The Correlation Between the Duration of Fetal Extraction During Elective Cesarean Section and Low Apgar Score

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Abstract

Objectives: To explore the relation between the duration of fetal extraction during cesarean section and Apgar score.

Study Design: 100 pregnant women were included in the study to assess the relation between the Apgar score after elective cesarean section and the following:
- The duration of fetal extraction starting from initiation of anesthesia, either general or spinal, till clamping of the cord.
- The duration of fetal extraction starting from the incision of the uterus, till clamping of the cord.

Results: The interval between initiation of anesthesia till cord clamping ranged between 3.5 and 25.5 minutes with mean (11.02 ± 4.8). On the other hand, the interval between uterine incision till cord clamping ranged between 0.25 and 4.5 minutes with mean (1.74 ± 1.01). There was no statistically significant correlation between initiation of anesthesia till cord clamping interval and Apgar score recorded after 1 minute and 5 minutes (p-value=0.575 and p-value=0.674, respectively), also no statistically significant correlation between uterine incision till cord clamping interval and Apgar score recorded after 1 minute and 5 minutes (p-value=0.329 and p-value=0.237, respectively).

However, the pregnant women with history of previous cesarean section showed increased duration of initiation of anesthesia till cord clamping, with highly significant correlation (p-value<0.001). There was significant correlation between uterine incision till cord clamping interval and BMI of the pregnant women (p-value=0.005).

93 of the neonates delivered did not develop TTN, while the other 7 neonates developed TTN upon which they were admitted to NICU for further management. Gestational age at timing of the cesarean section was highly significant with TTN, with p-value=0.019. Also TTN was significant with male gender, much more than female one, with p-value=0.053 (as TTN developed in 6 male neonates compared to only 1 female neonate). Duration, either initiation of anesthesia till cord clamping interval or uterine incision till cord clamping interval, has no significant difference with development of TTN.

Conclusions: No correlation between the duration of fetal extraction (either initiation of anesthesia till cord clamping interval up to 25.5 minutes or uterine incision till cord clamping interval up to 4.5 minutes) and Apgar score recorded at 1 minute and 5 minutes.

Key Words: Cesarean section – Apgar score – Anesthesia – TTN – Fetal extraction.

Introduction

CESAREAN section has classically been defined as delivery of a fetus through a surgically created incision in the anterior uterine wall. Because cesarean and section both refer to an incision, some prefer the terms cesarean delivery or cesarean birth to describe the procedure [1].

Cesarean section is associated with increased risks for adverse obstetric and perinatal outcomes [2]. Many factors may contribute in the unfavorable neonatal outcome during cesarean section. 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 [3].

With an ever increasing number of cesarean sections performed in the whole world, the necessity of understanding the influence of operative time on perinatal morbidity is important; as operative time may be one of the factors that contribute in the unfavorable neonatal outcome during cesarean section [4].

There are many factors that affect cesarean operative time. Operative time is affected either by modifiable or non-modifiable factors. Modifiable factors such as hand skills of the surgeon and timing of sterilization after initiation of anesthesia, markedly affect the operative time. Non-modifiable
factors, such as; history of undergoing cesarean section (number of previous cesarean sections), BMI of the pregnant women and presentation of the fetus may have a role in the cesarean operative time [4].

The aim of this study is to explore the relation between the duration of fetal extraction during cesarean section and Apgar score.

**Material and Methods**

This study involved 100 pregnant women who underwent elective cesarean section in Kasr Al-Aini Maternity Hospital, Cairo, Egypt from May 2010 to May 2011.

Full informed consent was obtained from all the patients involved in the study and details of the procedure were explained to them.

All cases included in the study had an elective cesarean section (either primary or repeat cesarean section) for a singleton full term pregnancy (37-42 weeks), no chronic or pregnancy induced illness and no history of maternal drug intake before the cesarean section (which may affect the neonatal wellbeing).

All patients involved in the study were subjected to detailed history on admission including personal, menstrual, obstetric, contraceptive, past and family history in addition to detailed physical examination including general, abdominal and local pelvic examination.

Time from the initiation of anesthesia till cord clamping and time from uterine incision till cord clamping were recorded. Apgar score after 1 and 5 minutes as well as respiratory rate and weight of neonate were calculated by trained pediatric resident, and then incidence of Transient Tachypnea of Newborn (TTN) among the studied neonates was calculated.

The primary outcome measure was to explore the relation between the Apgar score and the duration of fetal extraction starting from initiation of anesthesia till cord clamping as well as the duration of fetal extraction starting from the uterine incision till cord clamping. The secondary outcome measures were to explore the relation between the Apgar score and the number of previous cesarean sections, type of anesthesia, gestational age and BMI of the pregnant women.

The data were coded, entered and processed on an IBM-PC compatible computer using statistical package for social sciences (SPSS) version 17. *p*-value of <0.05 was considered significant. Unpaired Student's *t*-test was used to assess the statistical significance of the difference between two population means and medians in a study involving independent samples.

**Results**

100 pregnant women were involved in the study and underwent elective cesarean sections.

Table (1) shows that the interval between the initiation of anesthesia till cord clamping ranged between 3.5 and 25.5 min. with mean (11.02 ± 4.8). On the other hand the interval between uterine incision till cord clamping ranged between 0.25 and 4.5 min. with mean (1.74 ± 1.01). The women age ranged from 18 up to 41 years old with mean (26.93 ± 5.57). The gestational age of the selected cases ranged between 37 and 42 wks with mean (39.31 ± 1.24).

BMI of the pregnant women was calculated before admission to the operative room for the cesarean section. BMI ranged in this study from 21.3 to 38 kg/m$^2$ with mean (29.9 ± 3.4). Neonatal weights in this study ranged between 2.5 and 4.5 kg with mean (3.24 ± 0.45). 48 of the neonates delivered during the study were males, while the other 52 were females.

Table (1): Demographic data and vital characteristics of women and neonates involved in the study (no.=100).

<table>
<thead>
<tr>
<th>Range</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age</td>
<td>18-41</td>
</tr>
<tr>
<td>BMI (kg/m$^2$)</td>
<td>21.3-38</td>
</tr>
<tr>
<td>Gestational age</td>
<td>37-42</td>
</tr>
<tr>
<td>Birth weight (kg)</td>
<td>2.5-4.5</td>
</tr>
</tbody>
</table>

**Neonatal gender:**

| Male     | 48 (48%) |
| Female   | 52 (52%) |

**Duration from initiation of anesthesia till cord clamping (minutes)**

| 3.5-25.5  | 11.0±4.8 |

**Duration from uterine incision till cord clamping (minutes)**

| 0.25-4.5  | 1.74±1.01 |

**TTN:**

| Positive cases | 7 (7%) |
| Negative cases | 93 (93%) |

93 of the neonates delivered did not develop TTN, while the other 7 neonates developed TTN upon which they were admitted to NICU for further management. Gestational age at timing of the cesarean section was highly significant with TTN,
with \( p \)-value=0.019. Also TTN was significant with male gender, more than female one, with \( p \)-value=0.053 (as TTN developed in 6 male neonates compared to only 1 female neonate). Duration, either initiation of anesthesia till cord clamping interval or uterine incision till cord clamping interval, has no significant correlation with development of TTN.

Table (2) shows that there was no statistically significant correlation between initiation of anesthesia till cord clamping interval and Apgar score recorded after 1 and 5 minutes (\( p \)-value=0.575 and \( p \)-value=0.674, respectively), also no statistically significant correlation between uterine incision till cord clamping interval and Apgar score recorded after 1 and 5 minutes (\( p \)-value=0.329 and \( p \)-value =0.237, respectively).

There was also no significant correlation between number of previous cesarean sections and Apgar score recorded after 1 and 5 minutes (\( p \)-value=0.091 and \( p \)-value=0.256, respectively). There was no significant correlation between type of anesthesia and Apgar score recorded after 1 and 5 minutes (\( p \)-value=0.951 and \( p \)-value=0.486, respectively).

There was no significant correlation between the gestational age and Apgar score after 1 and 5 minutes (\( p \)-value=0.329 and \( p \)-value=0.237, respectively). There was no significant correlation between uterine incision till cord clamping interval and BMI of the pregnant women. (\( p \)-value=0.005).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Apgar score at 1 minute</th>
<th>Apgar score at 5 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( p )-value</td>
<td>Significance</td>
</tr>
<tr>
<td>Initiation of anesthesia till cord clamping interval</td>
<td>0.575</td>
<td>NS</td>
</tr>
<tr>
<td>Uterine incision till cord clamping interval</td>
<td>0.329</td>
<td>NS</td>
</tr>
<tr>
<td>Gestational age</td>
<td>0.194</td>
<td>NS</td>
</tr>
<tr>
<td>BMI of pregnant women</td>
<td>0.638</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Discussion**

Cesarean section rates show wide variation among countries in the world, ranging from 0.4 to 40 percent and a continuous rise in the trend has been observed in the past 30 years. The most known recommended figure is the 15 percent upper limit suggested by world health organization (WHO) in 1985. This recommendation was based on the cesarean section rates of the countries that had the lowest maternal and neonatal mortality rates in the world at that moment (approximately 10%). Since those were developed countries, (WHO) increased the recommended cesarean section rate to 15 percent, taking into consideration that developing countries had a larger proportion of population at risk that could benefit from cesarean section [5].

In Egypt about 50 percent of births are delivered at home in absence of trained medical personnel, largely because of lack of access to hospitals or appropriate modern medical services in rural areas (or rural-like areas of migrants). Home births, although still prevalent are decreasing. The vast majority of home births occur at home by default (no choice) [6].

The present study was designed to explore the relation between the duration of fetal extraction during cesarean section, either from initiation of anesthesia till clamping the cord or from the incision of the uterus till clamping the cord, and the neonatal outcome was assessed by Apgar score recorded after 1 and 5 minutes, as the primary outcome variable.

The current study, also, aimed to explore the relation between the Apgar score, recorded after 1 and 5 minutes, and secondary outcome variables such as number of previous cesarean sections, type...
of anesthesia, gestational age and body mass index (BMI) of the pregnant women.

The current study included 100 women, and as regarding the results, there was no statistically significant correlation between initiation of anesthesia till cord clamping interval and Apgar score recorded after 1 and 5 minutes (p-value=0.575 and p-value=0.674, respectively), also no statistically significant correlation between uterine incision till cord clamping interval and Apgar score recorded after 1 and 5 minutes (p-value=0.329 and p-value=0.237, respectively).

With the present study, Maayan-Metzger and colleagues showed no significant correlations between most of the major neonatal short-term clinical outcomes and duration of the 3 major stages of elective cesarean delivery at term (from induction of regional anesthesia to delivery (I-D); from incision of the skin to delivery (S-D); and from incision of the uterus to delivery (U-D)). The results indicate that obstetricians performing elective cesarean sections for term pregnancies under regional anesthesia have a relatively large timeframe to perform the operation without affecting neonatal wellbeing [7].

However, in a study done by Doherty and co-workers, low five-minute Apgar scores were directly related to an increased operative time. They categorize the cesarean section time interval as <30min., 30-60min., and >60min. Apgar score of 5min. <7 was significant with the duration between 30-60 min. and >60min. which was not reached in the current study (maximum duration was 25.5min., and Apgar score <7 was 1% of the patients in the present study). These findings persisted even after the underlying maternal conditions and the reason for the cesarean had been taken into consideration [4].

The current results showed no significant correlation between the number of previous cesarean sections and Apgar score recorded after 1 and 5 minutes (p-value=0.091 and p-value=0.256, respectively).

The present study agrees with a study done by Qublan and Tahat, in Jordan, and showed no significant correlation between the number of previous cesarean sections and Apgar score recorded after 1 and 5 minutes, where Apgar score >7 at one and 5 minutes were similar in the 3 groups; Group 1= with 1 previous C.S (n=1183); Group 2=2 previous C.S (n=781); and Group 3=>3 previous C.S (n=312) [8].

However, it disagrees with another study done by Gedikbasi et al. which showed that repeated cesarean sections increase the risks for operative complications and poor perinatal outcomes [9].

In the present study, there was no significant correlation between type of anesthesia and Apgar score recorded after 1 and 5 minutes (p-value=0.951 and p-value=0.486, respectively). The results agree with the study carried by Aftab and co-workers in which there was 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 [10].

The present study, also, agrees with another study done by Afolabi et al. and showed that one form of anesthesia has not been shown to be superior to the other, in the neonatal outcome assessed by Apgar score recorded after 1 and 5 minutes [11].

However, it disagrees with another study, which showed that the increased rate of adverse neonatal outcomes should be weighed up when general anesthesia is under consideration. However, the greatest absolute increases in the rate of intubation and of a 5-minute Apgar score <7 for deliveries performed under general anesthesia occurred in the most vulnerable infants: Those who were delivered by emergency C.S because of fetal distress [12].

In the current study also, there was no significant correlation between the gestational age and Apgar score after 1 and 5 minutes (p-value=0.194 and p-value=0.184, respectively). However, Catlin et al. showed that there was an impact of gestational age on Apgar score. The 1 and 5 minutes Apgar scores were directly related to gestational age. Respiratory efforts, muscle tone, and reflexes were the major determinants for a decreasing Apgar score with declining gestational age [13]. A recent study done in the United States showed that the distribution of Apgar scores depended on gestational age, the youngest gestational ages having higher proportions of low Apgar scores [14].

In the present study, there was no significant correlation between the BMI of the pregnant women and neonatal outcome, assessed by Apgar score recorded after 1 and 5 minutes (p-value=0.638 and p-value=0.502, respectively).

With the present study, there is a population-based study of 60, 167 deliveries from Wales found that a 5-minute Apgar score below 7 was not significantly more common in the obese compared to...
normal weight women [18]. Likewise, a Danish study of 8,092 women found no differences between normal weight, overweight, and obese women with regards to Apgar score [16].

Against the present study Straube and co-workers (2010), demonstrated an influence of maternal BMI on Apgar scores [17]. Also, Chen et al. (2010), concluded that maternal obesity is associated with a significantly increased risk for decreased Apgar scores at birth [18].

In the present study, the BMI of the pregnant women showed no significant correlation with the duration of cesarean section (\(p\)-value=0.546). It agrees with Wilson and co-workers study that showed the absence of correlation between operative times and body mass index [19].

However, it disagrees with Doherty and colleagues study where the operative time is longer in women with BMI >30 (\(p\)-value=<0.001) [4].

Further analysis for the results in the present study, showed that pregnant women with history of previous cesarean sections had increased duration of the initiation of anesthesia till cord clamping, with highly significant correlation (\(p\)-value=<0.001). It agrees with the study done in Mississippi where previous cesarean sections influenced the duration of cesarean operative time and were significantly related to the duration of cesarean section [4].

It agrees with another study done by Wilson et al. who concluded that in parturients with previous cesarean deliveries, operative time becomes longer [19].

It was noticed, in the present study, the absence of significant correlation between the initiation of anesthesia till cord clamping interval and the neonatal respiratory rate (\(p\)-value=0.817), or the occurrence of TTN (\(p\)-value=0.437). The current study, showed a significant correlation between the uterine incision till cord clamping interval and BMI of the pregnant women (\(p\)-value=0.005). BMI, in the present study, was one of the factors that increased the uterine incision till cord clamping interval. Doherty and colleagues showed that the operative time is longer in women with BMI >30 (\(p\)-value=<0.001) [4].

The uterine incision till cord clamping interval increased in the duration, with the increase of the duration of the initiation of anesthesia till cord clamping interval with a significant correlation (\(p\)-value=0.007). It agrees with a study done by Maayan-Metzger and colleagues that showed longer initiation of anesthesia till cord clamping interval among women with longer uterine incision till cord clamping intervals (\(p\)-value=0.04) [7].

In the present study, presentation of the fetus was one of the factors, that affected the uterine incision till cord clamping interval, in which breech presentation was associated with increase in uterine incision till cord clamping interval with highly significant correlation (\(p\)-value<0.001). It disagrees with Maayan-Metzger and colleagues study where the breech presentation is not significantly correlated with uterine incision till cord clamping interval [7].

In the present study also, birth weight of the neonates showed no significant correlation with the initiation of anesthesia till cord clamping interval and uterine incision till cord clamping interval (\(p\)-value=0.553 and \(p\)-value=0.342, respectively). It agrees with Doherty and co-workers study done in 2008, [4] while in Maayan-Metzger and colleagues study done in 2010, [7] there was a significant correlation between birth weight of the neonates and uterine incision till cord clamping interval, but no significant correlation with the initiation of anesthesia till cord clamping interval.

Further analysis in the results of the present study showed that the gestational age was statistically significant with Transient Tachypnea of Newborn (TTN), as gestational age increase is associated with decrease in the incidence of TTN (\(p\)-value=0.019). The study done by Tita and co-workers indicates that for elective cesarean delivery, fewer problems occur if the surgery is delayed until fetal gestational age is more than 39 weeks and younger than 41 weeks [20].

Robinson et al. suggested that there are benefits for waiting until 39 weeks of gestation to perform an elective repeat cesarean delivery. The model demonstrated increased costs through increasing adverse outcomes among elective repeat cesarean deliveries performed <39 weeks of gestation [21].

It was observed in the present study that TTN developed in 6 males while only 1 female developed TTN, with \(p\)-value of 0.053 which is almost significantly correlated, and that made the male gender of the neonate may be one of the risk factors of developing TTN. A study done by Derbent and co-workers showed that lower gestational age, C.S delivery, and male sex are independent risk factors for TTN [22].
References


