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MATERNAL AND NEONATAL OUTCOMES OF REPEAT CESAREAN DELIVERY IN WOMEN WITH A PRIOR CLASSICAL VERSUS LOW TRANSVERSE UTERINE INCISION

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Abstract

We compared maternal and neonatal outcomes following repeat cesarean delivery (CD) of women with a prior classical CD with those with a prior low transverse CD. The Maternal Fetal Medicine Units (MFMU) Network Cesarean Delivery Registry was used to identify women with one previous CD who underwent an elective repeat CD prior to the onset of labor ≥36 weeks. Outcomes were compared between women with a previous classical CD to those with a prior low transverse CD. Of the 7,936 women who met study criteria, 122 had a prior classical CD. Women with a prior classical CD had a higher rate of classical uterine incision at repeat CD (12.73% versus 0.59%; $p < 0.001$), had longer total operative time and hospital stay, and had higher intensive care unit admission. Uterine dehiscence was more frequent in women with a prior classical CD (2.46% versus 0.27%, OR 9.35, 95% CI 1.76-31.93). After adjusting for confounding factors, there were no statistical differences in major maternal or neonatal morbidities between groups. Uterine dehiscence was present at repeat CD in 2.46% of women with a prior classical CD. However, major maternal morbidities were similar to those with a prior low transverse CD.

Keywords

cesarean delivery; classical cesarean delivery; prior cesarean; maternal outcomes; neonatal outcomes

INTRODUCTION

Cesarean delivery (CD) is a term used to describe delivery of a fetus through incisions in the abdominal wall and the uterine wall[1]. In most cases a low transverse uterine incision is performed. Perhaps the most important reason to utilize a low transverse incision is that, by avoiding the contractile portion of the uterus, the patient may be a candidate for a vaginal delivery in subsequent pregnancies. There are several instances when a classical uterine incision may be required, including fetal malpresentation, undeveloped lower uterine segment, placenta previa or accreta, severe bladder adhesions, or the presence of lower uterine segment fibroids2.

Surgical complication rates are greater for classical CD compared to low transverse CD and include higher blood loss, greater need for transfusion, higher infection rates, and more severe post-operative pain.[3] In future pregnancies, the risk of uterine rupture is also much greater for women with classical CD compared to those low transverse CD[3]. It is unknown is whether there is also a higher rate of surgical complications in future pregnancies at the time of repeat CD.

The objectives of this study are to describe the frequency of adverse maternal and neonatal outcomes at the time of repeat CD in women with a prior classical CD and compare these rates with those who had a prior low transverse CD.

METHODS

The cesarean registry was a prospective, observational, cohort study performed by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network during the years 1999-2002[4]. This study, conducted at a total of nineteen academic centers, was designed to collect data on maternal and neonatal outcomes and complications from CD. Approval was granted by the institutional review board of each academic center that participated, as well as the institutional review board of the data coordinating center.

The cesarean registry included all women that had a previous CD and delivered ≥ 20 weeks with a singleton gestation and a birth weight ≥ 500g. Trained research nurses at each center reviewed medical records and collected data on standardized forms. Data abstraction methods have been previously described.[4] Neonatal outcomes were collected until discharge or for up to 120 days after delivery. Data were transmitted to the George Washington University Biostatistics Center where it was stored, monitored and edited for missing or inconsistent data. All cases of maternal death, stillbirth, uterine rupture and hypoxic ischemic encephalopathy underwent a secondary review by study investigators.

This secondary analysis included women with a singleton pregnancy who had one prior CD and underwent repeat CD without a trial of labor. In order to avoid the confounding effects associated with preterm birth, only those who delivered ≥ at 36 weeks 0 days were studied. Women who had a prior low vertical, T, J, or unknown uterine incision were also excluded. For this analysis, labor was defined as cervical dilation ≥ 4cm or if oxytocin or cervical ripening agents were administered. Maternal and neonatal outcomes after repeat CD were compared between women with a prior classical CD to those with a prior low transverse CD.

In order to analyze for differences in rare events between groups, composite outcomes were utilized. The same composite outcomes were used as previously described in our earlier paper which looked at maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery[4]. The composite maternal outcome included uterine rupture, uterine dehiscence, hysterectomy, thromboembolic disease, endometritis, blood transfusion or maternal death. Other maternal morbidities studied were need for blood transfusion(s), intensive care unit admission and the presence of placenta accreta. The composite perinatal outcome consisted of antepartum/intrapartum stillbirth, hypoxic ischemic encephalopathy or neonatal death. Other perinatal morbidities analyzed were neonatal intensive care unit admission, 5-minute Apgar scores ≤ 5, and umbilical-artery blood pH ≤ 7.0.

Uterine rupture was defined as a disruption or tear of the uterine muscle and visceral peritoneum or a separation of the uterine muscle with extension to the bladder or broad ligament. Uterine dehiscence was defined as a disruption of the uterine muscle with intact serosa. Postpartum endometritis was defined as a clinical diagnosis of puerperal infection in the absence of findings suggesting a non-uterine source of infection. Fetal deaths that occurred before hospital admission were classified as antepartum stillbirths.

The statistical analysis was performed using SAS (SAS Institute, Cary, NC) and Cytel Studio. Statistical analysis for continuous variables utilized descriptive statistics as well as the Student's T-Test or Wilcoxon rank-sum test, where appropriate. Categorical variables were analyzed using the Fisher's exact test. The exact confidence intervals were calculated for odds ratios. No p-value adjustments were considered for multiple comparisons. Multivariable

logistic regression was performed to adjust for potential confounding factors including gestational age, maternal age, race/ethnicity, insurance type, smoking status, body mass index (BMI), maternal diseases, neonatal birth weight of the previous CD, and neonatal birth weight of the current delivery. Two-sided p-values are reported with statistical significance defined as $p < 0.05$.

RESULTS

Over the study period, there were 35, 420 women in the cesarean registry who had a singleton gestation with a history of one prior CD; of these 9,766 had repeat CD prior to labor. After exclusions (GA < 36 weeks [n=212], missing data [n=5], and prior low vertical, T/J, or an unknown uterine incision [n=1,613]), there were 7,936 women who met all study criteria (N= 122 prior classical CD and N = 7,814 prior low transverse CD).

Demographic and clinical characteristics are described in Table 1. There were a higher proportion of African-American women in the prior classical CD group. This is most likely due to the association between African-American maternal race and preterm birth (i.e. preterm delivery has higher risk for malpresentation and classical CD). Women with prior classical were also more likely to have governmental insurance.

Repeat classical CD was more common in women with a prior classical CD (12.73% vs. 0.59%; $p < 0.001$). Women with a prior classical CD had longer total operative time (61.44 ± 21.31 vs. 51.98 ± 21.16 minutes; $p < 0.001$), and a longer hospital stay (3.49 ± 2.01 vs. 3.24 ± 1.72 days; $p = 0.01$). Major maternal complications were rare in both groups (see Table 2). There were no cases of uterine rupture in either group. Uterine dehiscence and admission to the intensive care unit were more common in women with a prior classical CD. However, there was no difference in the rate of the composite maternal outcome (4.10% vs. 2.18%; OR 1.92, 95% CI 0.60-4.70). After adjusting for confounding variables with multivariable logistic regression, there was still no difference in composite maternal outcomes between groups (OR = 3.31, CI: 0.91 – 11.97; $p = 0.07$). Additionally, there were no differences in rates of individual major maternal morbidities between groups. Due to the population being studied (women having repeat CD ≥ 36 wks) neonatal complications were very rare and similar between groups. Due to the relatively sample size and infrequency of adverse events, 95% CI's are extremely wide for group comparisons of both maternal and neonatal outcomes.

There were a total of 5 postoperative maternal deaths (prior classical CD=1, prior low transverse CD = 4). One woman with a prior classical CD who was a Jehovah's Witness refused blood products and died due to complications from severe anemia and disseminated intravascular coagulation. Two women with a prior low transverse CD died from amniotic fluid embolism. Another women who had sickle cell disease and chronic pulmonary thromboembolism died from cardiac arrest associated with pulmonary emboli. The final death occurred in a women who had morbid obesity (weight = 612 pounds), gestational diabetes, and prior deep vein thrombosis and pulmonary embolism. She was receiving heparin anticoagulation and died six days postoperatively due to complications of an acute subdural hematoma.

DISCUSSION

Two novel findings were derived from this analysis. First, women with a prior classical CD undergoing repeat CD at term have another classical incision in approximately 12% of cases. Second, 2.46% of women with a prior classical CD have uterine dehiscence noted at repeat CD. Other key findings include the fact that women with a prior classical CD have similar rates of major maternal and neonatal complications compared to those with prior low transverse CD

(after adjustment for confounding factors). The absence of differences in outcomes might be explained by the selection of a "lower risk" population (delivery > 36 wks without labor). Thus this study does not allow us to generalize these results to all women with a prior classical CD.

Various reports in the literature have reported maternal complications associated with classical CD. In a single-institution study of women delivering between 1983 and 1995, Greene and colleagues reported that out of 84,299 deliveries of with birth weight ≥ 500g, 8,514 (10.1%) had CD and 62 (0.073%) of these were classical CD.[3] Rates of maternal complications for these women with classical CD were common (49% infection and 19% hemorrhage requiring transfusion). Other authors have also reported high maternal complication rates in women with a classical uterine incision[5-7].

Strengths of our study include standardized data definitions and collection methods and multi-center involvement. Another strength is that we evaluated outcomes of women with a classical CD at the time of repeat CD, while prior studies have only evaluated outcomes of the classical CD.

The study also had some limitations. Because we studied only women who had repeat CD ≥ 36 without labor, the low rate of complications may not be applicable to those who present with labor or deliver preterm. Additionally, due to the rarity of adverse outcomes and small sample size of women with prior classical CD, there is relatively low power for statistical comparisons as evidenced by very wide 95% CIs. Finally, since the majority of the hospitals studied are associated with academic medical centers, these finds may not be applicable to some clinical settings such as non-university based community hospitals.

In conclusion, women with a prior classical CD are more likely to have a repeat classical CD and have uterine dehiscence noted at time of repeat CD. Despite this, they have similar rates of major maternal and neonatal morbidity compared with those with a prior low transverse CD. This information may be helpful when counseling women with a prior classical CD.

Condensation

Compared to those with a prior low transverse cesarean delivery women with a prior classical cesarean delivery have similar rates of major maternal morbidities following repeat cesarean delivery.

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Table 1

Demographic and clinical characteristics of study population.

Characteristic	Prior Classical CD N=122	Prior Low Transverse CD N=7,814	P value
Maternal age at delivery (y)	29.21 ± 5.69	29.62 ±5.70	0.44
Race or ethnic group			< 0.001
African-American	45 (36.89%)	1,594 (20.40%)	
Caucasian	33 (27.05%)	4,327 (55.37%)	
Hispanic	36 (29.51%)	1,523 (19.49%)	
Other	8 (6.56%)	370 (4.74%)	
Married	60 (49.18%)	5,448 (69.72%)	<0.001
Body mass index pre-pregnancy (kg/m^2)	28.21 ± 7.92	27.69 ± 6.92	0.81
Smoker during pregnancy**	19 (15.57%)	909 (11.64%)	0.20
Governmental insurance	80 (65.57%)	3078 (39.39%)	<0.001
Maternal disease*	23 (18.85%)	1,707 (21.85%)	0.51
Prior vaginal delivery**	46 (38.33%)	1227 (15.77%)	<0.001
Parity	1 [1-2]	1 [1-1]	<0.001

Data expressed as mean ± SD, median [inter-quartile range], or n (%).

*Asthma, diabetes, chronic hypertension, seizure disorder, thyroid disease, renal disease, or connective tissue disorder

**Data not available for all patients

Table 2

Maternal Complications According to the Type of Prior Uterine Incision

Characteristic	Prior Classical CD N=122	Prior Low Transverse CD N = 7,814	OR (95% exact CI)
Uterine dehiscence	3 (2.46%)	21 (0.27%)	9.35 (1.76-31.93)
Hysterectomy	0 (0)	12 (0.15%)	*
Thromboembolic Disease	0 (0)	3 (0.04%)	*
Endometritis	1 (0.82%)	98 (1.25%)	0.65 (0.02-3.78)
Blood Transfusion	0 (0)	47 (0.60%)	*
Maternal Death	1 (0.82%)	4 (0.05%)	16.13 (0.32-164.40)
Composite Outcome**	5 (4.10%)	170 (2.18%)	1.92 (0.60-4.70)
ICU Admission	2 (1.64%)	14 (0.18%)	9.29 (1.01-41.08)
Placenta Accreta	1 (0.82%)	4 (0.05%)	16.13 (0.32-164.40)

Data presented n (%). Outcome data not available for women.

There were no cases of uterine rupture in either group.

* -Denotes not applicable

** - Maternal composite outcome includes one or more of the following complications: uterine rupture, uterine dehiscence, hysterectomy, thromboembolic disease, endometritis, blood transfusion, or maternal death.

Table 3

Perinatal Outcomes According to the Type of Prior Uterine Incision

Characteristic	Prior Classical CD N=122	Prior Low Transverse CD N = 7,814	OR (95%CI)
Antepartum/Intrapartum stillbirth	0	8 (0.10%)	-*
Neonatal Death	0	4 (0.05%)	-*
Composite Outcome**	0	12 (0.15%)	-*
Admission to NICU	11 (9.02%)	694 (8.89%)	1.02 (0.49-1.90)
5-minute Apgar ≤5	0	15 (0.19%)	-*
Umbilical-artery blood pH ≤ 7.0***	0	22 (1.11%)	-*

Data presented as N (%).Outcome data not available for women.

There were no cases of Hypoxic-ischemic encephalopathy in either group.

* - Denotes not applicable

** - Perinatal composite outcome includes one or more of the following complications: antepartum/intrapartum stillbirth, hypoxic ischemic encephalopathy, or neonatal death.

*** cord blood gases not available for all patients