 5 ملليجرام لكل كيلوجرام كبداية التخدير، مع إعطاء الساكسينيل كولين 1-2 ملليجرام لكل كيلوجرام، ثم وضع الأنبوبة الحنجرية، ويستمر التخدير بإعطاء التخدير الاستنشاقى أيزوفلوران 0.5%، ثم بعد ولادة الطفل يتم إعطاء 100 ميكروجرام فنتانيل وفي **المجموعة الثانية** تم عمل القيصرية تحت تأثير التخدير النصفي باستخدام الماركان الثقيل 2-3 مل وحقنه من خلال إبرة قطرها 25 فى الفراغات بين الفقرات القطنية من 3 إلى 4 أو الفقرات القطنية من 4 إلى 5 بدون إستخدام الاوبوييد.

نتائج البحث: كانت النسبة المئوية للأطفال حديثي الولادة الذين تم ولادتهم وكانوا يعانون من ضائقة تنفسية (مع أو بدون إدخال وحدة الرعاية المركزة لحديثي

الولادة أعلى بشكل ملحوظ في مجموعة التخدير العام مقارنة بمجموعة التخدير النخاعي وكانت النسبة المئوية للأطفال حديثي الولادة الذين تم ولادتهم والذين كانوا في حاجة لدخول وحدة الرعاية المركزة لحديثي الولادة أعلى بكثير في مجموعة التخدير العام وكان هناك أيضاً دليل متزايد على إكتئاب الجهاز التنفسي عند حديثي الولادة من السيدات اللواتي تم ولادتهن تحت التخدير العام كما هو موضح في متوسط تراجع سيلفرمان أندرسون ومتوسط داونز النتيجة عند الأطفال حديثي الولادة ومتوسط نتيجة على مقياس أبجار في الدقيقة الواحدة ومتوسط درجة أبغار عند 5 دقائق. أخيراً وكان هناك فرق ذو دلالة إحصائية عالية بين مجموعتي الدراسة فيما يتعلق بنسبة الأطفال حديثي الولادة الذكور والإناث فيما يتعلق بإجمالي عدد الأطفال حديثي الولادة الذين تم ولادتهم والذين عانوا من ضائقة تنفسية في كل مجموعة.

وقد تبين من هذه الدراسة حدوث إنخفاض في التنفس بالنسبة للأطفال حديثي الولادة مع التخدير الكلي أكثر من حدوثه مع التخدير النصفى من خلال حجز الأطفال في الرعاية المركزة لحديثي الولادة و باستخدام عامل ابجر وعامل سلفرمان اندرسون و عامل داون.

الاستنتاج: من الأفضل إجراء الولادة القيصرية الاختيارية تحت تأثير التخدير النصفى، مع الاهتمام بضرورة استخدام التخدير الكلي في حالات الطوارئ باعتبارها الوسيلة الأسرع للتخدير.

الكلمات الدالة: التخدير العام، التخدير الموضعي، العملية القيصرية الاختيارية، صحة الأطفال حديثي الولادة.