Trial of Labor After Cesarean Section

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Definition

- TOLAC – trial of labor after cesarean section
- VBAC – vaginal birth after cesarean section
- HBAC – home birth after cesarean section
- VBAC-2 vaginal birth after 2 prior cesarean sections
Uterine Rupture

- Separation of the uterine scar (determined at laparotomy), immediately preceded by either:
  - a nonreassuring fetal heart rate pattern (determined by the treating provider) or by signs/symptoms of acute maternal bleeding (systolic blood pressure <70 mm Hg, diastolic blood pressure <40 mm Hg, heart rate
  - or by the presence of blood in the maternal abdomen at the time of laparotomy

VS

- Disruption of all uterine layers with consequences for potential hemorrhage, cord compression, abruption, fetal compromise and significant maternal morbidity
Epidemiology

- Cesarean Section Rate (National Health Statistics)
- 1965 – 4.5%

<table>
<thead>
<tr>
<th></th>
<th>2013 Cesarean Section rate</th>
<th>2013 Low risk Cesarean Section rate</th>
<th>2014 Cesarean Section Rate</th>
<th>2014 Low risk Cesarean Section rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>32.7</td>
<td>26.8</td>
<td>32.2</td>
<td>26.0</td>
</tr>
<tr>
<td>West Virginia</td>
<td>35.9</td>
<td>29.3</td>
<td>35.4</td>
<td>25.4</td>
</tr>
</tbody>
</table>
Declining rates across ethnicities over the past five years

- Non-Hispanic white 31.4%
- Non-Hispanic black 35.6%
- Hispanic 31.9%
- API 33.2
- AIAN 28.5%
Trial of Labor After Cesarean Section
(NIH Consensus Development Conference Statement VBAC: New Insights)

- **Risks**
  - Uterine Rupture
  - Blood Transfusion
  - Hysterectomy
  - Neonatal Unit Admission
  - Perinatal asphyxial Injury/Death

- **Benefits**
  - Maternal Mortality
  - Shorter Hospital Stay
  - Lower rates of DVT
  - Decreased rate of abnormal placentation
Figure 4. Maternal morbidity for women with a previous cesarean delivery, by method of delivery and trial of labor: 41-state and District of Columbia reporting area, 2013

1Difference in rates between VBAC and Repeat cesarean-No trial of labor is not statistically significant.
2Difference in rates between Repeat cesarean-Failed trial of labor and Repeat cesarean-No trial of labor is not statistically significant.

NOTES: The birth certificate reporting area represented 90% of all U.S. births in 2013. ICU is intensive care unit.
No prior cesarean section 0.65%,
One prior cesarean section 0.42%
Two prior cesarean sections 0.90%
Three prior cesarean sections 2.41%
Four prior cesarean sections 3.49%
Five or more prior cesarean sections 8.99%
Future Morbidity

- Placenta Previa (rates)
  - 1 prior c/s - 0.8-1.5% (10/1000)
  - 2 prior c/s - 1.1-2.0%
  - 3 prior c/s – statistically significant increase up to 3.7% with 5 or more C/S (28/1000)

- Placenta Accreta
  - Occurs most frequently in women with a h/o c/s with a current placenta previa
  - H/o 2 prior cesarean section the risk for accrete becomes statistically significant

- Complication Rates
  - increase in additional cesarean sections
    - Blood transfusion
    - Adhesions
    - Surgical injury
    - Hysterectomies
• Total of 39,117 women (Spong, et. al., 2007)
• H/o one prior cesarean section
• 2,721 elective repeat c/s with labor
• 5,002 indicated c/s without labor
• 1,078 indicated repeat c/s with labor
• VBAC rate 73.3%
Uterine Rupture

- Term pregnancy women with prior c/s
  - 0.32%
- Term pregnant planning a repeat c/s
  - 0.05%
- Risk adverse perinatal outcome – 0.27%
  - Still birth
  - Hypoxic ischemic encephalopathy - 15 cases
    - 12 after TOLAC
    - 3 repeat c/s without labor
- Neonatal Death
Maternal Risks

- 6 maternal deaths (Spong, et. al., 2007)
  - None associated with rupture
  - 5 elective repeat cesarean births
    - 3 amniotic fluid embolism
    - 1 hemorrhage
    - 1 anesthetic complication
  - 1 Tolac (hemorrhage)
TOLAC/VBAC

- If one prior cesarean section
  - Rupture rate 0.7% (Mercer, et al, 2008)
  - Success rate 73.4%
- If one VBAC after cesarean section
  - Rupture rate 0.45%
  - Success rate 87.6%
- If two VBAC after cesarean section
  - Rupture rate 0.43%
  - Success rate 90.9%
- Single prior c/s – success rate (74%) (Landon, 2006)
- Multiple prior c/s – success rate 66%
- Increased risk maternal morbidity
  - Odds ratio 1.35
- Perinatal outcomes – no significant difference
  - Stillbirth or neonatal death
  - Hypoxic ischemic encephalopathy
Maternal outcomes for women who had a VBAC attempt after 1 or 2 previous cesarean deliveries (n = 13,617) (Macones, 2005)

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>One previous cesarean delivery (n = 12,535)</th>
<th>Two previous cesarean deliveries (n = 1082)</th>
<th>Unadjusted RR (95% CI)</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterine rupture</td>
<td>0.9%</td>
<td>1.8%</td>
<td>2.0 (1.24-3.27)</td>
<td>2.30 (1.37-3.85)</td>
</tr>
<tr>
<td>Bladder Injury</td>
<td>0.43%</td>
<td>0.55%</td>
<td>1.28 (0.56-2.98)</td>
<td>1.22 (0.52-2.84)</td>
</tr>
<tr>
<td>Transfusion</td>
<td>0.68%</td>
<td>0.92%</td>
<td>1.36 (0.70-2.62)</td>
<td>1.24 (0.64-2.41)</td>
</tr>
<tr>
<td>Fever</td>
<td>9.5%</td>
<td>8.9%</td>
<td>0.93 (0.77-1.14)</td>
<td>0.82 (0.65-1.04)</td>
</tr>
<tr>
<td>Other major operative injury</td>
<td>0.99%</td>
<td>1.02%</td>
<td>1.02 (0.56-1.90)</td>
<td>0.94 (0.49-1.81)</td>
</tr>
<tr>
<td>Composite major morbidity</td>
<td>2.12%</td>
<td>3.23%</td>
<td>1.53 (1.08-2.16)</td>
<td>1.61 (1.11-2.33)</td>
</tr>
</tbody>
</table>
Increased Risk of Uterine Rupture

- Risks (Landon, 2007, NIH 2010)
  - Oxytocin augmentation
  - Induction of labor
  - < 2 year interval from last c/s

<table>
<thead>
<tr>
<th>Inconclusive Association (NNEPQIN 2011)</th>
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<tbody>
<tr>
<td>Gestational age 41 weeks or greater</td>
</tr>
<tr>
<td>Birth weight &gt;4000 gm</td>
</tr>
<tr>
<td>Previous single layer closure of the uterus</td>
</tr>
<tr>
<td>Maternal obesity, variously defined</td>
</tr>
<tr>
<td>Recurrent indication for initial cesarean delivery</td>
</tr>
<tr>
<td>Unfavorable cervical status at admission</td>
</tr>
<tr>
<td>Non-white ethnicity</td>
</tr>
<tr>
<td>3 or more prior cesarean sections</td>
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</tbody>
</table>
Associated with TOLAC Ending in Cesarean Section

- Higher rates of chorioamnionitis (Kamath, 2009)
- Nonreassuring fetal heart tones
- Induction of labor
Dosing affects probability of rupture (Cahill, et al, 2007)

- 1-5 mu/min nonsignificant increase
- 6-20 mu/min 3x risk uterine rupture
- > 20 mu/min 4 x risk or greater uterine rupture
Lowest Admission rates to NICU with VBAC (Kamath, 2009)

Highest admission rates with TOLAC ending in cesarean Section

Same with elective cesarean section with or without labor

With increased number of VBAC’s, trend toward decrease in frequency of low APGAR’s and hypoxic ischemic encephalopathy (Mercer, et al, 2008)

Perinatal death or encephalopathy 0.5/1000 TOLAC (Landon, 2008)
**Factors Associated With Decreased VBAC Success (NNEPQIN)**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Labor induction</td>
</tr>
<tr>
<td>Labor augmentation</td>
</tr>
<tr>
<td>Short inter-pregnancy interval</td>
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<tr>
<td>Birth weight &gt;4000 gm</td>
</tr>
<tr>
<td>Gestational age 41 weeks or greater</td>
</tr>
<tr>
<td>Excess maternal weight gain, variously defined</td>
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<tr>
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<td>Non-white ethnicity</td>
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The following recommendations are based on good and consistent scientific evidence (Level A):

Most women with one previous cesarean delivery with a low-transverse incision are candidates for VBAC and should be counseled about VBAC and offered a TOLAC (ACOG, 2010)

Women with two previous low transverse cesarean deliveries may be considered candidates for TOLAC.
Challenges of providing TOLAC care
A trial of labor after previous cesarean delivery should be undertaken at facilities capable of emergency deliveries (ACOG 2010)
Northern New England Perinatal Quality Improvement Network

Low Risk Patient: Risk for uterine rupture approximately 0.3-0.7%.

- 1 or 2 prior low transverse cesarean section(s)
- Spontaneous onset labor
- No need for augmentation
- No repetitive FHR abnormalities
- Patients with a prior successful VBAC are especially low risk. However, their risk status escalates the same as other low risk patients.
Medium Risk Patient: Risk for uterine rupture is likely greater than 0.7%.

- Induction of labor
- Oxytocin augmentation
- < 18 months between prior cesarean section and current delivery.
- 3 or more prior low transverse cesarean sections.
### TABLE 3
Duration of labor in women experiencing uterine rupture, and successful and failed TOLAC

<table>
<thead>
<tr>
<th>Cervical dilation, cm</th>
<th>Successful TOLAC (n = 341)</th>
<th>P value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Uterine rupture (n = 115)</th>
<th>P value&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Failed TOLAC (n = 120)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-4</td>
<td>0.63 (0.13, 3.11)</td>
<td>.46</td>
<td>0.48 (0.10, 2.37)</td>
<td>.26</td>
<td>0.48 (0.16, 3.81)</td>
</tr>
<tr>
<td>4-5</td>
<td>0.48 (0.09, 2.63)</td>
<td>.53</td>
<td>0.59 (0.11, 3.21)</td>
<td>.26</td>
<td>0.89 (0.16, 4.89)</td>
</tr>
<tr>
<td>5-6</td>
<td>0.32 (0.05, 1.87)</td>
<td>.42</td>
<td>0.42 (0.07, 2.45)</td>
<td>.89</td>
<td>0.44 (0.08, 2.60)</td>
</tr>
<tr>
<td>6-7</td>
<td>0.16 (0.03, 0.93)</td>
<td>.30</td>
<td>0.24 (0.04, 1.40)</td>
<td>.95</td>
<td>0.39 (0.07, 2.24)</td>
</tr>
<tr>
<td>7-8</td>
<td>0.16 (0.03, 0.79)</td>
<td>&lt;.01</td>
<td>0.38 (0.08, 1.91)</td>
<td>.44</td>
<td>0.27 (0.06, 1.36)</td>
</tr>
<tr>
<td>8-9</td>
<td>0.10 (0.02, 0.39)</td>
<td>&lt;.01</td>
<td>0.28 (0.07, 1.10)</td>
<td>.48</td>
<td>0.29 (0.07, 1.14)</td>
</tr>
<tr>
<td>9-10</td>
<td>0.16 (0.03, 0.82)</td>
<td>.83</td>
<td>0.14 (0.03, 0.74)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4-10</td>
<td>2.61 (0.87, 7.84)</td>
<td>.37</td>
<td>3.16 (1.05, 9.50)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Adjusted for prior vaginal delivery. Data are median (5th, 95th percentile) in hours.
TOLAC, trial of labor after cesarean.

<sup>a</sup> Compares successful TOLAC to uterine rupture; <sup>b</sup> Compares failed TOLAC to uterine rupture.

High Risk Patient: Patients who have intrapartum signs or symptoms that may be associated with uterine rupture or failure of vaginal delivery.

- Recurrent clinically significant deceleration (variable, late or prolonged fetal heart rate decelerations) not responsive to clinical intervention
- Significant bleeding of uterine origin
- New onset of intense uterine pain
- 2 hours without cervical change in the active phase despite adequate labor


Tasheen F, Griffiths M: Vaginal birth after two caesarean sections (VBAC-2)—a systematic review with meta-analysis of success rate and adverse outcomes of VBAC-2 versus VBAC-1 and repeat (third) caesarean sections. BJOG 2010;117:5–19