Medical sciences (2019) 1–8

Index Medicine International

Medical Sciences
Official website :
www.medicsciences.com

Multiple repeat cesarean sections – incidence and consequences: a review of 3 years in a tertiary hospital experience

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Background and aim. In this study, we aimed to investigate the fetal and maternal results of multiple cesarean sections, due to cesarean section procedure importance in terms of probable intraoperative and postoperative complications. **Materials and methods**. A retrospective electronic health records data analysis was conducted in the tertiary hospital in Lithuania during the period 2013-2017. 655 women who underwent at least one cesarean at one fetus were selected. **Results**. Women in group II-IV had a significantly higher mean age at birth, gravidity, parity than women at group I. Mean gestational age was lower in groups II and III ($p<0.001$). Women with 4 previous cesarean sections have a combined 3.18 higher odds to give birth prematurely than women with 1 ($p = 0.002$). **Conclusion**. During the consultation of women who had a previous cesarean section and planning a repeat cesarean section, we have to take this into consideration and the patient has to be informed about increase in poorer outcomes.

Keywords: multiple cesareans section; optimal care after previous cesarean section; perioperative risk; premature birth.

Introduction

Cesarean section (CS) usage has dramatically increased worldwide in the last decades particularly in middle- and high-income countries, despite the lack of evidence supporting substantial maternal and perinatal benefits [1]. Elements that appear to play an important part of CS rates rise are changes in maternal characteristics and professional medical practice styles, increasing malpractice pressure, as well as economic, organizational, social and cultural. These factors taken together with the public conception that a cesarean birth is now an almost risk-free procedure might be contributing to the rise in the number of CS performed [2, 3].

Worldwide, CS rates had increased from 6.7% in 1990 to 19.1% in 2014. Based on American Medical Association information published in 2015 (they had observed cesarean birth rates for 172 WHO member states), the highest CS rates (per 100 live births) were in Brazil (55.6%), Chile (49.6%), Dominican Republic (44.3%), Turkey (48%), Mexico (46.9%), Iran (45.6%), Italy and Georgia (36.7%), Portugal (34.8%) and Australia (32.2%) [4].

Lithuania is Eastern European country near the Baltic Sea. The area of is 65300 km^2. Population density in Lithuania in 2016 is 44.2. According to data of 2016, there were 30361 births in Lithuania, of which 22.14% were cesarean sections. There were more than twice as many births in cities than in rural areas. 9903 (32.3%) newborns were born in the district of capital of Lithuania Vilnius, 6025 (19.7%) and 3584 (11.7%) in the districts of the second and third largest cities of Lithuania Kaunas and Klaipeda in 2016. During the periods of 2013–2014–2015–2016 in Vilnius University hospital were: 2422-3370-3547-3638 births, of which 277 (11.43 % of all births) – 421 (12.49 %) – 544 (15.34 %) – 485 (13.33 %) respectively were after a previous cesarean section. CS rates in our hospital were 26.55–25.6–23.7–22.6 % during 2013–2014–2015–2016.

In this study we aimed to investigate the fetal and maternal results of multiple CSs in pregnancies of women aged 18 - 46 years, as CS procedure is important in terms of probable intraoperative and postoperative complications. These complications also increase in relation to the increasing number of CS. The best-known complications are placenta previa and placenta accreta, hysterectomy, bladder and bowel injuries [5, 6].

Materials and Methods

Vilnius University Hospital Santaros Clinics is a tertiary hospital in the capital of Lithuania. During the period of 2013-2016, in this hospital, Department of Obstetrics and Gynaecology, a retrospective electronic health records data analysis was conducted. A permission to use individual pregnant women's medical record information has been received from the hospital Ethic Committee. Women who had underwent at least one cesarean with a singleton pregnancy were selected. The main indications to perform a repeated CS are previous cesarean birth, breech presentation, labour dystocia, and foetal distress (such as fetal heart rate anomaly). There are no cesarean births in Santaros Clinics without some medical indications. The data included the following demographic parameters of pregnant women: age, gravidity, parity, and gestational week at birth. Intra-operative parameters included rate of uterine scar insufficiency, uterine rupture, adhesions involving the omentum, peritoneum and bladder, incidences of placenta previa, placental abruption and placentation abnormalities, the need for additional surgical interventions, such as hysterectomy, Lynch suture, and need for blood transfusion because of haemostatic instability. Post-operative complications included the need for transfusion following measurement of pre- and post-operative haemoglobin levels and patient complaints, need for intensive care unit and length of hospital stay for the entire procedure. The study also included following fetal parameters: birth weight, height, and Apgar scores (1 and 5 minutes).

The inclusion criteria were determined as being more than 18 years, having undergone at least one cesarean section, not having undergone other abdominal surgery. 46 was the oldest woman in the data. Multiple pregnancies and births under 34 weeks of gestation were not included in the study.

Analyses of data were performed using the $\chi 2$ test for categorical variables and Student's t test for means of continuous variables (parity, grade and APGAR score). The odds ratios (ORs) and 95% confidence intervals were used to establish the proportional rate of prematurity between all groups.

Results

During the period from 29 Mar 2013 to 26 Feb 2016, 13375 births took place in the tertiary hospital's Department of Obstetrics and Gynaecology, of which 3275 (24.5%) were cesarean sections. A total of 655 women who met the defined conditions were included in the study. Four research participants groups were formed according to the number of cesarean sections. Group I (1 previous CS) contained 494 women (75.4 %), group II (2 previous CS) – 139 (21.2 %), group III (3 previous CS) – 15 (2.3 %), and group IV (4 ≥ previous CS) – 7 (1.1 %).

Women in group II-IV had a significantly higher mean age at birth, gravidity, parity than patients at group I (Table 1). Mean gestational age was lower in groups II and III ($p<0.001$).

The higher the number of cesarean sections had prior to the current pregnancy, the higher the odds are of a premature birth during following pregnancy. Women with 4 previous CS have combined 3.18 higher odds to give birth prematurely than women with 1 previous CS ($p = 0.002$). Other perinatal characteristics were similar between groups (Table 2).

Table 3 demonstrates the perioperative and postoperative characteristics of the reviewed women. There was significantly longer operation time ($p = 0.036$) and delivery time ($p = 0.011$) in groups II-IV than in group I. Other perioperative and postoperative characteristics including blood loss during operation, hospitalization time, need for blood transfusion, need for intensive care and others, were similar between the groups.

The cumulative incidence of perioperative complications (uterine rupture, massive blood loss, placenta previa and placental invasion) and additional procedures during surgery (adhesiolysis, Lynch suture, hysterectomy (main indications - uterine atony, abnormal placentation, coagulopathies), need for intensive care or blood transfusion) increases between groups: I - 13,1 %, II – 23,0 %,III – 31,8 %, IV – 14, 27 %, (p=0,002)

Table 1. Statistical analysis of demographic data

Characteristics	All	Group I	Group II	Group III	Group IV	p
Mean age (years)	32.90±4.50	32.49±4.38	34.05±4.64	34.73±4.43	35.57±4.93	**0.0001**
Gravidity (n)	2.91±1.19	2.60±1.08	3.69±0.93	4.60±0.83	5.57±0.79	**0.0001**
Parity (n)	2.42±0.76	2.14±0.57	3.11±0.41	4.00±0.00	5.14±0.38	**0.0001**
Gestational age (weeks)	38.43±2.58	38.61±2.47	37.98±2.66	37.27±3.77	37.57±3.69	**0.014**

Table 2. Statistical analysis of neonatal data

Perinatal characteristics	All	Group I	Group II	Group III	Group IV	p
Infant weight (g)	3441.41±749.81	3467.40±752.51	3384.42±730.29	3276.66±833.60	3095.71±726.66	0.185
Infant height (cm)	51.65±4.25	51.88±4.21	51.09±4.18	50.20±5.86	50.00±3.92	**0.003**
Apgar score after 1 min.	9.00±1.11	9.01±1.07	9.05±1.11	8.60±2.03	9.14±0.69	0.673

Apgar score after 5 min.	9.63±0.76	9.65±0.68	9.60±0.84	9.20±1.86	9.43±0.53	0.516

Table 3. Intraoperative and post-operative data

Operative and postoperative characteristics	All	Group I	Group II	Group III	Group IV	p
Operation time (min)	39.45±13.61	38.75±13.61	41.76±13.69	38.93±12.88	41.00±10.08	**0.036**
Incision-to-birth time (min)	4.93±2.93	4.74±2.86	5.42±3.08	5.60±1.92	6.17±4.02	**0.011**
Blood loss during operation (ml)	649.65±349.92	629.03±132.15	716.07±693.91	671.43±111.27	660.00±197.99	0.259
Hospitalization time (days)	4.29±3.80	4.18±2.67	4.77±6.51	3.66±1.35	4.29±1.98	0.720
Hospitalization time after CS (days)	3.19±1.68	3.14±1.48	3.34±2.28	3.20±1.42	3.71±1.60	0.618
Uterine rupture (n)	3 (0.46%)	2 (0.40%)	1 (0.72%)	0	0	0.845
Placenta previa (n)	16 (2.44%)	11 (2.23%)	4 (2.88%)	0	1 (14.26%)	0.722
Placental invasion (n)	6 (0.92%)	3 (0.61%)	2 (1.44%)	0	1 (14.26%)	0.998
Adhesiolysis (n)	32 (4.86%)	17 (3.44%)	11 (7.91%)	2 (13.33%)	2 (28.57%)	0.852
Lynch suture (n)	4 (0.61%)	4 (0.81%)	0	0	0	1
Hysterectomy after CS (n)	2 (0.31%)	0	2 (1.44%)	0	0	1
Need for intensive care unit (n)	22 (3.36%)	19 (3.85%)	3 (2.16%)	0	0	**0.038**
Need for intensive care unit (days)	1.62±0.90	1.45±0.68	2.66±1.53	0	0	**0.026**
Need for blood transfusion (n)	9 (1.37%)	6 (1.21%)	3 (2.16%)	0	0	0.691

Table 4. Operative time and birth time associations with the number of CS.

	First CS	Second CS	Third CS	Fourth CS	Fifth CS	≥6 CS	*P*
Operative time, min							
Robert et al. USA [13]	50.6 ± 24.0	54.9 ± 23.2	60.7 ± 25.6	64.5 ± 32.7	67.9 ± 32.6	79.9 ± 53.4	**<0.001**
Özcan et al. Turkey [14]	34.8 ± 11.3	37.5 ± 10.6	40.3 ± 13.8	44.7 ± 17.2	-	-	**<0.001**
Kaplanoglu et al. Turkey [15]	-	38.7±13.6	38.9±13.7	47.9±14.3	45.2±12.2	50.3±13.4	**<0.001**
Our results	-	38.7±13.6	41.7±13.7	38.9±12.9	41.0±10.08	-	**0.036**
Birth time, min							
Özcan et al. Turkey [14]	3.7 ± 1.0	2.5 ± 0.2	5.9 ± 3.6	7.0 ± 3.3	-	-	**< 0.01**
Lynch et al. Ireland [6]	3.4 ±0.8	3.7 ±1.2	4.3 ± 2.4	6.5 ± 2.1	7.2 ± 0.8	-	**0.006**
Kaplanoglu et al. Turkey [15]	3.2 ± 1.3	4.1 ± 0.9	5.6 ± 2.7	6.2 ± 3.4	-	-	**0.001**
Our results	-	4.74±2.86	5.42±3.08	5.60±1.92	6.17±4.02	-	**0.011**

Table 5. Gestational age associations with the number of CS.

Gestational weeks	First CS	Second CS	Third CS	Fourth CS	Fifth> CS	P value
Kaplanoglu et al. Turkey [16]	-	37.6 ± 1.6	36.2 ± 2.2	-	-	-
Kaplanoglu et al. Turkey [15]	-	37.6±1.6	37.5±1.7	37.5±1.4	37.7±1.9	0.629
Our results		38.61±2.47	37.98±2.66	37.27±3.77	37.57±3.69	**0.014**

Table 6. Perioperative complications.

	First CS	Second CS	Third CS	Fourth CS	Fifth CS	≥6 CS	*P*
Blood transfusion							
Lyell et al. USA [17]	1.8%	2.6%	4.3%	4.6%	14.6%	-	**<0.001**
Kaplanoglu et al. Turkey [15]	-	2.10%	2.10%	4.80%	8.90%	3.80%	**<0.001**
Bladder injury							
Lyell et al. USA [17]	0.13%	0.09%	0.28%	1.17%	1.94%	-	**<0.001**
Kaplanoglu et al. Turkey [15]	-	0.50%	0.80%	4.20%	0.00%	3.80%	**<0.001**
Risk of hysterectomy							
Lyell et al. USA [17]	1:159	1:238	1:111	1:41	1:29	-	-
Kaplanoglu et al. Turkey [15]	-	0.40%	0.60%	1.80%	2.50%	3.80%	**0.004**
Endometritis							
Lyell et al. USA [17]	5.98%	2.56%	2.81%	2.96%	1.55%	-	**<0.001**
Kaplanoglu et al. Turkey [15]	-	1.80%	1.00%	1.50%	3.80%	1.90%	0.350

Table 7. Long-term maternal complications.

	First CS	Second CS	Third CS	Fourth CS	Fifth CS	≥6 CS	P
Pelvic adhesions							
Robert et al. USA [13]	0.2%	11.5%	26.0%	44.8%	54.5%	50.6%	-
Lyell et al. USA [17]	-	24.4%	42.8%	47.9%	-	-	-
Kaplanoglu et al. Turkey [15]	-	8.4%	7.6%	16.1%	5.1%	17.3%	**<0.001**
Placenta praevia							
Robert et al. USA [13]	Women with at least 1 previous cesarean were at 2.6 (95% CI 2.3-3.0) times greater risk for previa than those delivered vaginally.						-
Kaplanoglu et al. Turkey [15]	-	1.50%	2.10%	4.50%	3.80%	3.80%	**0.010**
Placenta accreta							

Robert et al. USA [13]	0.24%	-	-	2.13%	2.33%	6.74%	-
Kaplanoglu et al. Turkey [15]	-	0.80%	1.00%	2.10%	1.30%	0.00%	0.287

Discussion

Cesarean births were initially performed to separate mother and fetus in an attempt to save the fetus of a moribund patient. They subsequently developed to resolve maternal or fetal complications not amenable to vaginal birth, either for mechanical limitations or to temporize birth for maternal or fetal benefit. Literature shows that leading indications for cesarean birth (almost 85% cases) are previous cesarean birth, breech presentation, labour dystocia, and foetal distress (such as abnormal or indeterminate fetal heart rate tracing) [7].

The number of women who require repeat CS is increasing. Nevertheless, the most important aspect is given by the large contribution to CS rate by women with previous CS [8]. In agreement to the literature conclusive findings recognize it as the main contributor to CS rate [9]. However, it is a major surgery and is associated with immediate maternal and perinatal risk and may have implications for future pregnancies as well as long-term effects that are still being investigated [10 – 12]. Consulting patients with previous CS regarding birth options typically focuses on the risks of a trial of labor on a scarred uterus and the potential for uterine rupture in this pregnancy rather than the risk of repeat CS in future pregnancies.

Operative and birth time, gestational age

Firstly, reviewing the literature, it is observed that the higher the number of cesarean section had prior, the longer are the operation time and time of birth of the fetus (Table 4). It is usually affected by adhesions which prolongs the operation time due to adhesiolysis. Though the assessment of pelvic and abdominal adhesions is rather subjective, and the clinical relevance of adhesions is uncertain, nonetheless, it is clear that adhesions expand operating and birth time, blood loss, and the risk of injury to surrounding organs [13].

Based on literature review, CS at around 39 weeks compared with at 38 weeks is associated with an increased risk for maternal adverse outcome with no apparent advantage in terms of neonatal outcome, but some researchers claim that CS decrease the rate of neonatal morbidity due to respiratory distress syndrome [18, 19]. In our study, gestational week was statistically significantly lower as the number of CS increased (Table 5). In Santaros Clinics elective CS are planned between 38 and 39.5 gestational weeks for those women who have undergone one or two CS. Women with three or more previous CS are scheduled for surgery at 37.0 and 38.0 weeks. However, we do not have information why CS was made earlier, because our data collection was from electronic health record. Not in all cases we found all the necessary data.

Kaplanoglu et al. (2014) data describe an increased risk of delivery prior to 37 weeks of gestation in women having multiple repeat cesarean births. According to our data, repeated CS after 1 previous CS is performed about a week later than in other literature sources (Table 5). It is necessary to emphasize that, under favorable conditions, the aim is to maximize the time and give a chance to self-developing childbirth activity, which increases the probability of the birth of natural paths after previous CS.

Short-term and long-term complications

CS safety increased with the positive advances in surgical techniques as well as in patient care. However, women undergoing cesarean birth are at an increased risk for short-term and long-term complications. In Table 6 and 7 we provide literature review data (PubMed/Medline, Embase, Web of Science, and BIOSIS and Scholar Google electronic databases were searched).

An increasing number of previous CS increases the adhesions rate. It was already mentioned that due to adhesions the operation and birth time is prolonged but also it is linked to other complications. Literature indicates higher rates of blood transfusion, injury of adjacent organs such as urinary bladder [15, 17]. Also based on literature review it is noted that in women with multiple CSs had a significantly higher rate of placenta previa and placenta accreta [13, 15] which increases risk of hysterectomy [15, 17]. Our data supports the literature. Although we didn't have enough data to prove the risk of isolated complications, but the cumulative incidence of those complications increased between groups.

The risk for the mother and the fetus of repeated CS should be assessed after the first cesarean section, and women should be informed about the scope of the operation as well as consulted for a potential future birth of natural pathways. Moreover during following pregnancy, when planning a repeat cesarean section, we must take increased risk into consideration and the patient must be informed.

In our data analysis we discovered that the main indications for hysterectomy were uterine atony, abnormal placentation, and coagulopathies. This observation emphasizes the importance of prenatal diagnostics - fetal ultrasound with careful examination of placenta, as well as other specialists' consultation if woman has comorbidities. The indications for the first cesarean section should be carefully thought out, as this will have a major impact on subsequent repeated CS and associated complications. It should not be based solely on the wishes of the mother.

The main limitation of our study is the lack of data. The data was collected from an electronic database which was used by many doctors and resident doctors. Some information was not documented accurately and not strictly assessed. Due to inaccuracies or lack of some data entry, we have not been able to evaluate all desired parameters. We believe that in the future, this kind of research could be repeated with more patients included from other tertiary hospitals in Lithuania and from supplemented/refined database.

Vaginal birth after cesarean

In most of the cases the first cesarean was often a shock and not planned for, or expected, and may have finished after a long period of birth. Many of the studies described the experience of having a cesarean, how women felt about themselves and their relationship with maternity care providers and the maternity system. Having a VBAC (vaginal birth after cesarean) has many positive physical and psychological benefits for women. After the first CS, women blame themselves, they describe compounding guilt surrounding feelings of ignorance and lack of knowledge and failing to be prepared. In case of scarring in the uterus after one previous CS, patients should be informed that in presence of favorable factors, priority should be given to the birth of natural pathways. It is important to acknowledge the woman's previous cesarean birth and provide options to discuss and work through any issues during pregnancy to support the woman to move towards a positive birth experience and address the women's fears regarding VBAC.

Conclusion

Our study data shows a significant increase of neonatal complications (lower gestational age) as well as short - term and long - term operative complications, such as blood transfusion, intensive care, hysterectomy need, also placenta previa and placenta accreta, with an increasing number of CSs. During the consultation of women who had previous CS and are planning a repeat cesarean section, we must take this into consideration and the patients must be informed about increased risk of mentioned complications. The risks should be assessed after the first cesarean section, and the women should be informed about the scope of the operation as well as consulted for a potential future birth of natural pathways. The indications for the first cesarean section should be carefully thought out, as this will have a major impact on subsequent repeated CS and associated complications.

Acknowledgements and/or disclaimers
The authors declare that there is no conflict of interest regarding the publication of this paper.

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