Effect of Prior Vaginal Delivery or Prior Vaginal Birth After Cesarean Delivery on Obstetric Outcomes in Women Undergoing Trial of Labor

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OBJECTIVE: We sought to study the effects of prior vaginal delivery or prior vaginal birth after cesarean delivery (VBAC) on the success of a trial of labor after a cesarean delivery.

METHODS: An observational study of patients who underwent a trial of labor after a single low-transverse cesarean delivery. Patients with a previous cesarean delivery and no vaginal birth were compared with patients with a single vaginal delivery before or after the previous cesarean delivery. The rates of successful VBAC, uterine rupture, and scar dehiscence were analyzed. Multivariable regression was performed to adjust for confounding variables.

RESULTS: Of 2,204 patients, 1,685 (76.4%) had a previous cesarean delivery and no vaginal delivery, 198 (9.0%) had a vaginal delivery before the cesarean delivery, and 321 (14.6%) had a prior VBAC. The rate of successful trial of labor was 70.1%, 81.8%, and 93.1%, respectively ($P < .001$). A prior VBAC was associated with fewer third- and fourth-degree lacerations (8.5% versus 2.5% versus 3.7%, $P < .001$) and fewer operative vaginal deliveries (14.7% versus 5.6% versus 1.9%, $P < .001$) but not with uterine rupture (1.5% versus 0.5% versus 0.3%, $P = .12$). Patients with a prior VBAC had, in addition, a higher rate of uterine scar dehiscence (21.8%) compared with patients with a previous cesarean delivery and no vaginal delivery (5.3%; $P = .001$).

CONCLUSION: A prior vaginal delivery and, particularly, a prior VBAC are associated with a higher rate of successful trial of labor compared with patients with no prior vaginal delivery. In addition, prior VBAC is associated with an increased rate of uterine scar dehiscence. (Obstet Gynecol 2004;104:273–7. © 2004 by The American College of Obstetricians and Gynecologists.)

LEVEL OF EVIDENCE: II-2

Women who have had a previous cesarean delivery undergoing a trial of labor have a reported rate of

successful trial of labor of 56–82% and a risk of uterine rupture of approximately 0.1–2.3%.[1–5] A history of prior vaginal delivery has been associated with a higher rate of successful trial of labor.[6–8] At least 1 study reported a lower rate of uterine rupture with prior vaginal delivery.[9] However, there is paucity of data regarding the difference in obstetric outcomes between women who had a vaginal birth after a cesarean delivery (prior VBAC) and those who had their primary cesarean delivery after a previous vaginal delivery (vaginal delivery before cesarean delivery). In 1 study, patients with a prior VBAC were associated with a higher rate of successful trial of labor compared with patients who had a vaginal birth before cesarean delivery, but the rate of uterine rupture or uterine scar dehiscence was not reported.[7] The purpose of this study was to estimate whether a vaginal delivery prior or subsequent to a previous cesarean delivery correlates with the success of trial of labor, the rate of uterine rupture, uterine scar dehiscence, and other obstetric outcomes.

MATERIALS AND METHODS

This was an observational cohort study that included all women with a single previous low-transverse cesarean delivery who underwent a trial of labor in our institution at 24 weeks of gestation or greater between January 1988 and December 2002. Sainte-Justine Hospital is a tertiary care center with approximately 4,000 deliveries per year, including 80% Caucasian, 14% black, (mostly from Haitian origin), with the others mostly Asiatic or Hispanic. Exclusion criteria included having more than a single vaginal delivery, multiple gestation, intrauterine fetal demise, and fetal anomalies. Three databases were used to ensure that all cases were identified. The first database was the Perinatal Database of Sainte-Justine Hospital, where data collection started in 1988, the second was from the Medical Records Department, and the third was the logbook in the labor and delivery suite. Previous studies have been published from those databases.[10–13]

Two observers independently reviewed all previous operative reports, medical, and nursing records. Data were collected for the following variables: maternal age, gestational age, parity, previous vaginal birth, previous VBAC, indication for the previous cesarean delivery, type of closure of the prior low-transverse uterine incision, date of delivery, birth weight, augmentation of labor with oxytocin, use of epidural analgesia, induction of labor, cervical ripening using a transcervical Foley catheter, shoulder dystocia reported by the obstetrician present at delivery, third- and fourth-degree perineal laceration (a partial laceration of the anal sphincter was considered a third-degree laceration),[14] and complete uterine rupture or scar dehiscence. The diagnosis of uterine scar dehiscence was an incidental finding made at the time of cesarean delivery or at the time of postpartum emergency laparotomy and was defined as a defect that involved the entire thickness of the uterine wall but not the visceral peritoneum. Uterine rupture included a defect in the overlying peritoneum with extrusion of intrauterine contents into the peritoneal cavity that necessitated an emergency cesarean delivery or postpartum laparotomy. Uterine scar separation included both uterine scar dehiscence and uterine rupture noted at the time of surgery.

Patients were classified into 3 groups: 1) patients who had 1 prior cesarean delivery and no vaginal delivery, 2) patients who had a single vaginal delivery before their cesarean delivery, and 3) patients with a prior vaginal delivery after their cesarean delivery (prior VBAC).

Differences between groups were assessed through proportion comparisons by using the Pearson χ^2 test or Fisher exact test and post hoc Bonferroni correction where appropriate. Levene homogeneity of variance test was performed for continuous variables, and thereafter analysis of variance with post-hoc Duncan test were used for comparisons of means. Kruskal–Wallis and Mann–Whitney U tests were used for comparison of medians for nonparametric analyses. Multivariable logistic regression analysis was performed to adjust for confounding variables, including maternal age 35 years or older, gestational age 37 weeks or greater, diabetes, prior cephalic pelvic disproportion, single-layer closure of the previous low-transverse uterine segment incision, labor induction, oxytocin use, birth weight 4,000 g or greater at the time of trial of labor, reason for repeat cesarean delivery, and year of birth (before or during 1996 and later). The reason for the repeat cesarean delivery was not used as a confounding variable for the success of trial of labor or for uterine rupture. SPSS 10.0 (SPSS Inc, Chicago, IL) was used for statistical analysis, and $P < .05$ was considered statistically significant. This study was approved by the Institutional Review Board of Sainte-Justine Hospital.

RESULTS

From January 1988 to December 2002, 2,204 patients with a live singleton fetus at 24 weeks of gestation or greater underwent a trial of labor after a single low-transverse cesarean delivery and 0 or 1 prior vaginal deliveries. Of these patients, 1,685 (76.4%) had a previous cesarean delivery and no vaginal birth, 198 (9%) had a single vaginal birth before their cesarean delivery, and 321 (14.6%) had a prior VBAC. Table 1 reports the demographic and clinical characteristics of each group.

Patients with a prior vaginal birth (before or after their prior cesarean delivery, n = 519) were more likely to have a successful trial of labor (88.8% versus 70.1%, $P < .001$) and less likely to have a uterine rupture during labor (0.5% versus 1.4%, $P = .02$). However, this last finding could be incidental and should be interpreted with caution.

Table 2 shows the comparison of obstetric outcomes between the 3 groups. Compared with patients who had a previous cesarean delivery and no vaginal birth, women with a prior VBAC and women with a vaginal delivery before their cesarean delivery were more likely to have a successful trial of labor, less likely to have a cesarean delivery for dystocia in the first or second stage of labor, less likely to have an operative vaginal delivery, and less likely to have a third- or fourth-degree perineal laceration. Moreover, women with a prior VBAC had a higher rate of successful trial of labor when compared with the 2 other groups.

There was no significant difference in the rate of uterine rupture between the 3 groups. However, patients with a prior VBAC had a higher rate of uterine scar dehiscence (21.8%) compared with patients with a previous cesarean delivery and no vaginal birth (5.3%; $P = .001$), as well as a higher rate of uterine scar separation (including both uterine rupture and incidental scar dehiscence) that was diagnosed at the time of surgery (Fig. 1).

Multivariable regression analyses were performed to adjust for confounding variables associated with the success of trial of labor, uterine rupture, uterine dehiscence, and scar separation at the time of cesarean delivery. A prior VBAC (odds ratio [OR] 6.21, 95% confidence interval [CI] 3.93–9.80; $P < .001$) as well as a vaginal delivery before cesarean delivery (OR 1.72, 95% CI 1.17–2.54; $P < .001$) remained associated with a higher rate of successful trial of labor compared with patients with a previous cesarean delivery and no prior vaginal delivery. A prior VBAC was associated with a higher rate of successful trial of labor compared with

Table 1. Demographic and Clinical Characteristics

Patients characteristics	No previous vaginal birth (N = 1,685)	Vaginal birth prior to cesarean delivery (N = 198)	Prior VBAC (N = 321)	P
Maternal age (y)	30.8 ± 4.5	31.8 ± 4.8	32.00 ± 4.4	.51
Maternal age ≥ 35 y	349 (20.7)	51 (25.8)	85 (26.5)	.03
Gestational age (wk)	39.7 (24.0–42.6)	39.3 (26.6–41.6)	39.7 (24.6–41.9)	< .01*
Double-layer closure at the previous cesarean delivery	1,059 (68.3)	129 (72.9)	223 (79.4)	< .001†
Induction of labor	436 (25.9)	62 (31.3)	101 (31.5)	.05
Use of Foley catheter for cervical ripening	195 (11.6)	16 (8.1)	29 (9.0)	.17
Use of oxytocin	1014 (60.2)	113 (57.1)	154 (48.0)	< .001‡
Epidural analgesia	1233 (73.2)	108 (54.5)	172 (53.6)	< .001*†
Birth weight (g)	3,410 (575–5,185)	3,830 (1,055–4,885)	3,425 (665–5,040)	< .01*‡
Birth weight > 4,000 g	180 (10.7)	17 (8.6)	36 (11.2)	.61

VBAC, vaginal birth after cesarean delivery.

Data are presented as mean ± standard deviation, n (%), or median (range).

* P < .05 for patients with vaginal birth prior to cesarean delivery vs patients with no prior vaginal delivery, based on post hoc test using Bonferroni's rule.

† P < .05 for patients with prior VBAC vs patients with no prior vaginal delivery, based on post hoc test using Bonferroni's rule.

‡ P < .05 for patients with vaginal birth prior to cesarean delivery vs prior VBAC, based on post hoc test using Bonferroni's rule.

prior vaginal delivery as well (OR 3.47, 95% CI 1.93–6.22; P < .001). A prior VBAC remained a risk factor for uterine scar dehiscence (OR 7.36, 95% CI 2.35–23.0; P = .001) or uterine scar separation (OR 4.55, 95% CI 1.54–13.47; P = .006) when compared with patients who had a previous cesarean delivery and no prior vaginal delivery.

DISCUSSION

Previous single vaginal delivery and, particularly, prior single VBAC were associated with a higher rate of successful trial of labor. Moreover, as secondary outcomes, we found that a prior vaginal delivery also was associated with a lower rate of third- and fourth-degree perineal lacerations and a lower rate of operative vaginal delivery. The higher rate of successful trial of labor was explained by lower rates of cesarean delivery for both fetal distress and labor dystocia in the first or second stage of labor. After adjustment for confounding variables, a prior vaginal delivery before cesarean delivery or a prior VBAC were not related to uterine rupture; however, we found that patients with previous single VBAC had more incidental uterine scar dehiscence and more uterine scar separation at the time of surgery when compared with patients who had a previous cesarean delivery and no prior vaginal birth.

Improved rate of successful trial of labor for patients with previous vaginal delivery has been well de-

Table 2. Obstetric Outcomes

	No previous vaginal birth (N = 1,685)	Vaginal birth prior to cesarean delivery (N = 198)	Prior VBAC (N = 321)	P
Successful trial of labor	1181 (70.1)	162 (81.8)	299 (93.1%)	< .001*†‡
Reason for cesarean delivery				
Fetal distress	167 (9.9)	17 (8.6)	9 (2.8)	< .001†‡
1st stage dystocia	265 (15.7)	18 (9.1)	9 (2.8)	< .001*†‡
2nd stage dystocia	72 (4.3)	1 (0.5)	4 (1.2)	< .001*†
Operative vaginal delivery	247 (14.7)	11 (5.6)	6 (1.9)	< .001*†
3rd/4th-degree lacerations	144 (8.5)	5 (2.5)	12 (3.7)	< .001*†
Shoulder dystocia	23 (1.4%)	3 (1.5)	4 (1.2)	.91
Uterine rupture	26 (1.5)	1 (0.5)	1 (0.3)	.12
Uterine dehiscence	27/504 (5.3)	1/36 (2.8)	5/24§ (20.8)	.001†

VBAC, vaginal birth after cesarean delivery.

Data are presented as n (%).

* P < .05 for patients with vaginal birth prior to cesarean delivery vs patients with no prior vaginal delivery, based on post hoc test using Bonferroni's rule.

† P < .05 for patients with prior VBAC vs patients with no prior vaginal delivery, based on post hoc test using Bonferroni's rule.

‡ P < .05 for patients with vaginal birth prior to cesarean delivery vs prior VBAC, based on post hoc test using Bonferroni's rule.

§ Three cases of dehiscence were diagnosed during a cesarean delivery and 2 cases during an emergency postpartum laparotomy.
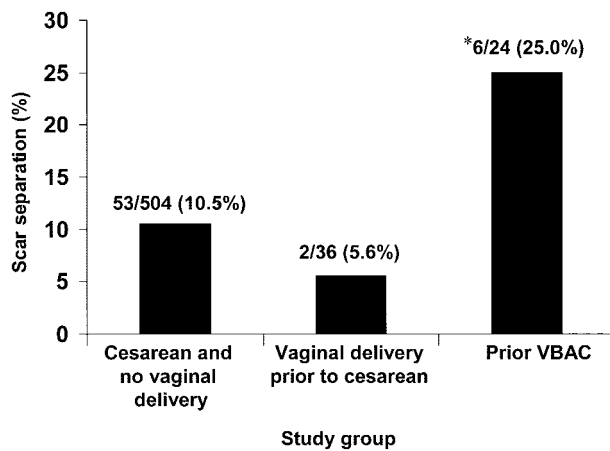
Fig. 1. Difference between the study groups in the rate of uterine scar separation (symptomatic uterine rupture and incidental finding of uterine scar dehiscence) at the time of cesarean delivery or postpartum emergency laparotomy. Patients with a prior vaginal birth after cesarean delivery (VBAC) had more scar separation compared with patients with a vaginal birth before cesarean delivery and with patients with a prior cesarean delivery and no vaginal birth (∗ P < .05).

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scribed.[1–8] Scoring systems include prior vaginal birth as a predictor for a successful trial of labor, whether it is VBAC or prior vaginal birth.[15,16] Our results correlate well with the study of Caughey et al,[6] who reported the rate of successful trial of labor in 800 patients with a prior cesarean and a single prior vaginal delivery. They found a 92.8% success rate for trial of labor in patients with a prior VBAC compared with 84.3% in patients with a single vaginal delivery before the index cesarean delivery (P = .002). However, they did not compare the rate of uterine rupture or dehiscence between the 2 groups.

It is an important finding that prior VBAC is associated with a higher rate or uterine scar dehiscence. There are few data in the literature on this subject. Zelop et al[9] evaluated the effect of a previous vaginal birth on the risk of uterine rupture in 3,783 women undergoing trial of labor. Of these women, 2,762 (73%) had a previous cesarean delivery and no vaginal birth, and 1,021 had 1 or more previous vaginal delivery. The rate of uterine rupture was 1.1% and 0.2%, respectively (P = .01). After adjusting for confounding variables, 1 or more previous vaginal delivery (OR 0.2, 95% CI 0.04–0.8) and induction of labor with oxytocin (OR 4.6, 95% CI 1.5–14.1) remained associated with uterine rupture. They did not adjust their results for the order of deliveries (vaginal delivery before cesarean delivery or prior VBAC) or for the number of prior vaginal births. The type of closure of the prior cesarean delivery as well as the rate of uterine scar dehiscence or scar separation was not reported. It is noteworthy that in that same study, the only 2 patients with 1 or more vaginal deliveries who ruptured their uterus had 2 prior VBACs and no vaginal delivery before their cesarean delivery.

We hypothesize that the process of labor or maybe pregnancy itself after a previous cesarean delivery could potentially stretch the scar and therefore increase the rate of uterine scar dehiscence at the subsequent delivery. Because a successful prior VBAC is associated with a shorter labor and a lower rate of labor dystocia, the higher rate of dehiscence does not necessarily reflect into a higher rate of uterine rupture. Gotoh et al[17] reported that the thickness of the low uterine segment of patients after a cesarean delivery decreases during the third trimester of pregnancy. However, they did not study the thickness at the subsequent pregnancy or between patients with and without prior VBAC. Further studies are needed to confirm our data.

The main limitations of our study remain: 1) the retrospective collection of the data, 2) the rarity of uterine scar separation, and 3) the possible variability in the report of uterine scar dehiscence. However, because the proportion of cesarean deliveries for dystocia or fetal distress was comparable between the groups, we believe the bias in the report of uterine scar dehiscence to be limited.

In conclusion, a prior vaginal delivery and, particularly, a prior VBAC should be considered as favorable factors associated with successful trial of labor, low rate of operative vaginal delivery, and low rate of third- and fourth-degree perineal laceration in patients with a prior cesarean delivery. However, it is possible that a prior VBAC increases the rate of uterine scar dehiscence. Therefore, prolonged labor dystocia should probably be avoided in this population.

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