A Comparative Study of the Spontaneous Labor Rate in Scheduled Elective Cesarean Section at 38 Weeks versus 39 Weeks of Gestation in Parturient with Previous Cesarean Section

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Objective: *To assess the effect of the different scheduled gestational age for a repeat elective cesarean section (CS) on emergency cesarean section rate and adverse pregnancy outcomes in pregnant women with history of previous CS.*
Material and Method: *A prospective cohort study of singleton pregnant women who had a history of CS and were scheduled for a repeat elective CS to be performed. The cases were divided into two groups of which the elective CS was appointed at 38 or 39 weeks of gestation as study and control groups, respectively. Emergency cesarean section rate, maternal and neonatal complications were defined as main outcomes.*
Results: *Of 415 scheduled elective repeat cesarean deliveries performed at 38 weeks of gestation or later, 209 were scheduled between 38 0/7 and 38 6/7 weeks (study group), and 206 were scheduled between 39 0/7 and 39 6/7 weeks (control group). Most of the cases had one previous cesarean delivery. The emergency CS rate before schedule in the study group was significantly less than in the control group (15.3% vs. 51%, p<0.001). Spontaneous labor pain was a major factor to have unplanned delivery. The maternal intra-operative complications were significantly increased in women who had emergency cesarean before schedule compared to elective CS on scheduled in 38 weeks group (25% vs. 12.9%, p<0.001) and 39 weeks group (31.4% vs. 14%, p<0.001). The major intra-operative complication was uterine atony. There were no statistically significant differences in maternal post-operative and neonatal complications in scheduled elective CS in 38 and 39-week group. Transient tachypnea of the newborn (TTNB) was higher in elective CS at 38 week compared to emergency CS.*
Conclusion: *The emergency CS rate in 39 weeks gestation group was significantly higher than 38 weeks group. The incidence of adverse maternal intra-operative complications was statistically difference with emergency CS when compared to elective CS in case and control groups. Recommendation of elective repeated CS at GA39 weeks may be suitable only under some circumstances. The number of prior CS is one of factors that should be considered.*

Keywords: *Repeated cesarean section, Previous cesarean section, Spontaneous labor, Maternal and neonatal outcome*

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Rising cesarean section rate is a public health problem in both developed and developing countries around the world, including Thailand. The rate of cesarean delivery in Thailand rose from 23.35% in 2005 to 31.30% in 2012. In Thailand, there has been a continuous, increasing rate of cesarean section, around 4% every year[1]. Cesarean section (CS) is now a major and common surgery for Obstetricians; however, this procedure increases the likelihood of short and long-term adverse effects in mothers and babies[2].

The risks and benefits of delivery at a specific gestational age need to be compared with the potential complications of pregnancy continuation to get the optimal time for scheduled cesarean delivery. The objectives of this study were to compare the effect of different scheduled gestational age to the percentage of spontaneous labor and to determine if emergency CS had any association with maternal and neonatal adverse outcomes in pregnant women with previous cesarean section.

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Material and Method

The research protocol was reviewed and approved by the ethic committee of Thammasat University Hospital (registered number 160/2014). The prospective cohort study was conducted at Thammasat University Hospital between October 2014 and October 2015. Eligibility criteria were singleton pregnant women aged between 18-35 years with history of cesarean section in prior pregnancy. The exclusion criteria were pregnant women who had underlying diseases, uncertained gestational age (GA), multiple pregnancies, detected fetal anomaly, fetal growth restriction, morbid obesity and those who refused to participate in the study. All participants were confirmed for gestational age (GA) by ultrasonogram in early gestation. The participants who met the inclusion criteria were all enrolled at 34-36 week gestation then divided into two groups by patient-physician preference. The study group consisted of patients scheduled for repeated CS between 38^{+0}-38^{+6} week gestation. Those scheduled for repeated CS between 39^{+0}-39^{+6} week gestation were defined as the control group. The sample size was calculated based on the determination for difference in proportion between schedule elective and emergency CS groups. From the study of Melamed et al[8], the difference of percentage between two groups was 10.3%. If estimation of the difference and power were 20% and 80%, respectively, the number of participants in each group was 201. Considering the 10% attrition rate on the follow-up, the total sample size was up scaled to 221pregnant women in each group.

All participants were thoroughly orientated by research personnel and all received written research participant guideline. Written informed consent was signed after counseling. The participants were followed-up and their data were collected. The data comprised of demographic, GA at delivery, spontaneous labor rate, maternal intra-operative, post-operative complications and neonatal outcomes. For the participants who underwent emergency CS, the actual GA at delivery, indication for CS, the presence of uterine contractions, cervical dilatation, membrane status and pregnancy complications were also documented.

Primary outcome was emergency CS rate before scheduled in both groups. Emergency CS was defined as when CS was performed for any indications prior to scheduled date such as spontaneous labor pain, rupture of membrane and fetal compromised. Secondary outcomes were maternal and neonatal complications. Maternal complications included intra and post-operative complications.

Maternal intra-operative complications composed of uterine atony, extension of uterine incision, bladder injury, blood loss exceeding 1,000 ml. and cesarean hysterectomy. Maternal post-operative complications included postpartum hemorrhage (PPH), blood transfusion, wound infection, urinary tract infection (UTI), endometritis, hospitalization >5 days, intensive care unit (ICU) admission and maternal death. Neonatal complications included Apgar score at 5 minutes less than 7, respiratory distress syndrome (RDS),transient tachypnea of the newborn (TTNB), newborn ICU admission within 48 hours neonatal sepsis, perinatal death and still birth

Basic demographic data were presented as percentages for categorical variables, as mean and standard deviation (SD) for continuous variables. Rate of spontaneous labor before schedule, maternal and neonatal complications were compared between the 38 weeks and 39 weeks group. Data analysis was performed with the SPSS v23.0 software. Analysis of continuous data was done by unpaired t-test, and categorical data was compared using Chi-square or Fischer exact test as applicable. The *p*-value of less than 0.05 was considered significant.

Results

Four hundred fifteen out of 442 pregnant women completed the present study. Of these, 209 were in 38 weeks group (study group) and 206 were in 39 weeks group (control group). Twenty-seven participants dropped out before scheduled elective CS due to delivery elsewhere and loss of follow-up. The baseline characteristics in both groups were demonstrated in Table 1. The maternal age and average of GA were different between two groups. Most of the participants had one prior cesarean delivery.

The emergency CS rate before schedule was significantly different between study and control group (15.3% vs. 51.0%, respectively, $p<0.001$).The most common indication for emergency CS was spontaneous labor pain (87.5% vs. 86.7% in 38 and 39 weeks group, respectively). There was statistically a significant difference in maternal intra-operative complications. Nevertheless, the data did not showed a statistically significant difference in maternal post operative complications and adverse neonatal outcomes between the two groups, as presented in Table 2. The adverse pregnancy and neonatal outcomes in elective and emergency CS in the 38 and 39-week groups were compared as showed in Table 3. The maternal intra-operative complications especially uterine atony were

significantly increased in participants who had emergency cesarean delivery, as compared to scheduled CS in both 38-week groups (25% vs. 12.9%, $p<0.001$) and 39 weeks group (31.4% vs. 14%, $p<0.001$). The major intra-operative complication in both groups was uterine atony. However, maternal post operatives were not demonstrably significant differences between the 38 and 39-week groups with emergency cesarean delivery compared to elective group.

Following the subgroup analysis, the data demonstrated that the pregnant women with more than one prior CS had significantly higher maternal intra- and post operative complications comparison to one prior CS group in both 38 and 39-week groups (30.8% vs. 17.4%, $p = 0.022$ and 11.3% vs. 1.9%, $p = 0.003$, respectively).

Discussion

In 415 women scheduled for elective CS at 38 weeks of gestation or later, 137 (33%) cases showed up as unplanned emergency CS. This study demonstrated emergency CS in 15.3% and 51% of 38 and 39-week groups scheduled for elective CS, respectively. Similar high proportions of emergency CS were also reported from Glavind, et al study in Denmark, with up to 60% of emergency CS occurred prior to 39 weeks of gestation[6]. These findings were also found in Melamed, et al study, they demonstrated significantly higher rates of unplanned CS in the 39-week group compared with 38-week group (23% vs. 13.3% , respectively, $p = 0.02$)[8]. This study showed that the most common cause of emergency CS was labor pain before schedule time. In addition, this finding was similar to previous reports from Glavind et al and Roberts et al[9-11]. The reason for the high proportion of emergency CS in women who had scheduled for elective CS at 39-weeks may be explained by the engagement of fetal head and the stretching of the lower uterine segment that developed more with advanced gestational age[12].

The data demonstrated the parturient who scheduled elective CS in 38, 39-week gestation groups, there was significant difference in intra-operative maternal complications. However, the neonatal complication was not different between the two groups. Similar to the results from Israel, they reported that repeated planned CS to week 39 compared to week 38 was associated with an increased risk of maternal adverse outcome (31.9% vs. 21.6%, $p = 0.03$), but showed no significant different in adverse neonatal outcome[8].

The data showed significantly higher maternal intra-operative complications in the emergency group compared with the scheduled elective group either in 38-week and 39-week gestation groups. Similar findings were demonstrated from previous study[12,13]. Emergency CS led to uterine atony and extension of uterine incision because the operations were often performed during the advance stage of labor.

For neonatal composite morbidity, this study demonstrated the significant different between the emergency group compared with scheduled elective group in 38-weeks group; but this finding did not show significant different in the 39-week group. These findings were difference from the previous study by Robert, et al in 2014, they demonstrated significantly increased risk of neonatal morbidity (RR: 1.53-3.26, $p< 0.001$)[10]. The reason might be due to the small number of this group in the present study.

The data demonstrated that the pregnant women with more than one prior CS had significantly higher maternal intra- and post operative complications comparison to one prior CS group in both 38 and 39-week groups. These results were similar to the Balchin, et al study, who presented a cohort study with 377 women, all with two or more previous CS. High rate of adverse maternal outcome was shown at 21.5% vs. 31.9% in 38 and 39-week groups. The main adverse maternal outcomes were uterine scar dehiscence, infectious morbidities and wound hematoma[4].

Despite that, this study was a prospective study designed with adequate sample size, it still had some limitations. Firstly, the enrolled participants were assigned into groups by patient and physician preference, not by randomization. This could lead to selection bias. The study design as a randomize controlled trial might minimize selection bias. Secondly, the measurement bias from gestational age that was calculated from last menstruation with ultrasonogram in early gestation could have been in error by 5-7 days. Some participants could be mixed up in the groups. Thirdly, lack of control for some confounding factors such as size of fetus, amount of amniotic fluid, cervical condition and cervical length, patient activity or stress that might have an effect on difference times up to spontaneous labor pain. Moreover, the number of pregnant patients that have more than one prior CS was too low to demonstrate a strong correlation with the outcomes.

This research found that appointment to CS at 39 weeks gestation have more emergency CS rates that have statistical significant. Additionally, emergency CS was an important factor that has effect on maternal

intra-operative complications. However, scheduled elective CS at 38 weeks carried significant risk of neonatal complications as TTNB when compared with emergency CS and CS at 39 weeks. Thus, the appropriate appointment to delivery in previous CS women has to look for many factors such as the number of previous surgeries and gestational age by balancing between maternal and neonatal benefit.

Conclusion

Scheduling elective CS for the 39-week group (39^{+0}-39^{+6}) leads to as significant increase in emergency CS and is associated with adverse intra-operative maternal outcomes. The main cause of emergency CS was labor pain. Elective CS scheduled at 38 weeks carried significant risk of neonatal complications. A recommendation of elective repeated CS at 39 weeks GA may be suitable under some circumstances.

What is already known on this topic?

Important situations about which clinicians have concern in women with a history of cesarean delivery is the timing schedule for the pending CS. In year 2013, the American College of Obstetricians and Gynecologists (ACOG) recommended that elective cesarean delivery should be done after 39 completed weeks of gestation[3]. This recommendation was created by the previous literatures suggesting a strong association between adverse neonatal outcome and elective cesarean section at 37-38 weeks of gestation. Infants born by planned cesarean delivery (before the onset of labor) have an increased risk of respiratory distress syndrome (RDS) or transient tachypnea of the newborn (TTN) when compared with infants of similar gestation who experienced labor[4].

On the other hand, scheduled CS after 39 weeks increased the likelihood of an emergency cesarean section ranging from 25 to 60%[5,6]. Repeated cesarean delivery performed after the onset of labor was associated with higher risks of maternal complications such as uterine rupture, infection and increased intra-operative blood loss[7]. In some specific cases, cesarean delivery may be done prior to 39 weeks of gestation in order to avoid an emergency CS situation.

What this study adds?

As ACOG recommend to delivery by CS at 39 weeks may be appropriate with other indications that might not be suitable for overall indication such as in pregnant women with more than one previous CS. Number of prior CS is one of factors that should be considered.

Potential conflicts of interest

None.

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การศึกษาเปรียบเทียบอัตราการเจ็บครรภ์ก่อนการนัดผ่าตัดคลอดที่อายุครรภ์ 38 และ 39 สัปดาห์ในสตรีที่เคยผ่าตัดคลอดบุตร

ณัฐวดี ต่อดำรงค์, จรินทร์ทิพย์ สมประสิทธิ์, ชำนาญ แท่นประเสริฐกุล, กรณ์กาญจน์ ภมรประวัติธนะ, คมสันติ์ สุวรรณฤกษ์

ภูมิหลัง: *ในประเทศไทยพบว่าการผ่าตัดคลอดบุตรมีแนวโน้มสูงขึ้นอย่างมากโดยมีอัตราเพิ่มขึ้นถึงร้อยละ 4 ในแต่ละปีซึ่งอาจทำให้มีภาวะแทรกซ้อนของมารดาและทารกที่มากขึ้น การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาถึงการเปรียบเทียบอัตราการเจ็บครรภ์ก่อนการนัดผ่าตัดคลอดที่อายุครรภ์ 38 และ 39 สัปดาห์ในสตรีที่เคยผ่าตัดคลอดบุตรและภาวะแทรกซ้อนทางมารดาและทารก*

วัสดุและวิธีการ: *ศึกษาโดยการเก็บข้อมูลชนิดไปข้างหน้า (prospective cohort study) เก็บข้อมูลจากหญิงตั้งครรภ์เดี่ยว ซึ่งมีประวัติผ่าตัดคลอดบุตรในครรภ์ก่อนโดยแบ่งผู้ป่วยออกเป็น 2 กลุ่มได้แก่ 38 และ 39 สัปดาห์ (กลุ่มศึกษาและกลุ่มควบคุม) เก็บข้อมูลอัตราการเจ็บครรภ์และได้รับการผ่าตัดคลอดก่อนการนัดผ่าตัดคลอด รวมทั้งภาวะแทรกซ้อนในมารดาและทารก*

ผลการศึกษา: *หญิงตั้งครรภ์จำนวน 415 คนแบ่งเป็น 2 กลุ่มได้แก่ กลุ่มนัดผ่าตัดคลอดที่อายุครรภ์ 38 สัปดาห์ (ระหว่าง 38 0/7 ถึง 38 6/7 สัปดาห์) จำนวน 209 คน (กลุ่มศึกษา) และกลุ่มนัดผ่าตัดคลอดที่อายุครรภ์ 39 สัปดาห์ (ระหว่าง 39 0/7 ถึง 39 6/7) มี 206 คน (กลุ่มควบคุม) ส่วนใหญ่มีประวัติการผ่าตัดคลอด 1 ครั้งพบว่าในกลุ่มศึกษามีอัตราการผ่าตัดคลอดฉุกเฉินน้อยกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (ร้อยละ 15.3 และ 51, ตามลำดับ p<0.001) การเจ็บครรภ์คลอดพบว่าเป็นสาเหตุหลักของการผ่าตัดคลอดฉุกเฉินโดยทั้ง 2 กลุ่มที่ได้รับการผ่าตัดคลอดฉุกเฉินพบภาวะแทรกซ้อนทางมารดาระหว่างผ่าตัดมากกว่ากลุ่มผ่าตัดคลอดตามนัดอย่างมีนัยสำคัญทางสถิติ (p<0.001) ภาวะแทรกซ้อนหลักได้แก่ มดลูกไม่แข็งตัว ภาวะแทรกซ้อนทางมารดาหลังผ่าตัดและภาวะแทรกซ้อนทางทารกพบว่าไม่มีความแตกต่างกันอย่างมีนัยสำคัญ*

สรุป: *อัตราการผ่าตัดคลอดฉุกเฉินในกลุ่ม 39 สัปดาห์สูงกว่ากลุ่ม 38 สัปดาห์ อย่างมีนัยสำคัญทางสถิติและการผ่าตัดคลอดฉุกเฉิน พบว่าทำให้เกิดภาวะแทรกซ้อน ทางมารดาระหว่างการผ่าตัดสูงว่าการผ่าตัดคลอดตรงตามนัด ข้อแนะนำการผ่าตัดคลอดบุตรที่ 39 สัปดาห์ อาจเหมาะสมในบางกรณีโดยควรพิจารณาปัจจัยอื่นๆ ร่วมด้วย*