**Uterine Rupture During VBAC Trial Of Labor:**

**Risk Factors and Fetal Response**

Taken from  **Risk Factors and Fetal Response** by Nancy O'Brien-Abel,  RNC,  MN

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**Abstract: For the woman with a prior uterine scar, neither repeat elective cesarean birth nor vaginal birth after cesarean birth (VBAC) trial of labor (TOL) is risk-free**

**Informative Excerpts for "Informed Consent" Relative**

**to Trial  of Labor /VBAC Decision Making**

**When VBAC-TOL is successful, it is associated with less morbidity than repeat cesarean birth. However, when VBAC-TOL fails due to uterine rupture, severe consequences often ensue**.

**(R)enewed controversy about the relative safety of VBAC-TOL has resulted in a rapid decline in the number of women who experience VBAC, falling from 28.3 per 100 women in 1996 to 16.4 per 100 in 2001, a 42% decrease.**

**Neither repeat cesarean birth nor TOL after cesarean is risk-free for women with a prior uterine scar. When VBAC-TOL is successful, it is associated with less morbidity than repeat cesarean birth.**[2-5, 9, 13]

However, **when VBAC-TOL results in uterine rupture, neonatal death or permanent neonatal injury can occur even in facilities with immediate access to cesarean birth**.

**A woman and her health care provider must evaluate the following:**

1) risk of complications associated with VBAC-TOL versus repeat elective cesarean birth,

2) capabilities of the birth facility,

3) personal choice, and

4) the probable success rate of VBAC-TOL.

Recent research has  **better defined factors that influence probable success of VBAC**.

**Characteristics in a woman's obstetric history (type of uterine scar, single-layer versus double-layer uterine closure, number of prior cesarean births, number of prior vaginal births, interdelivery interval, maternal age, maternal fever following cesarean), in addition to factors related to current labor management (induction or augmentation with prostaglandins and/or oxytocin), have been found to significantly influence uterine rupture rates during VBAC-TOL.**

**.... the authors concluded that women with a prior low vertical uterine incision are not at increased risk for uterine rupture during TOL compared with women who had a prior low transverse uterine incision**.

In a recent, larger, observational cohort analysis, Bujold et al.[35] **identified a nearly four-fold increased incidence of uterine rupture during VBAC-TOL in women who had a single-layer closure of the previous lower uterine segment incision compared to women who had a previous double-layer uterine closure**

At the time of the initial cesarean, single-layer closure was used in 489 women and double-layer closure in 1491 women.  **Uterine rupture occurred in 15 (3.1%) of the women with previous single-layer closure and in 8 (0.5%) of the women with a previous double-layer closure**  (*P* < .001). On the basis of these findings, **the authors recommended that surgeons consider using a double-layer closure technique** for women who may subsequently experience a TOL.

**Uterine rupture occurred in 1.7% of the women with two or more previous cesareans compared with a uterine rupture incidence of 0.6% in those with only one prior cesarean birth**  (OR: 3.06; 95% CI: 1.95-4.79; *P* < .001). However, this retrospective analysis did not control for other aspects of the women's obstetric history or labor management.

 **Uterine rupture occurred in 1% (3/302) of the women with two or more prior cesareans compared to 0.5% (5/1,110) in the women who had one prior scar on the uterus**. More recently, Caughey et al.[37] conducted a retrospective analysis of 3871 women who underwent a VBAC-TOL. **The rate of uterine rupture was 3.7% among 134 women in the two-scars group compared to 0.8% in the 3,757 women with one previous uterine scar**

After controlling for maternal age, epidural analgesia, oxytocin induction, oxytocin augmentation, use of prostaglandin E2 gel, birth weight, gestational age, type of prior hysterotomy, year of TOL, and prior vaginal delivery, **women with two prior cesarean scars were still 4.8 times more likely to experience uterine rupture during VBAC-TOL than women with one prior uterine scar** (OR: 4.8; 95% CI: 1.8-13.2).

In summary,  **women with two or more prior uterine scars have a significantly increased risk of uterine rupture during VBAC-TOL**  compared to women with only one prior uterine incision.

Although the number of previous cesarean births appears to increase a woman's risk for uterine rupture during a VBAC-TOL, **prior vaginal birth appears to be somewhat protective**.

**Vaginal birth, which occurred either before or after the incident cesarean birth, lowered the risk of uterine rupture in subsequent VBAC-TOL**. The rate of uterine rupture among women **with prior vaginal birth was 0.2% (n = 2/1,021), compared to a rate of 1.1% (n = 30/2,762) among the women with no prior vaginal births** (*P* = .01).

After controlling for birth weight, use of epidural analgesia, duration of labor, maternal age, year of TOL, induction with oxytocin, induction with prostaglandin E2 gel, and oxytocin augmentation,  **women having one or more prior vaginal births had a rate of uterine rupture that was one fifth the rate noted in women without prior vaginal birth**  (OR: 0.2; 95% CI: 0.04-0.8).

**Uterine rupture occurred in 2.8% of the women with an interdelivery interval of 24 months or less compared to 0.9% in women with an interdelivery interval greater than 24 months**  (*P* < .01).

After controlling for potential confounding variables, **women with an interdelivery interval 24 months or less were almost 3 times more likely to experience uterine rupture (OR: 2.65; 95% CI: 1.08-5.46). Furthermore, the combination of an interdelivery interval 24 months or less and single-layer uterine closure of the previous uterine incision increased the incidence of uterine rupture to 5.6%.**

After controlling for birth weight, labor induction, labor augmentation and interdelivery interval,  **women 30 or more years of age were 3.2 times more likely to experience uterine rupture during VBAC-TOL than women younger than 30 years old**  (OR: 3.2; 95% CI: 1.2-8.4).

**Three large population-based, cohort analyses have demonstrated that the risk for uterine rupture exists, whether a woman with a prior cesarean birth has a scheduled repeat cesarean or VBAC-TOL**

Rageth et al.[10] examined a database of records from 1**7,613 women attempting VBAC-TOL in Switzerland and reported an overall uterine rupture rate of 0.4%**  (n = 70/17,613) in the VBAC-TOL group, **which was slightly higher than the 0.19% uterine rupture rate in the women who underwent elective repeat cesarean birth** (n = 22/11,433).

Lydon-Rochelle et al.[12] reviewed Washington State vital records and abstracted hospital discharge (ICD-9)  **diagnoses to report a 0.16%** (n = 11/6,980)  **incidence of uterine rupture among women who underwent an elective repeat cesarean without labor and an incidence of uterine rupture of 0.6% (n = 80/13,115) among women attempting VBAC-TOL**

**...it is unclear whether this increased incidence of uterine rupture is secondary to other risk factors, specifically the additive effect of induction of labor with either oxytocin and/or prostaglandins.**

Lydon-Rochelle et al.[12] found **women who experienced spontaneous labor had a 0.52% (n = 56/10,789) incidence of uterine rupture compared to an incidence of 0.77%** (n = 15/1,960) in women whose labors were induced with oxytocin.

Zelop et al.[44] **reported a uterine rupture rate of 0.7% (n = 16/2,214) among women attempting VBAC-TOL with spontaneous labor compared to 2.0% (n = 9/458) among women induced with oxytocin**.

After controlling for birth weight, epidural anesthesia, duration of labor, maternal age, year of delivery, and years since last birth, **induction of labor with oxytocin was associated with a 4.6-fold increased risk of uterine rupture, compared to the rate noted in women who had spontaneous labor (**OR: 4.6; 95% CI: 1.5-14.1).

**Augmentation with oxytocin was found to be associated with a 2.3-fold increased risk of uterine rupture**  (OR: 2.3; 95% CI: 0.8-7.0); however, this difference was not statistically significant.

Leung et al.[45] conducted a case-control study of 70 women with prior cesarean birth attempting VBAC-TOL. After controlling for confounding variables,  **women receiving oxytocin were almost 3 times more likely to experience uterine rupture than the women in the control group** (OR: 2.7; 95% CI: 1.2-6.0).

Dysfunctional labor had an even greater effect on increasing the incidence of uterine rupture.  **Dysfunctional labor, primarily arrest disorders, increased the risk of uterine rupture 7-fold**  (OR: 7.2; 95% CI: 2.7-20.0).

**The presence of dysfunctional labor may be a factor for uterine rupture or a marker for its occurrence.** Further study is needed to determine if the major risk for uterine rupture is dysfunctional labor, use of oxytocin, or both. In summary, studies performed to date suggest  **oxytocin use may result in a higher risk of uterine rupture during VBAC-TOL.**

Overall,  **the rate of uterine rupture among those who received any PGE2 gel was 3.9% compared to 0.9% among those who did not receive PGE2 gel** (*P* = .02).

After controlling for oxytocin induction and augmentation, birth weight, use of epidural anesthesia, duration of labor, maternal age, year of delivery, and years since last birth,  **induction of labor with PGE2 gel alone was not found to be a significant risk factor for uterine rupture**.

 **Uterine rupture occurred at a rate of 1.6 per 1,000 women who experienced a repeat cesarean birth without labor compared to an incidence of 24.5 per 1,000 women in the induction of labor with prostaglandins group**  (RR: 15.6; 95% CI: 8.1-30.0).

**The study was stopped prematurely secondary to two emergency cesarean sections with noted uterine disruption at the time of surgery in the women who received misoprostol.** In a larger series, Plaut et al.[52] reviewed the uterine rupture cases from two hospitals over 20 months in 1996 to 1997.  **Of the 89 women induced with misoprostol in this combined series, uterine rupture occurred in 5.6% (5/89)**.

**Studies examining the fetal heart rate (FHR) prior to uterine rupture consistently report that non-reassuring fetal heart rate patterns are the predominant sign suggesting impending or actual uterine rupture.**

Menihan[57] examined the FHR tracings of 11 women attempting VBAC-TOL and reported **fetal bradycardia in 82% (n = 9/11) prior to uterine rupture.** **Prior to the bradycardia, 73% (n = 8/11) had variable decelerations, 36% (n = 4/11) had late decelerations, 27% (n = 3/11) had early decelerations, and**  **none had tachycardia.** In a review of eight  **fetal monitor tracings for 2 hours preceding uterine rupture, Ayres et al.[58] identified recurrent late decelerations in 88% (n = 7/8) and terminal bradycardia in 50% (n = 4/8) of the tracings.**

In a larger study, Leung et al.[14] analyzed the FHR and uterine contraction pattern immediately prior to 78 cases of uterine rupture. **Prolonged deceleration was defined as a FHR less than 90 beats per minute that exceeded 1 minute without return to baseline. Prolonged deceleration (alone or proceeded by either severe late or variable decelerations) occurred in 71% (n = 55/78) of the cases of uterine rupture.**

**Although similar in response times, neonatal neurological morbidity was more significant with uterine rupture than with umbilical cord prolapse**. Neonatal arterial blood pH less than 7.1 occurred in 47% of the uterine rupture cases compared to only 3% in the umbilical cord prolapse group (*P* < .005).

**Likewise, 5-minute Apgar scores less than 6 were found in 33% of the uterine rupture cases compared to 3% in the umbilical cord prolapsed group (*P* < .05). At 2- to 6-month follow-up, three (20%) of the newborns in the uterine rupture group were diagnosed with ischemic encephalopathy and major neurologic impairment compared to none in the cord prolapse group (*P* < .05).**

Porter et al.[15] examined the neonatal outcome in 26 cases of uterine rupture occurring during VBAC-TOL in large hospitals in a single metropolitan region, all of which had 24-hour in-house anesthesia coverage. Six (23%) infants suffered either neonatal death or adverse neurologic sequelae as a result of the uterine rupture. **Poor neonatal outcome was seen in 31% of the infants birthed within 30 minutes and in 33% of the infants birthed within 20 minutes of either severe variable decelerations or bradycardia. In a larger study, Leung et al.[14] evaluated 78 cases of uterine rupture in a large tertiary care medical center and reported significant neonatal morbidity when 18 minutes or more elapsed between the onset of prolonged deceleration and birth. When the prolonged deceleration was preceded by severe late or variable decelerations, fetal asphyxia occurred as early as 10 minutes from the onset of prolonged deceleration.**

Bujold and Gauthier[17] examined 23 cases of uterine rupture in a tertiary care medical center with in-house obstetricians and anesthesiologists.  **Nine neonates (39%) had severe metabolic acidosis. Among these, four neonates had seizures, two had multiple organ failure, and three were diagnosed with hypoxic-ischemic encephalopathy.** Within this group, **one intrapartum death** occurred. All three neonates with hypoxic-ischemic encephalopathy were outside the uterus at the time of laparotomy. Contrary to the findings of Leung et al., **less than 18 minutes elapsed** between the time of prolonged deceleration and delivery in two of the three neonates diagnosed with hypoxic-ischemic encephalopathy (15 and 16 minutes). **Prompt intervention does not always prevent severe, fetal metabolic acidosis or neonatal death. Even in facilities with immediate access to cesarean birth uterine rupture can result in catastrophic outcome.**

**Summary**: A pregnant woman with a previously scarred uterus is at increased risk for complications whether she has a successful VBAC-TOL, unsuccessful VBAC-TOL or elective repeat cesarean birth. Neither elective repeat cesarean nor VBAC-TOL is risk-free.  **Only by eliminating primary cesarean deliveries can we hope to obviate the need for repeat cesareans or VBAC-TOL.**

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