

Neonatal Adverse Outcome of Elective Repeat Cesarean Delivery at Term

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Objective: To evaluate neonatal outcome between general elective repeat cesarean section (ERCS) at gestational age at birth < 39 or ≥ 39 weeks, and to assess the neonatal adverse outcome of delivering by emergency cesarean section (CS).

Materials and Methods: Retrospective cohort study of 1,461 singleton pregnant women scheduled for repeated CS at term from the Department of Obstetrics and Gynecology, Prapokklao Hospital from January 2013 to December 2015. The women were divided into two groups for CS at 37 - 38⁺⁶ weeks or at 39 - 42 weeks. Primary objective was the adverse outcome of neonatal including pulmonary complication, hyperbilirubinemia, APGAR score at 5 min < 7 and admission at neonatal intensive care unit (NICU). Independent t-test was used to compare maternal age and birth weight. Fisher exact test and Pearson's chi-squared were used to compare nominal data between the two groups.

Results: CS of 1,048 (71.7%) cases was performed before 39 completed weeks of gestation while 413 (28.3%) cases were operated at ≥ 39 weeks of gestation. Neonatal outcome between the 2 groups were not statistically different. Patients of parity > 2 signified more risk for emergency CS than those of parity ≤ 2 (2.16% versus 0.84%). Premature rupture of membrane (PROM), which is one of the causes of unplanned CS was found 3.82% in gestational age < 39 weeks group, compared to 1.69% in gestational age ≥ 39 weeks group (*p-value* 0.047). In emergency CS, the neonates were prone to NICU admission 3% (*p-value* 0.042).

Conclusion: There is no significant adverse neonatal outcome of ERCS at gestational age < 39 or ≥ 39 weeks. The adverse neonatal outcome from emergency CS was NICU admission.

Keywords: Previous cesarean section, Emergency cesarean section, Elective caesarean section, repeated cesarean delivery

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Rate of cesarean section (CS) is progressively increased worldwide in recent year^(1,2). Causation of this problem is unclear but involves many factors such as advanced maternal age, breech presentation, obesity in pregnancy, preeclampsia and maternal request. One of the most significant factor is the increase number of repeated cesarean sections cases⁽³⁾. Many studied reported that elective repeated cesarean section (ERCS) after previous CS in term or delivery before 39 weeks increased risk for neonatal adverse respiratory outcome (respiratory distress syndrome, pneumothorax)⁽⁴⁻⁶⁾, and admission to neonatal intensive care unit (NICU) when compared to after 39 weeks gestation⁽⁷⁻¹⁰⁾. The

American College of Obstetricians and Gynecologists (ACOG) and the National Institute for Clinical Excellence (NICE) recommended that general ERCS should be scheduled at 39 weeks of gestation because ERCS at 39 weeks decreased rated for adverse neonatal outcome^(11,12). The higher of gestational age planned for repeated cesarean section, the higher of emergency CS was observed. Emergency CS is known to be associated with increased complication for both maternal and neonatal adverse outcomes such as uterine rupture, fever, respiratory distress syndrome (RDS) and admission to the NICU⁽¹³⁻¹⁷⁾.

Patients planed for ERCS at or beyond 39 weeks of gestation could deliver prior to the scheduled date. Thus, both maternal and neonatal might face an unplanned CS which would increase risk of morbidity^(18,19).

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The aims of the present study were to evaluate neonatal outcome between general ERCS at gestational age less than 39 weeks against at or beyond 39 weeks group, and to assess the neonatal adverse outcome of delivery by emergency CS.

Materials and Methods

The present study was retrospective cohort study, conducted at the Department of Obstetrics and Gynecology, Prapokklao Hospital, Chantaburi, Thailand. The hospital is a tertiary care institution in Eastern region of Thailand. After approval by the Ethics Committee of the Chanthaburi province, the data of 1,461 singleton pregnant women delivered from January 2013 to December 2015 were analysed. Inclusion criteria were pregnant women with history of at least one previous CS. Cohorts were scheduled for a repeat CS delivery at term (beyond 37 weeks of gestation). Cases with placenta previa, placenta adherens, abruptio placenta, fetus with a major congenital anomaly, fetal death, severe medical disease and CS scheduled prior to 37 weeks of gestation were excluded.

The pregnant women were divided into two groups according to the gestational age when CS was performed. The gestational age < 39 weeks group included women who had CS at gestational age between 37 weeks to 38⁺⁶ weeks; while, the ≥ 39 weeks group included women who had the CS done at gestational age 39 - 42 weeks. Medical records were reviewed for demographic, clinical data of pregnant women and CS status. Gestational age was estimated based on clinical dating and early ultrasound (US) examination. Primary objective was to evaluate the adverse neonatal outcome. Pulmonary complication need for phototherapy, birth asphyxia (APGAR score at 5minute < 7) and NICU admission were evaluated. Neonatal outcomes and rate of emergency CS were compared between the < 39 weeks and ≥ 39 weeks groups.

RDS rate of neonatal outcome from Abdel-Baset et al⁽⁷⁾ was used to calculate the sample size. The ratio of sample size between 2 groups based on the pilot study. The sample size required at least 979 in gestational age < 39 weeks group and 392 in ≥ 39weeks groups. Statistical analysis was performed using STATA software version 12.1. Mean, standard deviation, and percentage were used for data analysis. Independent t-test was used to compare differences in mean maternal age and birth weight between the two groups.

Fisher's exact test and Pearson's chi-squared test were used to compare nominal data among groups. A *p*-value < 0.05 was considered statistically significant.

Results

A total of 1,461 pregnant women delivered by ERCS performed at term was enrolled for the present study. After exclusion, the subjects were divided into two groups depending on gestational age at time of cesarean section. There were 1,041 (71.7%) women in the group of gestational age < 39 weeks and 413 (28.3%) cases in gestational age ≥ 39 week group. Some had prenatal care at associated primary hospital but were referred to the present study's tertiary hospital for their delivery. The main indication for cesarean delivery was previous CS. Demographic data of the subjects were shown in Table 1. There were no significantly differences between the two groups, except for pregnant woman who attend prenatal care in tertiary hospital had higher rate of delivery at gestational age < 39weeks than gestational age ≥ 39weeks (71.7% vs 60.5%, *p*-value <0.001).

The incidence of adverse neonatal outcomes by gestational age groups at delivery were presented in Table 1. Among women who underwent ERCS at term (37 - 42 weeks gestation), there were no differences in neonatal adverse outcome between the < 39 and ≥ 39 complete week groups, including pulmonary complication, need for phototherapy, birth asphyxia and NICU admission. Neonatal birth weight was divided in the three groups: normal birthweight (2,500 - < 4,000 g), low birthweight (< 2,500 g), macrosomia (≥ 4,000 g). There was no significant difference of neonatal weight in both gestational age groups. However, women who appointed for CS at < 39 weeks with emergency CS were more prone to premature rupture of membranes (PROM) compared to the other group (3.8% vs 1.7%, *p*-value 0.047).

Maternal characteristics and neonatal outcomes in both elective and emergency CS were reported in Table 2. Maternal group of parity > 2 was more likely to have emergency CS (2.2% vs 0.8%, *p*-value 0.034). The pregnant women attended prenatal care in tertiary hospital had a higher rate of elective CS than emergency CS, (72.2% vs 61.7%, *p*-value <0.001). The neonates in emergency CS group had a higher rate NICU admission than the elective group (0.6% vs 0%, *p*-value <0.018). Nevertheless, there was no difference in neonatal adverse outcome between two groups.

Table 1. Maternal characteristics and neonatal outcome of the study population according to gestational age group (n = 1,461)

Characteristic	Total*	GA* (weeks)		p-value
		< 39 (1048,71.7%)	≥ 39 (413,28.3%)	
Age (yr) **	29.91 ± 5.87	30.08±5.7	29.47±6.2	0.121
< 20		25 (2.4)	17 (4.1)	
20-34		776 (74)	106 (25.7)	
> 35		247 (23.6)	107 (25.7)	
Parity				0.849
≤ 2		1,034 (98.7)	408 (98.8)	
> 2		14 (1.3)	5 (1.2)	
Place of ANC				<.001
Primary hospital		297 (28.3)	163 (39.5)	
Tertiary hospital		751 (71.7)	250 (60.5)	
Cause for CS				
Elective		676 (64.5)	276 (66.8)	0.111
Emergency		372 (35.5)	137 (33.2)	0.401
Indication CS				
Uterine contraction		328 (31.3)	127 (30.7)	0.9
PROM		40 (3.8)	7 (1.7)	0.047
Cervical dilatation		4 (0.4)	3 (0.7)	0.411
Medical complication	66 (4.5)			0.924
No		1,001 (95.5)	394 (95.4)	
Yes		47 (4.5)	19 (4.6)	
Neonatal Pulmonary Complication	99 (6.8)			0.106
No		970 (92.6)	392 (94.9)	
Yes		78 (7.4)	21 (5.1)	
APGAR at 5 min				0.160
< 7		5 (0.5)	0 (0)	
≥ 7		1,043 (99.5)	413 (100)	
NICU admission	3 (0.2)			0.276
No		1,045 (99.7)	413 (100.0)	
Yes		3 (0.3)	0 (0)	
Phototherapy	177 (12.1)			0.854
No		920 (87.8)	364 (88.1)	
Yes		128 (12.2)	49 (11.9)	
Birth weight (g)**	3,123.4±392.9	3,103.44±393.4	3,174.104±387.6	0.070
Low		56 (5.3)	13 (3.1)	
Normal		991 (94.6)	398 (96.4)	
Macrosomia		1 (0.1)	2 (0.5)	

*: n (%), ** mean±Standard deviation, yr: years, GA: gestational age, CS: cesarean section, PROM: premature rupture of membrane, NICU: neonatal intensive care unit; ANC: antenatal care clinic, APGAR: Apgar score, g: gram

Table 2. Maternal characteristics and neonatal outcome of the study population according to emergency CS group (n = 1,461)

	Total*	Elective*(952)	Emergency*(509)	p-value
GA				
< 39 weeks		676 (71)	372 (73.1)	0.428
≥ 39 weeks		276 (29)	137 (26.9)	0.428
Maternal				
Pregnancy Complication	164 (11.2)	116 (12.2)	48 (9.4)	0.112
Teen age	42 (2.9)	25 (2.6)	17 (3.3)	0.511
Elderly mother	353 (24.2)	236 (24.8)	117 (23)	0.481
Parity				0.034
≤ 2	1,442 (98.7)	944 (99.2)	498 (97.8)	
> 2	19 (1.3)	8 (0.8)	11 (2.2)	
Place of ANC				<.001
Primary hospital	460 (31.5)	265 (27.8)	195 (38.3)	
Tertiary hospital	1,001 (68.5)	687 (72.2)	314 (61.7)	
Medical complication				0.29
No	1,395 (95.5)	913 (95.9)	482 (94.7)	
Yes	66 (4.5)	39 (4.1)	27 (5.3)	
Neonatal				
Pulmonary Complication				0.915
No	1362 (93.2)	887 (93.2)	475 (93.3)	
Yes	99 (6.8)	65 (6.8)	34 (6.7)	
APGAR at 5 min				0.237
< 7	5 (0.3)	2 (0.2)	3 (0.6)	
≥ 7	1,456 (99.7)	950 (99.8)	506 (99.4)	
NICU admission				0.018
No	1,458 (99.8)	952 (100)	506 (99.4)	
Yes	3 (0.2)	0 (0)	3 (0.6)	
Phototherapy				0.262
No	1,284 (87.9)	830 (87.2)	454 (89.2)	
Yes	177 (12.1)	122 (12.8)	55 (10.8)	

*: n(%), ** mean±Standard deviation, yr: years, GA: gestational age, CS: cesarean section, NICU: neonatal intensive care unit; ANC: antenatal care clinic, APGAR: Apgar score

Discussion

There are recommendations from NICE and ACOG in 2012 and 2013 that elective CS should be scheduled at 39 complete weeks of gestation^(11,12). The purpose of the current study was to assess the effect of the scheduled gestational age for a repeat planned CS, the risk for an unplanned CS and adverse neonatal outcome in women with one or more previous CS. The present investigation used retrospective data from 2013 onward. However, some of the elective CS cases were scheduled not based on ACOG and NICE

guideline because our hospital was delayed in setting for new schedule at 39 complete weeks which occurred in late 2014. There were 1,048 (71.7%) pregnant women delivered before 39 weeks of gestation. Similarly high proportions were also reported from some European countries that 53% – 64% of planned CS were scheduled prior to 39 complete weeks of gestation^(10,20,21).

In the present report, there was no difference in neonatal outcome between pre-and post-39 complete weeks of gestation. This is similar to the study of Nir

Melamed, et al. that they did not detect the difference in neonatal outcome between ERCS scheduled of 38-week and 39-week groups⁽¹⁷⁾. Nevertheless, some study showed adverse neonatal respiratory outcome increase when ERCS was set at < 39 weeks^(6,7).

Rate of emergency CS was significantly high in pregnant women of parity > 2. The present study's result showed similar findings as reported by Ali et al⁽¹³⁾ that a higher parity was associated with higher emergency CS than the elective group.

Pregnant women who attended ANC at tertiary hospital had higher rate of delivery at gestational age < 39 weeks than at gestational age \geq 39 weeks. This might be the maternal control of medical and obstetrical conditions and proper management for complications in the tertiary hospital is better than those from the primary hospital. Both of these (control medical and obstetrical conditions) may be the confounding factors for emergency CS. Maternal risk for unplanned CS should plan to study in the near future. When comparing between emergency CS and elective CS, those in tertiary hospital had higher rate of elective CS than emergency case, might be because of ANC in tertiary unit can early detect and proper management for complications. In the current study, delaying planned CS to 39 weeks did not significantly raise the rate of emergency CS. This result was the same as Ojido JI, et al⁽²²⁾. In contrast to these reports, the study of Abdel-Baset et al reported that patients scheduled ERCS at \geq 39 complete weeks were more prone to deliver by emergency CS.

The rate of unplanned CS from PROM was significantly higher in gestation < 39 complete weeks group. Amniotic-fluid infection was a cause and a consequence of premature rupture of the fetal membranes⁽³⁾. Unplanned CS has consistently been shown to be associated with an increased risk of neonatal adverse outcomes⁽⁷⁾. The present study showed that the women who face an emergency CS were associated with a significant higher risk of neonatal NICU admission. There are many studies confirm this findings^(7,15,23). The strength of the present study is timing of 3 years to collect all cases of planned elective CS due to previous CS in our hospital. This population may represent maternal characteristic in Eastern part of Thailand. No previous published study in Thailand that shows adverse neonatal outcome comparing between elective CS at term gestational age < 39 weeks vs \geq 39 weeks. In the near future, another research extend to collect data from multicenters and study neonatal adverse outcome from ERCS by each gestational

age group. The present result may be used to adjust schedule for elective CS in the region.

The limitation of the present study is its retrospective and the small sample size. The authors cannot exclude the possibility of the confounding factors resulting from emergency CS. The difference of population included may be the reason that made it different from some other study^(6,7).

Conclusion

It is reasonable to define the optimal gestational age for planned CS and should be based on case history. In the authors' hospital, planned CS at 37 - 38⁺⁶ week and \geq 39 week face the adverse neonatal outcome and emergency condition in the same way. Major risk factor for emergency repeat CS were PROM and multiparity. The adverse neonatal outcome from emergency CS was NICU admission. The optimal balance between maternal and neonatal complications from the present study is achieved when the planned CS is scheduled around 37 - 42 weeks of gestation.

What is already known on this topic?

Previous literatures from worldwide reported increasing risk of adverse neonatal outcomes in ERCS before 39 weeks of gestation. However, there are some controversial aspects for maternal characteristic such as parity, place of ANC and emergency CS status.

What is this study added?

Planned CS at 37 - 38⁺⁶ week and \geq 39 week of gestation face the emergency condition in the same way. Unplanned ERCS tends to be increasing in NICU admission. Mostly cause of emergency CS was PROM and parity > 2.

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Potential conflict of interest

The authors declare on conflict of interests.

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