



Does the Decision-to-incision Time Affect Neonatal Outcomes in the Emergency Cesarean Section?

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Abstract

OBJECTIVES

We examined whether the decision-to-incision (D-I) interval of 30 min in women undergoing emergency C-section is meaningful for actual clinical outcomes of neonates. We also examined the correlation between D-I interval and neonate health status.

STUDY DESIGN

A retrospective study of 212 mothers who underwent emergency C-section was performed from March 01, 2008 to February 28, 2013. The mothers were divided into two groups: Group I (n = 135) had neonates with gestational age < 37 weeks, and Group II (n = 77) had neonates with gestational age \geq 37 weeks. Each group was further divided into two subgroups: those with D-I interval \leq 30 min and those with D-I interval >30 min. Neonatal prognostic factors, including Apgar scores, were compared between the subgroups.

RESULTS

In Group I, no significant differences in 1-min and 5-min Apgar scores, umbilical arterial pH and NICU admission rate were observed between cases with D-I interval \leq 30 min and >30 min. In Group II, there was no significant difference in 1-min and 5-min Apgar score.

CONCLUSION:-

Neonatal prognosis was not significantly associated with D-I interval.

Keywords: Cesarean delivery, Decision-to-incision interval, 30-minute rule

Introduction

Emergency delivery by Cesarean section (C-section) accounts for 2% to 5% of total deliveries worldwide, and is recommended when protection of the fetus or mother is needed [1]. The purpose of emergency C-section is to minimize harm to the fetus and maintain health of the mother. Therefore, it is important that the C-section is done as quickly as possible.

Several medical societies proposed guidelines to

achieve rapid emergency C-section. For example, the American College of Obstetricians and Gynecologists (AGOC), the American Academy of Pediatrics, the Royal College of Obstetricians and Gynecologists, and the Canadian National Consensus Conference recommend that emergency C-section be performed within 30 min of the decision for this procedure. The German Society of Gynecology and Obstetrics recommends less than 20 min [1-4].

These criteria are based on the minimum time needed to prepare for emergency surgery at a facility, not on the condition or outcome of the neonate. In this study, we examined whether the decision-to-incision (D-I) interval of 30 min is meaningful for actual clinical outcome. We also examined the correlation between the D-I interval and the health status of neonates.

Materials and methods

This is a retrospective study of 212 mothers who underwent emergency C-section at Seoul Paik Hospital, Inje University College of Medicine, from March 01, 2008 to February 28, 2013. There were 252 neonates, including twins.

Maternal information (age, parity, gestational age, and anesthetic method for surgery) were collected. Indications for emergency C-section (non-reassuring fetal heart rate, placental abruption, placenta previa, pregnancy-induced hypertension [PIH], and uterine rupture) were also recorded. The Apgar score and umbilical arterial pH of the neonates were collected.

All mothers were divided into two groups. Group I (n = 135) had neonates with a gestational age < 37 weeks, and Group II (n = 77) had neonates with a gestational age \geq 37 weeks. Group I was further divided into 2 sub-groups: those with D-I interval \leq 30 min and those with D-I interval >30 min. In each of these sub-groups, each neonate's Apgar score at 1 min and 5 min, umbilical arterial pH, and admission to a neonatal intensive care unit (NICU) were recorded. Group II was also divided into 2 sub-groups: those with D-I interval \leq 30 min and those with D-I interval >30 min. The Apgar scores at 1 min and 5 min were collected for each of these sub-groups.

Statistical analysis was performed using the Mann-Whitney and Chi square tests, as appropriate,

and a *p* value below 0.05 was considered significant.

Results

The mean D-I interval of all 212 mothers was 48 min. The D-I interval was ≤ 30 min in 69 mothers (32.5%), and >30 min in 143 (67.5%) mothers. There were 174 neonates in Group I (gestational age < 37 weeks); the D-I interval was ≤ 30 min in 53 (30.5%) of these neonates, and >30 min in 121 (69.5%) neonates. There were 78 neonates in Group II (gestational age ≥ 37 weeks); the D-I interval was ≤ 30 min in 26 (33.3%) of these neonates, and >30 min in 52 (66.7%) neonates.

Table 1 summarizes the characteristics of the 212 mothers, including age, gestational age, twinning, and anesthetic methods. All of these mothers received surgery with an indication for emergency C-section due to non-reassuring fetal heart rate, umbilical cord prolapse, placental abruption, placenta previa, PIH, or uterine rupture.

Table 2 and Figure 1 summarize the neonate data for Group I (gestational age < 37 weeks). The mean Apgar score was 6.28 ± 1.32 (D-I interval ≤ 30 min) and 6.18 ± 1.55 (D-I interval > 30 min). The mean umbilical arterial blood pH was 7.29 ± 0.04 (D-I interval ≤ 30 min) and 7.23 ± 0.66 (D-I interval > 30 min); this pH was less than 7.20 in 3 (5.7%) of neonates whose DI intervals were below 30 min, and in 7 (5.8%) neonates whose DI intervals were above 30 min. These 2 groups had no significant differences in any of these parameters, nor in admission rate to the neonatal intensive care unit (NICU).

Table 3 and Figure 2 summarize the neonate data for Group II (gestational age ≥ 37 weeks). Comparison of neonates with D-I intervals >30 min and ≤ 30 min indicated no significant differences in the 1 min Apgar score (8.34 ± 1.04 vs. 8.21 ± 1.19) or the 5 min Apgar score (9.34 ± 0.67 vs. 9.42 ± 0.77). None of these neonates were admitted to the NICU.

Discussion

Delivery by emergency C-section is a procedure that requires the collaboration of professionals in obstetrics, anesthesiology, pediatrics, and nursing. Delays in surgery can negatively impact the health of the neonate and mother. Thus, several studies have suggested 30 min as the maximum time for the D-I interval. In US hospitals, about two-thirds of emergency C-sections have D-I intervals less than 30

min. More specifically, 62% of cases with non-reassuring fetal heart rate and 98% of cases with obstetric anomalies (umbilical cord prolapse, placental abruption, placenta previa, and uterine rupture) had D-I intervals less than 30 min. However, some recent studies showed that limiting the D-I interval to 30 min provides no benefit to mothers or neonates [5, 6, 13].

There is only limited research on the D-I interval. In the 1950s, Halsey et al. reported the average D-I interval for emergency C-section was 43 min [7]. In the 1960s, Choate and Lund reported the mean D-I interval for 177 emergency C-sections was 12 min, and recommended that delivery should occur within 15 min; however, in one-third of their deliveries, the D-I interval exceeded 15 min and 14% of deliveries required more than 30 min [8]. In the 1990s, Schauburger et al. examined emergency C-sections in 75 patients, and reported that 63% of patients had D-I intervals below 30 min, but that the D-I interval was unrelated to neonatal morbidity [9]. A recent US study reported that the D-I interval averaged 30.5 min in 84 preterm neonates [10]. Maintaining a D-I interval of 30 min or less may be challenging for most hospitals. The wide range of D-I intervals in these previous studies is also an important issue, and may be due to different hospital settings. However, it necessary to determine if a maximum D-I interval of 30 min is medically appropriate, and to compare the results of various studies to establish guidelines.

The most frequent indication for emergency C-section in this study was a non-reassuring fetal heart rate. The D-I interval was less than 30 min in 32.5% of these cases; but the D-I interval had no significant effect on the status of these neonates in both groups. On the other hand, other studies reported statistically significant results over D-I interval. For example, neonates with short D-I intervals had lower Apgar scores, and MacKenzie and Cooke reported that a longer D-I interval was associated with higher the umbilical arterial pH [9, 11, 12]. There are two possible reasons for this. In most cases, an early surgical decision was made, or the condition of the fetus might not have been serious. Some authors suggested that other factors, such as maternal postural changes, intravenous injection, and administration of oxygen and terbutaline during transfer to the operating room may allow fetal uterine resuscitation. However, it is generally believed that taking immediate action is needed to prevent further damage to the neonate.

Spinal anesthesia is a time-consuming procedure. Quinn and Kilpatrick reported that the mean D-I interval of their study subjects was 25 min, but the D-I interval was less than 20 min for general anesthesia

[14]. In our study, spinal anesthesia was performed in 24.5% of patients whose D-I intervals exceeded 30 min, and 17.4% of patients whose D-I intervals were less than 30 min. However, the D-I interval had no significant effect on neonatal outcome. Moreover, we found that shortening of the time required for surgery did not significantly affect the neonatal prognosis. Therefore, a new guideline should be established that is based on more comprehensive clinical findings. The currently recommended D-I interval may be acceptable in some hospitals. But, it is important to quickly determine the need for surgery and perform the procedure as quickly as possible, and this requires the collaboration of various professionals to reduce the time needed for preparation.

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Illustrations

Illustration 1

Table 1. Characteristics of mothers who delivered neonates by emergency C-section.

Table 1. Characteristics of mothers who delivered neonates by emergency C-section.

Characteristic	All patients (n=212)	D-I interval ≤30 min (n=69)	D-I interval >30 min (n=143)
Maternal Age, years			
15-19	1 (0.5%)		1 (0.7%)
21-24	2 (0.9%)		2 (1.4%)
25-29	56 (26.4%)	16 (23.2%)	40 (28.0%)
30-34	97 (45.8%)	36 (52.2%)	61 (42.7%)
35-39	50 (23.6%)	16 (23.2%)	34 (23.8%)
40-44	6 (2.8%)	1 (1.4%)	5 (3.5%)
Gestational age, weeks			
<37	135 (63.7%)	43 (62.3%)	92 (64.3%)
≥37	77 (36.3%)	26 (37.7%)	51 (35.7%)
Twins			
No	172 (81.1%)	59 (85.5%)	113 (79.0%)
Yes	40 (18.9%)	10 (14.5%)	30 (21.0%)
Anesthesia			
General	165 (77.8%)	57 (82.6%)	108 (75.3%)
Spinal	47 (22.2%)	12 (17.4%)	35 (24.5%)
D-I interval			
≤30 min or less	69 (32.5%)		
>30 min	143 (67.5%)		

*D-I interval, decision-to-incision interval

Illustration 2

Table 2. Apgar score, umbilical artery pH, and NICU admission rate of Group I neonates (gestational age < 37 weeks, n = 174). Data indicate number (%) or mean ± standard deviation.

Prognostic factor	D-I interval ≤30 min (n=53)	D-I interval >30 min (n=121)	P
1 min Apgar score (mean±SD)	6.28 ± 1.32	6.18 ± 1.55	0.830
5 min Apgar score (mean±SD)	8.33 ± 0.99	8.14 ± 1.38	0.425
UA pH†	7.29 ± 0.04	7.23 ± 0.66	0.344
>7.20	50 (94.3%)	113 (93.4%)	
≤7.20	3 (5.7%)	7 (5.8%)	
NICU admission‡	4	5	0.458

†Umbilical artery pH was missing for 1 neonate.

‡NICU, neonatal intensive care unit

Illustration 3

Figure 1. Frequency distributions of 1 min and 5 min Apgar scores and umbilical arterial pH of Group I neonates (gestational age < 37 weeks, n = 174) whose D-I intervals were less than and >30 min.

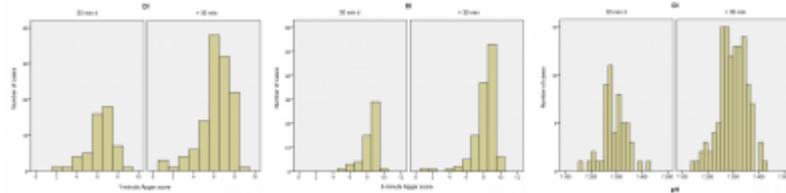


Illustration 4

Figure 2. Frequency distributions of 1 min and 5 min Apgar scores of Group II neonates (gestational age ≥ 37 weeks, n = 78) whose D-I intervals were ≤30 min and >30 min.

