Obstetrics; *Maternal-Fetal Medicine and Perinatology*

The Implications of Multiple Repeat Cesarean Deliveries on Maternal Morbidity

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ABSTRACT

OBJECTIVE: This study aimed to assess the obstetric outcomes of cesarean delivery (CD) in a cohort of pregnant women who had a history of four or more previous CDs and compared them with those who had a history of three or fewer previous CDs.

STUDY DESIGN: The cohort of this retrospective study consisted of all pregnant women who gave birth in our hospital via elective or emergency CD and who had previously undergone one or more other cesarean sections. Pregnant women who had a history of four or more CDs were included in the multiple repeat CD group, and cases who had a history of fewer than 4 CDs were enrolled in the lower-order repeat CD (comparison) group. Demographic data, medical history, clinical features, intraoperative events, and postoperative complications were recorded.

RESULTS: The multiple repeat CD group comprised 63 women, and the lower-order repeat CD group (comparison group) included 1097 cases. Intraabdominal dense adhesions (28.6% versus 14.1%, *p*=0.002), placenta previa (11.1% versus 4.1%, *p*=0.009), placenta accreta spectrum (PAS) (7.9% versus 2.4%, *p*=0.008), bladder injury (6.3% versus 1.7%, *p*=0.011), intraoperative massive hemorrhage (7.9% versus 2.2%, *p*=0.004), uterine artery ligation (4.8% versus 1.1%, *p*=0.012), internal iliac artery ligation (4.8% versus 1.2%, *p*=0.008), cesarean hysterectomy (4.8% versus 1.5%, *p*=0.045), blood transfusion (12.7% versus 4.1%, *p*=0.001), and maternal intensive care unit (ICU) admission (14.3% versus 2.0%, *p*<0.001) were significantly more common among women in the multiple-repeat CD group compared with the lower-order repeat CD group.

CONCLUSIONS: Pregnant women having multiple repeat CDs have a significantly increased risk of dense adhesions, placenta previa, PAS, intraoperative massive hemorrhage, blood transfusion, bladder injury, additional surgical interventions, including uterine artery ligation, internal iliac artery ligation, cesarean hysterectomy, and maternal ICU admission.

Keywords: Maternal intensive care unit, Maternal morbidity, Multiple repeat cesarean delivery

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Introduction

Cesarean delivery (CD) is a surgical procedure that can be a lifesaver in emergency circumstances and reduce fetal and maternal morbidity and mortality. The incidence of primary and repeat CDs has dramatically increased over the last decades around the world (1). Türkiye also demonstrates this trend and the rate of CD continues to rise each year, in which 8% of the CD rate in 1993 has increased to an overall CD rate of 51.2% in 2017 (2). Various factors contribute to an increased rate of CD, including increasing rates of labor induction and advanced maternal age, the introduction of fetal monitoring in labor, widespread use of assisted reproductive techniques, maternal request for a CD, decreased use of operative vaginal delivery, a reduction in vaginal delivery following CD because of the uterine rupture risk, mother's refusal to sterilization offers, and medicolegal concerns (3,4). Also, some physicians, especially from private facilities, are advocating

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primary CD regardless of the pregnant woman's physical situation and the fetal position (5).

It is widely accepted that advances in the safety of anesthesia, pre-operative and post-operative monitoring, antibacterial drugs, and the availability of blood products, in conjunction with modified obstetric practices had a strong effect on the increased CD rate entire the world (6). Also, several studies investigated the applicability and safety of a labor trial following CD and reported an increased perinatal and maternal morbidity related to a labor trial after CD compared with a scheduled repeat CD (7,8). These studies have led to a significant reduction in the vaginal birth rate after CD and a concurrent increase in the CD rates. Counseling pregnant women with previous CD concerning the preference of delivery mode mostly emphasizes the adverse outcomes of a labor trial on a scarred uterus and the risk for uterine rupture in the current pregnancy rather than the adverse outcomes of repeat CD in subsequent pregnancies. Most cases decide to repeat CD or give birth in a healthcare center that does not provide vaginal birth after CD (9). Based on common practice, sterilization procedures were offered to mothers following their second or third CD due to the presumption that there is an increased frequency of scar rupture and numerous complications during the pregnancy period following multiple repeat CDs. However, in countries such as Turkey, where couples are encouraged by social and cultural factors to have many children, most cases do not accept sterilization procedures; all attempts to restrict the number of CDs tend to be refused and it is frequent to see a pregnant patient ready to have the fifth or sixth CD (10).

All cesarean section procedures carry several risks, including adverse effects of anesthesia, adhesion formation, intraoperative and postoperative severe hemorrhage, injury to adjacent organs, post-operative infection, and embolism. Repeated CDs are associated with additional risks, including difficulties in surgical dissection, placenta previa, abnormal placental invasion, and peripartum hysterectomy. These complications could be life-threatening for both the pregnant woman and the baby (11,12). However, it remains uncertain whether the frequency of adverse outcomes differs with increasing numbers of CDs. It is essential for pregnant women and clinicians to clarify both the adverse outcomes of the trial of labor after CD and the risks that are related to multiple repeat CDs to provide better counseling. Likewise, it is crucial to realize the risks for mothers with multiple repeat CDs to assure that facility and medical professionals are capable to provide adequate healthcare (9).

To date, there is a limited number of studies that especially discussed maternal complications related to multiple cesarean deliveries in our country. This study aimed to assess the obstetric outcomes of CD in a cohort of pregnant women who had a history of four or more previous CDs and compared them with those who had a history of three or fewer previous CDs.

Material and methods

We carried out this retrospective case-control study from 1 January 2020 through 30 June 2020 at the Obstetrics unit of Kanuni Sultan Suleyman Training and Research Hospital, which was a tertiary referral hospital with a maternal-fetal medicine unit in Turkey. The Ethics Committee of the same hospital approved the study project (2022.03.61). All procedures were performed according to the Declaration of Helsinki. Written informed consent was obtained from all participants for using data. The study cohort consisted of all pregnant women who gave birth in our hospital throughout the study period via elective or emergency CD and who had previously undergone one or more other cesarean sections. The inclusion criteria were pregnant women who had experienced at least one CD and had not undergone abdominal surgery other than CD. Pregnant women who underwent primary CD, who had previous classic or low vertical incisions, who had undergone previous abdominal surgery other than CD, and missing or incomplete medical records were excluded. All eligible women who met the criteria for the study were divided into two groups according to their previous number of CDs. Pregnant women who had a history of 4 or more CDs were included in the multiple repeat CD group, and cases who had a history of fewer than 4 CDs were enrolled in the lower-order repeat CD (comparison) group.

According to our clinical protocol, elective CDs are scheduled at 39 weeks of gestation for those cases who had previously undergone two or fewer CDs, whereas cases with three or more previous CDs are planned for surgery between 38 and 39 gestational weeks after confirming the gestational age by the first-trimester ultrasound (US) examination. This strategy is sought to reduce the uterine rupture risk, related to spontaneous labor in cases with multiple uterine scars. The emergency CD was performed in cases with nonreassuring fetal heart rate status or cases at the active labor phase. All CDs were performed either by residents supervised by experienced staff obstetricians or by the staff obstetricians themselves. We used a Pfannenstiel incision to access the abdominal cavity, and a transverse lower segment uterine incision to enter the uterine cavity. Following the delivery of the fetus, and removal of the placenta, the uterus was externalized from the abdominal cavity. The uterine incision was closed by a single-layer interlocking suture with a 1-0 multifilament absorbable suture. If necessary, additional hemostatic sutures were used. The pelvic cavity was dried, and the parietal peritoneum was closed. All cases were operated on with the same surgical technique and suture types during the study period. A second-generation cephalosporin was administered intraoperatively for infection prophylaxis. Postpartum thromboprophylaxis was provided to cases who are at increased risk for thromboembolism.

Maternal outcomes and surgical complications for cases

undergoing a fourth or more number of CDs were compared with those undergoing third or fewer number of CDs (except for primary CD). The medical records and patient files for all eligible cases were reviewed and analyzed. Demographic data, medical history, clinical features, intraoperative events, and postoperative complications were recorded. Intraoperative events included the incision type, the presence of uterine rupture, placenta previa, placenta accreta spectrum (PAS), intraabdominal dense adhesions, the occurrence of massive intraoperative hemorrhage, ureteral, bladder, or bowel injury, the requirement for blood transfusion, intrauterine balloon tamponade (IUBT) placement, and additional surgical interventions, including uterine artery ligation, internal iliac artery ligation, uterine compression sutures, and cesarean hysterectomy. Postoperative complications included wound infection, the requirement for relaparotomy, thromboembolic complications, maternal intensive care unit (ICU) admission, and hospital length of stay (LOS). Composite maternal morbidity was defined as the presence of any of the following conditions: intraoperative massive hemorrhage, blood transfusion, uterine rupture, placenta previa, PAS, ureteral, bladder, or bowel injury, IUBT placement, additional surgical interventions, and maternal ICU admission.

Uterine rupture was defined as a tear or disruption of the whole uterine muscle and the visceral peritoneum. Intraoperative massive hemorrhage was defined as a blood loss of >1000mL or transfusion of at least two units of erythrocyte suspension as an indirect expression of excessive blood loss during the surgical procedure (13). Placenta previa describes the situation in which the placental tissue overlying the internal cervical os is totally or partially (14). PAS was diagnosed with histopathological confirmation if the mother had undergone a cesarean hysterectomy or according to the intraoperative findings reported by the surgeon as a placental invasion of the uterine wall or an inability to separate the placenta from the uterine wall at the time of CD (15). Dense adhesions were described as the fibrous bands of scar-like structures that formed between the uterus and abdominal wall, surrounding tissues or organs that did not separate easily (13). Wound infection was defined as any wound complication requiring antibiotic treatment, including cellulitis, abscess, or seroma requiring antibiotics (16). Hospital LOS was calculated by subtracting the day of the surgery from the day of the discharge.

Statistical analysis

The continuous variables were given as mean ± standard deviation (if normal distribution) and median (interquartile range) (if not normal distribution). The categorical variables were given as frequencies and percentages. The Chi-square (χ^2) test was used to compare the categorical variables between the groups. The Kolmogorov-Smirnov test was used to assess whether the variables were normally distributed. The Student-t or Mann-Whitney U test was used to compare the continuous variables between the groups according to whether it was normally distributed or not. A p-value of <0.05 was considered statistically significant. All statistical analyses were performed using the Statistical Package for the Social Sciences version 24.0 software program (IBM Corp., Armonk, NY, USA).

Results

A total of 4127 births occurred during the study period. Of these, 2025 were performed by vaginal delivery, and 2102 were conducted by CD with a mean CD rate of 50.9%. The number of primary CDs was 942 with a rate of 22.8%. A total of 1160 pregnant women who had undergone one or more previous CDs were included in the study. The multiple repeat CD group comprised 63 women, and the lower-order repeat CD group (comparison group) included 1097 cases.

We illustrated the demographic data, medical history, and clinical features of the study cohort based on the number of CDs in Table I. The mothers were significantly older in the multiple repeat CD group (33.4 ± 5.0 years) than the lower-order repeat CD group (30.5 ± 6.0 years, $p<0.001$). As expected, the median numbers of gravidity and parity were higher in the multiple repeat CD group than those of the comparison group ($p<0.001$). The inter-delivery time interval since the last cesarean section was significantly shorter in the multiple repeat CD group (2.98 ± 1.0 years) than in the lower-order repeat CD group (3.51 ± 1.6 years, $p=0.011$). Delivery occurred approximately with a mean of 1 week earlier in the multiple repeat CD group (37.14 ± 2.66 weeks) compared with the comparison group (38.21 ± 2.38 weeks, $p<0.001$). A significantly higher incidence of neonatal ICU (NICU) admission was found among neonates born to the multiple repeat CD group (33.3%) relative to the lower-order repeat CD group (22.5%, $p=0.048$). We found no differences between the groups regarding gestational weight at birth and 5-min APGAR scores of the neonates.

We presented intraoperative events, postoperative complications, and surgical outcomes of the study cohort according to the number of CDs in Table II. Uterine incision type, mean preoperative, and postoperative hemoglobin values were similar between the groups. Intraabdominal dense adhesions (28.6% versus 14.1%, $p=0.002$), placenta previa (11.1% versus 4.1%, $p=0.009$), PAS (7.9% versus 2.4%, $p=0.008$), and bladder injury (6.3% versus 1.7%, $p=0.011$) were significantly more common among women in the multiple-repeat CD group compared with the lower-order repeat CD group. The rates of bowel injury and uterine rupture were not significantly different between the groups. Women in the multiple repeat CD group experienced intraoperative massive hemorrhage more frequently than women in the comparison group (7.9% versus 2.2%, $p=0.004$). The proportions of cases having IUBT placement and uterine compression sutures were similar in both groups. Women with ≥4 CDs were more likely to require uter-

Table I: *Demographic data, medical history, and clinical features of the study cohort*

Variables	All population	Lower-order repeat cesarean delivery group (CD≤3; n=1097)	Multiple repeat cesarean delivery group (CD≥4, n=63)	*p*
Maternal age, years	30.6 ± 6.0	30.5 ± 6.0	33.4 ± 5.0	**<0.001***
Gravidity, median (IQR)	3 (3-4)	3 (2-4)	5 (5-6)	**<0.001¥**
Parity, median (IQR)	2 (1-3)	2 (1-3)	4 (4-5)	**<0.001¥**
Previous abortion, median (IQR)	0 (0-1)	0 (0-1)	0 (0-1)	0.313¥
Clinical features, n (%)				
Gestational hypertension	96 (8.3)	94 (8.6)	2 (3.2)	0.131
Gestational diabetes	95 (8.2)	86 (7.8)	9 (14.3)	0.070
Fetal growth restriction	26 (2.2)	25 (2.3)	1 (1.6)	0.718
Intrahepatic cholestasis of pregnancy	6 (0.5)	6 (0.5)	0 (0.0)	0.556
Premature rupture of membranes	11 (0.9)	10 (0.9)	1 (1.6)	0.591
Cardiovascular disease, n (%)	4 (0.3)	4 (0.4)	0 (0.0)	0.631
Goiter, n (%)	6 (0.5)	6 (0.5)	0 (0.0)	0.556
Inter-delivery time interval since last cesarean section, years	3.48 ± 1.6	3.51 ± 1.6	2.98 ± 1.0	**0.011***
Preterm birth <37 weeks, n (%)	160 (13.8)	151 (13.8)	9 (14.3)	0.907
Gestational week at birth	38.17 ± 2.49	38.21 ± 2.38		**<0.001***
Gestational weight at birth, g	3082 ± 1032	3086 ± 1052		0.598*
5-min Apgar score <7	71 (6.1)	68 (6.2)		0.644
Neonatal intensive care unit admission, n (%)	268 (23.1)	247 (22.5)		**0.048**

*Data presented as fraction (%), mean ± standard deviation, or median (interquartile range). For statistical analysis, * refers to Student's t-test, ¥ refers to the Mann-Whitney U test, and all others from Chi-square (χ^2) test. Bold values denote statistical significance at the p-value <0.05 level.*

Table II: *Intraoperative events, postoperative complications, and surgical outcomes of the study cohort*

Variables	All population (n=1160)	Lower-order repeat cesarean delivery group (CD≤3; n=1097)	Multiple repeat cesarean delivery group (CD≥4, n=63)	*p*
Uterine incision type, n (%)				0.214
Transverse incision	1132 (97.8)	1072 (98)	60 (95.2)	
Vertical incision	22 (1.9)	19 (1.7)	3 (4.8)	
Inverted T-incision	3 (0.3)	3 (0.3)	0 (0.0)	
Preoperative hemoglobin, g/dL	11.4 ± 1.4	11.4 ± 1.4	11.3 ± 1.2	0.699*
Postoperative hemoglobin, g/dL	10.2 ± 2.5	10.2 ± 2.5	10.0 ± 1.4	0.666*
Intraabdominal dense adhesions, n (%)	173 (14.9)	155 (14.1)	18 (28.6)	**0.002**
Placenta previa, n (%)	52 (4.5)	45 (4.1)	7 (11.1)	**0.009**
Placenta accreta spectrum, n (%)	31 (2.7)	26 (2.4)	5 (7.9)	**0.008**
Uterine rupture, n (%)	6 (0.5)	5 (0.5)	1 (1.6)	0.223
Bladder injury, n (%)	23 (2.0)	19 (1.7)	4 (6.3)	**0.011**
Bowel injury, n (%)	6 (0.5)	5 (0.5)	1 (1.6)	0.556
Intraoperative massive hemorrhage, n (%)	29 (2.5)	24 (2.2)	5 (7.9)	**0.004**
Intrauterine balloon tamponade, n (%)	5 (0.4)	4 (0.4)	1 (1.6)	0.150
Uterine compression sutures, n (%)	15 (1.3)	15 (1.4)	0 (0.0)	0.350
Uterine artery ligation, n (%)	15 (1.3)	12 (1.1)	3 (4.8)	**0.012**
Internal iliac artery ligation, n (%)	16 (1.4)	13 (1.2)	3 (4.8)	**0.018**
Cesarean hysterectomy, n (%)	19 (1.6)	16 (1.5)	3 (4.8)	**0.045**
Composite maternal morbidity, n (%)	134 (11.6)	120 (10.9)	14 (22.2)	**0.006**
Composite maternal morbidity without placenta previa and placenta accreta spectrum, n (%)	84 (7.2)	75 (6.8)	9 (14.3)	**0.007**
Wound infection, n (%)	14 (1.2)	13 (1.2)	1 (1.6)	0.823
Tubal ligation, n (%)	203(17.5)	176 (16.1)	27 (42.9)	**<0.001**
Blood transfusion, n (%)	53 (4.6)	45 (4.1)	8 (12.7)	**0.001**
Maternal intensive care unit admission, n (%)	31 (2.7)	22 (2.0)	9 (14.3)	**<0.001**
Hospital length of stay, days, median (IQR)	2 (2-5)	2 (2-3)	2 (2-5)	0.329¥

*Data presented as fraction (%), mean ± standard deviation, or median (interquartile range). For statistical analysis, * refers to Student's t-test, ¥ refers to the Mann-Whitney U test, and all others from Chi-square (χ^2) test. Bold values denote statistical significance at the p-value <0.05 level.*

ine artery ligation (4.8% versus 1.1%, p=0.012) and internal iliac artery ligation (4.8% versus 1.2%, p=0.008) than women with ≤3 CDs. Women with multiple repeat CDs required hysterectomy in 4.8% (n=3) of cases, compared with 1.5% (n=16) in women with lower-order repeat CDs, and this difference was statistically significant (p=0.045). Eight (12.7%) women in the multiple repeat CD group received a blood transfusion, whereas 4.1% (n=45) of women in the comparison group were transfused (p=0.001).

The proportion of women having composite maternal morbidity was significantly higher in the multiple repeat CD group (22.2%) compared with the lower-order repeat CD group (10.9%, p=0.006). Even in the absence of placenta previa and PAS cases, this proportion was still higher in the multiple repeat CD group (14.3%) than in the comparison group (6.8%, p=0.007). Cases with multiple repeat CDs (14.3%) had an increased rate of maternal ICU admission compared with the control group (2.0%, p<0.001).

No ureteral injury occurred, no relaparotomy was required, no pulmonary embolism was detected, and no maternal deaths occurred in either of the groups studied. The median postoperative hospital LOS was similar between the groups.

Discussion

Serious maternal adverse surgical outcomes increase with the increasing number of CDs. The majority of these risks are considered to be caused by that related to the placenta previa, placental invasion abnormalities, intraoperative massive hemorrhage, and the requirement for a cesarean hysterectomy. Placenta previa was present in 11.1%, and PAS was detected in 7.9% of cases having their fourth or greater CD. About 4.8% of cases undergoing their fourth or higher CD required cesarean hysterectomy, which is about 3-fold higher than women having their third or fewer CD (1.5%). Even in the absence of placenta previa and PAS, we found a strong association between composite maternal morbidity and increasing CD number, suggesting that women undergoing multiple repeat CDs cannot be completely secured. Also, blood transfusion, bladder injury, additional surgical interventions, including uterine artery ligation and internal iliac artery ligation, and maternal ICU admission were increased with the increasing number of CDs.

Intraabdominal dense adhesions, which have been also indicated by previous studies, pose challenges for the surgeon and cause an increased risk to the mother by increasing the risk of intraoperative hemorrhage and injury to surrounding structures and adjacent organs (13,17,18). In a review, Lyell et al. reported that the incidence of adhesion formation after CD ranges between 46-65%. These adhesions demonstrate differences regarding their size, location, and density as some adhesions are easily separable and filmy in density and others are thick and dense, especially after multiple repeat CDs (19). We also demonstrated that, compared with the fewer numbers of CDs, multiple repeat CDs are related to more intraoperative adhesions, surgical difficulties during the dissection of the abdominal wall, and an increase in the rates of bladder injury. Our rates of dense adhesions (28.6% in the multiple repeat CD group) are lower than those reported in previous studies. We consider that this is due to we recorded only dense adhesions that could not be dissected easily. High attachment of the bladder on the abdominal wall has been detected commonly in cases with multiple repeat CDs and should be considered while entering the abdomen (20). Surgeons also experienced difficulties with the separation of the bladder from the lower uterine segment because of the dense adhesions in cases with multiple repeat CDs (21).

The incidence of placenta previa increases with the increasing number of CDs and ranges from 1.2% in cases without a previous CD to 2.8% in patients with three or higher CDs (9). Previous studies also confirmed the significant relationship between PAS and the increasing number of CDs in cases with placenta previa (10,22,23). All women with placenta previa and PAS, regardless of history of previous CD, were at substantially increased risk of massive intraoperative hemorrhage, blood transfusion, additional surgical interventions such as cesarean hysterectomy, and maternal ICU admission (9,23-26). Our study also revealed a significant increase in the rates of placenta previa, placenta accreta, massive intraoperative hemorrhage, blood transfusion, uterine artery ligation, internal iliac artery ligation, cesarean hysterectomy, maternal ICU admission in cases undergoing multiple repeat CD compared with women having CDs after fewer previous CDs. We consider that pregnant women who had undergone multiple repeat previous CDs should be classified as high risk because of the increased risk of placentation abnormalities and should be warned of the increased risk of maternal morbidity. This knowledge has crucial implications for pregnant women and clinicians, particularly in rural areas that might not provide blood bank and ICU capabilities to handle severe hemorrhage associated with PAS. Conversely, some researchers denied that higher-order repeat CDs carry an increased risk for placentation abnormalities (18,21). These differences may be accounted for by their low sample size and their study cohort which included relatively few cases having a previous higher-order CD.

Our study revealed increased composite maternal morbidity with the increasing number of CDs, regardless of the presence of placental abnormalities. The rate of composite maternal morbidity was significantly higher in cases with higher-order CDs than those cases having CDs following fewer previous surgeries, which is in keeping with previously published studies (9,20).

A significant pregnancy complication of multiple repeat CD is previous uterine scar rupture increasing both fetal and

maternal morbidity and mortality (20). Several authors found no association between uterine scar rupture incidence and the increasing number of CDs (17,21,23). In accordance with these studies, our study also did not identify an increase in uterine rupture in cases having multiple repeat CDs. Lower uterine segment thickness was inversely correlated with the increasing number of previous CDs and decreased faster in the first and second trimesters than in the late third trimester (27). Based on this knowledge, higher-order CD cases follow up closely and are scheduled earlier (before 39 weeks of gestation) for delivery than patients who have undergone low-order repeat CD to avoid the risk of uterine rupture. This management appears to be an effective way to reduce the risk of uterine rupture in patients with multiple repeat CDs.

Our study describes a significantly lower mean gestational age at delivery in cases with multiple repeat CD (37.14 ± 2.66 weeks) than the control cases (38.21 ± 2.38 weeks). Also, neonates born to mothers with multiple repeat CDs had an increased rate of NICU admission compared with the control group. Women with four or more CDs had abdominal pains in the late weeks of gestation, and this symptom was commonly related to a thin or membranous isthmic layer (28). The complaint of pain could be the cause of lower gestational weeks at delivery (17). Moreover, clinicians might be concerned to deliver placental abnormality cases with antepartum hemorrhage during working hours with senior surgeons available, even before the scheduled time (23).

There are some limitations to this study. Because of the retrospective nature of this study, we cannot rule out that some worse outcomes were not completely recorded. Data concerning dense adhesions and blood volume loss could not be quantified and are depending on the subjective comment of the clinicians (13,29). The comparatively high percentage of high-risk cases observed in our referral center is a potential source of bias toward adverse outcomes. The outcomes might not be capable of being generalized to smaller rural hospitals, and our records probably underestimate the substantial risk in smaller hospitals without maternal ICU. Even with a considerable number of control cases, the number of patients who underwent four or more CDs is fairly small. The cases delivered by resident doctors might introduce a bias toward adverse outcomes. It is hardly possible to assess this subject since the participation of resident doctors in every patient was not evaluated. The main strengths of this study are similar maternal care and management protocols for all cases, and a large number of the comparison group. We consider that our investigation has essential implications for counseling pregnant women regarding the outcomes of multiple repeat CDs.

Conclusion

Our data demonstrate that pregnant women having multiple repeat CDs have a significantly increased risk of dense adhesions, placenta previa, PAS, intraoperative massive hemorrhage, blood transfusion, bladder injury, additional surgical interventions, including uterine artery ligation, internal iliac artery ligation, cesarean hysterectomy, and maternal ICU admission. With the growing incidence of CD worldwide and in Turkey because of the well-establishment of the general safety of this surgery, maternal morbidity from multiple procedures should be taken into account. Patients who desire more children should be counseled and warned regarding the increased risk of maternal morbidity following multiple repeat CDs. Although repeat CD was connected with increased maternal morbidity, most cases did not experience adverse outcomes. Also, no maternal mortality case was observed in our study cohort. Thus, this study does not provide evidence to recommend an upper limit to the number of CDs for pregnant women.

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